Assessing the Future

LANDSCAPE of Scholarly Communication

An Exploration of Faculty Values and Needs in Seven Disciplines

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In 2005, the Center for Studies in Higher Education embarked on an exploratory study of the future of scholarly communication, which had at its core an investigation of academic value systems in five disciplines. The present report represents an extension and more in-depth continuation of that work, focusing on seven additional fields. Our premise has always been that disciplinary conventions matter and that social realities (and individual personality) will dictate how new practices, including those under the rubric of Web 2.0 or cyberinfrastructure, are adopted by scholars. That is, the academic values embodied in disciplinary cultures, as well as the interests of individual players, have to be considered when envisioning new schemata for the communication of scholarship at its various stages.

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ABSTRACT

Since 2005, the Center for Studies in Higher Education (CSHE), with generous funding from the Andrew W. Mellon Foundation, has been conducting research to understand the needs and practices of faculty for in-progress scholarly communication (i.e., forms of communication employed as research is being executed) as well as archival publication. This report brings together the responses of 160 interviewees across 45, mostly elite, research institutions in seven selected academic fields: archaeology, astrophysics, biology, economics, history, music, and political science. The overview document summarizes the main practices we explored across all seven disciplines: tenure and promotion, dissemination, sharing, collaboration, resource creation and consumption, and public engagement. We published the report online in such a way that readers can search various topics within and across case studies.[*] Our premise has always been that disciplinary conventions matter and that social realities (and individual personality) will dictate how new practices, including those under the rubric of Web 2.0 or cyberinfrastructure, are adopted by scholars. That is, the academic values embodied in disciplinary cultures, as well as the interests of individual players, have to be considered when envisioning new schemata for the communication of scholarship at its various stages.

We identified five key topics, addressed in detail in the case studies, that require real attention:

(1) The development of more nuanced tenure and promotion practices that do not rely exclusively on the imprimatur of the publication or easily gamed citation metrics,
(2) A reexamination of the locus, mechanisms, timing, and meaning of peer review,
(3) Competitive, high-quality, and affordable journals and monograph publishing platforms (with strong editorial boards, peer review, and sustainable business models),
(4) New models of publication that can accommodate arguments of varied length, rich media, and embedded links to data; plus institutional assistance to manage permissions of copyrighted material, and
(5) Support for managing and preserving new research methods and products, including components of natural language processing, visualization, complex distributed databases, and GIS, among many others.

Although robust infrastructures are needed locally and beyond, the sheer diversity of scholars' needs across the disciplines and the rapid evolution of the technologies themselves means that one-size-fits-all solutions will almost always fall short. As faculty continue to innovate and pursue new avenues in their research, both the technical and human infrastructure will have to evolve with the ever-shifting needs of scholars. This infrastructure will, by necessity, be built within the context of disciplinary conventions, reward systems, and the practice of peer review, all of which undergird the growth and evolution of superlative academic endeavors.

[*] See: http://escholarship.org/uc/cshe_fsc

CHAPTER 1: OVERVIEW, FINDINGS, AND CONCLUSIONS

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INTRODUCTION

While many studies have addressed specific issues like the costs of launching academic journals and the finances of university presses,[1] there has not yet been a broad-scale, comprehensive analysis focusing on how the university and its various stakeholders, most notably faculty, value traditional and emerging forms of scholarly communication. The A.W. Mellon Foundation awarded The Center for Studies in Higher Education (CSHE) a multi-year grant in January 2007 to conduct research that explores the emergence of alternative scholarly communication models in relation to faculty values in a select number of academic disciplines. This report provides the results of our work.[2]

Our research focuses on understanding faculty needs and practices for *in-progress* scholarly communication as well as archival publication. Among our goals is providing a broader understanding of the full array of activities related to the scholarly communication lifecycle in order to enable the accurate assessment of the academy's future communication and publication landscape. The following are among the questions driving our work:

- What will scholars in various core disciplines want to do in their research and with their research results, and what new forms of communication do or do not support those needs?
- How will scholars want to disseminate and receive input on their work at various stages of the scholarly communication lifecycle?
- What are the emerging trends in research and publication practices?
- What is the scope and depth of pent-up demand for new models of communication in various sectors/disciplines?
- How do institutions and other stakeholders support these faculty needs, if at all?

We suggest that more innovation does and will occur first during in-progress communication than in final, archival publication. One can foresee a scenario where useful and effective innovations in in-progress communication may eventually serve to drive improvements in final, archival publication. It is therefore worthwhile to gain deeper insight into the needs, motives, and new capabilities within in-progress communication as well as final, archival publication. We describe here our results based on the responses of 160 interviewees across 45, mostly elite, research institutions in seven selected academic fields: archaeology, astrophysics, biology, economics, history, music, and political science. The report is divided into eight chapters, which include a chapter synthesizing our methods and research results plus seven detailed disciplinary case studies.

The significant work leading up to the current research, including the planning project report (King *et al.* 2006, Harley *et al.* 2007), the five associated disciplinary case studies, and the most recent proposal can be found on the Future of Scholarly Communication project's website.[3]

[1] See, for example, studies cited in background documents at the Future of Scholarly Communication project website, such as the bibliography of the planning grant final report (King *et al.* 2006): http://cshe.berkeley.edu/research/scholarlycommunication

[2] Many of the conclusions in this report were presented preliminarily in an interim report (Harley *et al.* 2008).

[3] The planning grant disciplines were anthropology, biostatistics, chemical engineering, English-language literature, and the combined field of law and economics. These are published at http://cshe.berkeley.edu/research/scholarlycommunication/

METHODS AND RESEARCH QUESTIONS

GOALS

The goals of this project were to map and assess systematically, in seven disciplines:

- The current and evolving scholarly communication needs of researchers in seven selected representative academic fields. Our focus is on assessing scholars' attitudes and needs as both producers and users of research results,
- The capabilities of various traditional and emerging models of scholarly communication and publication for meeting those needs, and
- The likely future scenarios for scholarly communication (by field), and how those scenarios might be best supported by institutional organizations and units (e.g., departments, libraries, commercial publishers, societies, etc.).

DISCIPLINES

In consultation with our steering committee[4] and others, we explored approximately 12-14 disciplines for inclusion in the study. In the first three months of the study, we conducted a large number (~20) of so-called "lay of the land" interviews with University of California (UC) colleagues and scholars with whom we had been put in contact by various sources. Based on those discussions, interviews from the planning grant, and background research activities, we chose seven broad disciplinary areas to be the subjects of our case studies:

- Archaeology (including classical, Mediterranean, and overlaps with history and art history)
- Astrophysics
- Biology/Molecular and Cell Biology (including a sample of large, interdisciplinary projects)
- Economics (including a sample of behavioral/neuroeconomics)
- History (the entire field plus a sample of collaborative, interdisciplinary centers and projects)
- Music (including electronic composition/performance and ethnomusicology)
- Political Science (the entire field, quantitative subfields, and neuropolitics)

INTERVIEWS AND FOCUS GROUPS

Our primary methodology relied upon in-depth interviews with faculty, supplemented by interviews with parties responsible for implementing innovative scholarly publishing initiatives, including librarians, publishers, and IT professionals. These interviews formed the primary basis for the disciplinary case studies. All but a few of the interviews were audio recorded, and each recorded interview was transcribed, cleaned, summarized, and tagged. Detailed notes were taken during all interviews. All interviews are stored on a secure, password-protected, file-

[4] A list of steering committee members is available at: http://cshe.berkeley.edu/research/scholarlycommunication/steeringcommittee.htm

sharing system provided by UC Berkeley. We conducted nine focus groups in addition to the interviews.

Interview Protocols

We developed an interview protocol that explores: how faculty use and value in-progress communication; how in-progress communication relates to needs and values for archival publication; faculty needs for the various types of in-progress communication and archival publication; and the extent to which in-progress communication influences reputations *vis-à-vis* final, archival publication. We distinguished between perceptions of new forms of communication (e.g., blogs, wikis, online conferences, etc.) and the need for databases and other intensive resource development. The short protocol, which we sent to interviewees prior to speaking with them, is below.

Short Protocol

Our overall goal is to understand what you and your colleagues want or need to support your research over the entire scholarly communication "lifecycle." This includes making a name for yourself, and requirements for tenure and promotion. We are interested in both final, archival publication (journals, books, etc.) as well as your needs in the earlier stages of your research (what we call "in-progress" communication).

1) What is required in your field for tenure and promotion? For making a name?
2) What criteria do you use when choosing a medium for publishing your research results or sharing your research ideas?
3) How has technology affected your scholarly communication practices, if at all? Including:
   - Do you share your work with other scholars and keep up to date in a field? Why or why not? How? When? What?
   - Do you collaborate with other scholars? Why or why not? How? At what stage of research?
   - What types of data/resources do you create and use for your own scholarship (e.g., the value of data archives, data sets, bibliographic, news sources, etc.)? What do you need that you don't have?
4) To what degree do you or your colleagues engage with the public? How? Why or why not?
5) What new, transformational developments in your field are on the horizon?

Sampling

We limited our investigation almost exclusively to research universities. Our sample of informants was derived through a combination of convenience and snowball sampling. Convenience sampling is typically used in exploratory research, and we have employed it since the beginning of the study; as the name implies, the sample is selected because it is convenient for the researcher. Snowball sampling is often used when it is difficult or cost prohibitive to

locate respondents in a more randomized way. Snowball sampling relies on referrals from initial informants to generate additional informants, and can be particularly effective in gaining access to elite populations. We are aware that both methods introduce bias because they reduce the likelihood of sampling a cross-section that is representative of the entire possible population. In spite of these drawbacks, however, we are convinced that these methods are especially useful when conducting qualitative research of the nature we are reporting here.

One hundred and sixty (160) interviews inform this report. We began exploration from our base at UC Berkeley; therefore, the early sample was heavily UC-centered. We did not limit ourselves to any one institution, however. We conducted formal interviews with individuals drawn from more than 45 institutions, most of which were Research I universities, but also included publishing houses and elite research centers and laboratories. Our method was to ask each interviewee for recommendations of colleagues. We then followed up with these individuals selectively. We made a conscious effort to talk with a sample of graduate students and postdoctoral scholars as well. Of the 160 total interviews, 132 were individual interviews; the remaining 28 participants met in nine focus groups.

Disciplines	**Completed***
Archaeology (3PG)	25
Astrophysics	25*
Biology (1PG)	25*
Economics (3PG)	14*
History (2PG)	24
Music/Performance (1PG)	22
Political Science (1PG)	16
Consultants (1PG)	4
Publishers (2PG)	3
Librarians (2PG)	3
Totals	**160**

In this sample (see table above), we have also included 16 planning grant (PG) interviews representing archaeology, economics, history, political science, the humanities in general, academic computing, publishing, and libraries. Roughly one-third of our sample represents full professors, one-sixth of our sample represents associate or untenured faculty, and another one-seventh of our sample represents faculty currently in high-level administrative positions (provosts, deans, vice chancellors, etc.). The remaining approximately one-third of our sample is composed of graduate students, postdoctoral scholars, librarians, publishers, research scientists, and IT/academic computing professionals. Within the entire sample, 29 faculty participants also hold active editorial positions and 24 of the professor-level participants have current or past experience as high-level administrators (e.g., dean, department chair, director of a research center, vice chancellor, provost, president, etc.).

We have also had innumerable one-on-one conversations that covered the broader perspectives of additional scholars, librarians, and publishers. Our attempt to describe the larger "ecologies" of relevant scholarship also included taking numerous opportunities to participate as

* This category includes one individual who was interviewed twice (three individuals are duplicated in sample). The number of interviewees included in each case study may be more than the number of scholars interviewed in a particular discipline. This is due to the fact that some interviews "bled" across cases, and discipline-neutral consultants/publishers/librarians were brought in to comment where relevant to particular cases.

observers in meetings, symposia, and workshops that brought together a large number of scholars around themes and topics relevant to the present study.[5] Additionally, we targeted technological innovators and specific centers and projects (if they existed) in each field; physical visits to these sites provided us with a sense of institutional organization and support. We also asked the scholars we interviewed to describe where they go for support and their opinions about the quality of that support.

In the analysis, we combined the results of the interviews and focus groups with: (1) our knowledge from the planning study, (2) our ongoing background research on individuals and initiatives, and (3) the results of associated surveys and other activities,[6] to identify the current and evolving scholarly communication needs of researchers in selected disciplines. Additionally, we hosted a series of meetings. In November 2007, The University as Publisher meeting brought together scholars, publishers, administrators, and librarians, among others.[7] On the occasion of a visit to CSHE from Paul Courant (University Librarian and Dean of Libraries at the University of Michigan) in March 2009, we convened a small group meeting to discuss the nature, meaning, and future of peer review.[8] Our steering committee and expanding network of scholars and practitioners was an invaluable source of information and guidance.

DEVELOPING THE CASES: SELECTING AND ANONYMIZING QUOTES

It should be noted that our interviewees are independent souls with copious experience, opinions, and ideas. Many are well-regarded leaders, and even stars, in their fields. Although we tried to adhere to a "structured" interview format, it was not unusual for our interviewees to lead us on some merry and enlightening chases. We willingly complied because they brought issues to the surface that we may have not otherwise anticipated.

Exercising such freedom in the interview process ultimately resulted in significantly more time required to clean, summarize, code, and analyze interviews after the transcriptions were delivered. Moreover, the final case studies reflect not only the wide range of questions we chose to explore at the outset of the study,[9] but also a range of new and relevant topics introduced by our interviewees. For this reason, the granular aspects of each case study's outline vary according to the different scholarly communication practices, traditions, and challenges in each of the seven fields. Within these new frameworks, we spent considerable time analyzing each interview to select and cluster quotes as appropriate for content-relevance and readability; this was no small task given the expansive nature of the original dialogues. We chose quotes that we deemed the most compelling and that would contribute to the construction of a "conversational" narrative. We often used multiple quotes from different informants that carried a similar message to underline the fact that a majority opinion existed. Finally, we spent a significant amount of time simply anonymizing the quotes to comply with institutional review board

[5] These include George Mason University (GMU) Center for History and New Media, the Pacific Neighborhood Consortium (PNC), The Scholarly Communications Institute (SCI), The UCB Digital Humanities focus group, UC Irvine Humanities Research Institute (UCIHRI)/HASTAC MacArthur Foundation Future of Learning, and Bamboo.
[6] We have reviewed a variety of relevant internal and external reports from diverse sources including Ithaka, the Scholarly Communication Institute, the Association of Research Libraries, the Council on Library and Information Resources, and the California Digital Library, among others.
[7] A report from the meeting is available as Harley (2008).
[8] This meeting resulted in a grant to CSHE from the A.W. Mellon Foundation to explore the issue in more depth, commencing in October 2009.
[9] The questions informing the full protocol are published on p.5 of the original research proposal http://cshe.berkeley.edu/research/scholarlycommunication/sc_prop_final_lite.pdf

requirements for the protection of human subjects. Most of the quotes have been heavily edited, and sometimes paraphrased, to eliminate the possibility of inadvertent identification. All interviewees were invited to review the case studies before publication, with some reviewed multiple times. Although this process extended the time required for publication, we received a significant level of peer review that has added immeasurably to the quality and veracity of the documents that make up this report. We accept all responsibility for any errors.

SUMMARY OF FINDINGS

TENURE AND PROMOTION

WHAT ARE THE REQUIREMENTS FOR TENURE AND PROMOTION? WHAT ARE THE QUALITIES OF A SUCCESSFUL SCHOLAR?

There are virtually no surprises here. As we found in the planning study, peer-reviewed prestige publications are the "coin of the realm" in tenure and promotion decisions. Monographs and books—and, secondarily, journal articles—are important in history, traditional musicology, and archaeology.[10] Journal articles are important in astrophysics, biology, economics, and, increasingly, in the quantitative subfields of political science (and we hear "acceptable," in some cases, in music theory and classics). Music composition and performance, as with the arts in general, have other products (performances, commissions, software, etc.) that are judged. Securing grants in astrophysics and biology (as in many, if not most, sciences) is exceptionally important for advancement.

A Suite of Achievements Anchored by High-Impact Publication

There are a variety of criteria used to judge a successful scholar in a tenure and promotion case: publication, service, and teaching. Excellence in the latter two holds little weight without a stellar publication record and evidence that a scholar's work: is widely read, is judged to be of high quality by internal and external reviewers, and advances the field. Adjectives such as "groundbreaking," "creative," "original," "transformational," "high impact on the field," "indicative of sustainable scholarship," and "lauded by the larger community of scholars" are just some of the descriptive criteria that are used to judge the quality of a scholar's work in every discipline we examined.

Assessing Case by Case

We noted a fair amount of flexibility in terms of how a scholar coming up for tenure and promotion is judged; "quality over quantity" was a common refrain. Exceptions to the unwritten rules (e.g., N journal articles per year, N books, rigid adherence to citation indices, etc.) are regularly made if a scholar meets the more qualitative criteria given above. Each tenure and promotion case receives a prodigious amount of scrutiny and analysis (although a few interviewees mentioned cases in which the final review committees were not well equipped to make an informed decision given their distance from the subject matter, particularly in cases of

[10] For an examination of the extent to which scholarly monograph publication is essential for scholars to earn tenure in the humanistic disciplines, see Estabrook and Warner (2003).

dual departmental appointments). Interdisciplinary research and non-traditional scholarly products can require special attention in the review process, but we did not get the sense that these were insurmountable challenges. That is, mechanisms are built into the current system to address deviations from the norm, including myriad creative pursuits that fall outside of the bounds of traditional text scholarship. Codification of such practices is prevalent in the arts and some professional schools.

Institutional Variation

Every institution and department has different traditions and standards. At many of the institutions we surveyed, much of the vetting takes place before a scholar is hired. That is, the determination of a "good fit" with a department's goals is made well before the tenure case is presented. Some suggested that standards at second-tier institutions can vary significantly from those at the most competitive (e.g., publications in less selective journals and presses; fewer, or sometimes more, publications; more emphasis on teaching, etc.), but that anxiety about getting published in what is described as a "competitive" market can be much higher. This anxiety is exacerbated by what some observed to be an inexplicable and negative trickle-down effect from the practices of the top-tier research universities to those whose core missions are centered around teaching, not research.

Visibility in the Field, Reputation, and External Letters

The common practice of soliciting external letters as part of a tenure/promotion review means that making a name in the field is often closely linked to advancement requirements. As one economist commented, "You may not know these external reviewers directly, so they are only aware of you through your high-visibility publication record." In fields with working paper or preprint cultures, such publications can raise a scholar's visibility among senior scholars but are rarely, if ever, used in the final tenure and promotion dossier. Outlets such as blogs may contribute to a scholar's visibility, but are described as "neutral" or "negative" in institutional review.

Judging Other Scholarly Products

Scholars who produce data sets, cell lines, edited volumes, critical editions, exhibitions, dictionary/encyclopedia entries, software, etc., will get credit for that work, but these are usually not the sole basis upon which their scholarship is judged. Without high-impact publications, such activities do not count for much. Official credit can be earned, however, in a peer-reviewed publication that "discusses" the resource or data set. "Support" personnel, such as instrument builders in astrophysics, bioinformatics specialists in biology, and various technical support personnel in archaeology, are crucial to the overall scholarly productivity of any faculty member in those fields, but they produce non-text "scholarship" that can be difficult to assess by traditional means. This challenge will only grow as large collaborative projects, especially in the sciences, depend on ever-expanding cadres of technical experts.

Age and Institutional Factors

We found no evidence to suggest that "tech-savvy" young graduate students, postdoctoral scholars, or assistant professors are bypassing traditional publishing practices. In fact, as arguably the most vulnerable populations in the scholarly community, one would expect them to hew to the norms of their chosen discipline, and they do. Established scholars seem to exercise significantly more freedom in the choice of publication outlet than their untenured colleagues, although, in the sciences, high-impact publications remain important for garnering research grants throughout a career. There is some indication that faculty in newer and less-established departments in the humanities and social sciences may be more amenable to risk-taking in publication practices since their particular institutions support such efforts to carve out the identity of niche departments.

Conferences and Seminars

Some conference attendance—but not too much—is seen as important for newer scholars to network and to make a name for themselves (i.e., it's good to "make senior friends"). Senior faculty may spend less time at large conferences than their younger colleagues, although several charismatic professors in various fields firmly believed that attending conferences and keeping in touch with young scholars stimulates research in an important way. Smaller, subfield-specific meetings are preferred by almost everyone because of the ability to connect face-to-face with a manageably sized network and old friends. It takes time for a young scholar to break into these by-invitation meetings, so they are coveted as a way to raise one's visibility, reputation, and influence in a field.

New Publication Genres in the Humanities

As noted above, institutions already have experience in judging non-text productivity in the arts and some professional schools. Some individuals and departments in humanistic disciplines are discussing or implementing amendments to tenure and promotion criteria in order to draw analogies between existing forms of scholarly publication (e.g., books and articles) and new, multimedia, dynamic forms of publication. A number of interviewees identified the need to have a more nuanced tenure and promotion system that could judge "intermediate" forms of scholarship, such as archival websites, perhaps as something in between "service to the field" and a more formal peer-reviewed publication that advances a well-developed scholarly argument.

The fact remains, however, that: (1) new forms of scholarship must be perceived as having undergone rigorous peer review, (2) few untenured scholars are presenting such publications as part of their tenure packages, and (3) the mechanisms for evaluating new genres (e.g., nonlinear narratives and multimedia publications) may be prohibitive for reviewers in terms of time and inclination. Associate professors may well be the class that will exercise more freedom in the type of publication submitted for promotion to full professor (e.g., an encyclopedia or electronic resource instead of the second book).

Advice to Young Scholars

The advice given to pre-tenure scholars was quite consistent across all fields: focus on publishing in the right venues and avoid spending too much time on public engagement, committee work, writing op-ed pieces, developing websites, blogging, and other non-traditional forms of electronic dissemination (including courseware).[11]

PUBLICATION PRACTICES

WHAT ARE THE CHALLENGES AND OPPORTUNITIES FOR DISSEMINATING RESEARCH? WHAT ARE YOUR CRITERIA FOR CHOOSING A MEDIUM?

The Lack of Time and the Need for Filters

Although there is a universal embrace of the rapidly expanding body of digital "primary" sources and data, there is an equally strong aversion to a "glut" of unvetted secondary publications and ephemera. Time is one of the most important limiting factors for all parties involved in the production and consumption of scholarship. The unfiltered "noise" and low-quality work found both on the Internet and in the monograph and journal world has resulted in the perception that "junk" is proliferating at a rapid pace. Peer review, perceived selectivity, and other less formal mechanisms, such as "reputation," function to filter such noise for time-pressed faculty in the process of keeping up to date and determining what to read. The corollary is that, when choosing a venue for their own work, most authors choose the most selective outlets. There was near unanimity among scholars within a field in identifying those venues.

Speed

Speed to publication is essential for astrophysics, biology, economics, and political science. Archaeologists, historians, and music scholars are not generally concerned with speed for its own sake, although some lament the extensive time lag to publication. Working papers and preprints in astrophysics, economics, and political science are ways that scholars can get well-developed articles in the public domain quickly, thus laying claim to the ideas before their formal publication. Working papers seem to be nonexistent (and even disparaged) in molecular and cell biology, but journal turnaround time is generally very rapid. Although conferences and seminars function to get early ideas "out there" in all fields, the degree to which conference papers are circulated and/or published can vary by discipline and by individual conference (or, indeed, by individual preference).[12]

Targeting the Right Audience

As noted above, when a scholar is choosing where to publish, the stature and selectivity of the publication outlet, as well as its appropriateness for targeted audiences, are of utmost importance in all disciplines. We suspect that the desire for "wide readership" is an outgrowth of

[11] Archer (2008) also notes that this pressure contributes to "professional anxiety" among many pre-tenure scholars to attract funding and publish in the "right" places.
[12] None of the seven fields was observed to be moving to the computer science model in which conference papers are the most important form of scholarly dissemination in a dossier.

these criteria and not the primary motivation for selecting a publication venue (i.e., an open access online publication *without* a prestigious imprimatur will not usually be chosen over a prestigious commercial or not-for-profit publisher). When selecting a publication, scholars choose an outlet that will garner the highest visibility for a particular piece of scholarship within the specific audience they want to reach, even if that targeted audience is small. As a result, scholars often balance high-impact publications in flagship journals with publications in a variety of smaller outlets targeted at specific audiences both within and outside of the discipline.

Perceptions of a Crisis in Publishing

We heard little about a crisis in scholarly communication from our interviewees, with a few exceptions. For example, more than a few biologists, being well aware of the serials "crisis," exhibit a bias in support of open access journals, and may refuse to publish in commercial journals (especially Elsevier). Some select PLoS publications are making inroads as highly competitive outlets of choice as more top scientists eschew Elsevier and other commercial publications. Other biologists insist that the solution lies in supporting the non-profit journals published by scholarly societies. Starting new journals can be a challenge since selectivity, speed, the right target audience, and a very high-quality editorial review board are prerequisites for any new journal brand to take hold in the sciences. With the exception of perhaps speed, these criteria are important for any new journal to succeed in all of the fields we investigated.

Among humanists, there were quite a few rejections of the idea that there is a publishing crisis (with the exception of art history, a number of fields outside of American history, and perhaps at institutions whose faculty and graduate students are not as "competitive").[13] Good scholars doing good work at top-tier institutions seem to be able to get their books published with premier publishers. There was some (but not universal) consternation expressed about: (1) the growing two-book requirement for tenure in history and classics, (2) the glut of lower quality publications resulting from such a requirement, and (3) young scholars wasting time developing the dissertation into a first book instead of moving on to the second book (and showing the ability to sustain more than "one good idea"). For those who did see a publication crisis, this crisis was located in the fact that scholars producing good work could not get published—not because of the quality of their work—but because certain university presses had simply "stopped publishing" books in a number of areas and/or the costs of permissions were prohibitive. The oversupply of Ph.D.'s in some fields within the humanities and its effect on the monograph publication crisis (described as scandalous by some) cannot be ignored.[14]

Editorial Quality and Peer Review

Not surprisingly, there was a fair amount of criticism about the editorial and peer-review process for both journals and books, including laments of long lag times and editorial quality issues.[15] Although there were recommendations for improving it, peer review, like Churchill's democracy, was generally viewed as the best available system. Complaints were made about too many reviewers and reviewers who may lack the specific knowledge or background to judge

[13] For a detailed discussion on the perceived crisis in scholarly publishing in literature-related fields, see (MLA) Ad hoc Committee on the Future of Scholarly Publishing (2002).
[14] See, for example, Menand (2009).
[15] See Abbott (2008) for a discussion of the long history of such complaints about the scholarly communication system and peer review.

scholarship effectively. There were a number of comments about "too powerful" and/or "uninformed" editors arbitrating who gets published, even in some of the most prestigious journal imprints and presses. In some emerging or small fields, finding an unbiased reviewer can be difficult; a critical mass of potential reviewers able to give unvarnished opinions may not yet exist. In addition, some senior scholars felt overloaded by the number of requests to review work (including being asked to review the same paper moving down the journal "food chain" after serial rejections). This overload factor was cited by some as an important cause of the general decline in the quality of peer review. Opinions about alternative systems of peer review were proffered, but, given the general trust in the current system and the absence of a clear path to better alternatives, we could not discern what new models might actually succeed.[16] Various scholars suggested keeping the current peer-review system, but making it faster, more transparent (e.g., publishing peer reviews, identifying peer reviewers), and/or less redundant (e.g., sharing peer reviews when a paper is turned down and resubmitted to a different journal to save editorial and reviewer time). The over-reliance on proxies (such as the impact factor) for quality assurance is seen by many as a dangerous move away from the in-house assessment of scholarship and toward the increased outsourcing of peer review.

New Publishing Models/Quantum of Output

New publishing models were mentioned as being needed for shorter "monographs" in some humanistic disciplines and longer articles in the sciences. In biology, criticism was raised against constraining word limits to achieve "the smallest publishable unit" (*Science* and *Nature* being the extreme examples), which often eliminates detailed discussions of methods and room for deeper arguments. In history and archaeology, similar complaints were expressed about the exclusion of methods sections and constraints on the inclusion of high quality images and other supporting materials. Some humanists in music, art history, and history lamented the prohibitively high costs of permissions for publishing archival images and sound excerpts in their work.[17] Scholars in all seven fields embraced the potential of linking final publications directly to data sets and/or primary source material.

Affordances and Limitations of Dissemination Models

Concerns about the limitations of the current publication system have led to growing interest in the potential of electronic publication to extend the usefulness and depth of final publications (multimedia books, CDs, linked data, footnotes, embedded media, software, etc.). Those innovators in book-based fields who use hyperlinks, graphics, and audio want publications that can accommodate high quality media. No one we talked to, however, could point to the existence of easy-to-use tools (and sufficient institutional support and expertise) for publishing multimedia monographs and articles. The lack of such tools, the perceived difficulty of evaluating such publications, and the prohibitive costs to produce truly multimedia monographs suggest that experiments with these genres likely will be rare in the near term.

In sum, our findings suggest that enthusiasm for the development and adoption of technology should not be conflated with the hard reality of tenure and promotion requirements (including the needs and goals of final, archival publication) in highly competitive and complex

[16] See also Brown (2009).
[17] Ballon and Westermann (2006) speak about this crisis as it pertains to publishing reproductions in art history.

professional environments. Experiments in new genres of scholarship and dissemination are occurring in every field, but they are taking place within the context of relatively conservative value and reward systems that have the practice of peer review at their core. Perhaps as a consequence, we found that young scholars can be particularly conservative in their research dissemination behavior and that established scholars can afford to be the most innovative with regard to dissemination practices.

SHARING

HOW DO YOU SHARE YOUR WORK WITH OTHER SCHOLARS AND KEEP UP TO DATE IN A FIELD?

The Social Nature of Scholarship

Sharing scholarly work at multiple stages of development is universal. Most scholars are inherently "social" in this regard, although it is clear that personality is a key determinant of who shares what, with whom, and at what stage of research. Sharing most often occurs first using informal email exchanges within a circle of trusted colleagues (e.g., "personal communication"). As a piece of work becomes refined through this informal exchange, and before it is made public or submitted for publication, an ever-widening circle of colleagues may be enlisted for critiques (via presentation at conferences or, in some fields, the posting and circulation of working papers).

Cultures of Sharing: Informal Networks and Web 2.0

Astrophysicists, political scientists, economists, and perhaps performers/composers are the groups that have the lowest threshold for sharing scholarship prior to formal publication. Astrophysicists use the arXiv and economists (and some political scientists) use preprint servers or personal websites for posting in-progress work. It is important to note, however, that scholars in these fields do not share their in-progress work widely until they feel it has reached a certain level of excellence. That is, a modicum of privacy is essential for many scholars in their initial research dissemination practices. Indeed, research may not be posted as a working paper until it is deemed "good enough" for submission to a journal. This well-developed and informally vetted version is often referred to as the "penultimate draft."

Historians and archaeologists, with some notable exceptions, hold their work very close to the chest until their ideas are well developed, which can take many years. As far as we can determine, molecular and cell biologists in the most competitive universities do not share early findings or preprints until a paper has been accepted for publication, perhaps explaining the low uptake of Web 2.0 platforms for sharing early results. This group may be at the extreme among biologists; biomedical scientists and chemists may exhibit these tendencies as well. This is certainly due to the hyper-competitive atmosphere of those fields, the need for exceptionally rapid dissemination of results, the large size of the subfields, the speed with which experiments can be conducted, the imperative to receive due credit for work, and the commercial potential of some research. As one biochemist said, "Why publish early ideas? Just get the publication out there...Without formal publication, all of your brilliant ideas do not matter." Other interviewees suggested, however, that the sharing of early work may be comparatively more relaxed in fields

such as neurobiology, evolutionary biology, certain communities in the plant sciences, and ecology.

Mechanisms for Sharing

Personal websites are ubiquitous, even if used only to post a short bio or C.V. Some scholars also post course lists, working papers, and links to published papers. Blogs, RSS feeds, wikis, Twitter, etc., were not cited as common ways in which scholars broadcast and receive information. Listservs, seminars, and conferences were cited as important for finding out about new developments in a field and for seeking feedback on new ideas. Graduate students were mentioned by some tenured scholars as essential sources of new information; others lamented that they rarely were. It is worth noting that scholars are resourceful. For example, Gaulé (2009) describes the importance of informal peer-to-peer sharing of non-open access scientific articles among researchers in developing countries.

Sharing Data

Opinions varied on sharing and publishing data sets. Generally, most scholars are agreeable to sharing as long as they have finished their analyses and publication of the data in question. Sharing can ultimately depend on who is doing the asking and what they want to do with the data, since scholars need to ensure that they are properly credited and that work will not be "ripped off" for commercial purposes. Journals in the sciences, economics, and political science increasingly require that data sets be published by authors. Funding bodies are more often promoting the publication of data; whether or not this policy is mandatory differs among agencies. For example, NASA and other agencies require that observatories archive all observational data stemming from projects they support. Some scholars publish supplementary data sets on their websites, including codebooks and so on, after they complete and publish analyses.

Despite mandates, data sharing is idiosyncratic and may not occur at all (Nelson 2009, Noor, Zimmerman, and Teeter 2006, Savage and Vickers 2009, Schofield *et al.* 2009). In many fields, barriers to sharing include: a lack of personal time to prepare the data and necessary metadata, a desire to "squeeze" more publications out of the data in the future, a lack of clarity about how to prepare data for specific repositories, concerns about privacy and ownership of some data sets, and the sometimes Herculean difficulty of converting analog data to digital formats or migrating old digital formats to new ones. Some suggested that sharing data should be a high priority in academia because it allows for data reuse and provides transparency to replicate and facilitate better scholarship. Yet, institutional support for hosting and managing such data is not generally provided (with the exception of some large facilities for social science data and large-scale science repositories). There were also a few remarks that transparency may not be welcomed by those who fear that their work practices will come under too much scrutiny.

Blogs

Among most of our interviewees, blogs were simply off the radar as a source of scholarship and are generally viewed as a waste of time because they are not peer reviewed. "You have to have some standards! How in the hell are you going to judge the quality of what's on a blog?" "...who has the time!? There have to be some filters!" There was, however, limited mention of "good"

blogs in economics, astrophysics, political science, archaeology, and history (that often serve simply as more sophisticated versions of the subject listserv and are used in much the same way: for finding out about new developments or events in a field and for making general announcements). But again, the particular scholars we interviewed generally said that they do not spend time following them (even those who maintain their own blogs). A number of faculty mentioned reading blogs related to a topic of their research (e.g., a historian consulting a blog about a particular branch of science or a political scientist consulting a well-known economics blog in preparation for an interview with a media outlet).

Conservatism of Young Scholars

There may be a trend among young scholars in all fields, and particularly graduate students, to be especially leery of putting ideas and data out too soon for fear of theft and/or misinterpretation.[18] Given these findings, we caution against assumptions that "millennials" will change the landscape of scholarship by virtue of their facility with technology. There is ample evidence that, once initiated into the profession, newer scholars, be they graduate students, postdoctoral scholars, or assistant professors, adopt the behaviors and norms of their mentors to advance their careers.[19] Of course, teenagers eventually develop into adults. Moreover, given the complex motivations around sharing scholarly work and the importance of peer review as a quality and noise filter, we think it premature to assume that Web 2.0 platforms geared toward early public exposure of ideas or data, or open peer review, are going to spread among scholars at the most competitive institutions. These platforms may, however, become populated with materials—such as protocols or primary data—that established scholars simply want to disseminate in some formal way without undergoing unnecessary and lengthy peer review. It is also possible, based on our scan of a variety of "open peer review" websites, that scholars in less competitive institutions (including internationally), who may experience more difficulty finding a high stature publisher for their work, will embrace these publication outlets. Time will tell.

COLLABORATION

HOW DO YOU COLLABORATE WITH OTHER SCHOLARS? AT WHAT STAGE OF RESEARCH?

Motivations

Many fields are changing in ways such that "one group of experts can't do everything." This is particularly dramatic in fields that require significant computational analysis. Scholars in new music, archaeology, astrophysics, and biology are highly collaborative and rely on large teams of individuals who have varied expertise. Collaborations are not uncommon—although on a smaller relative scale—in history, economics, and political science. Collaborations are usually multidisciplinary by nature. Scholars collaborate for several reasons and, similar to the differing levels of comfort with sharing, the desire for collaborating depends on individual personality. Many scholars are motivated to collaborate because it is "fun," "makes you think harder," and

[18] Additional evidence for this conclusion is found in the concerns voiced by some of our young interviewees about not being able to get a book contract if they are forced to make their dissertation available electronically. See also, Foster (2008) and Taylor-Vaisey (2008).
[19] The strength of this "socialization" has been noted by many, including Covi (2000) and Hall and Burns (2009), among others.

provides opportunities to "bounce ideas around" with people who have different backgrounds and interests. When a scholar has an idea that requires different skills and expertise, finding the right people—the best people—with whom to collaborate is essential.

Collaborations arise in many ways. They may grow out of relationships forged in graduate school with peers or mentors, or in chance encounters at conferences and seminars. Scholars may identify collaborators by reading their publications (including when blind reviewing articles). Frequently, funding agencies (such as those in the European Union) require large-scale interdisciplinary collaborations crossing institutions and national borders, which increasingly require armies of technical support staff. In cases where data sets or equipment (e.g., telescopes, supercomputers, or fMRI) are shared, or funding is awarded across institutions, collaboration can be essential. Despite significant interdisciplinary research endeavors in many fields, the difficulty of locating publication venues and funding sources that straddle multiple disciplines may stymie some scholars.

Grand Challenge Questions

Large-scale collaboration is standard and increasing in the sciences, especially with funding bodies demanding innovative approaches to grand challenge questions or, as is the case in the European Union (EU), making cross-national collaborations a requirement of funding. Collaborations around interdisciplinary grand challenge questions are especially complex, creating new demands on funding streams, administrative homes, sharing of resources, institutional recognition of an individual's scholarly contribution, and the need to learn the "languages" of the multiple contributing disciplines. The picture is more mixed in many of the humanities and social sciences; collaboration beyond joint authorship of a paper or volume of essays is relatively rare in the US. That being said, there is a small, but well-funded, "digital humanities" community whose projects often have complex collaborations at their core.

Mechanisms for Collaboration

Astrophysicists and musicians/composers appear to use the most sophisticated technologies for collaboration (Skype, password-protected wikis, and high-speed networks to move data). It seems to be second nature for many of them. Wiki-like sites are often used internally in biology labs as well. Except for astrophysics and many large-scale projects in the sciences, most collaborators and coauthors use more prosaic mechanisms, such as the exchange of documents by email and FTP, using tracked changes. Scholars emphasized the importance of face-to-face contact for fostering dynamic and creative exchanges among collaborators. The sentiment that a handshake and eye contact provide the foundation of productive collaborations was near unanimous. These fundamental elements cannot be replaced by technology, although tools can enhance and sustain established collaborations among geographically distant scholars.

Intergenerational Collaboration

More than a few senior scholars mentioned the importance of collaborating and coauthoring with younger scholars to give them an advantage in their pre-tenure years. In some cases, graduate students (and postdoctoral scholars in some fields) are essential to collaborations and are often relied upon for technical support. One theme raised regarded "intergenerational models" for scholarly publication and communication, i.e., the various ways that faculty and graduate

students interact to develop technology and project innovations as well as new scholarly communication modes. For example, young scholars, often assuming the role of technical expert, may work with senior scholars on multimedia projects, archival repositories, computational and visualization problems, and the development of complex databases. It is not the case, however, that all young scholars are tech-savvy. Indeed, several scholars mentioned the growing need for graduate students to be trained with, and given exposure to, new tools and technologies for conducting research.

Multiple Authorship

Multiple authorship is the rule in astrophysics and biology, and it is increasing in economics and political science. There are often disciplinary conventions governing the position of authors in a publication that can range from the clearly formalized to the more *ad hoc*. Formalized conventions, however, do not reduce the difficulties facing tenure and promotion committees concerned with judging each author's individual scholarly contribution. Some suggested that the current academic reward system's focus on individual contributions can therefore work against scholarly collaborations. Balancing the institutional need to evaluate an individual's body of scholarship with the collaborative demands of grand challenge questions will only increase in many fields. The contributions of younger scholars in collaborations with senior scholars may be viewed with some suspicion, and pre-tenure academics may face a high burden of proof regarding their individual contributions. Collaborations involving technology (e.g., informatics, GIS, etc.) can also complicate judging individual contributions to multiple-authored papers or projects. The deans and other administrators we talked with suggested that technical contributions cannot win the day in tenure and promotion cases if they are not accompanied by robust metrics, such as significant publication in prestigious peer-reviewed outlets.

RESOURCE CREATION AND CONSUMPTION

WHAT DO YOU NEED TO CONDUCT YOUR RESEARCH?

The variety of resources and "tools" at the disposal of scholars for their research is dazzling and growing in sophistication by the day. The tools being used and the parties using them vary by discipline and are described in the individual case studies. GIS, visualization tools, virtual reality, and natural-language processing are just a few of the technologies being applied by researchers to advance knowledge in their fields. This is to say nothing of the sophisticated instruments that allow scientists to investigate micro- and macroscopic processes with ever more precision. The exponential growth of data generated by observations and experiments in some fields, much of it "born" digital, has led to numerous online archives containing both raw and processed data. For instance, astrophysics has witnessed the birth and growth of the Sloan Digital Sky Survey and biology has seen the boom of GenBank and other genome repositories. Another example is the new field of cultural analytics, which involves "analysis and visualization of large sets of visual and spatial media: art, photography, video, cinema, computer games, space design, architecture, graphic and Web design, and product design."

Balancing Abundance and Computational Power with Careful Analysis

Scholars are unanimously enthusiastic about the growing volume of research material located online and the development of powerful tools to process them. Too numerous to list in this summary, these include electronic journals (including JSTOR), digitized books, social science and cultural data sets, massive scientific data repositories, archival materials, governmental data, and international newspapers. It is a vast treasure trove for researchers. Despite this abundance, scholars warn that the ability to process more information in a shorter amount of time does not always result in better scholarship. Particularly in the humanities, scholars expressed hope that the wealth of digitally available material would make scholarship "better, not faster" by enhancing the search, discovery, quality, and analysis of more data, but not replacing the need for a careful analytical research process. In the sciences, there can be tensions that arise between those who collect data (e.g., directly from organisms in molecular biology) and those who use sophisticated computational methods to analyze them; this difference in approach and orientation can sometimes call into question just what data are.

Selective Digitization

Quite a few scholars lamented the loss of browsing and serendipity in discovery that electronic search and selective digitization entail. This may be particularly acute in fields such as history and political science, which depend on archives or a sense of "space and place," although a few biologists expressed the sentiment as well. Some scientists proclaimed that, "If it's not online, it doesn't exist, and it's not important." (One biologist, however, pointed out that not everything made it into PubMed when its digital archives were created.) Similar criticisms have surfaced around Google Books. The selectivity and bias of digitization may serve to undermine its utility as a definitive scholarly resource. Other concerns about selective digitization arose around the politics of selectivity, especially for scholars who depend on archives in countries outside of the US and Western Europe.

Preservation

The preservation and storage of a researcher's own data are thorny issues. Support structures and organizations available for such preservation are uneven at best, and given the enormity of the challenges, most institutions seem to be approaching the problem in a piecemeal manner, if at all. Scholars are tremendously dependent on third parties, such as curators, librarians, publishers, and even political authorities (in the case of archaeology) for the conservation of primary materials.

PUBLIC ENGAGEMENT

TO WHAT DEGREE DO YOU OR YOUR COLLEAGUES ENGAGE WITH THE PUBLIC? HOW? WHY OR WHY NOT?

Service to the Discipline and the Public

Engagement with the public is valued at the institutional level and occurs in all fields we investigated. It is considered to be an important part of service and is judged by tenure and

promotion committees as such. In some fields, such as archaeology, scholars see public education as important to the success of their research mission. In other cases, such as biology and astrophysics (and for faculty at publicly funded institutions), scholars feel an "obligation" to give back to the public in return for taxpayer funding. But, it must be emphasized that public engagement is something that is only viewed as appropriate on any appreciable scale once a scholar has been promoted and has made a name in the field. The general public reception of one's work has little impact on the strength of one's tenure and promotion case, and can sometimes have a negative effect if not accompanied by a stellar research record. Consequently, scholars who write exclusively for the general public can be stigmatized for being "public intellectuals."

Variability in Engagement

The degree to which scholars engage with the public varies according to age, personality, and discipline. For example, scholars in highly theoretical fields, such as theoretical astrophysics and music theory, reported less public interest in their work than scholars in history or archaeology. Opportunities for public engagement also follow the changing winds of interest in the public arena, as "topical" subjects shift with current events. While some scholars manage their own public outreach, mediators like press office liaisons, bloggers, and journalists play an important role in some fields to connect scholarly work to the broader public debate. The mainstream press does not always appreciate the "nuances" of academic research, however, and several scholars valued the importance of academia as preserving a "pure space" for research, the larger implications of which may not be worked out for some time.

Many "Publics"

As we did not define the term "public" for our interviewees, scholars interpreted the question to refer to a wide spectrum of activities and described their own personal "publics." One biologist interpreted public engagement as embodied in expanding private industry partnerships. Political scientists and economists mentioned consulting work with the government and NGOs. Teaching, public lectures, op-ed pieces, K-12 outreach, performances, websites, TV and radio interviews, concerts, and festivals were also cited. In music technology, some research centers release software tools for musical composition as a form of public engagement. In astrophysics, "citizen scientists" are playing an increasing role in processing large amounts of telescope data and by volunteering home computing power. Blogs were not reported as being used as outlets for public engagement very often.

IDENTIFYING FACULTY NEEDS

At the outset of the research, a proposed goal was to assess both faculty needs and the types of organizations, whether universities or other entities, that are implementing and facilitating new models of scholarly communication at the single- or multi-discipline level. The terms "scholarly communication" and "organization" are defined quite broadly here; the former encompasses both in-progress communication as well as final, archival publication, and the latter includes universities, research centers, funding bodies (like the NSF or NEH), the tenure and promotion apparatus, publishers, and other media outlets.

The simple answer to the question of faculty needs is that money, and the resources it can buy, often translates into satisfaction among those receiving the funds (and that funders can, for good or ill, bias significantly the direction of research agendas). The more complex answer is that the means of funding and organizing research in a discipline is profoundly important. We cannot suggest that our interviewees had singular or unanimous opinions about what, or even if, change was needed in the current scholarly communication system of their respective disciplines, but we identified five key areas, addressed in detail in the case studies themselves, that require real attention:

(1) The development of more nuanced tenure and promotion practices that do not rely exclusively on the imprimatur of the publication or easily gamed citation metrics,
(2) A reexamination of the locus, mechanisms, timing, and meaning of peer review,
(3) Competitive high-quality and affordable journals and monograph publishing platforms (with strong editorial boards, peer review, and sustainable business models),
(4) New models of publication that can accommodate arguments of varied length, rich media, and embedded links to data; plus institutional assistance to manage permissions of copyrighted material, and
(5) Support for managing and preserving new research methods and products, including components of natural-language processing, visualization, complex distributed databases, GIS, among many others.

A MORE NUANCED REWARD SYSTEM

Although some suggest that hide-bound disciplines cannot and do not reward innovative work as quickly or eagerly as they should, we have been struck by the fact that our sample of research institutions exhibit built-in flexibility in terms of how scholarship and intellectual creativity are judged. According to most of our interviewees, the reward system in place at their institutions has ways to judge non-text or non-traditional scholarship, as is done regularly in professional schools and in the arts. This seems logical since, as Becher and Trowler (2001), Anderson (2003), and others have demonstrated, the values of the academy have historically accommodated the growth, evolution, branching, and merging of disciplines.

There were calls, however, for a more nuanced academic reward system that is less dependent on citation metrics, slavish adherence to marquee journals and university presses, and the growing tendency of institutions to outsource assessment of scholarship to such proxies. It was the opinion of some interviewees (but certainly not all) that experimentation with new publication genres may be outpacing the ability of tenure and promotion committees to adapt appropriately. Interdisciplinary scholarship, new hybrid disciplines, the rise of heavily computational sub-branches of disciplines, the development of new online forms of edition-making and collaborative curation for community resource use (Waters 2007, 2009), large-scale collaborations, and multiple authorship (Kennedy 2003) are growing challenges to the way scholars' creative output is judged by institutions.

A major irony, however, is that tenure and promotion committees are not often exposed to new forms of scholarship because faculty are not presenting them as part of their dossiers (or these genres are not being categorized as research). (We do note, however, that post-tenure scholars are pushing the boundaries much more than their younger colleagues since they have already earned tenure and are therefore less risk-averse in their research and publishing

practices.[20]) Such an absence can result in elite institutions not having individuals with the necessary experience to judge new scholarly forms, and, therefore, identifying external reviewers with relevant experience within their ranks can be difficult.

That being stated, there are many cases throughout the academy where individual departments and universities, as well as scholarly societies (e.g., MLA, APS, APA/AIA, AAHC) and publishers (e.g., PLoS), are addressing new publication genres head on.[21] Others call for a new category, between service and research publication, to accommodate "difficult to peer review" products, such as websites, activities including data curation, or the creation of other new types of scholarly resources.[22] Such initiatives aim to establish standards and criteria for evaluating the value of innovative scholarly products.

If any advice could be offered to those who are experimenting with new publication genres, it would be to begin building their cases early on—both to their department chair and peers—and to ensure that their scholarly output is thoroughly and demonstrably peer reviewed, irrespective of the medium in which it is packaged. Once the department chair is on board, the onus lies squarely with him or her to convey the message to the dean, and so on. Such cases will be reinforced by active efforts of many departments, colleges, and scholarly societies to reevaluate existing definitions of scholarship in electronic form or to identify and isolate the important features of "published work" (i.e., peer review, closely-reasoned argument, etc.).

It must be noted that there is an insidious "trickle down" of tenure and promotion requirements from elite research universities to second- and third-tier institutions (e.g., some teaching institutions are now requiring two books for promotion in history, which contributes to a glut of publications). Additionally, there is mounting pressure, perhaps at times unrealistic, on academics in emerging economies to publish their research in the most select international outlets so that national goals for research distinction can be realized. Perhaps if more nuanced and capacious tenure and promotion criteria were made explicit at the most competitive research universities, it could provide a pragmatic "signaling effect" to other institutions and government ministries. Such a change might also encourage the growth of fields in ways not dictated exclusively by scholars at elite institutions.

PEER REVIEW

The importance of peer review flows from being the primary avenue of quality assessment and control in the academic world. Among the reasons peer review persists to such a degree in the academy is that, when tied to the venue of a publication, it is an efficient indicator of the quality, relevance, and likely impact of a piece of scholarship. Peer review strongly influences reputation and opportunities. It determines whether a scholar gets published and where, whether grants

[20] Fountain (2004) found that pre-tenure scholars were more reluctant than their tenured colleagues to develop Web-based projects and engaged in "safer" publishing activities.

[21] Specific guidelines for the evaluation of new publication genres have been issued by the following scholarly societies, among others: the MLA Task Force on Evaluating Scholarship for Tenure and Promotion (2006), the APA/AIA Task Force on Electronic Publications (2007), and the AAHC Suggested Guidelines for Evaluating Digital Media Activities in Tenure, Review, and Promotion (2000). For additional discussion on the evaluation of digital resources for the arts and humanities, see**:** Bates *et al.* (2006), Ballon and Westermann (2006), Ippolito *et al.* (2009), and Warwick *et al.* (2007). For specific examples of criteria for assessing digital scholarship issued by universities and departments, see: Mount Holyoke College (2000), University of Victoria (1998), University of Virginia (2001), and University of Nebraska-Lincoln (2008).

[22] See, for example, Scheinfeldt (2008).

are secured and from whom, whether an academic gets tenured and promoted within the university, and what a scholar's value is in a competitive academic marketplace.

The growth of the Internet and low-cost alternatives to print publication have been predicted to have a profound effect on how faculty disseminate their work, in some cases enabling them to efficiently bypass more formal routes, including journal and university press outlets. In fields like astrophysics and economics, which have strong working paper traditions, scholars can expose well-developed, but not formally peer-reviewed, research for public comment, while preserving their intellectual property with a date/time stamp. But why has this seemingly elegant system not replaced the imperative to publish in traditional, highly selective journals? We suspect that the cultures of these fields allow the existence of such "parallel" systems for disseminating research because it permits scholars to get their work out quickly while simultaneously respecting the integrity of peer review in shaping the final, archival version of record. Lightly or non-peer-reviewed conference proceedings may accomplish a similar task in humanities fields that have long lags to monograph publication.

Moreover, our work suggests that the opportunities provided by rapid dissemination through working papers and preprints in some fields,[23] and the posting of research papers on personal websites and in institutional repositories, will not soon abolish the overriding influence of the formal, peer-reviewed publication system on tenure and promotion requirements in most disciplines [nor lead inexorably to higher citations as is often asserted by advocates of open access (OA)].[24] These established practices remain strong and may become even more so as the information glut increases and scholars demand quality filters to sift through the unvetted detritus on the Web.

Whatever the shortcomings of peer review—and they are legion—it, as noted earlier, appears to represent the best available system.[25] The litany of complaints include a significant decline in quality because of hurried reviews, long lag times for review, editors and reviewers who may lack the specific knowledge or background to judge scholarship effectively (especially in small, interdisciplinary, and/or emerging fields) (Lee 2006), submission of papers to successive journals until eventual acceptance (Alberts, Hanson, and Kelner 2008), maintenance and reinforcement of orthodoxies, the subjective and idiosyncratic nature of peer review,[26] fear of reviewer-competitors "scooping" or "delaying" submitted manuscripts and grant proposals, problems locating reviewers in emerging subfields, and scholars feeling overloaded by the increasing number of requests to review work. This is to say nothing of the sense that publishers may hold authors hostage to high-priced journals by literally "owning" peer review and any subsequent rights to published material, while scholars themselves are essentially working for "free" (Bergstrom 2001).

So, what are the solutions to the challenges associated with the current system of peer review? There have been various suggestions (and experiments) to end-run the current entrenched system, which is organized primarily by publishers, but carried out by faculty. These include development of alternative means of validating and evaluating scholarly papers through

[23] See Ellison (2007), who suggests in economics that online dissemination improves the ability of top-ranking authors to share their work without going through the traditional peer-review process. Our research indicates that senior scholars invariably do not recommend such an approach for younger colleagues.
[24] For evidence suggesting that open access does not necessarily lead to higher citations, see Davis *et al.* (2008) and Davis (2009), unpublished report to the A.W. Mellon Foundation.
[25] Other studies of faculty norms and values have come to the same conclusion, including Weale *et al.* (2007).
[26] See, for example, the grant review process at the NIH (National Institutes of Health 2008) and the grant review process in some of the humanities and social sciences (Lamont 2009).

automated systems that can assess citations or some measure of readership, reputation, and impact.[27] A fundamental problem with such metrics, which include the much-maligned impact factor, is that they can be easily gamed (e.g., Haque and Ginsparg 2009) and they can exacerbate the problem of outsourcing the judgment of scholarship from within the institution to an outside proxy.[28] A nonproprietary system, organized by some central body, such as a government, has also been suggested for the EU (Waaijers 2009). In our opinion, such a government-run and centralized bureaucratic model would be anathema to most US academics.

Other efforts target reform of the process itself. "Open" peer review, eliminating the blind review process, paying for reviews, publishing reviews (or otherwise giving credit), sharing reviews among publishers, and post-publication peer review (such as Faculty of 1000) are among the moves toward reform. Peer-review experiments, as practiced by *Nature* and *PLoS ONE*, have not been met with resounding success in the scientific arena.[29] In the former, there clearly was little interest in early public exposure of ideas. In the latter, we suspect that the most competitive scholars will submit their work to more prestigious, traditionally peer-reviewed, outlets. A fundamental problem with both models is that they assume the most competitive scholars are going to, first, find time to participate in such a free-for-all, and, second, publicly expose their critiques with no upside potential and plenty on the downside.

There are no easy answers, but it seems likely that the current system, which is inherently conservative, will not be replaced anytime soon. What was clear from our informants is a desire to both reclaim the process from journals and university presses—which currently serve as proxies of a piece of work's value—and to eschew excessive reliance on citation metrics as the measure of scholarship's value. This requires that faculty be evaluated in-house in a multi-dimensional and thorough way, a process that inevitably requires close reading of a scholar's work.

NEW PUBLICATION OUTLETS: HIGH QUALITY, PEER REVIEWED, AFFORDABLE

The scholarly communication environment for any discipline is composed of multiple dissemination models. That is, within any one discipline, there may be a variety of publishing strategies available to authors. For example, in physics, astrophysics, and mathematics, discipline-specific repositories such as the arXiv are essential outlets that exist alongside formal commercial and society-owned journals. Economists use working-paper repositories, such as SSRN, and personal websites for disseminating research, but continue to avail themselves of society and commercial journals for final, archival publication. In the book-based fields of the

[27] A variety of new automated systems or evaluative metrics have gained visibility in recent years, including eigenfactor (created by Carl Bergstrom), the Faculty Scholarly Productivity Index (created by Academic Analytics), the h-index (Hirsch 2007), SciVal Spotlight (Elsevier), and the European Reference Index for the Humanities (European Science Foundation). For more information on the emergence and reliability of various metrics, see Adler, Ewing, and Taylor (2008), Bollen *et al.* (2005, 2009), Monastersky (2005b), and Jensen (2008). See also Bergstrom, Hendler, and Chudnov (2007) on creating fantasy journals as a "source of valuable bottom-up bibliometric tagging information."

[28] The so-called "Impact Factor" is a measure of the citation frequency of papers in journals and is thereby equated by some to the stature and, presumably, the prestige of the journal. For more information on the controversy surrounding the reliance on impact factor, see, e.g., Monastersky (2005a), Altbach (2006), The PLoS Medicine Editors (2006), Brown (2007), Hobbs (2007), and Williams (2007). Other criticisms have been levied at citation statistics writ large, including by Howard (2008) and Greenberg (2009). Also note the upcoming NSF workshop on "Scholarly Evaluation Metrics: Opportunities and Challenges" http://informatics.indiana.edu/scholmet09/announcement.html

[29] See, for instance, Greaves *et al.* (2006) on the failure of the *Nature* open peer-review experiment, as well as select articles in the *Nature* peer-review Web debate (Nature 2006b).

humanities, journals are still important as a means for disseminating short arguments, books reviews, and other discipline-specific communication. In computer science, peer-reviewed conference proceedings are the most prestigious outlets, but distribution of scholarship using more open methods, such as posting on personal websites, is common. In musicology, there are multiple outlets ranging from books and critical editions to highly competitive and selective society journals to encyclopedias. In biology—and perhaps other sciences that are fast-moving, well-funded, highly competitive, and have commercial potential—there is a more limited range of outlets (although numerically many more journals in some subfields). The journal article reigns in these fields, and "the more prestigious the journal, the better," from the perspective of faculty at competitive institutions.

Are more dissemination outlets needed for scholarly work or are there already too many? If the former is the case, in which fields? How many? For what purpose(s)? With what costs (Crow 2009, Waltham 2009)? And with what role for the university? (Shulenburger 2007, Association of American Universities *et al.* 2009)? These are thorny questions and are highly dependent on discipline and subdiscipline dynamics, including the supply and demand for Ph.D.'s, especially in the humanities.

In biology, economics, and many of the sciences, a proliferation of commercial journals and their associated high cost is perceived to block the flow of knowledge; the model is fundamentally flawed in that the academy currently pays for research and then buys back the fruits of that research through journal subscriptions.[30] The current suite of remedies to this serials crisis is located both within and outside of universities. The range includes: establishing new open access journals, such as the PLoS brand (most of which charge author submission fees—a form of "Gold OA"); providing institutional funds for authors to publish in such open access journals; funder and university "mandates" or resolutions that require the deposit of research products in repositories after variable embargo periods ("Green OA");[31] [32] hybrid journal pricing whereby authors can choose open access for a fee to the publisher;[33] and ongoing aggressive negotiations between libraries and commercial publishers to reduce the high costs of journals (and their bundling). It should be noted that the establishment of university funds for paying open access fees, and hybrid journal pricing practices, are not without controversy. Many critics point out that these university interventions in the form of fees will do nothing to address the high price of commercial journals, but rather simply provide another revenue stream for the publishers (e.g., Kaemper 2009a, 2009b, Davis 2009b, and Poynder 2009).

Scholars in political science, astrophysics, music, and history did not identify open access publishing, *per se*, as a particular need. In astrophysics and political science, a working paper culture combined with a small number of society-owned journals seems to serve the current needs of faculty. In music and history, so much of the relevant scholarship is published by

[30] See, for example, Noll and Steinmueller (1992), Edlin and Rubinfeld (2004), and Aviv, Rubinfeld, and McCabe (2005).
[31] Open access mandates or resolutions at institutions like Harvard and MIT are on the rise. They have been criticized because of their opt-out policy, which allows faculty to appeal the policy on a case-by-case basis. It is arguably premature to predict how effective either of these policies will be. It is clear, however, that they have set a standard that will likely make it easier for other institutions of their caliber to follow with similar policies. Peter Suber has a running commentary on university open access mandates on his blog http://www.earlham.edu/~peters/fos/fosblog.html; see also Suber's OA tracking project at http://oad.simmons.edu/oadwiki/OA_tracking_project
[32] For discussion of these issues, see, for example, Harnad (2000), Suber (2009a), and Shieber (2009).
[33] A Hybrid Open Access Journal is a journal that provides the option to authors, for a fee to the publisher, to publish articles as open access.

scholarly societies that there is the perception that those who need access (i.e., most active scholars) generally get access through their universities or through their personal society memberships. It is worth noting, however, that, in music, the small number of society-owned journals are not sufficient to publish much of the good scholarship; as a result, some scholars have taken it upon themselves to start new, online, open access journals that draw upon department or personal research budgets as well as the good graces of graduate students and reviewers in the field who work for free or very little. A quick scan through the Directory of Open Access Journals (DOAJ) suggests that there are few open access journals in archaeology (22 total). There are 134 in history, but almost all of those in the English language (approximately 20 total) often fall under the "area studies" rubric. We wonder if the proliferation of open access journals is more prevalent in fields that are relatively new, or have grown relatively rapidly—perhaps like ethnomusicology—and have a need to quickly develop additional outlets to accommodate emerging fields of scholarship, than is the case in more established fields like history.

BALANCING THE AFFORDANCES OF ELECTRONIC PUBLISHING MODELS WITH COSTS AND INSTITUTIONAL REVIEW

In the humanities, the success of creating new models of monograph and journal publication that can integrate sophisticated media and data sets, now done mostly on an *ad hoc* basis, will depend on institutional support from humanities centers, new media centers, presses, and libraries.[34] Although there are experiments with, and theories about, the future of publishing genres,[35] robust and easy-to-use publication software is needed to build authoring platforms allowing anyone to create multimedia monographs that are sustainable, accessible, persistent, and reviewable. At present, it is expensive to employ artists and programmers—and store and migrate digital media—to say nothing of the time it takes for faculty to become familiar with these new platforms. Although the role of university presses has been predicted to be important,[36] and many are experimenting in new publication genres, clear and sustainable business models do not yet exist for publishing complex multimedia products.[37] Even if the cost hurdles can be cleared, as we outlined earlier, new criteria will be needed in the assessment of such scholarship. In addition, some mechanism for recruiting peers to review these products will be a major hurdle to widespread acceptance; inevitably scholarly societies and individual institutions must take the lead in addressing these challenges.

Finally, it must be noted that the costs of securing permissions is particularly problematic in music and history (as well as art history).[38] Although institutions can and do offer subvention funds, these alone do not appear adequate to solve the problem of what copyright holders charge and the chilling effect these fees can have on scholarship. Several of our interviewees called upon their scholarly societies to take a more active role in mediating between copyright holders and scholars.

One purpose of expanding the affordances of electronic publishing models is to allow scholars to publish and archive the data supporting a publication. In biology, this problem has been

[34] Harley (2008).
[35] In the humanities, see, for example, Unsworth (2000). For a future vision of the book, see Esposito (2003).
[36] Brown *et al.* (2007). But see Shulenburger (2007) for a different view.
[37] Manning (2004).
[38] See, for instance, Ballon and Westermann (2006).

solved, in part, by hyperlinking data deposited in PubMed and archival publications. In astrophysics, data associated with a publication are provided in the form of supplementary online material (e.g., data can be published in *The Astrophysical Journal Supplement Series*, which serves as a data archive). In other fields, such as ethnomusicology, scholars look to the promise of annotated and curated data in their own right as a final, archival research product. Still other fields, such as archaeology and music, are exploring the creation of comprehensive PubMed-type data repositories (e.g., Kansa 2005). As discussed below, these complex efforts require various types of support from institutions, publishers, and funding bodies.

SUPPORT—CENTRAL VERSUS LOCAL

The scope of support needs (including robust cyberinfrastructure) expressed by scholars across fields could not be more starkly different. For scientists, whose funding streams are orders of magnitude larger than in other fields, the pressing needs include bigger "pipes" to move digital data; new ways to store, manage, process, visualize (Frankel and Reid 2008), and reuse massive amounts of data; and mechanisms to encourage and support grand challenge research.[39] The support needs of the social scientists and humanists we talked to were comparatively more modest, technologically and financially, although there are certainly vibrant communities of social scientists and humanists who see the potential (and have to assume the burden of associated costs) of integrating complex data mining, computational analysis, and visualization in their research practices (as evident in the emerging and relatively well-funded field of digital humanities).

One trend we observed was that disciplines, such as astrophysics, biology, and new music composition, often have dedicated groups of scholars sharing resources and infrastructure at one institution (e.g., telescopes, laboratories, and centers respectively). In these cases, we did not discern a lot of anxiety about general institutional support for research (although it is worth noting that low bandwidth hampers data-intensive research in astrophysics, which some thought needed to be addressed at the institutional level). In history, archaeology, economics, musicology, and political science, scholars tend to operate in a more solitary fashion relative to their institution's resources; therefore, there was perhaps more reliance on the home institution, societies, and publishers to solve identified problems in the scholarly communication system.

Preservation of Data

One common theme across all fields, although it varied by scale, was the problem of data sharing and preservation. And almost all scholars were concerned about preservation of their "personal data." Large national funding bodies may invest in these activities (and the perception is that the EU seems to have such issues as a higher priority compared to the US).[40] Even though data sharing and deposit are currently mandated in some fields by funding bodies or journals (e.g., in biology, political science, economics), policies are uneven and faculty practices

[39] The cyberinfrastructure needs for researchers in the sciences have been explored by Atkins *et al.* (2003), Nature (2006a), and Borgman (2007), among others. Needs for funding support in the area of data preservation and curation is addressed by new grant programs such as National Science Foundation (2009). See also select essays in Hey *et al*. (2009).

[40] The institutional needs associated with increased data production have been discussed by many, including Borgman (2007), Larsen (2008), Lynch (2008a), UK Research Data Service (2008), and the UK Digital Curation Center and Joint Information Systems Committee (2008).

remain highly idiosyncratic. One significant problem is developing consistent standards for data annotation, deposit, and curation. While much (but far from all) data within the physical and biological sciences are relatively more comparable and can be deposited into common databases, no such "common denominator" exists for social and humanistic data since data types, sources, and collecting practices can vary so widely (Lynch 2007).[41] The result is that the financial costs and the time needed to prepare data for sharing can be prohibitive for some scholars in fields that are not well-funded.

Technical Support

Additionally, needs were expressed by some (across all of the disciplines) for a wide variety of specialized technical support in areas such as GIS, various forms of computational data analysis, visualization, and multimedia publishing. Most faculty do not have time to take on technical tasks themselves, so qualified individuals within an institution or lab who can support specific technology-intensive projects are required (including for prosaic activities such as designing and maintaining a website). Solutions can include enlisting university IT and library staff, training graduate students and postdoctoral researchers, or collaborating with other principal investigators whose labs have such expertise. Many scholars voiced a preference for technology-savvy scholars who work in intimate collaboration versus a model of "academic computing services" personnel who are unaware of the scholarly questions and methodologies that drive research in a discipline. Therefore, the training and funding of graduate students and postdoctoral researchers in providing support is critical in many fields. Even though some younger scholars were described as surprisingly technologically "illiterate," a large number are essential to every kind of nuts-and-bolts task. Scholars trained in both an academic field and in a particular new technology or tool are also important to advancing new research agendas. Such expertise can also provide young scholars with marketable skills should they opt for (or be forced into choosing because of slack job markets) a non-academic position (Harley 1999).

The Preferred Locus of Support

Rough disciplinary differences emerged in stated support needs and the means to pay for them. In the sciences, grant money is used to establish and maintain labs and to pay personnel to manage data. In contrast, most humanists are seldom able to pay for extensive support out of personal research funds and many voiced the need for "in-house" (i.e., institutional) technical support for individual research projects. Libraries are often on the front lines of supporting these faculty with their research and publication needs. For example, the library is assumed, in many cases, to be the locus of support for archiving, curation, and dissemination of scholarly output.[42] Specialized centers, such as those in new music and digital history, provide a potpourri of services and support to collaborating or individual scholars, including an intellectual and administrative home for new projects. They can also offer workshops, consolidate shared resources, host digital resource projects, and act in an advocacy capacity for integrating new technologies in research. They may also play a key role in establishing standards for the

[41] For an overview of the specific needs of the social sciences and humanities, see Berman and Brady (2005), the ACLS Commission on Cyberinfrastructure for the Humanities and Social Sciences (2006), and Crane and Friedlander (2008).
[42] See, for example, Waters (2005), Hahn (2008), Proffitt and Schaffner (2008), and Housewright and Schonfeld (2008).

publication or dissemination of new genres (as in music technology). Some scholars noted that campus-based "digital humanities" centers are obvious places to support new projects, but others suggested that they can sometimes be fragmented and overly bureaucratic (or that they aspire to projects that are too sophisticated or grandiose for scholars simply wanting to experiment with text mining or video production). The structure and services provided by such centers vary significantly among campuses (Zorich 2008). Moves to establish national and international centers of excellence and best practices (e.g., centerNet) are a way to address some of the emerging challenges in the establishment of a humanities cyberinfrastructure.

Finally, although robust infrastructures are needed locally and beyond, the sheer diversity of scholars' needs across the disciplines and the rapid evolution of the technologies themselves means that one-size-fits-all solutions will almost always fall short. As faculty continue to innovate and pursue new avenues in their research, both the technical and human infrastructure will have to evolve with the ever-shifting needs of scholars. This infrastructure will, by necessity, be built within the context of disciplinary conventions, reward systems, and the practice of peer review, all of which undergird the growth and evolution of superlative academic endeavors.

CHAPTER 2: ARCHAEOLOGY CASE STUDY

CONTENTS

INTRODUCTION AND OVERVIEW OF THE FIELD

Archaeology is the study of the material remains and environmental effects of human behavior throughout prehistory to the modern era. Scholarship in archaeology is divided into a large number of subdisciplines, many defined geographically (e.g., North America, Egypt, Near East, Oceania) and/or by time period (e.g., Paleolithic, Neolithic, Classical). A moderately sized field, archaeology overlaps with a range of other scholarly disciplines, including biological anthropology, ethnobotany, paleozoology, geology, and classics (in particular, paleography, philology, papyrology, epigraphy, numismatics, history of the ancient world, Hellenic literature, and art and architectural history). There is also a large private-sector component to the field, which includes contract archaeology and cultural resource management. The sub-specialization of research in archaeology and its institutional and regional contexts influence publishing behaviors, criteria for advancement, mechanisms for keeping up to date, and practices of sharing and collaboration. Sampling across these varied subdisciplines, as performed intentionally here, presents a complex picture of scholarship in archaeology and of the diversity of approaches the field encompasses.

Publishing practices are somewhat fluid throughout this broad interdisciplinary domain. Final publication can take the form of one, or often two, books or monographs, while more scientific work (e.g., in ethnobotany) or technical work (e.g., in papyrology) tend toward the publication of articles in peer-reviewed journals. Some scholars also publish edited volumes or editions of primary sources. In publication, scholars place great weight on choosing a press or journal with prestige in their particular research area. Speed to publication can be a problem in archaeology, as excavation of a field site can take a decade or more to complete and the publication of work-in-progress can be constrained by funding bodies, local governments, and other stakeholders. Problems in monographic publication disproportionately affect highly specialized and heavily illustrated work, which has led to a desire to experiment with high-quality, lower-cost digital monograph series. Existing publishing models limit the amount and nature of data that can be presented, leading some scholars to embrace supplemental and alternative publication outlets such as DVDs and complex multimedia websites to disseminate extensive data sets, images, virtual models, and other data.

Although practices differ by subfield, most scholars (including those pre-tenure) keep data and work-in-progress close to their chest before archival publication. Informal networks are the most prevalent means of sharing early ideas and receiving feedback on drafts of work. Given the long lag time to final monographic publication, conferences and conference proceedings are an important vehicle for dissemination and publication, particularly for data just "out of the ground." The public posting of well-polished working papers on personal websites or in repositories has been embraced by some, generally senior, scholars. Yet complaints were voiced about the lack of rigorous peer review and established prestige in conference proceedings, collected volumes, and various forms of in-progress publication. While listservs, blogs, and social networking tools can disseminate useful information in the field and may help communities of scholars to stay in touch, they were not used to share work-in-progress among our informants.

Archaeological research is somewhat exceptional among its humanistic neighbors in its reliance on time- and location-specific data, abundant use of images, and dependence on complex interdisciplinary teams of scholars and specialists, who work on both site excavation and complex lab-based data analysis. Teams produce a plethora of data types in archaeology, including three-dimensional artifacts, maps, sketches, moving and still images, flora and faunal

assemblages, geological samples, virtual reconstructions, and field notes. Site directors use complex databases (which are sometimes networked) to organize excavation data and facilitate collaboration among team members. Scholars who work with archival materials may similarly cluster around common data sources and tools in technical fields such as papyrology and epigraphy. The mechanisms of collaboration across archaeology range from email and Skype to sophisticated Web-based platforms and Google Office tools for document/database exchange. Emerging geospatial technologies, 3D modeling, and other visualization tools are facilitating new ways to analyze data and create dynamic publication models. Subdiscipline-specific research centers and more general digital humanities centers can be important sources of support for innovators at some institutions.

Archaeology has an "ethic of preservation." Like astrophysics, it is a data-intensive, observational, and time-dependent field. Recording and archiving an excavation accurately are imperative in archaeology; once a site is excavated, it is effectively destroyed and nothing can be repeated. Unlike astrophysics, however, data collection, management, sharing, and preservation practices are anything but standardized. Data management practices are defined by varied criteria such as the nature and scope of the site itself, the training and interests of the lead researcher, the nature of data and the methods involved in their collection and preservation, and the influence of various stakeholders (e.g., funding bodies, universities, museums, governments, and/or local authorities).

Rather than viewing archaeological data as the property of the individual researcher, some scholars are seeking outlets for the dissemination, curation, and reuse of archaeological data by the research community through professionally managed "archaeoinformatics" initiatives. Though establishing standards for data curation remains problematic, experiments in "radical data sharing" have the potential to open up swathes of archaeological data for reuse. Questions of time, funding, preservation, and the conversion of analog data to digital formats, as well as intellectual property and excavation security concerns, all pose obstacles to realizing such an open system of data sharing in the near term.

Archaeology has an "Indiana Jones" and "Golden Idol" panache that results in a relatively widespread appeal and various outlets for engaging the public. Such activity can be driven by funding requirements but generally does not count for much in institutional review. Public engagement, however, is personally important for many scholars, who note that educating publics about the value of cultural heritage is essential to its preservation. Outreach can consist of varied practices such as museum curation, public lectures, and even virtual reconstructions of archaeological sites for public exploration.

In sum, archaeology is an exceptionally heterogeneous field, and its publishing models and needs are reflected in that heterogeneity. Although the monograph is the norm, journal articles and conference papers are also important dissemination outlets. There is a desire for publications that can affordably support diverse, multimedia data types, virtual reconstructions, and complex databases. Digital imprints could play an important role in ensuring peer-review and the quality of new publication models. Because archaeological excavations cannot be repeated, and artifacts are diverse, fragile, and distributed in collections around the world, archaeologists are eager to extract and document as much information as possible using a variety of digital and non-digital media. There is a resulting need to preserve and share large amounts of diverse data for posterity and reuse, but issues of common standards for data curation and preservation remain pressing. Repositories for certain primary sources, such as papyri, are already playing an important role in ensuring access to digital surrogates of artifacts.

In the study of written evidence, these databases of annotated primary sources could also play an important role as digital critical editions. Collaborative research environments can also afford new types of mechanisms for amending previously published interpretations. Additional funding, clear statements on intellectual property and data reuse, centralized repositories, and funder-led guidelines for data curation are important for preserving more work generated in the field. Making more archaeological data accessible in a centralized manner may also raise questions about evaluating the contributions of multiple scholars to final publications based on "curated" data, rather than original fieldwork.

1. REQUIREMENTS FOR TENURE AND PROMOTION: WHAT ARE THE QUALITIES OF A SUCCESSFUL SCHOLAR?

Archaeology represents a complex interdisciplinary domain straddling the humanities, social sciences, and natural sciences. The specializations in archaeological research constitute a field that is "more like an area study than a single discipline, really." Correspondingly, individual archaeologists may find themselves based in a wide array of academic departments and research centers, and may be subject to significant variation in the requirements for tenure and promotion.

> Archaeologists in the US are, of course, in a lot of different academic environments…They're with people in the social sciences, in anthropology…in Near Eastern language and cultures. There are people in classics and art history. So we are in different departments among people who are not archaeologists.

The gold standard for final publication in archaeology generally takes the form of one, or in certain cases, two strong analytical books or monographs, supplemented by articles and other shorter publications. Many scholars anticipate that emerging forms of digital work, such as websites, databases, or digital monographs, will transform the field. Currently, these digital forms are not generally considered by tenure and promotion committees to be scholarly products on par with books and articles. Thus pre-tenure scholars may be advised to avoid excessive engagement with these digital activities, in order to maintain focus on traditional models and outlets of publication.

Ar1.1 A Suite of Achievements Anchored by High-Impact Publication

While certain quantitative requirements for tenure and promotion must be met that are specific to the institution/department/subfield, successful scholars are described as "making a new discovery," "contributing to the field," and doing work of "considerable significance." The key element of a successful scholar in archaeology is establishing a strong scholarly trajectory and publishing consistently over the course of a career.

> Whenever you're evaluated for regular merits or promotion or tenure, you're evaluated on research and scholarship, one, second on your teaching, and third on your service. And you can have fantastic service, including all sorts of outreach efforts and so on, and be a great teacher, but if you haven't published that book you're not going to get tenure.

> I probably should have put "publishing" in capital letters, or maybe four or five times. Getting a name for yourself and publishing is pretty much the number one way to earn tenure. Publishing and making a name are very closely related; you can get a name for yourself without publishing, but you're not taken as seriously.
>
> …especially in a field like archaeology, you might just luck into a wonderful site and make some great finds. But, if you don't publish those or publication falls behind, then you're not as competitive as somebody who perhaps has lesser finds but actually publishes a good analysis of them.
>
> First of all, within the area of the humanities, which I'm firmly a part of, there are certain expectations, broadly speaking, in terms of the work that you're expected to do, not only as a junior faculty member but as a continuing senior faculty member. Of course, the reason you're granted tenure is on the assumption that you will not rest on your tenured laurels, or anything else for that matter, and that you will continue on the same trajectory that you had followed previously. In fact, the advancement from an associate professor with tenure to full professor with tenure is an acknowledgement that you have continued on that trajectory. What that involves is the production of major material that advances your field of study. Typically that means "original research of some manner, shape, or form that results in peer-reviewed articles or books," and this still remains the standard expectation. When committees meet or when faculties meet to judge advancement of a given junior faculty member or an associate professor to full professor, they begin with those time-honored assumptions. Have you followed that trajectory as one would expect you to do? To the extent that you have, it is easier for you to get tenure; to the extent that you haven't, then you'll have to make a case for why what you're doing is nonetheless of considerable significance. So for example, let us say someone came along and instead of having a major book or two books finished, published, reviewed, and well liked—which would be a standard measurement—you said, "Well, no, I haven't done that, I have eight or nine seminal articles."

Imprimatur matters in judging the prestige of scholarship, but faculty seem to be able to gauge the quality of a scholar's work independently or by looking at how their publications have been received in the field. Some scholars, however, reported that consideration of the quantity of publications or imprimatur may be overshadowing careful judgment by peers at some institutions.

> I do think that the norm here, as I understand it and from what I've observed, is that if you have one really good book—it doesn't even actually have to be out yet in hard cover, but if there's a pretty strong consensus that this is a really first-rate piece of work from the faculty and the people reading it and the judging of it that they get from outside—then that will amount to a strong case for tenure. That's certainly supported if it came from a leading university press, but I wouldn't say that this is an absolute, that the fetish of the leading publishing house is the only marker of acceptability. I can think of occasions on which so-so publishers have been the place that this really good piece of scholarship came out, and people (colleagues) actually have confidence they can tell what's good and what's not good, regardless of publisher. So that's the tendency here, whereas at some other big universities, I'd say, there seems to be a greater emphasis on quantity and on the stature of the publisher. I think sometimes it's a matter of, if you have an institution where…the humanities are always on the defensive, they feel they are so totally eclipsed by the big money, that they feel that they must prove that they are super, super effective and so on…So to some degree I think the institutional custom of trusting one's own faculty and other faculty in the field to be able to read a manuscript and say if it's good…means it's less of a panic attack than institutions that would rely entirely on whether there is a book out from a press they've heard of, which they

> trust as being proof that the person must be good. So I think that does vary a bit from field to field, and certainly from institution to institution.
>
> I think to some extent one begins today with a look at quantity, and then says, "Is that quantity possessing of quality?" But the quantity is looked at first. Or let me put it to you this way: If you don't have a quantity of material, people say, "Well, now you've got to make your case on quality." I would think that if you were going back to the way people were being judged in the 1950s and the 1960s, to take an example—maybe even the 1970s—people would have said, "What is this scholar's contribution to the field?" Then they might further say, "By the way, did s/he write any books?"

Although the interpretive nature of the humanities means that the full impact of a piece of work may not be felt immediately, there is generally consensus in the subfield as to the quality of the work.

> Making a name in the field has to do with lots of factors…I'd say that it oftentimes has to do with making a new discovery, finding something new, or at least finding something that you then tell us is new, changing the historical narrative about something: "We think culture developed in this way, but oh, wait, it didn't, it developed this way." Developing and expanding a new method oftentimes, especially if you apply it to something. Also carrying out sort of large-scale, systematic work that becomes a case study that others can use for teaching and for modeling their own work, or writing a book in a way that really captures people's imagination, would be some of the things…So a lot of it is more on the writing, the presentation of the material.
>
> I always had the idea…that the reason to go into academia or the reason that you're alive is to try to do something with your life that's different, some kind of contribution, and for an academic you do that by some kind of discovery or innovation…And I always thought that you were supposed to make a discovery of some sort if you were a scholar or a scientist, that that's the fun part of it, where the glory is. And I also just assumed that if you did that there would be a reward, but it might not come immediately because there's always a lag of people understanding just what you're trying to do, especially in the humanities, which is so interpretive, and there could be a lag in terms of confirmation, because a lot of the work you do is speculative and we're not an experimental discipline so you can't confirm it, you can't force the confirmation, put nature on the torture rack and torture nature into saying "yes" or "no" and you're right or wrong, which is what scientists can do.

As a result of the personal nature of judging work in archaeology, very little was mentioned about review committees or high-level administrators turning to external indicators, such as citation indices, to judge the quality of a scholar's work. Though, as one professor of archaeology demonstrates below, citation indices could play a role in some limited cases:

> The citation index can enter into judging. It can. I would say that it would probably be very low on the list. It certainly can. Maybe somebody is a little light on publications, then you can look to those.

What is judged: Variable combinations of books and articles according to subfield

"A good book" is necessary for tenure in much of archaeology, and will be supplemented with articles, conference papers, reviews, and other kinds of materials. While the nature of the book will differ across subfields, at the most competitive institutions, the book in mainstream archaeology must be an analytical, synthetic work, and not a site report. (As many

archaeologists publish a site report as a first book, this means that they may be required to publish two books for tenure at some institutions.) More scientific or technical work tends toward the acceptance of articles published in high-stature, peer-reviewed journals. For promotion, many institutions look for second (or third) books, or perhaps collections of articles and papers that can count instead. Again, this is highly variable by department, institution, and even career trajectory of individual scholars.

> At most Research I or II universities, archaeology still falls under the general model of anthropology/social science, which is a book, a major book for tenure, but generally supplemented by some articles in peer-reviewed journals. That's the standard model. And the "book" varies, obviously, and it may be more than one book because very often an archaeology dissertation that gets turned into the book is site-based, so it's more along the lines of a very descriptive monograph. I can think of a number of cases where somebody has that, and that gets published in more of a technical report series, but then a really strong, good tenure case would often have a second book that might be more synthetic, integrative, synthesizing over a field, not just based on one site. That would certainly constitute, in most people's opinions, a strong tenure case. Biological anthropology is where you might get the biggest deviation from this classic anthropology model, where it would be possible to get tenure on a series of peer-reviewed journal articles…Bioanthropology has moved more into the science model. I'm thinking of colleagues that I know in molecular anthropology who have gotten tenure…they haven't written books but they've done a series of articles in well-respected journals or in some cases, higher profile journals, like *Science*, or *Nature*, or PLoS, but where I think you could easily build a case for tenure on a set of articles…But archaeology is still largely book-based. The core of it is a book. It's kind of a mix, that's the way I see it.
>
> Within anthropology, social and cultural anthropology is much more book-driven and much more highly values books, whereas within archaeology or biological anthropology they're more aligned with the sciences, and peer-reviewed articles are much more common. In fact, you can probably get all the way to above scale in some of these fields without ever having written a single-authored book or even a monograph, and I think that's the case in the sciences for sure. And, in fact, sometimes when you do write a book in the sciences it's really not given as much credit, if you will, by peers, as writing peer-reviewed journal articles that appear in *Nature* or *Science* or some top-ranked journal. So there is a lot of difference, not only between disciplines but within disciplines, and they tend to fall out along more peer-reviewed journal articles versus books, as the major differentiation.
>
> The difference in terms of publication regimes between classics—and it varies even within subdisciplines of classics—and, say, English or history is significant. History is a book field, not an article field. In my particular subdiscipline, articles are typical. I like to think that a one-size-fits-all mentality is not the norm.
>
> My certainty, because I've been on quite a lot of people's dissertation committees here and I'm involved in their placement and have followed what happened with careers, is that I'm quite well aware that institutions vary a lot as to what their standards are and what their exact criteria are…Particular institutions have their own particular mentalities, and yes, they are, I would say, on the whole, fairly predictable…Harvard doesn't really tenure people much…Oxford, I think, it used to be quite possible to advance through the old-school British system without writing a book, to start with. And I think within fields such as philosophy, or linguistics, that outlook may exist in some US institutions nowadays…So it does mean that there's room for different kinds of systems, even within the larger general discipline.
>
> …we know that we're generally expected to have a book for tenure, and then as far as promotion from there on, it's often a second book, but sometimes there are a number of

> articles and conference papers that can count as a book…and I think that that is very much on an individual basis. It doesn't seem to be very strictly set in stone. And it's a little different for archaeologists than it is for most classicists as far as the kind of books that we do.
>
> I don't know that archaeologists get published only on site reports. I think most archaeologists, to move to the full professor level, will have to write a synthetic or an analytical work in addition to publishing site reports.
>
> In Near Eastern studies, the kind of thing that's needed to become tenured is that you have to produce a book, and if you then go from associate to full professor, you have to publish a second book. You have to publish at least two monographs and then articles, reviews, etc.

Again, tenure criteria vary across and even within subdisciplines, as well as institutions. Scholars in self-described "technical" fields, such as papyrology, epigraphy, or biological anthropology, may publish articles in lieu of books. (Papyrologists also publish archival volumes of edited texts, which are similar in character to many articles in the field.) Arguments can be made that "very significant" and "quite important and distinctive" articles can count for advancement in these areas.

> In our area articles actually are much more important than books for one reason or another…It depends on the field. For example, let me talk about how one could build such a case in epigraphy. One could very well argue that if you publish ten significant articles that open up ten significant inscriptions that were not understood before, that that is an intrinsically greater contribution than if you wrote a narrow, 200-page study on a given topic. There have been a number of people in the field who have been highly successful, who have not built their success on books. It's not a norm, mind you, but it can happen if you can make a strong case in this regard. One of the great epigraphists, that everyone acknowledged was a great scholar, was a fellow named Jonas Greenfield at Hebrew University. He never wrote a book as far as I know, and if he did I never saw it. But Jonas wrote tens and twenties of articles, and the articles were all extremely important, and they built his reputation. And they were often narrowly focused articles on this or that aspect of the study of ancient languages or ancient inscriptions…but he wrote a lot of them, and they were all very significant and they were all peer-reviewed. No one doubted that he should advance, as he certainly did, to be one of the senior people in the field and one of the great minds in the field. Nobody ever doubted that. I'll give you another example, H.L. Ginsberg. Ginsberg, when he was young, wrote one book, but after that…he wrote one great article after another, and the articles were so important that some of us think that his contribution to the study of Semitics is like what Einstein did for physics. People even named laws of grammar after him because he was the first to observe one thing or another. He was a brilliant man. It is possible to make your case in a field like ours on the basis of a series of articles, if the articles are very significant.
>
> I would say that classics, probably, has some of the most conservative, old-fashioned publication formats. We publish still text with Greek in a big scholarly apparatus…very troublesome texts that only very few people are going to buy. And a few scholars still will specialize in doing that at a very high level of expertise, and will be rewarded and respected for doing that, even though, on the opposite end, there are scholars whose work…is coming out in a medium that looks much more like what the social sciences are doing…versus writing the kinds of books that I've just been describing: big, old-fashioned editions…It's a bit idiosyncratic in that most of the colleagues I know, here or elsewhere, of the same level of distinction, have actually written more books than I have, they have tended to put things more into book form than I have, and occasionally I start wondering what's wrong with me, why didn't I write books like other people. So, I'd say yes, I definitely think writing only articles could be a dangerous move pre-tenure. It wouldn't necessarily be fatal, but I think

> there are certain places where if you write several articles that people decide are actually quite important and distinctive articles, they wouldn't say now you've got to turn this into an actual book for tenure…There's a variation among my colleagues. I can think of colleagues who have written a book every three or four years…

Criticisms of tenure and promotion requirements: A glut of books

Some scholars complained about the glut of books being produced. This glut was traced to several factors, including: the UK's Research Assessment Exercise, the two-book tenure requirement, the rapid expansion of many subfields and associated conference volumes, and an increase in institutions requiring a strong publication record.

> So many people write books. In England, they've got this terrible thing at the moment in writing books. There is this have this competition, the Research Assessment Exercise, between different universities now for money. And the way they do it is every two or three years, you're reviewed, your university department is reviewed…And what that's doing in archaeology over there is producing a huge glut of paper books, and the publishers are all really happy with this thing, but the archaeologists, it drives us crazy…because it's just the same stuff, and it's being churned out. There was a huge glut of the book kind of publication in the '70s and '80s. Then it kind of went off a bit. I suppose it's still a lot. But digital publication is not at all standard yet in archaeology.
>
> Another huge change in my long life of scholarship is that when I started I don't think there were ever conference volumes. Now that's almost become as much as if not more of a vehicle for publication than the monograph. Almost every conference has such a thing. Now, partly what's driving this in different countries, in England, when the Blair government introduced these research assessments to universities on a regular basis, there was tremendous pressure on universities to churn out more and more publications, so you had more and more scholarly conferences, and then the university presses…So it's a self-generating process.
>
> If you were doing textual traditional Greek tragedy or textual criticism of Greek tragedy then there would probably be 25 people or something. But if you were doing literary interpretation of Greek tragedy then it would be much bigger…100 to 150. You could narrow it by saying, "I only want sort of traditional 19th-century aesthetic approaches to tragedy."…And it's not just the digital stuff, but the amount of paper publication in a field like Greek tragedy is just absolutely huge, and it's grown so much…there are just many more places that are requiring publication, there are many more universities doing conferences…

As in history, some established scholars complained about the quality of books being produced by these rising quantitative book requirements. In particular, they suggested that shorter expositions would be more useful and less prone to inflation. Other scholars questioned the need for turning the dissertation into a first book instead of devoting time to new work, and there are calls for a move to alternative publication forms as the solution.

> I'm especially resentful of the places that now expect people to have two books for tenure.
>
> People rush to crank out some really half-baked…I've seen some wretched cases, a couple of people I knew quite well, who were scrambling to get the second book into something they could present, which then looked like a mess and they didn't get tenure. Here, for better or for worse, we do have a bit of a reputation for being relatively rather easy to get tenure, in so far as we don't require as much in the way of quantity as some places, and we don't have a very tough failure rate of people being denied tenure. On the other hand, I do think that my

> institution takes a bit more care than some places to hire assistant professors and looks pretty carefully at what you're hiring and to foster them with the idea that you're hiring them thinking they are *supposed* to get tenure.
>
> It would be a great advantage to the humanities, though it's not going to happen, if there was some concerted attack on the idea that what you really need to get tenure is, quote, your 200-page monograph with 40-page bibliography. And if you look back to when research started in the humanities, it started in Germany, and I have on my shelves what are called program *schriften* or doctoral dissertations written 150 years ago. They're usually about 50 pages, and they got straight to the point, and you could read them in an hour and you knew exactly what the new work was. If you were a scholar you could evaluate it. And they were produced rather easily and cheaply. They're not very beautiful. Now, we expect a prestigious university press to be publishing your assistant professor's work, and the only people, I think, who are ever going to read through such a book from beginning to end are the author and the copy editor, because so much space is taken up with survey of scholarship. You'd almost say for many books for the bibliography, "See somebody else's book." And the amount of time that's being taken up…these are young people, in a way, at the most creative period of their scholarly lives, and they're putting out all this energy. And quite often, maybe they get one negative review from the press reader, so then they spend a lot more time changing their work. And I think, in many cases, it's quite demoralizing and extremely nerve-wracking. Now, of course, you get the general point…How could you change it? It would be like saying, "Let's have world peace. Let's destroy every weapon."

Issues facing young scholars

According to some scholars, the academic environment is becoming more competitive with the bar for publication getting higher, something that poses a particular problem for young scholars.

> I'd say make sure that you start publishing early when you're a graduate student, and make sure that you realize that your dissertation is only a step along the way and don't drag it out too long. I would advise them not to turn it into a book right away. I'd advise them to get the degree and then turn it into a book, and try for a postdoctoral research position to turn it into a book…I think young scholars are pretty much aware of what they have to do to get tenure, and they realize that they have to focus on what they have to focus on; it's certainly told to them a number of times.
>
> I've done most of what I've done by chance. I don't think I ever sat down and thought about it…When I meet with my students to talk about how best to manage their career, I think back. Nobody told me I needed this stuff. What is this that's coming out of my mouth? And maybe that's because the environment is more competitive now or there are more people, or we've begun to actually really produce M.B.A.'s instead of Ph.D.'s. I don't think I ever sat down with a game plan that "I should publish here, I should do this, etc."

The graduate students we spoke with were aware of the need to publish work while in graduate school, although the latter lamented a lack of clear advice:

> Nowadays it seems to get a job you need three publications, and usually peer-reviewed ones. A lot of us build up publications on chapters and edited volumes and things like that. Those don't count for nearly as much. But your Ph.D. is your major work. It takes years. And then there are two different strains…if you have a more scientific strain to your work, which my work does, if you get an article in *Science*, *Nature*, *PNAS*, then you're pretty much guaranteed at some point to get a job.

> It seems like there are more and more people getting Ph.D.'s now, so what I've been told is that it's always great to distinguish yourself. For me, hopefully before I finish, putting out a publication or two and getting teaching experience seem to be the things I want to do. It's a little tricky, because everyone seeks their own route in some ways in that. I won't say that I haven't had good advice on the issue, but I won't say I had definitive advice, such as, "You should do this; you should do that." Getting things out there while still in the Ph.D. program seems like it's getting more and more important, whereas possibly 30 years ago people weren't expected to publish until they had finished their dissertation or were well along with their dissertation.

Although graduate students may "build up publications" by publishing in conference volumes, the dean below discourages this practice as these do not substitute for peer-reviewed articles in scholarly journals:

> One of the concerns that I have with young faculty is that sometimes they get distracted by conference volumes, either writing chapters for them or editing them, and they need good strong mentoring on that score, because I don't think that that adds strength to a promotion file.

Visibility in the field

A strong publication record is the single most important indicator of a successful scholar and is the chief means to increase one's visibility in the field. Alongside publication, having a national and international presence sustained through conference attendance (particularly when a scholar is invited as a keynote speaker) and winning awards, prizes, and grants also inform a scholar's reputation. Younger scholars are advised to avoid expending excessive time on conferences and to concentrate instead on developing their research record.

> I think that what's much commoner in classics, ancient history, and archaeology is that people present the stuff as conference papers, well in advance of when stuff comes out in book form. I think that has accelerated in recent years. Every now and then you'll read somebody bellyaching about how there's a great shortage of travel money in the world, but in reality, people have more travel money than they used to and they're going to far more conferences than they used to. I've had to shout at recent Ph.D.'s occasionally and tell them they're going to too many conferences and spending all their time writing conference papers instead of getting the damn book out. And this is really, I think, very dysfunctional behavior. But people are sociable and they like spending time with colleagues talking, and they can't go to the conference unless they give a paper, because nobody will pay their way. So, they wind up giving a paper and presenting this somewhere, and every time they redo something for the needs of a particular conference, those days are lost to creating the book. So, when I see this long, long list of conference papers on a C.V., I begin to worry that the person's priorities are in the wrong place from the point of view of survival.
>
> Conferences and presentations play a minor role in tenure and promotion. I think it's bad if you don't do any, but you can also do too many. What's a good number per year? I think one or two.

The importance of extramural funding

In archaeology and classics, extramural funding is another important indication of successful scholarship in particular subfields.

> It's also helpful in archaeology, of course, if you have a grant from the National Science Foundation, National Geographic Foundation, or National Endowment for the Humanities to fund your excavation and archaeological research activities. Usually for tenure it's a mixture of articles, books, and grant-getting.

Ar1.2 Evaluating Other Scholarly Genres

Given the data-driven nature of archaeological scholarship, other scholarly contributions or products can encompass non-peer-reviewed online publications, curated databases, and resource websites, to name a few. At times there can be a degree of friction over evaluation of digital publication forms because of the lack of precedent, and many on the review committees revealed a conservative bias. Developing and maintaining databases or resource websites is considered a "research technique" or "services to scholarship." While high-level administrators are aware that these activities require considerable work, they are not considered scholarly activities because they do not require the skills considered the touchstone of being an academic (e.g., developing a careful interpretive argument) and are not peer-reviewed.

> Why the book? The book is considered a tangible validation system of the scientific work. Digital output is not yet accepted here, or, as in tenure positions in Europe, 90 percent of what the reviewers consider is your print publications or literature…
>
> In the humanities I think there's a swing back toward more traditional kinds of interpretative readings among younger scholars. I may be wrong about that but that's my sense. It's still coming out largely in the form of monographs.
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> I think young scholars are probably more at home with computers in general than I am, because it was part of their learning at a much earlier stage. But I would say the test for me is not do you have computer wizards doing classics—the answer is yes—but instead, are there works in classics that have come up, which are excellent particularly because of their technological connections? I don't know of one.
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> So I think that there is a basic mistrust toward the digital medium in academia, and particularly with regard to tenure and promotion. And I think that to some extent it's justified. Now, the reason why I think it's justified is because the use of the computer in the field of archaeology—and it seems to be the case in other areas as well—has not sufficiently developed the conceptions and intellectual dimensions that I was referring to. In one word, what is missing in the digital output that we have—except, of course, for PDFs, which are really not digital, the whole structure of the PDF thing is really a paper one, so leaving those aside—everything else does not develop an argument. At best, the digital medium produces data that are structured sometimes very well and with a great deal of interactive opportunities, search capabilities, and whatnot. But a website does not really develop an argument, and what we expect of a scholar, young or old, is to be able to develop an argument…In the first place, we expect a scholar to be accurate in the documentation, but then also, particularly if we talk about originality, we want to see an argument being developed. The digital publications that we have, especially websites, do not do that. It seems to me that the websites, at least in archaeology, are either very developed databanks or extended brochures, apart from the PDF files. But there hasn't really been an attempt at developing an argumentative style for a website…and I think that, for this reason, there has developed a certain reluctance in academia or, at least our field, to accept websites, in particular, as being demonstrative of proper scholarly endeavors and research. So, yes, I think that there is a distrust of the use of digital media for promotion, but to that extent it's

> justified, and that the way to change it is to really transform the use of the digital medium from a technique to a method.
>
> Judging a website is a tough thing, I think, because there are scholarly aspects to it and there are also technical aspects to it. They certainly involve a lot of work. I don't think anyone denies that. But whether they're the same as a publication is a difficult question, I think, because often a publication has an argument to make. And often websites are designed to provide information. So, I think that differential does have some issues that haven't been resolved. Publishing a model to the Web, I think, is an amazing accomplishment and clearly something that's equal to a great book or something, but it also is not something that has a singular author, and it's something that doesn't necessarily have a thesis, per se, a point of view that is trying to prove something. It's more open-ended. So I haven't yet seen anyone really write convincingly about how either we need to change our conception of what a publication is or we need to continue with traditional publications because they provide a needed scholarly output of a kind of individual concept of something.
>
> I think that alternative forms of publishing are more on the radar of the campus…I think there's more awareness on the part of the campus decision-makers at the dean and provost level that they have got to put more thought into this. Amongst scholars in my field, I think there is little awareness that these are big developments…There was quite a bit of promotion activity a number of years ago, and in a couple of cases people were doing things that by the very conventional standards of the field would be regarded as pseudo-publications. They were, for example, setting up and maintaining websites, which were scholarly resources, if you like. They were *not* publications of *original* scholarship by the professor in question. They were services to scholarship by gathering up lots of data in the field that the scholar happens to teach and organizing it in the form of a website. And I had to counsel one junior professor who was very invested in making a beautiful complex website that had all this imagery with all kinds of information, but most of it was in the public domain and was very well known. It was just making a nice presentation that would be very useful to other scholars and teachers. I said, "You are spending too much time on it and you've got to pull back, because you're not going to get credit for this to the degree that you may think you are." And, in the case of another colleague who already had tenure, s/he wanted this to be counted as a publication. And I said I was willing to hear the argument in terms of the type of originality of what was in this website, the creativity of pulling it together, and the analytic and critical perspectives brought to bear, but I needed to have that argument made. I couldn't just take it on faith. In the end, I decided that I wasn't going to count that too strongly.

Along with the difficulties of identifying an argument and scholarly contribution, it is difficult for review committees to assess the audience and impact of work published in non-traditional formats.

> I'm about to write up the case of someone who has gone really digital…so how do I frame this for a person who is very accomplished, has an international profile, and spends a lot of time putting things together for a major website that's accessed by people all over the world? It's reaching an audience far greater than if this scholar had published even in a top-notch journal, with ideas that people can access from little villages, say, that wouldn't have access to even *Science* or *Nature* or whatever. So, how to evaluate the potential audience that the work is going to have, is, to me, for example, one of the kinds of questions that need to be addressed…I'll just indicate that this scholar is part of a research team that's being led by scholars from prestigious institutions and so on and so forth, this is excellent work and that it is reaching people, has a much larger audience in terms of providing guidelines and a framework for thinking about things that can affect the doing of archaeology all over the world.

As one department chair pointed out, while websites and other new forms of digital scholarship are not equivalent to peer-reviewed publications, they are nevertheless valuable work and should be represented somehow in a "new category" that is intermediate between service and publication:

> We also had difficulty coming to agreements amongst ourselves about how websites would be reviewed, in terms of external reviews. Normally, for a full professorship, we would have a team of five or six people who would read my reference and send us a letter, and it would be a fairly cut-and-dried, well-defined review. So asking people to look at somebody's website and say what they think, they don't know what your criteria are and they're unsure what they're supposed to be judging. I wasn't against the idea. I felt that these scholars were doing valuable work. And I partly learned from that experience and partly from other experiences…that there ought to be a new category that's intermediate between service to the university and original scholarly publication in your research specialty for which one can be credited. That would include such things as maintaining a scholarly website as an alternative to dreck that's published in Wikipedia, or perhaps editing an online forum of scholarly communication in your field, serving as a moderator and a critic and an evaluator and gatekeeper. And that takes work and it takes application of your scholarly knowledge and skills to do it right…The problem is, there's no paper trail, the department chair can't really evaluate whose contributions are whose…

Judging work appearing in online-only journals

Similar to new digital forms of scholarly output, publishing articles in online-only journals is perceived by many as not being a legitimate, prestigious form of final publication.

> If you could get it to the *Cambridge Archaeological Journal*, that's where you'd like to be. You don't want to be on *e-archaeology*, which I think would have much less prestige.

> The standard forms of publication and communication in archaeology are professional journals. Those are more traditional than standard…Publication is traditionally paper, definitely…There are a couple of Internet journals. There's one that they tried in America called *e-tiquity*. It didn't work, and they're having a little kind of brainstorming group on why it didn't work…I don't know why it didn't…I'm pretty sure that it's for the same reason that other journals on the Internet—there's *Internet Archaeology* in England and another one called the *Semblage*—and they've not been terribly popular either. And a lot of it has to do with the fact that it's not rewarded in academia. It's not taken as a serious, legitimate publication to put in your personnel review. That's absolutely sure.

One key reason why online-only journals are viewed as less prestigious by tenure and promotion committees is the perception (perhaps erroneous) that they are less stringently peer-reviewed.

> I think some people do in our department publish in electronic journals, but I feel that those generally have less weight in front of tenure committees than the standard peer-reviewed print journals. I think most people feel that the editorial process and the review process are not as thorough on the Internet as they are on paper, and why that is I don't know, but they do. I guess maybe it has to do with the fact that it's still kind of hard to seriously read a detailed scholarly article on a screen.

> There's definitely the fear that articles that are in Internet journals, for example, are not peer-reviewed, although they are. *Internet Archaeology* is peer-reviewed, but there is a fear, so somehow it's not a legitimate form of publication.

Innovation and pushing the envelope

Print publication remains the basis of the tenure dossier, and scholars interested in pushing the envelope are still in the minority.

> The envelope is being pushed as far as publication and dissemination of research results in archaeology, definitely. But whether the pushing has gone far enough to really involve the core of a tenure dossier is another question. And so let me elaborate on what I mean by that. Some people…are very much into digital publication, if you could use that word in a broad sense…But this is a level of people who already have tenure and would like to see Web-based multimedia publication replace the traditional model…I'm not one of those. I'm a traditionalist. I admit that quite freely, for all kinds of reasons.
>
> I do think that new forms of publication hold the same value as standard forms in relation to advancement in archaeology, and I should say that some of my colleagues do…the others, much less so…Most of the other archaeologists would be interested, but they wouldn't do it themselves. They still think of paper as the main publication model.
>
> Publication format can vary. I think publication can be in the standard form of an article in a journal, and I think it can be a more Web-based publication depending on how your work falls. I think, still, there's a lot of preference for print media in the academic culture, at least in my side of academics. I don't know how it will end up panning out at the end, but I think people are definitely interested in putting their work out there earlier on in some form…

Some scholars we interviewed, however, believe that archaeology may be near the tipping point for recognizing and crediting emerging digital forms of scholarship. The key here is a critical mass of scholars and institutions in the field that acknowledge alternative forms of scholarship as such.

> I know that in architecture, people are architects so they produce buildings. It's sometimes not accepted as research because it's considered too practical. Archaeology is really on the verge there. It's not a professional school in the sense that we train archaeologists not only to dig, but also to interpret, and that gets reflected in the publication. But more and more those publications get different shapes…
>
> I think we're also going to sort it out in the sense that probably the publication of monographs as a criterion for promotion and tenure is going to recede. There are going to be other kinds of activities that will start to be given more credit in the process, and eventually, probably led by some individual innovators and scholars, maybe myself included, who will blaze the trail and put some major piece of scholarship out in a new format that everybody will immediately recognize to be important, high quality, and making an unquestioned, scholarly contribution. And once there's enough critical mass of examples of that, things will change.
>
> There have not really been trailblazers in the department. I think I'm one of the trailblazers, and I do have some colleagues who are convinced that what I'm doing is extremely valuable, so I definitely have some support here. I can't really predict how the discussions in the department will work out; I really have no idea. The dean also would have something to say about this. And I was actually thinking of alerting the dean that we might have trouble. I think there would be understanding. I think s/he really would look at or give more weight to all the other activities and the other types of publications.

> I've been pretty fortunate in terms of advancement in the field and that might color my opinion, but I think what I would say to a young scholar is, "Don't make decisions as to what you do or what you're interested in on the basis of what you think will get you tenure. If something looks exciting and important, do it. It doesn't matter whether it results in something digital or on paper. It doesn't matter whether it's a subject that others currently think is cool or not; value will be recognized." Maybe I'm too optimistic on this point.

Some scholars who push the envelope currently report frustration with the inability of department chairs and university high-level administrators to understand their work as a form of scholarship.

> I was slower to advance than other people were because of the way I was doing things. I'll never forget when I was a junior professor and I was explaining to my then-dean the digital work I wanted to do. And the dean looked me in the eye, and said, "That's all very interesting, but what does it have to do with scholarship?" And it was at that point I realized that the dean would never understand what it is that I was trying to do. I basically had to wait for this scholar to leave the position and, after several other deans came and went, finally it was recognized that what I was doing was what people ought to be doing. It took a while for the world to catch up. I would say people started to take seriously what I was doing in the late 1990s. But I was laboring in the vineyards long before that. I was taking what I guess you would call real academic risks because people didn't understand how important was the role that technology was going to play in scholarship in the humanities

> I think the advancement process should support new forms of publication…I think that that's the way in which things are going. I think there's a lot more interesting things that one can do with some of these new kinds of publications, in terms of the wider dissemination of ideas and research. And I don't know where the tenure and promotion committee is now. I think the last four or five years have been really an interesting and influential time in this regard. What that brings up is what happens not just at the tenure and promotion committee level, but at the departmental level, when you have the case of somebody who has invested or dedicated a lot of their scholarly communication to these alternative media, and the committee and the department—they don't even have to be luddites, they just have to be conservative about what constitutes valid scholarly communication—and how does that, even at the departmental level, begin to influence the way a case has been presented, so that by the time it gets to the tenure and promotion committee or the dean through a department chair, who may or may not have seen the story and who may or may not see what's going on, how does that then build toward maybe a more negative reception at the tenure and promotion committee level, than might be the case otherwise? So I think we have to look not just at the tenure and promotion committee, but I think we have to look at it before it leaves the department, because I think that people can get a bum rap, so to speak. It gets hard to overturn as it gets up to the higher levels.

> On my C.V., I label much of my digital work "service," but I regard much of it as research. The climate is slowly changing, but the tenure and promotion process at many institutions seems insufficiently nuanced to accommodate work that is clearly more than service but perhaps less than research. What about projects that are clearly not works of historical synthesis, but essential to the progress of knowledge, nevertheless? There is often no box into which to deposit that kind of work in the tenure process.

> Every faculty member has to fill it out a bibliography form. Nowhere is there room for…electronic publication. There are books; that's first…then there are articles in refereed journals, and then reports, and then there's a thing called "other" down on the bottom. It doesn't say "electronic;" it doesn't say it anywhere.

> We have these wonderful brilliant programmers who have gotten tenure on the basis of their publications, and not on the basis of their technology. Technology, in a way, is a much more elastic and productive thing than some of their publications.

Digital scholarship and institutional variation

Innovation starts with individual scholars, rather than institutions, according to a director of a research center, which could account, in part, for a lack of innovation at elite universities. This links back to tenure and promotion requirements and the lack of reward for scholarly pursuits that fall outside the realm of what is considered "scholarship."

> You have to ask yourself a question, and that is: why wasn't innovative work being done at a Harvard or a Yale, or Johns Hopkins or University of Chicago? These are the elites, in our view, where there is a long-established tradition of the study of ancient languages. At Yale, at the University of Pennsylvania, they have long-established collections of many thousands of tablets and text, or papyri. So why aren't they doing innovative things? And the answer is, because they were so locked into the way things were being done, they couldn't maneuver very fast. Whereas at other places, ironically—because there was nobody who really was interested in what was happening—scholars could be very maneuverable. They could go to people and talk them into letting them do this type of work, and then they would reach out, not necessarily to the institutional partnership, but to individuals at Harvard or Yale or Princeton or the University of Chicago, or wherever, and bring them in on the work. Then over a period of time these scholars could begin to move the institutions because they were moving the people. But this movement didn't start with the institutions, it started with the people.

> There's not much in terms of innovative publication models coming through the pipeline. I think at a place like here, it's not coming through. I think innovative publication models may be more of an issue at some other second-tier institutions, where they're not ambitious to become the most famous classicists as at Harvard and Princeton and Berkeley, but they are interested in technology and they have to start developing quite interesting projects. Then sometimes they are presented with a problem when they are evaluated at their own institution, because there's nobody around who can evaluate it. And if the administration then says, "Oh, well, let's ask someone at Berkeley or Princeton about this," they may also find that the experts of those areas are not that up to date with technology, so they may not have a real appreciation for what's going on. So there's still quite a bit of difficulty surrounding issues of peer review. So our scholarly society came up with a statement to say, "In principle this is what we support and peer review should continue to be important and it's quality and not quantity or format that matters." But it's still a difficult transition for people to go through.

In addition, two scholars suggested that state and newer universities may be better poised to support the digital humanities and digital work as scholarship.

> The McDonald Institute at Cambridge is the dark side of Cambridge, I think, because Cambridge is actually very conservative…It's like the architecture of the Roman Empire, because, if you compare Rome with the provinces, Rome was really conservative. Outside of Rome, there was a lot of innovation: experiments, artists coming from the Middle East, etc. This is a good analogy because in the case of Rome, experimental activities were coming from the periphery, not from the core of the power. It seems to be more or less the same in archaeology. In all likelihood, the most important universities in the world are—not conservative, that's too negative of a word—but traditional, so they want to preserve tradition…Harvard is a large brand in the world, like the McDonalds fast-food chain. And in the humanities, Harvard is really traditional. I was expecting it to have wonderful labs, artists,

> scientists, innovators. It seems that people in these places are really traditional, with little innovation and a lot of potential. For example, Harvard's anthropological museum is one of the best museums in the United States or maybe in the world. They have a wonderful collection of archives. And so more or less, they have codified the system, they have classified the archives, but there's no specific innovative approach to using the data in the archives for scholarship.
>
> I think the terrain here is shifting in what counts for tenure. When I first arrived…I was told by a dean that the tenure requirements were based on quantity: two books, neither of which must derive from the dissertation, and some number of articles that must grow out of subjects that are likewise not the same as the dissertation. I do not believe that this approach prevails any longer; work even in digital areas is seeing rewards. But I do I think that some institutions prefer not to be the first to take risks. I think in some ways "less competitive" universities have a kind of luxury to credit and reward digital scholarship. This is just a hunch.

Age and flexibility in innovative publication practices

While there is a presumption that younger scholars are, on the whole, more interested than senior scholars in digital scholarship, young scholars themselves appear to be more conservative when it comes to publishing digital work. Publishing in non-traditional forms, including digital Ph.D. dissertations, is perceived as a risky move for pre-tenure scholars. Consequently, as in history, it is more senior scholars who may innovate with digital technologies in scholarship.

> I'm now going up to full professor this year, and I've just decided that I'm not going to beat around the bush and just say, "It's my choice to put my time in this effort and cooperative efforts." I think it's definitely where the field is going and is already. So rather than taking time away from that and cranking out a monograph, which I undoubtedly could do, I decided not to put my time and energy there, and I'll see what they say. I know that some of my older colleagues will get very unhappy about that. I don't think they get the idea of cooperative work.
>
> Given where I am and seniority, I'm not so worried about counting how many articles I have or I don't have for my next review, and if one or two of them are going to be in something that people will say, "Well, that's not a big deal, and we'll give that a half a point instead of a full point," or however they work, I've decided I'm okay, it's worth it. I can't imagine that it will work against me. In some way, I still have some traditional publications. I'd like to think that the engagement with innovation might actually count for something a little bit…
>
> Younger scholars are tending, as far as I can tell, to publish digitally a little more rapidly. But there is also the parallel phenomenon of senior colleagues publishing in digital venues whether they're peer-reviewed or not, because their jobs are more secure. Time will sort some of this out, I expect.
>
> I really can't blame pre-tenure scholars for timidity in publication…One absolutely can't blame them. And so although I've been guilty of self-indulgent articles where I go off for a little bit and have a bit of fun in a footnote or two on something that I think is sort of intriguing but a bit off the point, a journal editor will let me do it because I've been around long enough where I'm going to insist, "No, I want it in there," and somebody earlier on in their career would not be advised to do that…But I guess life isn't fair in that respect. The ones who probably do that are bold…There are a few young colleagues here who are undaunted, whose whole *modus operandi* is one where they want to *épater les bourgeois*, and they want to have something that's in your face and different. And that's a calculated risk, but they will be going for certain kinds of jobs where that place wants somebody who's going to be cutting-edge and different.

> But that's a gamble certainly that may not always work. And certainly I advise my own students to package things in more or less conventional shapes…You want to be able to show that you're totally capable of playing the professional game properly and behaving yourself. At the same time, you want to show that you're transcending what other people have done before and you've got something distinctive. It's not an easy game to master, you have to be both supremely original and totally conventional at the same time.

The irony, as in history, is that older scholars, by and large, expect younger colleagues to transform the field.

> And we think that the newer generation of young people who are living with computers all the time need to understand that when they come and take our places, they need to change the culture about things like that.

> I think it's a transformation that this generation within which I belong might see digital work more as a kind of service, whereas younger scholars see something like maintaining a website as a form of scholarly activity…that these discussions and dialogues are scholarly content, and…I am putting my research and thinking into these dialogues.

Ar1.3 Teaching and Service

To gain advancement at a major research university, scholars in archaeology and classics are not only required to publish in traditional scholarly outlets but also to demonstrate a strong teaching and service record. Institutions, because of their particular missions and scholarly agendas, may emphasize publication, teaching, and service to different extents (for instance, teaching is emphasized at small liberal arts colleges). It is widely recognized that research and publication ranks highest of these three requirements in the most competitive research universities. Some scholars called for a greater recognition of teaching as going hand-in-hand with research, and a chair at one highly competitive institution noted that teaching is playing a bigger role in the tenure portfolio.

> Research and teaching go together in such a way that you are a thinker and you are an intellectual leader, not necessarily just somebody who hides in an ivory tower.

> In the last 10 years, and certainly the few years up to and including when I was on the committee, I think the tenure and promotion committee actually began to give even more weight to teaching, and I thought that was a very good and important move to take it much more seriously. I saw cases of people who have fantastic, enviable research records, and disastrous teaching records, and they in fact were not rewarded…They also took service quite seriously. I saw a number of cases come up for major figures on the campus (who were up for promotion to above-scale salary), and they had no campus service, and they didn't get the above-scale. "You're not giving to us, so why should we give to you?" Even just the four years that I was involved with it, I'd say that there was much more attention paid to making sure that the reward system included a more balanced approach to the record, and emphasizing research, yes, but teaching and service as well.

Contributions to teaching: Textbooks and documentary film

Making a film or writing a textbook is considered outside the remit of traditional archaeological scholarship, according to the scholars we interviewed, although documentary or ethnographic

film is prevalent in the neighboring discipline of social anthropology. Both may constitute part of a tenure package when treated as a pedagogical contribution.

> Some people like writing textbooks. I never have. I've been invited to several times, but I refuse…When you write a textbook, that's it. You don't do anything else. You can get labeled as a textbook writer, and be very famous and good at it, but it's not very good for doing research at the same time.

> In the same way as articles in online journals, films aren't credited. If you're in an academic discipline like archaeology you're not expected to make a film. You're expected to write a book…Sometimes, ethnographic film is a much more legitimate way of doing an academic subject…but it's really unusual. There are very few movies, documentary films, or otherwise made by archaeologists. There are lots and lots of films made by social anthropologists because it can count. Whereas, archaeologists, nobody is going to spend a huge amount of their effort if it's not going to get them a promotion. By this period in my career, I don't care. So that makes a difference, it really does, because I've always been interested in this kind of stuff, but I've always had to do it as a sideline, whereas now I'm actually very interested in doing it as a full-time occupation.

> Now, when people also produce films or new media kinds of things, which was perhaps more likely in the year 2000 or so, I think it depended on the nature of the film and what it was intended for. If it was more a pedagogical sort of thing to communicate content that could be used in classrooms, that tended to be treated as teaching materials and in support of the teaching component of the record, rather than in support of the research component, even though obviously research went into it. And the same thing happens with judging textbooks, that when people do textbooks they almost always are seen as a contribution to teaching rather than to research, even though clearly research has to go into it.

Service and age

Service commitments may be taken more seriously for promotion to full professor than for tenure, and young scholars are counseled to avoid spending a lot of time on outreach and service. Senior scholars complained, however, that they may become inundated with service requests, preventing them from advancing their research.

> I would say, at the tenure level, my advice would be: Don't spend a lot of time doing service. Whenever you're evaluated for regular merits or promotion or tenure, you're evaluated on research and scholarship, one, second on your teaching, and third on your service. And you can have fantastic service, including all sorts of outreach efforts and so on, and be a great teacher, but if you haven't published that book you're not going to get tenure. So, practical advice to young faculty is: Do a good job teaching, do some minimal service…focus on getting your research moving, and focus on some significant establishment of an independent record of scholarship. But after you're tenured, that balance can change a little bit, and certainly once you become a full professor and climb up those steps, the tenure and promotion committee does take service, then, quite seriously. And we want to see both professional service, which includes the public intellectual thing, but also campus service. We want to see people on all sorts of committees that the university needs to operate. That's very important, but that's something that we see as the higher you go up in the ranks, the more of an obligation you owe to the university and the professions to give that service. But we get upset when we see departments overburdening junior faculty, which sometimes happens. What happens is the senior faculty members are caught sticking all the dirty work onto some junior, like being graduate chair or things like that. That's really not appropriate for an untenured assistant

> professor to be doing this heavy service. The trouble is that if it eats into their time so that they don't publish, carry out their research and publish it, it's extremely unfair to them.
>
> One thing I have learned as I've advanced up the academic ladder is that you get inundated by diversions. People call you up and want to interview you for an hour or so…You find that as you get higher and higher on the academic ladder, people keep asking you for your advice on things, which means that you don't have time to do the work that advanced you in the first place. There's a tendency to bog down, and it's not because you're not doing stuff, it's because you're doing too much stuff. Sometimes I think it's because you've complained so much about how inadequate the certain aspects of academia are that people say, "All right, you think you're so smart, so now we're seeking your advice about this," or, "We want you to chair this committee and take care of this thing," and so suddenly your time is eaten up by all these things and you are not getting your work done. And that happens very commonly to people who get into the senior levels. One does the best one can. It's not easy to balance and I would say a number of people don't balance it very well.

In contrast, one senior scholar explained that years of doing administrative work in the department was worth temporarily postponing one's own research, because it enabled the creation of a better scholarly environment:

> I was given tenure very quickly…and then my career actually slowed down, because I got involved in academic administration…And so I actually got off the track of being a professor who's mainly trying to do discoveries into somebody who's trying to develop programs…driven by increasing enrollment…which I thought was important…But, you're not going to get promotion to full professor for doing admin work…It wasn't that I didn't want to write the book. I also felt that it was a temporary sacrifice with a long-term payoff because my colleagues, like most academics, are very conservative. If I ramped up the level of activity and the business side of the department, that would have a long half-life. Even if they did very little or they messed it up…I would be in a much more exciting place with more students around and the ability to support graduate students, which is what the teaching assistantships give you, and I would benefit from that, which is true. That worked out, and things did stabilize, which was fine…And so then I was in a much more stable place and we started getting really good graduate students.

2. CHALLENGES AND OPPORTUNITIES FOR DISSEMINATING RESEARCH: WHAT ARE YOUR CRITERIA FOR CHOOSING A MEDIUM?

The interdisciplinary nature of archaeology leads scholars to publish their research in a number of outlets, reflecting their roots in fields such as classics, anthropology, and art history. These publication forms include monographs, journal articles, published conference proceedings, edited volumes, and media formats (such as CDs, DVDs, or websites) for supplementary or dynamic data and materials that can include large volumes of images, maps, and 3D reconstructions. Publication norms for tenure and promotion require publishing books and articles with the most prestigious imprimaturs. There is some fluidity in publication practices, however, and scholars often publish with the press or journal most relevant to their area of specialization. Such an array of choices and practices does not create a clearly defined publication landscape.

Scholars in highly specialized, technical, and image-heavy subfields have encountered increased difficulties and costs associated with publication, which some describe as a crisis. As a result, scholars have experimented with digital monograph series or various flavors of print

text/multimedia hybrid publication, including DVDs, complex multimedia websites, and online 3D "publications."

Ar2.1 Criteria for Choosing a Publication Outlet: Prestige, Peer Review, Audience, Speed

Descriptive publishing practices

Archaeological research leading to publication has a comparatively long life cycle; it can take decades to fully collect and analyze the data from an archaeological excavation. Consequently, research from a single excavation may be published in a variety of formats over decades of research and excavation. Traditionally, the publication format concluding a project in archaeology is the print book, and archival volumes of edited texts play an important role in the study of written evidence, such as papyrology. As described previously, journal articles can substitute for the book in particularly technical or scientific subfields. Articles also play an important role in helping scholars in monograph-based subfields to publish work at a more preliminary stage so as to stake a claim in the scholarly discourse. As in history, archaeology has witnessed an increase in edited volumes, such as conference proceedings, in many areas of specialization.

> Ultimately, there will be a monograph or monographs that present the final publication of the archaeological work that's gone on. Leading up to that, though, there are both journal articles and especially conference papers and articles that will use material coming out of the ground, and with it an initial analysis and interpretation, primarily because it does take us so long to do the fieldwork, that it takes us a long time to write it all up. Today we don't like to have to wait to disseminate the information. Certainly in prehistory, but I think in classical archaeology overall, conferences have become vital, and conference publications are important both to us on our C.V.'s, but even more so for getting new information, the stuff that's brand-new, that's coming up in the field, out, and we rely very heavily on these conferences, because that's when people step up and show what's new, where we may have to wait 10 or 15 years before the book is out. And it's frustrating that that's the case, but we've worked out a system to do it.

> We do not really deal with short pieces and narrow text. We encourage pieces that are expansive. But I think it does mean in the field at large, that increasingly…even if you're publishing the book as your first thing, you'll have an article that is supposedly staking a claim to the field: you're working on this thing, you're doing your dissertation, you're going out and getting a job, you know it may be two, three, four years before your book's really finished and out, or even more sometimes, it may be five or six years before it's actually out, and you probably will have given a job talk or two, which is probably in effect a dissertation chapter or something like that…So journals are one range of things. And, as I say, those can range from quite short little bits, just to get you started, something on your C.V. or a bit of the work you're doing, to, in some cases, really hefty chapters. The problem may come in when, if you've got a couple of those out, that's at least half your book already out in print, and some presses may not particularly want then to publish a book that's already mostly out.

This fluidity in publication practices, especially post-tenure, is illustrated by a senior scholar in classics, who simply prefers long-form articles to books or conventional shorter articles:

> In my own particular case I've tended to write quite a lot of articles, including some very long articles, rather than books. I've written a single-author book early on, that was my dissertation book, and then a couple of editions with a bunch of commentary, so it's a

> university press type thing, or a fairly technical press that's geared partly toward a wider audience. But a fair amount of the most original work I've done, most of it over the last 20 years, is more synthetic and has drawn together a lot of things. But, the more adventurous or imaginative stuff I've done, I've mostly put in articles. I'm aware that there were a couple of clusters of articles that I could have worked into a book and published, and I think I could've found a publisher if I'd wanted to work at it and trim it down and make it a little more reader-friendly and slightly less technical…but because I already had tenure and was already doing okay and didn't particularly feel that hardcover books or university press books were the only kind of standard that I minded, it was more convenient for me to write these very long articles, 50-60-page articles with a lot of footnotes, which were still in some ways fairly readable and fun…

Fluidity in publication practices: Prestige, audience, speed, affordances

There appears to be some fluidity in publication practices due to the diversity of the field. Different presses and journals cater to different subfields, theoretical approaches, and political allegiances. Scholars aim to publish with certain presses and journals that have established prestige in a *particular research area* and that cater to a particular audience.

Books

While scholars aim to publish with prestigious university presses, good scholarship can be published by less prestigious presses and still be recognized as significant. Again, scholars choose university presses for their reputation in a particular subfield. For example, Oxford University Press and Cambridge University Press have "put out a lion's share" of general books, monographs, and edited volumes in prehistoric archaeology. These and other prestigious university presses are desired because they can distribute a book quickly to a wide and interested audience, as well as provide high quality illustrations for the particular genre of work.

> How I publish typically depends on the type of books. My last book…was published by a very traditional publisher…because my choice was to be published in the very traditional catalog books…There are many criteria I use for choosing a publisher. There are technical criteria—the quality of the publication—so, plates, colors, layout, etc., are really important because they form part of the standing of the book. And, second, of course, is if the publisher is very well known and prestigious in scientific terms, and in some few cases has the capacity to distribute the book widely…

> Speed is certainly a factor in my choice of publication outlet. It's a combination of factors. Sometimes it's obvious if I've been at this conference or I gave a lecture at such and such a place, and they say, "We'd like to publish it in this journal," I'll usually just go with that. The books I've published have all been from Cambridge University Press, and they did okay, they distributed it all right, and it didn't take too long. So I guess there's a little bit of snobbery in that I'd prefer it to be somewhere I've heard of. But certainly some of the conference volumes have come out in places that I didn't know that much about, and they did a fine job, and I would rather that it be out so somebody can read it, relatively promptly. I just don't want them to make me mess with it. I want to write it the way I want to write it. I do not particularly like to be heavily edited. If I'm contributing to something and it's clear they want the things to be roughly the same size, I don't insist that mine has to be five times as long as everybody else's, but given that there's some room for choice as to where you publish, I'm fairly happy with the idea that I can place it somewhere where it looks like it will be sort of

appropriate, and if people want to find it they can find it. It doesn't have to always be the premier journal.

Journals

Given the increasing subspecialization in archaeology, there are, according to some, "too many journals" and few agreed-upon top outlets with maximum reach that provide a wide overview of the field. Instead, choosing a journal for publication in archaeology seems to be based on a scholar's impressions of the particular kind of work a journal publishes, as well as the audience that he or she is trying to reach. While pre-tenure scholars are told to aim for a handful of "flagship" journals, ultimately they must take into account other factors including "fit," audience, and quality of the illustrations.

> Identifying the three top journals in my field is a tough one, because there are too many journals…And even within archaeology it's very difficult to evaluate the top journals because a lot of it actually depends on where people work in the world. So, for example, while I'm based in a North American institution, my primary professional society as an American archaeologist is the Society of American Archaeology. But because I don't work in North America, and my work is in Europe, my flagship journal, which is *American Antiquity*, is not likely to publish my work, because they really primarily publish…people who do their archaeology in North America. So you've got some of those sorts of constraints…And then because of our work as archaeologists, probably most of us would say that it would be fantastic if we got an article in *Science*, but then it would only be a certain kind of archaeology as well. It's very complicated, I'm not sure there's a straight out answer to that one…So, deciding where to publish is really an audience question. I try to anticipate who I think the readers are and whether this piece is something that I either want that audience to read or think that they would be the best audience for. I think I have more of a sociological sense of who the audience is, who the readers are of the different journals…We do give graduate students this advice and suggest to them that, as they're building their careers, these are the six or seven journals that they should aim for, but in order to aim for them they need to go back and read the journals and see what kinds of things are getting published there. We just did a review like this in a class of mine, where the graduate students went and looked at what the journal topics were, the geographic areas, what the themes were, how many were collaborative papers, how many were single-authored, and where the authors came from in terms of their institutions, both in the United States as well as internationally, so that they could get a sense of who the contributors are and what it is they're contributing that was being accepted, so that they could then maybe anticipate at least what the editors of the journal had in mind, or what was the best thing for their readership and their audience…
>
> I think most scholars think, "This would make a great article for the *Bulletin of the American Schools of Oriental Research*, or this is a good article for the *Journal of Near Eastern Studies*, or this is for the *Cambridge Archaeological Journal*." A lot of it will depend on what other kinds of articles the journal publishes, the format of the journal, and how good, especially in archaeology, the illustrations are. I can tell you that some journals are less archaeologically friendly because they're a smaller format and they don't use glossy paper, things like that.
>
> The field, at the moment, is reasonably healthy in that there are a fair number of journals, different choices, some of which have fairly different kind of intellectual focuses to them. They like different types of work. And some of them are known to accommodate longer articles than others…*Classical Antiquity* is actually where two very long articles have previously appeared.

Site reports and grey literature

Archaeological books and articles are highly analytical and interpretive in focus and are not able to accommodate the wealth of data collected during the excavation. Instead, detailed data (including preliminary results, field notes, and databases) are usually presented separately as "grey literature" or field/excavation reports. These intermediary publications are often necessary to continue a funding stream or to share data alongside the more synthetic book and article publications. Though intermediary publications are traditionally produced for narrow, specific audiences, scholars may turn to online outlets to disseminate grey literature more widely.

> I have a very large excavation project, and from there I publish articles in journals, and I will publish joint volumes with a lot of different authors. And my research unit has been really good at publishing excavation reports. So I think there I can publish, without any problem, my excavation publications.

> The grey literature is kind of a medium between field notes. You have a lot of field notes, and this can be your huge database of information. People are generally pretty open to sharing that information…And the medium level is your field report, which generally doesn't have a lot of interpretation. It munges all the nice data that you have over here into graphs, and it's usually not for publication, necessarily, but either to continue your permits for funding, or if you're working on a private corporation's land then you give it to the corporation, so it's kind of a medium ground thing. And it generally doesn't interfere with your official publication, which unfortunately for archaeologists is very far off, usually. There are archaeologists who have been working in places for 30 years and never published any of their results, but that's very much discouraged, obviously.

> Well, if it's a journal article, we are encouraged to publish in the most prestigious journal that we think will accept our article. Most of the current research in academic archaeology is published in journals. Books are obviously important as well. There is also a lot of grey literature. Increasingly we have archaeologists publishing raw data on the Web (finds databases, maps, photos, field data entry sheets) and then publishing the "digested" interpretations in journal articles. Occasionally we will also publish on the Web concurrently, but it's pretty rare.

Ar2.2 Perceptions of the Publishing Environment

Peer review

The issue of peer review was raised repeatedly; it acts as an important sign of quality, particularly when a scholar's work is evaluated by tenure and promotion committees.

> I do think, especially now speaking as a journal editor, I'm proud of the difference that we and our referees have made to articles and do make regularly. More articles than not are a lot better by the time they come out than they were when they first came, and of course some of the referees remain anonymous. They may at some point get the satisfaction of seeing, "Oh, this person did read my comments and did put that in there," and they know that most of us would rather see good work than bad work. And by a different definition you could say that that's an article that really three or four people have had a major role in turning it into what it is now…But I think most people understand that it evens out over the years. As you get older you probably are helping more people produce something better. When you start out you're grateful for help you've been given to get your ideas in shape.

> In some areas of archaeology, however, peer-review mechanisms appear to be more varied or fluid when compared to the natural or social sciences, given the intimate, specialized subfields within and across disciplines. This is due in part to the nature of data collection in the field, and the fact that peer review may focus less on the "accuracy" of the data in question, and more on the quality of the analytical argument put forward. As a result, some scholars said that the peer review system can run on "personal connections, networks, and vague notions of trust and reputation," at the expense of scholarly rigor. Furthermore, our scholar-editors report being frustrated by the poor quality of peer reviews they receive, as well as by authors who are reluctant to make revisions.

> My personal experience on peer review is both from reviewing articles for journals and reviewing grant proposals. I think the grant review process, at least in our field, is still probably too reliant on personal networks—who's doing the work, who they're working with, and that sort of thing, because it's still a small enough field that most people are known. There may be still more emphasis on the networks rather than stepping back and just looking at the research on its own terms to whatever extent you can. Obviously lots of times you can't. But the journal review process that I've experienced has improved in the sense that there's much wider distribution because it has become international. I think that people who run journals are now looking to scholars in a whole variety of countries, and they've actually expanded the potential pool of reviewers so that you get a variety of impressions. But what's not improved about it is that it still takes an extraordinary amount of time… unless editors get reviewers to have a consistent way of reviewing things, they're getting documents back that are handwritten on and commented on, as well as those that are done with the electronic tracking system. So there's still a lot of variation in how they're getting things that they then have to weed through as editors, to try to come up with their evaluation of the manuscripts. They could get more consistent.

> I think the experience of peer review is widely divergent. On the one hand, I think anyone would tell you peer review is essential. But on the other hand, many would report that the quality of peer review seems, anecdotally, to be slipping, tending more toward description than analysis. I think this same trend is visible in book reviews.

> Filtering is mostly informal…so someone has a good name or a bad name, but a lot of the publications are not in a peer-reviewed series…In some subfields of archaeology, peer review isn't really a very strong tradition, so some authors are really shocked if they get snide remarks about their article. Even worse, there are people who really feel completely shattered. I find myself emailing them that I've had many bad reviews in my life; it's quite true. I must say I was surprised by those authors' reactions to criticism.

> It depends on the field whether peer review is a helpful distilling mechanism. I'm putting this in a horribly elitist way, but any of the members of my specialist field who are any good are known to one another, unless they're young and they need to become full-fledged scholars…it's irrelevant. You just know enough that there are about 30 or 40 people that I need to take account of. And, of course, a brilliant graduate student may come up, but somehow that will get known.

Another symptom of the varied state of affairs in peer review is that collections of invited essays can be subject only to what is referred to as "light peer review."

> Then there is the publication between hard covers of collections of invited essays, which seem often not to have received very much peer review. I suspect that many would agree that peer review is important, but these volumes seem to speak of a different, parallel, story.

As in other fields, one senior classicist did embrace information technology as a way to "make the vetting process more rigorous, and less secretive and subject to personal whims." The downside to relying on Web-based technologies to facilitate peer review, as explained by a senior archaeologist, is that this may limit peer reviewers to scholars with high-speed Internet access:

> The other thing that's really a difficulty is if you tap into your international communities for reviewers, you're going to get people who don't have as good access, who don't have high-speed Internet. So if you've got somebody reviewing it in, say, Morocco, they may not be able to participate in the peer review process just because of the technological barriers.

Democratization versus peer review

Despite the problems with peer review, as well as moves by some scholars to create new forms of digital scholarship, peer review remains paramount as a filter separating serious scholarship from, well, Wikipedia. While some editors have spoken about the utility of putting non-peer-reviewed material online for rapid dissemination, this would never replace the scholarly, peer-reviewed publication as a mark of academic prestige.

> I think the biggest worry I have…is the peer review thing. The democratization of knowledge is all very well, but I think any of us, in my field, who go to check out Wikipedia or other websites to see where our students are getting information, are appalled. The amount of misinformation and erratic reporting that's going out there is happening all the time. I was saying that perhaps the era of the glossily published 250-page monograph to get tenure should be over because of various reasons, but on the other hand, one doesn't want that to be superseded by something that is a kind of "anything goes" publication. I think that's critical.
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> But, in terms of actually producing scholarly knowledge, to me one of the reasons I still favor the book-based approach is because of the whole process and apparatus of verification…When you submit a book manuscript to UC Press, Chicago Press, wherever, or you think of a book that's published by any of those presses, you know that this process lies behind it. You know there's been a serious peer review, you know that two or three experts in the same field have read that manuscript, and either said "yes" or "no" or "extensive revision" or whatnot. You know that it has been seriously copyedited by somebody. This stuff doesn't apply to the things on the Web. It generally doesn't apply. You have no way to verify. Wikipedia is an example of this, something that I use from time to time. I've looked up on Wikipedia stuff in my field, just for fun…In contrast, *The International Encyclopedia of the Social and Behavioral Sciences* entries are written by top people who were carefully selected. They took serious efforts in writing them. It got reviewed. So you go to an article there and you know you're getting something that's been really carefully vetted and authored…
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> The existing publication system seems a bit cumbersome and a bit almost hypocritical, whereas my instinct is to share…One would be happy to see people just stick all their publications up there when they finish writing something and everybody can read it. My inclination is to like that idea. At the same time I'm aware that there's an incredible amount of rubbish out there, and if you leave individual students to try to find what they think is good for them, they don't usually do a terribly good job of zeroing in on the best available source. So, I'm not yet convinced that we have to abandon the current system, even though I do sense that book publication is very arbitrary, in that the process of which really good pieces of writing turn into books, and which don't, is rather opaque. It seems that that's a bit hit-or-miss, and that there are a lot of really fairly pointless books getting published that are just getting written because somebody…I think it's only because it now seems that it's more

> expensive and people are worried about losing their money that they are being more selective…Maybe not, there have always been a lot of pointless books coming out.
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> I think there is something to be said for revisions and the review process to tighten up scholarship. I think there's a lot more junk online, or things that aren't thought through as much as they could be or should be. But somehow that may be all right, because a lot of them are not in media that are really costly, it's not like you're buying a book for 50 dollars that somebody wrote one night and just threw it together. So there seems to be no personal cost in accessing things like that; you just delete it, go to another website, or something like that. So I think that things could be done a little bit more hastily, although there certainly are some fantastic things about the publishing system.
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> One of the other points that people have pooh-poohed about the idea of electronic monographs is, "What's the quality?" Well, the APA (American Philological Association) print monograph series has an editorial board…and I think we should get a stronger editorial board for the electronic monograph series. The one for the APA print monograph series is actually elected. I think you want to pick pretty senior people with great reputations, and consult not only the board, but also ask for outside referees. Usually we do two referees, at least, whereas many presses are now doing only one, and sometimes they're referring the thing only on the basis of a summary of one chapter and not the whole thing. So, actually, the author doesn't get as much feedback from that type of review. So the other service of a monograph series controlled by scholars is that hopefully you do get a much higher quality and detail of feedback, so if something is not ready for publication, they get lots of tough questions asked of them and advice that they can actually work on.

Speed

On an archaeological dig, everyone has different publication timelines, which differ by subfield, age, and project. The time taken to analyze and publish an excavation can take as long as a decade or beyond, and scholars are further limited in their speed of dissemination by dig location (e.g., in Japan or Greece, researchers publish site reports yearly) and whom they work for (e.g., local funding bodies may hold first rights to the data). Furthermore, publishing a book can easily take an additional two years. As a result, archaeology can be a "particularly risky" field for young scholars needing to produce work within the constraints of a ticking tenure clock.

> Archaeology is a particularly risky field for young people, I'd say. You need a long lead time before you may understand a site. I've been excavating one project for, I don't know, 12 to 14 years, and it really was only about three years ago that it began to be evident what on earth it might be. Even now there's a speculative element to it. They're just now publishing the first decade of excavating that site, and this definitely did not help one pre-tenure scholar working on the site to be promoted…There was no storyline there…about something that happened, pottery or figurines or something…It's only now after more than a decade that it's really beginning to fall into place, and I think it will be fabulously exciting. So I think archaeology is a very dangerous field in that way. I really don't know what the solution to that is.
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> There's nothing set in stone about time to disseminate results other than in some areas of the world, where there are rules for who has the right to announce initial results. In these countries, some of the sponsoring or funding agencies must first announce official results before archaeologists working under their aegis can disseminate their research. So every year, usually in April or May, work from the previous summer is presented to the public as a brief synopsis by the director of the foundation, drawn from annual reports we submit every

> November of our initial results with pictures. A small publication that summarizes the reports is distributed at that time. Our full reports are also published annually, in theory, although they're a couple years behind. For example, the reports from 2003 just came out…So it's a long lag time, but neither one of those publications are considered final publication of our work. They're just preliminary reports…And when I present my current research at annual meetings in January here in the States, I always work a year behind, since I must wait for the annual presentation in the spring. It's awkward, but I understand why they do this. They want to be the first to present the material they sponsor or fund. But immediately thereafter I can start using the material in whichever way that I want to, and in some cases I do, in fact, put things out there slightly earlier, especially to colleagues who I know are working on things…That I would do through private conversations, communications, email, that kind of thing.

On the opposite end of the publishing spectrum are scholars who *choose* to sit on data and work for too long prior to publication, as illustrated by a scholar who specializes in classical art and archaeology:

> Like many humanities fields, there's even a kind of bias against quick publication and multiple publication and prolific publication. There's a feeling that my field is all about building up erudition and learning before you say anything about anything. And often that's been unhealthy, actually. And I personally think that the more that rapid and prolific publication is supported, and that it attracts more scrutiny and commentaries, the better. That's my own personal opinion. There are too many examples of senior scholars who just literally are buried away on their material that never saw the light of day. It was unclear whether they actually had anything to say about it. They, of course, said they did, but who knows?

Long journal/volume turnaround times

Although articles and conference proceedings were mentioned as a valuable way to publish work prior to completion of a book in archaeology, several scholars complained that they also suffered from long lag times to publication in the editorial process.

> Again, the experience of speed to publication is all over the map. My field is deeply international and in the case of submissions to some journals, it might take eight months before you even hear that they've received your piece…

> There are similar issues in terms of how long it takes to turn around an article, because the top journals take forever, and there are very few places in archaeology where you can just send in a small publication quickly…We have huge problems where one of the top journals will take over a year to send you back confirmation or not…There are plenty of small things in my thesis that could be a short article, but there basically isn't a venue for just saying, "Here's one piece of data and the implication," with a quick turnaround time. It would be very nice if there were, say, a monthly journal, because many of the top journals are quarterly. There are a couple that are quicker, but it would be nice if you could just publish small things separately…It would be nice to have small journals that were more accessible to lower level scholars in terms of quicker publications.

> The other part of it is that conference volumes, which are often a way to start getting your work known out there, on the whole tend to take often a rather long time, actually, to appear, and that can be an issue. You never quite know. In some cases they're really well organized and they have a good track record or a likely editor or a good local press. But there can be these really miserable cases where a really good conference happens, but it's five or six years

> before the papers come out. And that doesn't matter so much for the old fogies who have already got 30 or 40 articles out, but for some young whippersnapper for whom this is their great breakthrough, it can be pretty frustrating. And then, of course, these things tend to go out of date, not as quickly as they do in molecular biology, but there are new discoveries.

In general, the field needs the review process to move faster.

> One journal I know has a three-month policy, that is, they respond the day the submissions are received and they aim to have reader reports and a decision of thumbs up or down within three months. Few journals in my field operate that quickly. In this particular case it really just reflects the ideological commitment of the editors, "Why mess around?"

Ar2.3 The "Crisis" in Monographic Publication

The landscape documenting a crisis in scholarly publication is complex, in part, because of the multiple interdisciplinary domains under investigation. As in history, scholars in highly specialized or technical fields were struggling to find publishers for their work. In particular, many university presses have severely limited or stopped publishing site reports altogether. Not all scholars identify a crisis, however, especially those from competitive institutions. Yet work that demands high-quality illustrations, images, and other media components can be held hostage by high publication charges.[43]

> I do know that it is true that the presses are selling fewer copies of the books and that from their point of view there's a crisis, but I think that classics books are perhaps still selling better than some other fields. And, at any rate, they seem to figure out ways of putting them out.

> There is a certain amount of pressure, I don't think it's probably as bad as it is in some fields, but I think the difficulty is for those who really do feel they have to have a big-name press and they have to have their book out as a book. There are monograph series published in Germany or here that may be soft covers and don't look so elegant. I think if you settle for those, which are still fairly respectable, I would say that the pressure isn't too bad if those count as books. But the pressure to get Oxford or Cambridge or Princeton or Harvard or Chicago, that is a source of some anxiety, and my distinct impression is that each of those presses is constantly reviewing its criteria and deciding how much longer it can lose money doing it, and so there is anxiety that that might stop…I'm economically naïve. I don't really know at all what the financial end of this is, and I suspect that it's very, very hard to measure the prices of producing things that at some level are losing money, but universities associated with these presses depend on them to do their tenure reviews for them, practically for free, by getting these books read and approved and accepted. That seems like an informal system that's working.

> I don't think at the moment that I'm hearing that there's a crisis in scholarly communication in archaeology. Of course, there's competition…but I haven't heard anybody complaining recently.

Again, as in history, the publication crisis in classics and art history perverts specializations in the field by driving monographs in the direction of generality.

[43] For more information on specific issues in art history, see: Ballon, Hilary, and Mariët Westermann. 2006. *Art History and Its Publications in the Electronic Age*. Connexions website: Rice University Press, Council on Library and Information Resources (CLIR), September 20. http://cnx.org/content/col10376/1.1/

> In terms of university presses and the monograph, I think one of the problems that I observed is that the presses, for economic reasons, are pushing the monographs in a direction of generality, just in order to sell enough, and that perverts the specialization of the scholar…But there is actually a distinction between the type of book that university presses want to publish as a monograph, where they think they can sell enough copies at least to break even, and the type of work that in fact lots of scholars are or should be doing at a dissertation stage, which is more technical and specialized. And in Europe they have monograph series in Germany and in the Netherlands, which publish a lot of these types of things, although it's strange how the monograph series used to be 200 pages, and now almost every German thing is 400 to 600 pages. In fact, they don't have many general-purpose books in the German book trade. I guess there are some but we wouldn't hear about them. But they do have lots of these series. And so if you actually have a more technical type of topic you would be better off to submit it to one of those series than put it into a press in the United States because the press in the United States might say, "Well, if you do this and you do that and you generalize that, talk about this other issue, then it could be more marketable," or they would just say, "It's not sellable. We don't want it."
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> …and there's the whole issue…with the increased difficulty of getting first books published in narrow academic fields, the market is just drying up…No, I don't think this is a problem in archaeology, but I've heard my colleagues in the humanities say it's a huge problem increasingly in English and language fields.
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> I think that the phenomenon that's most visible to my colleagues in art history and about which they obsess, really, is the virtual disappearance of the traditional art historical monograph, heavily illustrated and published by a university press. There used to be seven or eight being published in a year. They represented what the field was doing…In art history, I would say that the biggest problem is getting published. That's the major transformation. To get this research into print between two hard covers, sold and reviewed by the appropriate people at the right moment in your career in terms of the promotion clock has become increasingly difficult, and, in fact, I would even describe it as a crisis. This, I think, is fairly specialized to that field.

For one department chair, the increased competition for book publication could perhaps be seen as an additional quality filter, correcting for the overproduction of monographs lamented by some scholars:

> Digital publishing comes into the solution, but there's a series of things that are happening. Some are end runs and some are really dysfunctional situations that are in stasis right now. And I'm expecting…something has got to break in this system. It'll be an earthquake-like tectonic shift, and all of a sudden we'll be into a new environment. But, for the moment, one thing that's happening is that there is very aggressive competition for the big publication subventions, and these are administrated by the professional organizations as well as several private funds. And this has meant that you now have to basically go through *two* competitive reviews: one for the publication subvention and one for the publisher. So that stretches out the time. It's arguable that it may be good for the quality of the books. I would have said 20 years ago a lot of dreck got published. Anybody whose dissertation was any good, it more or less found its way into print. This is not the case any longer, because of this hurdle.

High costs and challenges for image-heavy publications

There is often a high cost to publish highly specialized and technical works involving large numbers of illustrations, plans, and similar media. These costs are due to the need to prepare

archaeological illustrations and images for publication in technical books, print high-quality photographic reproductions, and secure expensive permissions prior to reprinting copyrighted images. These activities also add to the existing lag time in publication. While advances in digital photography are helping to reduce publication costs, digital images are still perceived as of lower quality than those prepared using traditional means.

> The main problem with publishing work dealing in visual images is the copyright law. A colleague published a book with lots of photographs from various sources, and a lot of the work that went into finalizing it was obtaining permissions and the good-enough photographs from wherever…So s/he had to deal with European museums and presses that had published the material. And sometimes you have to deal with Art Source, the commercial entity, where you pay fees. Alinari is one of the old names of this, but they've all been merged. I think it's all owned by one or two people now. These are stock photos. And usually the fees for these are pretty big because these people are used to selling images to advertisers for TV commercials and glossy magazine commercials, so they're used to charging quite a bit. And they'll sell you the rights to put it in a volume, but then if you're also going to have a PDF online, then there's a separate fee for that. That certainly has a very chilling effect. People who might be interested in adding illustrations to something who haven't done it before are very put off by the prospect, and for people who actually depend on publishing something for their livelihood, like art historians, it's really a very, very difficult thing.
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> The main problem is cost. Because of the kind of things that we need to do, we need a large number of illustrations, photographs, drawings, and plans, and the cost can be very prohibitive…The publications for a recent excavation of mine cost roughly $10,000 to prepare. They're particularly large volumes and they include a lot of photographs, but that's what you really need to do because this is putting it into the public domain. And I think more and more we're all exploring the possibility of reducing these costs…First, of course, we went to camera-ready preparation, and using digital photography helped to cut down the prep cost somewhat. But, still, the idea that we would find other ways, whether it be through the Internet or some other kind of digital format is appealing…
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> Heavily illustrated books have become prohibitively expensive for all but the most committed publishers. This is partly because many publishers are moving to production processes that use digitized images, which are perfectly okay for illustrating a scientific diagram or even something that might be as sensitive to resolution as a medical radiograph, but they're really unacceptable for fine art, representing works of fine art. So there is that issue. The second issue is that the intellectual property issues around images have become increasingly tangled, controversial, unpredictable, and expensive. This is because more and more parties are trying to claim a piece of the pie in extracting fees or payments from issuing reproductions, so not only the owners of the works of art, but also the museums that may hold the works as well as the photographers who take the pictures, as well as the Photoshop people, etc.…So there's a whole industry of people who are shaving off a piece of the cost. This means that most of these costs land up front on the doorstep of the would-be author. It's he or she who has to get these pictures, settle all the rights and reproduction issues, and then present all of that material to a publisher, often accompanying the presentation with the publication's subvention, enabling the publisher to print. And only when all those resources have been gathered up can the book move forward.
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> What we need to do is we need to find a way to have digitally prepared publications look as good as ones that are prepared in the more traditional manner, because they don't always. There's a lot that are created very quickly. People say, "This quality isn't as good." And we do have fairly high standards for what we expect our publications to look like, and I think part of that is because we have worked so hard and taken so long to get there, and we, ourselves,

> are impressed and excited about the things that we want to show, and so we want the quality to be the best possible…I think that financially it's just not going to be possible to do the kind of archaeological publications that have been done in the past. But digital photography, especially, is going to help us show and print more images and not have to suffer from the cost. I think it's going to help. And, it's changing pretty fast. I see every year that the images are better, the quality is better, and what you can do with it is more exciting.

Finding the financial resources to support publication is a growing challenge for scholars in the humanities, and may add substantially to the lag time in publication. Fortunate scholars may secure publication subventions in advance from home institutions or funding bodies, while others may have to alter their publications.

> My university provides virtually no subventions for illustrated book publication. In other arenas of the university, we are making many efforts to provide subventions, for example, toward page charges for scientific publication, but in my field we're talking about subventions on the order of $30,000 to $80,000 for a heavily illustrated monograph, and the deans just don't have that money…There is aggressive competition for the subventions that are available…And there's quite a bit of money sloshing around. In a weird way, I suppose there's enough money sloshing around in these subvention opportunities that people go for that first before they start compromising and saying to themselves, "Well, I'm going to have to drop this project" or "I'm going to have to publish in a different way." Or, most frequently, what's happening is that our field is changing through the back door, in a sense, because people are pulling out of the very idea of publishing a heavily illustrated book as a work of scholarship. And that, I think, has been an unremarked-upon phenomenon. But the field is actually intellectually changing because it's no longer possible to consider publishing 300 photographs, reporting on your research, and being like the scientists reporting the experimental results. You publish these photographs as a way for other people to check your materials and your measurements and your interpretations. Without that, things become a lot more open-ended…But the total number of photographs or images that are being published is just dramatically dropping. The publishers are now setting firm limits, for example, on the number that they will even think about looking at. So that has meant that our books are now looking more like a standard monograph in a field like history or anthropology, which might have ten or twelve illustrations, which is negligible in terms of publishing costs.
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> The author subsidy would depend entirely on the complexity of the typescript. If it were a very complicated thing with photographs, it would be much larger than a straightforward book in paragraphs. But again, a big criterion for subsidy is going to be probable demand, what is the demand for this? My sense is that a book, no matter how technical…they'll probably sell 300 to 400 copies, just by virtue of being out there, and mostly to libraries. Beyond that you're going to then have to start getting decent reviews or you're going to have to get some demand. And so anything that's probably any good, even if fairly technical, will probably then start to sell around 600 or 700 copies. I think if a publisher thinks it will sell that many copies they won't ask for a subsidy. In the world where it might be 250, 300 copies that are sold, it would probably be common to ask for payment from the author.
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> And of course, the problem with the German series is that a number of them ask for subventions and they're quite expensive to libraries…Some of them do charge authors…especially in the Netherlands, they are incredibly expensive. The only country that is as cheap as the United States in producing scholarly books is Italy, that I know of…I don't know how the Italians do it. There's some built-in subsidy in their system for publication…I don't know whether authors are expected to contribute in Italy, I suspect not…Two decades ago someone was asked for $3,000 for a supplement of about 200 pages. And I don't know what they're asking now.

> I had to pay thousands of Euros to publish my book…because we published 100 color plates in the book. I paid for that with my grant. The book was part of the grant…This was a national grant…from the government; part is private, part is public.

Openness to new electronic publication models

Discussions are emerging of how electronic publications can provide a means of cutting down on the cost and long lag times associated with print publication, in addition to increasing access to publication for scholars in more specialized and technical fields. They also provide more flexibility for cheaply integrating different kinds of illustrations into publication. Yet, as discussed previously, advancement committees and some senior scholars are still wary of moves by younger scholars in this direction.

> It's the same with the whole university press thing. I myself have mixed feelings as to whether it is worth having all the trouble of putting together books with shiny, hard covers and putting them out there, which will be read by a few hundred people and then they'll go out of print after three or four years and they'll never be reprinted again, when we could just put them online and let people who want to read them read them.

> In 2006, the American Philological Association (APA) and Archaeological Institute of America (AIA) joined together to create a Task Force on Electronic Publications to address these issues.[44] One of the central questions broached by the committee was the possibility of creating a digital monograph series for the APA. These works would perhaps be published following an on-demand and/or open access model. As the scholar below notes, the digital monograph idea raises questions about cost and sustainability, how digital products are to be evaluated, editorial quality, and issues around preparing high-quality images, character typeset, or other data forms.

> And so the idea of having a digital monograph series for the APA…I think that if you want to try this, then you have to try it, otherwise not…Eventually it's going to happen. If someone with authority takes leadership maybe it will happen in a good way…I believe that there is room for a digital monograph series that distinguishes itself from the university press monographs by being more technical, and not worrying so much about how many copies are going to sell. There are probably some start-up monies to try it out. But in the long term there is the question of how sustainable it would be and whether you would have to have some subvention, but perhaps something more reasonable. And in that case you publish 20 or 30 copies on demand, and when the thing is ready you send it out for review. So there are hard copies for the author to give to his personnel committees, but the main distribution is by PDF…So that is something I still think we need to try. There's also the question of who is going to actually take the risk of submitting to it at the beginning. And, again, if we do this, what we really need to do is to get senior scholars to put some stuff in at the beginning to establish it, to set an example, so that a junior scholar will feel braver about that.

> Again, for this monograph series, to start with they're going to have to limit themselves to basically textual material, because when you try to add images the cost goes up tremendously. The editors from the AIA say, "This is probably a good idea for the APA, but it's not possible yet for us in archaeology, with the kinds of data we have and the numbers of photographs and all this stuff, to save money in this type of publication, because it takes so much formatting and preparation that needs professional work." So they're working on it, but they don't think that it's actually going to reduce their costs very much. But whether it

[44] APA/AIA Task Force on Electronic Publications. 2007. *Final Report*. American Philological Association, Archaeological Institute of America, March 31. http://socrates.berkeley.edu/~pinax/pdfs/TaskForceFinalReport.pdf

> reduces their costs or not, it may turn into eventually the only way they can do it because the university presses are less and less likely to do some of these really big projects…

The Harvard Center for Hellenic Studies has founded its own digital publishing program and publishes electronic books on the center's website. Their goal is to make electronic publishing on the website interactive as a means by which to promote collaborative scholarship. It was suggested by one senior scholar that only when top-tier institutions, like Harvard, endorse online publication will this become a legitimate publication outlet and be recognized by tenure and promotion committees. An added advantage of this digital monograph series is that it would enable scholars to take care of typesetting Greek and other languages personally, rather than relying on presses (who some perceive as incompetent in this area).

> The Center for Hellenic Studies has a publishing program. They publish print books by Harvard University Press, which does the distribution of them, and they also publish electronic books on the center's website. The electronic books at the moment, there are some new things in them, and they have some born-digital books that are coming out now. Most of the publications are things that have been published elsewhere for which they've gotten permission, either from the author or from the publishing company, to publish electronically. There are various arrangements that they've made with other publishers and institutions, and the goal—they haven't achieved it yet—but the goal is to make electronic publishing on the website interactive, in a controlled way, so that it's like making scholarship more of a collaborative process, rather than one person saying the last word on something and signing it forever…whatever way it would be published…but instead making publications and scholarly material actively into an ongoing process, a dialogue. …They fully understand that…people may be afraid of, "What if my dean doesn't like it?" or "What if my promotion committee doesn't like it?"…But that there are people out there who are eager for alternatives, and who are eager to use the prestige of Harvard University, because they are the ones who oversee the Center for Hellenic Studies. I'm eager for Harvard to legitimize these new models of publication so that people can't just turn around and say, "Okay, this is great but my dean won't like it."…What they're trying to do is use their prestige to a good end…One of the urban myths about electronic publishing is that you have to read off a screen, which is not the case because you can print it out or you can have a print-on-demand function. You can have all sorts of beautiful ways of reading it however you want to read it. But what they're interested in is not keeping things static.

Electronic publication could also play an important role in the study of written evidence. Here, large databases of digital artifacts and documentary remains can enable scholars to integrate their own corrections directly into the centralized archive. As the last scholar below notes, there is an alternative way to judge the value of contributions published in this manner.

> I think the future looks different depending on your subdiscipline. It's pretty reasonable to expect that within 10 years most of the scholarly life cycle in papyrology, for example, will be integrated and accessible under a single IT platform. We're approaching a digital environment in which Greek texts can be published, searched, improved, or translated, and secondary scholarship can be published with deep links to the databases themselves and the images. Epigraphy is moving in the same direction. I hope our online tools for Greek literature will as well; Latin is not so well endowed with digital resources. So, the 10-year horizon looks very different from various vantages within classical studies.

> I take a scholarly edition to mean not only the publication of images, but of a commentary, a translation, a transcription, the whole nine yards…everything that people would need to understand a given text. But if everyone focuses their time on doing that, we'll never get as

> much accomplished. So what some scholars are doing is creating digital collections for other people to make additions to…but they have had a lot of trouble getting some of their peers to understand what it is they were doing at the outset. The question is always, "But where is the book?" And the response is "No, if we do a book all you'll get is a book. But if scholars invest their time into building an archive, they give other people the opportunity to do 50 books, 100 books, or as many books as they want." These digital projects make it possible for the rest of us to get access to the material that makes the books possible.
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> For years, scholars have written important articles in which they correct published ancient documents. Once you can do that work in the data set itself, this genre of publication will not be necessary. We are currently building an online, auditable editing environment in which users can generate reports, "Here are the 87 proposals that I made for corrections." And because all transactions in the system will be peer reviewed by rotating boards of editors, the same users can also characterize success rates. This is important not just because scholars need to know the state of play of a given text as it changes over time, but because individuals have a legitimate concern to show to those who are interested a measure of their contributions.

Data-rich archaeological publications

Archaeology is a data-driven field, and yet only a fraction of archaeological data ever sees the light of day in final, archival publication. The printed publication is what archaeologists work toward, but there is no peer review of the data supporting the work because the data often come out earlier in site reports or grey literature. Data dissemination is further complicated by technological advancements in data collection and analysis, which include the use of GIS, 3D modeling, and other dynamic media. As one archaeologist pointed out, "We're so busy working on the primary data, which I think is intrinsically more important, that we haven't spent a lot of time on this aspect of how to publish it." As a result, many scholars spoke of the pressing need to more completely integrate expanses of data, especially visual and dynamic data, with final publication. The current models of publishing extensive data, images, and dynamic scholarly media are threefold: (1) including a DVD/CD in the jacket of a book/journal, (2) building a multimedia website to accompany print publication, and (3) fully integrated online publication (in venues such as *Internet Archaeology*). Scholars' engagement with these dynamic publication models varies by area of specialization, the press publishing their work, their own expertise in new technologies, and their concerns about the prestige of online journals.

> Some of the people, for example, who are digital innovators in the field, are archaeologists. They have a lot of data. That field has been computerized…I think information technology is such a saving grace for archaeologists because imagine all the limitations on the dissemination of, not just discoveries and discovery procedures, but even data, because of the expense of publishing archaeological stuff. There's just no money to make it possible to publish all the data, so think of all the data that is just waiting there to be made public.
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> Catalog entries in archaeology are one of the things that take up the most space. One of the publishers that I had worked with, Oxbow, has been putting all of its database and catalog material…First it was on a microfiche, and now they've gone to a CD that's included in the book. The problem with that, though, is that a lot of people want it right there at their fingertips, they don't want to have to put something in a computer and have it pop up. They want it right there in the book. But it was conceived of and it's been continuing on as a cost-saving device, and it helps substantially, and we can literally put it all together on our computers. It goes on the CD, it goes in the book, and you save both space and print time

and all of that that's necessary. And I think those kinds of innovations are going to help all of us be able to do more. But we know that there are limits, because it is nice to pick up a book and open it up and have all the pictures and everything right there. But, financially, that's going to be an issue.

Yes, technology is changing scholarship a lot. One of the interesting things that happens when you get really high quality visual data is that there are aspects of an ancient inscription that you have to deal with that you've never dealt with before. For example, we now have the ability to photograph an ancient inscription in such a way that you can look at it from any light angle in real time. It's like you have a virtual light. You can turn it around and look at a text from all angles…And how do you convey to people that material? You try to put that on a printed page, but they can't understand because they can't see the dynamism of it. So the biggest crisis, and I use the word advisedly, that we face right now is I don't know how to publish anymore…The World Wide Web is not up to handling the material yet…You try to manipulate a 150-megabyte image over the World Wide Web. It's not so easy…If we're trying to show how we put the material together in terms of publication, there is, as of yet, no software that I'm aware of that adequately conveys what it is that I need to show. And I have no doubts that the software will catch up with us, but right now I can't show people what it is they need to see. It's really a funny thing: You've got these wonderful technologies, but the technologies don't translate into books anymore. They don't even translate into standard Web-based programs anymore because the quality isn't there. And so you've got to start thinking about how you're going to do this, how you're going to present it…Now I've got a couple of colleagues who are working on a major inscription…The DVD is going to have high-resolution digital images, and you'll be able to superimpose them over their drawings over them. You should be able to export the material so you can do it in one way or another, and the reason they're doing it in DVD format is because it's the only possible way that they can do what it is that needs to be done now…They're still working it out. And just lately we've worked out a way to put images that can be lit from any angle in the context of an image database where they can be easily viewed and easily downloaded. It's still in the Beta-stage, but by the time this is published, I bet it will be out.

For the last book, we put a DVD in the cover with additional movies…What is in the book is just printed in the book, and what is in digital format on the DVD is another kind of information or communication that is not in the book…There's also a website for the project, where we share some text from the book…The DVD is the best way to contextualize the text. It's a bridge between the digital world and the book…There are movies, Flash interface…more high resolution images, and so on. For example, in the archaeological site we studied, there are a lot of rooms and architectural details. These are printed in high resolution in the book, but it's not in 3D. So if you use the DVD, you can watch movies with the additional details. This time, the DVD was produced by my lab, we printed them with another service, and then the publisher collected them for the book, but this process is not common. For a monograph in archaeology, it's not so typical.

Another thing that's happening is that some innovative publishers are putting the image component of a research publication in a book as a CD, because the cost of publishing photographs really is in the paper, the ink, and other things. So as an example, one of my colleagues has published a book on a classical monument. The publisher printed some reasonable quality illustrations in the text…black and white. But the main thing is an interactive CD that gives all of the results and all the measures and everything. And that's, I think, relatively cheap. But it also involved my colleague in work that s/he had not ever done before: scanning images and getting them formatted…That is the wave of the future in art publishing, but that kind of publication is probably only less than five percent of the total.

> I think some of the younger faculty are adopting newer outlets of communication, and I think a lot of them would like to have the skills and guidance to be able to do better jobs. For example, with the collection and storage of data that then gets reported in the published book, how much credit do you get for the little CD that's in the back of the book, which would include additional materials, photographs, and so on? Or if you're doing a study that involves a lot of quantitative or empirical data, and your graphics, your charts, even your basic fundamental analysis, regression analysis or whatever, is not in an appendix but is in a CD, so if somebody picks up the book and they flip through it, they say, "Where's the analysis?" If they don't have the ability or interest to put in the CD and evaluate the supporting empirical data in some sort of way, what can we do?

Some scholars mentioned the possibilities of going beyond CD and DVD accompaniments by building websites to host expanses of data accompanying a publication. The Web-based data publication model could potentially be an extension of the online workspace already used by research teams to collaboratively present and analyze their data.

> The first question is how we publish essentially on the Web. I had thought of also having DVDs…but there is too much material for anybody to want to download all of the DVDs. So essentially it has to be the website, which actually is what we already have. We already have a website, which at this point is open only to our community of researchers…

> In the next 10 or 20 years we will have online publications, or at least publications that also have an online part where you can put your AutoCAD files, your databases, your photographs, and have that available and linked to your publication. A workspace would be important. In a way we use our database as an online workspace, but that certainly could be expanded. But I think the next step is really archiving and publication.

Finally, some scholars mentioned their preference for publishing in online journals that integrate digital media with text (rather than separating the former out in a DVD or Web-based accompaniment). While these outlets could "increase the efficiency" of publishing dynamic media, many scholars view these journals as less prestigious and less widely read than established print journals.

> I haven't given that much thought to the criteria I use for choosing a publication medium, but I think images and the actual physical things you're working with do affect this. If you're dealing with, say, prints, for instance, or drawings, often they're bound in books or it's simply impossible to include them in the publication…So having access to a wider variety of media through publishing digitally makes a lot of sense, just because in print media you might only be showing a handful of printed objects. I think this is more true. Architectural history is going this way when people do a three-year reconstruction. They will publish it online because 3D models really make no sense in printed form. So I think there are definitely factors—what you're talking about and what you're using to make your argument—that should in many ways dictate where you publish things. But at the same time, I think prestige-wise, publishing in a journal of record that's a print format, even if your research goes to something that would be better online, has a much higher prestige level. So, for even me, someone who uses technology a lot and hopes to publish online, I think if you can publish in the best journal, even if it's in print, people would tend to do that. And I think I would even, too, until we arrive at a place where people are consistently reading an online version of that and looking at it and it's becoming an integral part of the journal or other publication.

> I do think that there are people who submit things that are more appropriate for websites, and I would like to think that journals could actually sustain a variety of ways of publishing

> things, not just producing the standard journal…but that there could be online dimensions to them that actually might increase the efficiency with which things get out.

New Web-based publication models: Archaeological sites online

There have been disparate experiments in Web-based publishing of archaeological sites that go beyond the models of publishing text and media discussed thus far. Here, some scholars are experimenting radically with what constitutes archival publication by producing interactive websites that function both as textual publication and data preservation. These online "publications" integrate site reports, analytic texts, databases, photographs, video, and, in some cases, virtual reconstructions of the archaeological site. These initiatives are truly data-driven, collaborative, and require a shift in the traditional thinking of the "monograph as the final publication on a site." While these websites are specific to the archaeological site, and accepted practice for these publications vary, they offer near-immediate access to archaeological data as it comes, quite literally, out of the ground. A well-cited example of fully integrated publication is the Neolithic site of Çatalhöyük, in Turkey. Additionally, the Web-based projects Rome Reborn and Aquae Urbis Romae (The Waters of the City of Rome) offer immersive virtual reconstructions and interactive cartographic explorations of ancient Rome, again integrating visual data with historic texts and scholarly analysis (though without the real-time imperative). While careful 3D reconstruction work is the basis of projects like Rome Reborn, for the visual publication of archaeological sites, "the main goal remains the conceptualization of the data rather than an aesthetically beautiful product."

> There are a few experiments with digital publication, especially regional projects that have gone right onto the Web. There's a very good one that was done in the area of Pylos in Southern Greece—it's called PRAP, the Pylos Regional Archaeological Project—that has been publishing everything online. And it's been fine, it certainly is immediate access. I'm not sure everybody's aware of it; people still seem to find books more easily than they are finding the good information on the Web.
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> There are specific projects experimenting with Web-based publication. For example, I remember some sites in North England where they decided at the beginning of excavation to put everything on the Web, so that it was a process of work where everything was published only on the website. There are very extraordinary cases, like Çatalhöyük, for example…But now Çatalhöyük is like a brand: it's in Second Life, it's in books; there are experimental activities. But this is rare among most excavations. There are other cases, for example archaeological exhibitions in Syria directed by a UCLA professor—Giorgio Buccellati—that were directly published to the Web in PDF format. This is a compromise because a PDF is like a book but it's printed on demand, so it's in between…So the university is the publisher and they print it, because of course it's not really accessible. But if you go to the university you can have a CD with the great big layout made by UCLA, but the CD is a PDF. So it's digital, but it's a book…Particularly in the UK, there are many cases of archaeological sites where publishing is done directly on the Internet, on a website…without going through print publication or books. There are many examples…I don't think they are necessarily considered to be prestigious. You wouldn't find this at Cambridge, for example. Cambridge is very conservative.
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> …this does still count as digital publication, because I think that the sharing of databases is something that archaeologists do as a communication, which we do very much. It's a very important part of what we do. And we have all this data when we excavate. We have huge amounts of observations of what we're digging up, because when we dig, we destroy. That's the wonderful thing about our profession. We're actually very destructive, because you can't

> get down below what you're doing unless you destroy it, and you can't know the context of what it is unless you dig it, and when you dig it, you destroy it. So that means that we are very dependent on observations, and observations that we can write down, or there are other ways of recording observations. Those other ways of recording observations have not been that legitimate until recently. And that's where Çatalhöyük has been pretty much playing a leading role in this. So what they do there is all of the excavation observations are written down or put in whatever forms and are actually shared openly on the Internet…by a website. And at the moment, there are two competing ways of how to do it. One way—I'm not sure if it's proprietary—is not very open-source…And the other way is open-source…Immediately the whole world has access to it. So Çatalhöyük is not the first to publish data like that, but they are the first to really focus on publishing videos and do very intensive video recording and image recording of the process of excavation. They don't have the right software for the videos. The big, complicated database in London isn't ready yet for either images or video for some reason. So you've got these two ways of doing it currently.
>
> Interactive websites are definitely a *huge* resource, a resource in many ways much greater than any book published, because it can contain so much data that could never be affordable to print. With GIS, Rome Reborn is not only a collection of knowledge but it's also an infrastructure in which scholars can run models, which is something they haven't really gotten to yet, but it's designed to do that…The concept is that it will be an online publication in some way, that people who do models can publish them and publish scholarly articles attached to them in the three-dimensional model. So it gives a source of publication in that sense…I think it's yet to be seen how effective it is. It will take time. There's no way to convince everyone at one time that this is the way to go, and there's no way to convince everyone that they should look at this and this is important. But in the end, if it provides information in a quicker or more information-rich environment than can be conveyed any other way, people are going to move to it eventually.

The advantage of online, dynamic publication models is that the argument itself evolves as more data are published. Therefore, one of the assets of publishing archaeological sites online in near to real time is that it makes the process of developing an argument transparent to the "reader." A benefit of digital models of archaeological sites is that they can be used in an experimental sense, by using databases and digital models (including 3D reconstructions) to ask scholarly questions, or as a form of data sharing to expand scholarly knowledge about a particular area or culture.

> The second thing that has to be done in the two or three months between the conclusion of excavation and the online publication of the site is to produce a synthesis. About 90 percent of the data are produced automatically. Of course the observations are not automatic, those are all entered by humans, but the coalescing into the website is all automatic; however, about 10 percent consists of a synthetic piece, or synthesis, that essentially the general director of the project does at the moment, but more and more the individual directors will be doing. And there they bring together all the strands into a unified picture, which is very much analogous to that of an article or a monograph, but is conceived digitally…meaning that is much more articulated and dynamic, and of course hyperlinked, than a text paper. This is indispensable because any user has to go through—in fact, I don't even like to use the term "user," I like to say "reader"—any reader or any person who studies the website, not just uses it, has to approach it as an argument, as a conceptual whole, not just as a mass of data. And to approach it as a conceptual whole, you have to have this overall frame with the observations of the excavator, which are indispensable. But the instinct of the excavator, which is also the overall intuition of how things fall together, is also very important. In a way it's like the

editorial page in the paper, which is different from the informational part. And so we need to do that, and to really make the thing whole and usable we need to have that extra time.

The reason why I think archaeology, in the sense of the excavation part of archaeology, is so interesting and can really serve as a model, is because all of the data that come in each day come from a variety of people. And the input comes from everyone, whether it's a photographer, the drafter, the excavator, the ceramic analyst, everybody deals with data that come from a variety of different places, and at the end of the day everything coalesces into a meaningful whole. It's not just a meaningful whole that is static, meaning that it has pigeonholes where things are, and you have to go and look for them in order to develop an argument, but you actually have an argument that develops. So for instance, an example of an argument is the way in which things relate through time as a result of their space connections. So what you observe are contacts in space—spatial relationships. But the nature of this leads you to an understanding of the temporal sequence, which is essentially stratigraphy. And this is developed as a sequential argument by the programs that operate on the data categorized in a grammatical sense. Essentially this effort at developing an implicit tagging that is built into the categories of science to the data, and then to the process that utilizes these tags in order to construct an argument, is what it seems to me we should be doing as scholars…

We have an old-fashioned, outdated, I would even call it, publication model—thinking of the monograph still as the final publication on a site. I'm thinking of it much more as, "This is our expectation at the moment and yes it may change if you find more information or it might change if we find information from other sites, which we can get at if we share our data." I see it much more as a stage in trying to understand a particular area, particular region, or particular subject. We are trying to move there by now enabling online publication or partly online publication. It'll take a while for this to be online, but it's the first step to make that link between publication and monograph a little bit more loose and also to make a much closer link between publication and data. If you have a completely online publication or a printed book with an online component, you can put all your databases, your tables, your charts, all the things that you don't want to have in your text in that instead, because it's just way too expensive to print things. It's way too cumbersome to carry around. What you can do then is have direct links among your text, your argument, and your database, in which you actively draw from the database. So if I say in this particular area we see an enormous increase in a type of artifact, then you can just link to the database and show, oh yes, there's enormous increase…So I think that's a really important improvement on archaeological publication, that you can actually have those data available and have those data checked by your colleagues. That's really important because they can never redo your work, it's not like a scientific experiment where you can just follow a protocol and do it again and see if it works. Archaeology is a one-time thing. So to make this data at least available I think is extremely important.

Continued importance of the book and peer-reviewed publications

Although technology across the board is perceived as a boon to publication, there were complaints that these technologies are still too specialized; scholars may be reluctant to congregate around them until "it becomes obvious that it's the right thing to do." Moreover, producing Web-based archaeological publications requires "steep learning curves" and the specific tools and technologies used to create each online resource are not necessarily scalable. While websites are very useful ways to present databases, many have an unwavering commitment to the printed book. The key arguments in favor of the book were a reluctance to read off of a computer screen; the development of a sustained, linear argument; and continued

expectations in the field. As a result, we expect to see print publication continue alongside new publication models for the foreseeable future.

> There are about 100 months of work in the creation of the website, and so we chose the book as a tangible and scientific way to validate and synthesize all of this work. In fact, in the book there are long descriptions of the methods we used and a long discussion of our methodology for the website. So I believe in the book. I love books. I want to say that the goal of the digital mode of publication is not to cancel the printed mode.

> I'm a bibliophile. I love books, and I think there's something about…I hate sitting in front of a computer screen every hour of the day, and we do enough of that, with emails and everything else. I don't want to read books and monographs online. I want the hard copy. It's different, I think, for databases. I have a nice website. It needs a little updating right now, but I think websites are great for outreach, for the dissemination of current projects, to provide information, to lead you to publications. And I think they're great for databases, there's no doubt about that. I would like to make more use of my own website or other websites in the future to get databases up there where they're available. But I don't see replacing the carefully written, finely considered monograph or book. I hope we don't get to that point, myself, because I think it would be a loss.

> We need a dynamic, Web-based, electronic publication, except that, at the same time, we will continue having paper publication, that is, extensive articles, as we have been doing all along, and…also monographs, which will be at the same time available in PDF format, which is purely electronic rather than digital. I like to make the distinction, meaning that PDFs are just technically available online, but they're really not conceived as a digital entity. It's the same thing as paper, just electronic. And so we will continue doing paper publication, partly because the field expects it…

3. HOW DO YOU SHARE YOUR WORK WITH OTHER SCHOLARS AND KEEP UP TO DATE IN A FIELD?

Archaeologists share work at early stages of research and writing by sending drafts to trusted colleagues via email. Invited lectures and seminars may also provide a forum for scholars to "bounce ideas" off of their peers. Conferences are an important way to share more developed work with wider networks, and tenured scholars may post working papers or preprints on personal websites or deposit them in paper repositories. While the use of technologies for sharing (such as listservs and online conference proceedings) helps scholars keep up to date with emerging work in a subfield, most in-depth scholarly exchange prior to publication takes place via small meetings or email. Data sharing (particularly the open dissemination of data not presented in archival publication) is constrained by a variety of factors, including stakeholder interests, the sensitivity of archaeological sites, fear of poaching, concerns about the "messiness" of data, and the lack of common data standards.

Ar3.1 The Importance of Informal Networks

Scholars share work-in-progress primarily through private correspondence within informal networks. In particular, email was repeatedly cited as providing instant communication with trusted colleagues and strengthening informal networks. The subfield specializations in the discipline are small enough that scholars know whom to approach to review their work or to

assess the state of research in the area. Obtaining comments on well-polished manuscripts from colleagues often acts as a safety net before official publication. One archaeologist described this informal interaction and feedback as a necessary part of the "intellectual buzz" of the research process.

> I think most of us will have tried out our stuff on a class or in a seminar, or in a lecture we've delivered at a conference, and to that extent it's already benefited from contact. And, in my experience, I, and most of the colleagues I know and value, would never dream of publishing almost anything without showing it to at least one or two of our colleagues, or sometimes a graduate student or an ex-graduate student who's now teaching somewhere, if they work in that field…The exception is if this is something pretty straightforward and I know I've got it right and I don't need someone else to tell me. But mostly I share when I'm being a bit more exploratory, or sometimes it's also a matter of just not being sure. It's not that big a field but there's a lot of information out there. Am I missing something obvious that I need to have taken into account that someone else has done?…So, there is this process of informal circulation…in most cases, especially for junior people. We don't want to make fools of ourselves, and…I can certainly think of all kinds of places where things got better. I don't trust myself to have thought of all the ramifications and to have avoided all the mistakes and so on, so I'm lucky to have colleagues who will make the time.
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> And then things I have in preparation, you'll show them to people you trust, and then have them give you feedback before you submit it.
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> As of right now, most of my actual sharing goes through either verbal contacts with people and old-fashioned meeting them, or email contact, which is person-to-person rather than meeting through a collective large whole of an online forum or something…But, more and more, I make contact through email with people and share that way.
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> The sharing of drafts with colleagues by way of attachments is so easy that I certainly do more of that than I did in the past. Probably, also, the fact that revision is so infinitely easier than retyping a whole manuscript. Corrections are not nearly such a deterrent.
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> For my community, it seems email is definitely how people share and communicate new ideas…at least the people that I'm trying to reach in the archaeology world.

The downside of email, as cited by several scholars, is that it can easily become a "time sink."

> I think email, and also being able to send attachments, has changed how we communicate…The speed of communication is very important, *very important*. And you can edit attachments, of course, easily. It has its disadvantages especially, I think, when you get to my age because there's an awful lot of email, you don't want to be discouraging, but you get an awful lot of requests to read the work of people who are coming up, and people are sending you their work without even soliciting your views in advance. You don't want to be unfriendly, but you can't keep up.
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> Honestly, my spouse thinks that I'm addicted to email, and I'm not, actually. But it is critical, I think in academia now, just to communicate, because we don't send letters anymore, except recommendations, because that has to be a hard copy. And with your collaborators and graduate students, all this kind of stuff, it's a pain, seriously…I don't know how many emails I get. I'm just guessing, 50 or 60 emails a day…at least ones that I can't just automatically delete without opening. Between administrative duties on campus—from the department, from college, from graduate students, from my research project collaborators—just the time to open my emails is enormous. I was gone a week in the field and didn't have email access…It

> was heavenly, but then I came back and had five pages of email to try to catch up on…Yes, email now allows me to do in two or three hours what I never had to do before. A huge time sink.

Establishing informal networks

Several archaeologists mentioned the role played by graduate students and department colleagues as sounding boards for their current work. Key to developing a stimulating academic environment is to recruit the best graduate students, ideally with fellowships. For these scholars, the mentoring process creates another venue for informal feedback on work-in-progress. As one scholar points out below, the privilege of being at a prestigious institution may enhance opportunities for serendipity and informal exchange.

> It's like Pierre Bourdieu's *Homo Academicus*…the advantage you have of being on a corridor with some other really smart faculty and some really brilliant graduate students who are the next generation of first-rate scholars. You can get that even teaching really top-rate advanced students, where for a start you're going to do your homework before you try, you don't want to make an idiot of yourself there and you want to be stimulating them.

> These fields are competitive, but it varies from one department to another. They're somewhat collegial in that mostly they do like their colleagues to do well and they want the program to be good and to that extent they will help people find ways to improve things rather than constantly trying to compete them into oblivion, as it were, or humiliate them. What I'm driving at, though, is if you go to conferences or you give lectures at different places, like a leading research institution with a strong program, there's a difference between that and going to a little bit of a backwater place where some people who were bright and cutting-edge when they went there, and are still teaching well and still alert and reading stuff that comes out in print, you really become aware that they're some years behind in terms of what they've noticed is out there, because they don't have some archaeologist who just has seen this thing being dug out of the ground…So, you may not necessarily always want to be in that competitive environment where you're always feeling you've got to stay near the front of it all—some people may be happy to relax a bit and teach in a different kind of environment—but I think it does mean that being based in Oxford or Cambridge or Berkeley or Princeton or Harvard, Michigan or somewhere, it does mean you're in a much stronger position to stay abreast of what's going on, and it takes a lot more individual initiative if you're at a smaller place. I think that's one reason why conferences can be so good, because people can keep in touch better, but I do think also the electronic possibilities have already improved things quite a lot, that people can find out what's going on much faster than they used to.

Informal networks, including relationships between colleagues or between graduate students and advisors, also play an important role in flagging new scholarship.

> There are certain journals, obviously, that I need to keep on top of in my field, and then you find out about articles that you might not be able to read in that journal, but you hear, "Oh yeah, something has got interesting results. Hey, I'll go look it up."…I find out about these the same way we always did, by networks. Graduate students very often are…"Oh…have you seen this?" That happens a lot. I'll say to the student, "Tell me about something interesting…hey, send me the PDF." And in that sense, the PDFs become this means of circulating information, absolutely. Or, to your colleagues, "Have you seen this? Have you heard that?" in an email.

> I think it's a two-way street. The graduate students for a while had a journal reading club and that was always good to see what they were interested in reading, and sometimes I will see things that I will tell my graduate students about. I think it's pretty much fifty/fifty.

Moreover, some archaeologists complained that scholars are often unaware of their colleagues' research, which can lead to the duplication of work in some instances. While technologies for scholarly communication can help to combat this problem to some extent, there appears to be no comprehensive solution at this time.

> I think, frankly, the more people know what the other person is doing, the easier it is to get your own views and your own discoveries or discovery procedures out there and to share them. So I would say that information technology is a way to get beyond our culture of "loners." We still have that a lot. In fact, even with information technology, people invent the wheel in every other valley…And that is really demoralizing…There's such a worship of originality and finding something, being the first one to plant the flags on the South Pole, the secretiveness. We all remember situations where competing researchers will actually hide a book in the stacks by mis-shelving it so that other people can't get to it. It's very bad. And so I think that's why research and teaching have to be so much more organically linked with each other, and more intergenerational models of sharing, so that you don't just have one age class just competing with each other, and there has to be a teaching of ethics, too, or ethics by example.

> I think sharing and keeping up to date is a problem, even for those who use technology…This probably happens in a lot of fields…We have people who are neighbors to each other and see each other every day, and who don't know that they're both working on the exact same thing.

> This is very *ad hoc*, but there are things like departmental annual newsletters that list what people are working on…But it's not going to get to the person in Munich. I think there's room for more of that, actually, than we do. Again, in a small field like mine, you're somehow on the grapevine, you get some idea of what people are doing.

One senior scholar looking to stake a claim checked with colleagues prior to embarking on a large project:

> How I stake claim to my current work area depends on the project, really. Last spring, as I was finally deciding what my next research topic would be, I said, "First, is anybody else working on it, because it's a big project?" And so I wrote email and a couple of hard-copy letters to about 10 senior people in the field internationally. I said, "Do you know of anybody who is already working on this?" And they told me, "No." Now, I found out about a couple of dissertations that were relevant to it in one country, but that didn't stop me. And I actually have made no more progress in starting to work on it because I'm so behind on other things, but what I should do if I do go ahead is I should inform these same people, "Yes, I am going ahead," because before my question was just "Do you know of anybody? I'm thinking about it." But there's a section in one of the major review journals where people can list announcements that you're working on something. That's in print.

Subfield variations

In contrast to the informal sharing practices described previously, some scholars in specific subfields, such as those working on Near East inscriptions and the Dead Sea Scrolls, tend to engage far less in sharing prior to publication or delivering a conference paper. Papyrologists,

however, appear to buck this trend and work more collaboratively in general. The following quotes provide a flavor of this complexity.

> You would think that "classics is classics," but, in fact, the sensibilities inside the different subdisciplines can be radically different. For example, papyrologists are really keen to share and try to publish materials quickly. Epigraphy often tends more towards a slower model of "exhaustive commentary" and is sometimes less inclined to share materials. Technology is starting to change some of that.

> I don't know if the field is super open with sharing. With students, there's often a stigma in the field of history in general, and art history and architectural history in particular, that there are so many people often working on so few things that people don't always share information forthright. But I don't think that's endemic of the field. I think it's individual cases. But I think there is definitely an element of only so much is shared, especially in the beginning stages of research before people stake their territory…but among students I don't see that as much. I haven't met that many students in my field who are really closemouthed about their research, because they don't have anything to gain from that.

Ar3.2 Widening the Circle: Conferences and Conference Proceedings

Given the lengthy nature of data collection and publication in mainstream archaeology, conferences are an increasingly important way for scholars to communicate work-in-progress and learn about new developments in the field. Conferences can also be a means to network with potential collaborators; one principal investigator uses conferences to put teams of people together for excavations. The informal "social" and "collegial" activities between formal events are often more important than the formal paper presentations. In sum, conferences play an important role in the creation and maintenance of informal networks.

> What's much more common in classics, ancient history, and archaeology is that people present the stuff as conference papers, well in advance of when it comes out in book form. I think that has accelerated in recent years.

> I would say, in the last 10 years, that conferences have become a vital way of sharing work that would otherwise be locked up for the entire length of the research process. I don't think earlier than that. I think in the field of pre-history, for instance…there's a select group of people that are invited to come and present cases and people will suggest other people, but it's a fairly small number…And both the conferences themselves, but especially the publications, have become vital for really keeping up with both the material that's coming out of the ground, but also the latest thoughts on what's happening and how people are working and interpreting the material.

> I think conferences are important, they're fun, and they're interesting, and you hear new things, and that's a very important way to keep up to date.

> Often I think people connect during the informal times between or after formal events. So this kind of goes to a networking situation…finding out where a person's interest lies and where you and they can exchange knowledge…Sharing is a huge problem…and I thought a decent amount about this. I find that, still, sharing of things often happens at a verbal level of you meeting people when you say what you're working on and they say what they're working on. And so many times, that's the only way to find out things, serendipity…

The current conference model is not without criticism; some scholars described conferences as "sluggish" or "clubbish." Generally speaking, intimate symposia or smaller conferences seem to play a more important role in encouraging active scholarly communication and dialogue than larger society meetings.

> I rather like the idea of conferences where smallish numbers of people give slightly longish talks about projects, work that is in progress, and people bat it around and offer constructive criticism…and which may subsequently appear in print somewhere, preferably in peer-reviewed journals. I try to avoid large conferences featuring large numbers of very short talks, and likewise the more clubbish colloquia and roundtables and their almost inevitable published proceedings.

> Conferences can be very sluggish, because there's too much of a culture of waiting until the last minute and people not doing their homework to prepare their own presentation or familiarize themselves with co-presenters, and then really not even registering what the other person does because of bad organization. I should not have started with the negative, but I don't think conferences are necessarily the answer. They're kind of a stab in the right direction, but oftentimes they're rather inert…One of the models that works is not conferences but workshops, where you give a bunch of people an assignment, and you get together either in person or remotely by teleconference or videoconference, whatever, to have a pre-conference or conference. In other words, to use information technology for improving models. And this way by the time people get together they…have lines of communication going on already, and then you have very interesting chemistry when the live meeting actually happens. There are all these different models…and I think so much of the problem is ignorance and fear and people just not having tried it before. And the thing is to make it user-friendly and to make it prestigious, so that people can say, "Oh, look, this has the stamp of approval from a prestigious institution," for example, and then just wait for things to happen.

> It's not to say that autonomy isn't still important…I think it varies. Some scholars like to work on their own and like to get their ideas out and they're somewhat protective of their own terrain, they don't want someone else to scoop them, but I think most of them, if they think they're doing something interesting that's a little bit new, they're happy to be invited to present that somewhere as a lecture or as a seminar. Particularly the seminar format is something that many of us like, where you've got a handout, you talk, you discuss, you go away, and already you've got some other bits and pieces you're incorporating from that discussion.

Conferences function best, it seems, when they represent highly specialized groups of scholars willing to share their work in depth. Faculty mentors play an important role in initiating young scholars into these established networks.

> These days, graduate students and young faculty are much, much more visible and audible out there in the world, going to conferences, writing, than they were when I was young…I would say that up until the '80s, certainly, even into the early '90s, there weren't nearly as many conferences. When you invited someone to come and give a lecture, you tended to invite somebody that you'd heard of, that was fairly famous, or somebody would be traveling and would sort of invite themselves, so you'd get to hear them that way. So although everyone would be looking to publish their stuff, if you were not very well known, there were far, far fewer venues and places, particularly to meet other scholars and try your stuff out on them and get feedback and also just to be known to be working on that particular topic, and there were fewer publication opportunities. And I think now a high proportion of graduate students, if they and their faculty advisors are halfway on the ball and if they're doing good

> and interesting work, they're going to be going and reading a paper here or there before they've finished graduate school, they'll have probably had a couple of campus visits and given presentations of their papers, and I would say mostly they'll be advised to get one of those presentations published somewhere quite quickly, say within a year or so of getting their first job.
>
> How to get included in the specialized conference circuit is a good question that a lot of us have been trying to figure out…Of course, people immediately think of the well-known names, and it's hard to get established, and a lot of it is dependent on mentoring, in the sense that when you are working with some of the better-known, more established scholars, if they're good at what they do, and most of them are, thank goodness, they bring you along into this. They suggest your name to organizers…You have to get on the radar screen, and it's not always clear how you do that. I think it's predominantly by getting to know a few key people that like what you're doing and are willing to then promote you to others. Certainly, I think that's how I've been able to get into a number of different venues. And then once you are on the circuit, once you have done a few and people have seen that you're not just going to stand up there and drool, and you are not only doing good work but you are willing to put stuff out there that other people sit on for years and years, and you're showing this stuff that's literally just coming out of the ground, they want you back because you're promoting everything and helping the whole field move on.

In addition, the increasing online presence of conferences, including abstracts of paper presentations, may help scholars keep up to date in the field even when they cannot attend in person.

> You see what conferences are going on, and you can see the abstracts, and that can alert you, and you can contact the person who is apparently working on this thing close to where you are and maybe find out a bit more whether you're duplicating or whether you can benefit from each other. So I think that especially for a country as big as the United States—it's less of a problem in Britain where you can visit anywhere within a day, easily enough—if you want to stay *au courant*, you can do it better now…

Conference proceedings vs. journal publication

Varied responses were expressed concerning the importance of conference proceedings. While an increasingly widespread and important vehicle for early publication in some archaeological subfields, publications from a conference are viewed by some as "lightly" reviewed by peers and can take as long to publish as journal articles. Again, scholars may place a higher value on the publications that result from smaller, specialized meetings than large annual society meetings.

> Now conference proceedings have become as much, if not more, of a vehicle for publication as the monograph. Almost every conference has such a thing.
>
> Conference papers, annual meetings…You go to an annual meeting of the Society for American Archaeology, or the Society for Historical Archaeology. The main one in this country is the Society for American Archaeology, and almost every year I've given a paper there, or been a discussant, or perhaps a couple of papers. But some people just do the whole conference round. You could go all year to one meeting or another. Then there are international meetings on specific topics organized by someone in the field. That's very common in Europe, and I think less common in this country, but it's still pretty standard that they will make a symposium for a particular subject, invite people to come to it, and then you write a paper for that particular symposium. It could last two or three days. And then you're expected to

> publish that paper. Whereas, in the annual meeting thing, sometimes there will be a publication out of it, but, in general, it might just be an ephemeral thing where you just give the paper.
>
> Sometimes there are and sometimes there are not conference proceedings that are published. It depends on the conference. I believe that the next one that I will be going to, which meets every two years, those proceedings are generally published.
>
> The existence of published conference proceedings can vary a lot. The American Philological Association has an annual conference as most disciplines do, and papers that are read there are often very short, they are often bits of things that people are working on. Yes, very often those are collected together into conference volumes, and those increasingly sometimes do include graduate students, certainly include a fair number of junior faculty, so that's often a good place to get your ideas started. Often you give your presentation, say at the American Philological Association, and then you write that article up and send it off to a quite different journal. Those are quite disconnected, although the input you might have gotten and a couple of people you might have met at that panel may really have helped the thing get improved, and it's certainly not that unusual for an editor of a journal or one of his colleagues to hear a really interesting piece and get in touch with the author and say, "Why don't you send us that?" and it'll still get refereed and so on, but they can be looking for interesting things.
>
> There are these collective volumes emerging from specialized conferences, not from the broad-based ones. The disciplinary annual meetings are fundamentally dead in my view as a source of that kind of publication. There's no connection any longer between, let's say, transactions of the American Philological Association and the papers given at the annual meeting. And a lot of the papers given at the annual meeting will probably never see print. They are job talks more than anything else done by younger people. But the small conferences with specialized themes that are aimed at coming up with a volume, that has become a substitute for journal articles, as I say collectively sometimes, or synthetic monographs as well. But often those volumes take years and years and years. They're the slowest mode of publication. I just pulled out of several things like that over the years when it became clear that it was just never going to come out. I would be long dead and buried by the time it was published. So, I've become very, very leery of agreeing to give papers in conferences that are going to lead to a volume, because I just don't trust people to get it out in a reasonable time frame. I'd rather go to a working papers online structure myself. But, of course, I'm old and tenured and it doesn't make a damn bit of difference to me.

One downside of specialized conference proceedings as a publication outlet, as described by two senior scholars below, is that it contributes to the general fragmentation of the field at large:

> There are only 30 to 40 people in my network who are any good…One reason why I can say that is the field that I specialize in…has developed several subfields, just in my lifetime, and each of these has subfields. They would have their own conferences, which may be conferences on a regular basis, and almost all of them are producing their own journals now, so it narrows down the scholarship. Whether it's a good idea is another question, but that's how things are going…So there's a proliferation of these subfields and then publication outlets that go along with that…My own view is that this is bad. Most of the things that are in conferences should either be further developed and refined for periodical publication and regular peer review, or the collection should be published. And actually this does happen sometimes, where it becomes part of the journal as opposed to these separate volumes, because I think then it keeps the field a little more unified, in that you have journals with a whole range of topics in them and people are not completely ignorant of what else is out there.

> I entirely agree that the explosion of subfields with their own conference proceedings is bad, because I think one consequence is that when I was young, I published in journals. Now I hardly ever write for a journal, because everything I write is for a conference, goes into the conference volume, and then I haven't got any more energy left for anything else, even if I had any ideas. And this is affecting senior scholars more than junior scholars, so it would be very interesting to do an analysis of authors in good periodicals like *Classical Quarterly*. I think you'd find that the number of senior scholars has gone down, but it doesn't necessarily mean the quality has gone down. Another thing is that the fields have narrowed, but some of us have broad interests. I, myself, like to know what's going on in other subfields, so you want periodicals that do give some breadth as well as narrowness…like *Nature* is for scientists, or something like that.

Regardless of whether a scholar decides to publish a conference paper in proceedings or a journal, the final drafts are generally embargoed until they are in press.

> You sort of know what other people's papers are going to be like because the organizer of the conference gets people to send abstracts in…and they'll make up their own website for the participants in the conference, so you can see what other people are writing about. And sometimes they'll do that again after the conference is over and they are proceeding with the idea of a publication. They then will ask the contributors to send in their revised versions or final versions and post those so people can cite each other…To tell you the truth, I don't know what happened to the abstracts, but with the actual papers, I assume that once the volume goes off to the press, they get taken down. Usually the ones I've participated in were kept locked; they were only accessible to the other participants.

> My own preference is if people write to me saying, "You gave a paper on such and such at a conference," or "Your C.V. says you have this thing forthcoming that I know may take another year or more," I'll usually be happy to send them a PDF or something, and I think that's pretty widespread. Again, nothing happens so fast that you worry that if you give somebody a PDF now they can then write your article and actually get it out in print in two weeks. And again, people will remember that so-and-so gave this talk and that's this person's stuff, and you wouldn't just duplicate it…

Ar3.3 Open/Public Sharing: Working Papers, Personal Websites, and Repositories

Although most scholars in archaeology prefer to circulate working papers privately by email, some adventurous and secure scholars may post working papers to a personal website, a research center website, or a working paper repository (e.g., the Princeton/Stanford Working Papers in Classics). As with conference proceedings, the public posting of working papers is also driven, in part, by the lengthy lag time to archival publication. While this practice is not widespread, the (mostly senior) scholars who engage in this public sharing activity cite the benefits of increased speed of sharing and relevance of the feedback they receive (which can then be worked into archival publication). One member of a review committee even mused that a well-developed personal website could be considered a part of a scholar's research profile.

> There are people who have started putting out working papers and things like that. It's been very traditional for people to send drafts to their friends. They did it by mail and hard copy, and, in recent years, they send PDFs and get comments. So there always has been that kind of informal circuit of comment before publication. But now some people have started just putting things on their own website or in a working papers collection of some type.

I think that one of the factors that attracts people to alternative modes of communication is precisely that it's taking an awfully long time, even with the proliferation of journals, to get things out. So I think having other ways, posting it on websites, prepublication, you sending around PDFs, even when they're just articles that are going to come out in six months…gets the word out much faster.

I use my faculty page in the department website, and, on my faculty page, there's a link to my page that says something like "current research." And, if you click on that, you'll get files of recently published articles of mine, but more importantly, you will get unpublished articles, book chapters, lectures, syllabi—a full range of materials. I don't put absolutely everything up in a half-baked state…The work that goes up is what I regard as fairly finalized and on the way toward a publication in a serial or a monograph. But it's conceivable that, given all of these problems, some of these publications will never recur and this will be *de facto* publication. And I know that people from the outside world are treating it that way because they're reading these things on the Web and I'm beginning to get communications from scholars overseas, for example, about what I've put on my website, who would previously not have known about what I was doing until my book was published…which could be five years. So that's been an exciting opportunity for me. I've been doing that…for four or five years…I think I am unusual. I believe I'm the only one on our department…who does this. There may be a couple of people who put their syllabi on their webpages, or articles that have already been published…I'm going to guess that I am the only one who puts basically word-processed material…It would be equivalent to a preprint, and we don't have that system in our field, but I think I'm creating a niche like that…And given the immense lag times in scholarly publication in my field, it enables me to have more current discussions with people overseas who are reading my work in real time. I'm putting it up while I'm still working on it, and I'm still thinking about it. It's still a live wire rather than when my book comes out, that work is over and done with, and I'm three years beyond it.

The newer ways of communicating research and publishing are the kinds that I'm really interested in. I hate paper. I really try to resist publishing in paper, although I have to sometimes, but I just like doing it digitally. I like the dynamism of the digital publication. So, for instance, publishing a paper as a PDF and then distributing it through a website is a really interesting way of doing it to me. But, also, the whole two-way thing of the social software that I haven't got into yet, but I'm really interested in getting into that with the discussion forums on the one hand, and then blogs and wikis. At the moment, it's a fringe movement in archaeology, where people are getting into this kind of non-paper publication.

Another thing that my research center has is a pre-publication part of the website—which is intended mainly for young people, but also for the old people who want to try something out on everyone. There are papers by graduate students out there for people to respond to, and they get responses.

I find that my website probably draws people to me who wouldn't have found me otherwise. And I get all sorts of interesting queries, and not just archaeologists. Some are from archaeologists, but also others, like filmmakers or authors or this and that, not all of whom I actually want to hear from, but some of them you do…I would say it's a positive. It's neutral or positive most of the time.

What I would really like my institution to provide—I know they give you hard drive space and things like that—but I do want a place that is my forever node. I can always go back there. I'm not kicked out once I'm out of grad school, once they can wash their hands of me or whatever. I want to have a permanent email address, I want to have a place to host my C.V.…I'm not asking, I don't think, for gigs and gigs and gigs, just always a site where I can build up an online presence. One of the links I listed, one of the places that I lived, was at

> another institution and it's gone now. It was a wiki and it got hammered by spam incessantly, and so they took it down, and so I no longer have that place anymore. But a place to host my papers, a place to host information, or just a place to have links to the places I can host my information.
>
> There was concern and interest on the part of the tenure and promotion committee in having more immediate and efficient access to people's research, and to people's websites, because this is a means of scholarly communication that's really used, and who has a website and what's on the website, and to what extent that's really a part of somebody's research and scholarly profile. So I don't know whether people should be punished because they don't have a website, but I think putting together a website takes a lot of time and energy, even if you have somebody working on it, and so I think people should be able to submit their website as part of their research profile, and I don't know whether they've talked about that kind of thing as well.

Formal working paper and preprint repositories

There is limited evidence of preprint use in archaeology, though it is worth noting that the terms "working paper" and "preprint" were used interchangeably by many archaeologists. While not all scholars were aware of working paper repositories, those with familiarity mentioned either the Princeton-Stanford Working Papers in Classics, or SSRN's Classics Research Network (CRN). Motivations for posting papers in this manner include speed of dissemination, soliciting feedback, and wide dissemination of work by young scholars. Negative perceptions of these outlets involved the lack of peer review and concerns about "vanity" publication.

> I don't really understand all the pros and cons of prepublication, ins and outs of that, though you've probably looked at Princeton-Stanford Working Papers. And at the journal I am involved with, we heard from someone who wanted to do a review of how well it was working or not working…and it was a very sympathetic report on the value of the working paper series. But one or two of my colleagues were less sure; they were quoting the need for the process of peer review at that stage.
>
> There is a collaboration between Stanford and Princeton, which offers a classics working paper program, but if you're from another institution you seem to need to get permission to post work there. The site appears to contain mostly penultimate drafts, things that have already been accepted for publication. They're more preprints than working papers. This does not look to me like a forge in which ideas are tested.
>
> I think sharing is pretty good, and I, in fact, have just submitted my first working paper to be posted on the Princeton-Stanford classics site. And I think that's partly a matter of my career stage, that is, I'm old enough and entrenched enough now that I don't need to worry about the imprimatur of any particular journal. I also don't have the time right now to do the final polishing that a journal would ask for. And so getting it posted and available and citable online is quite tempting, it's useful.

Although it was suggested by a high-level administrator that the "working paper culture has not hit the ancient world yet," the creation of the Classics Research Network (CRN), as part of the Social Sciences Research Network, may well change that. For one senior scholar, everything rests on the younger generation adapting to use these tools. The same scholar noted that the CRN could serve both as an aggregating and a distillation mechanism:

> The disciplines that use preprint-type outlets tend to be more technical and more quantitative than classicists anyway, of course, but you're right, at a certain point some of this stuff becomes easy enough to use, that at least the younger generation will learn. I wonder whether this Classics Research Network will turn out to be the e-archive for the ancient world or not…Now…even if the CRN doesn't catch on as much as its initiators are hoping, just by having an interface that knows where to go to look for ancient-world material on the Web, you could build something to troll through it on a daily or weekly basis, and you can put in a profile that will send you alerts. And I think this is something that's doable. It would of course miss a huge amount of what is still only in print form, at least until it appears in the online version of bibliographic databases, which might of course be five or six years. But it would eventually get stuff; it's just that you wouldn't be completely up to date. I think that kind of a solution is feasible…

Barriers to sharing in-progress written work publicly

While some archaeologists share publication-grade work openly via personal websites and/or working paper repositories, others expressed fears and hesitancies about such sharing prior to public release. The main concern is that work may not be "publishable" (i.e., complete, correct, and well-polished), even in working paper form, until it has been through informal networks and all data analysis is completed. While these activities impede the timeliness in which work can be disseminated, they are important components of the writing process.

> Stanford and Princeton started a working paper repository a year or two ago…Myself, if I'm writing a paper and I want comments, I'd rather go directly to people I know, rather than putting it up for the public and hoping somebody comments on it. I'd rather they not see it until I felt it was publishable. I'm old-fashioned that way.

> I don't, no, have my papers up on a website. I have some pictures, I have some descriptions of the site and the things. It's mostly, though, for students to have some basic information. My stuff has been discussed in a couple of places by other people who are writing general texts about the area I work in, because it's a site that's important for a number of reasons. But I don't have things just on the Web. And part of that is just because I'm not sure that I have anything conclusive to say. So far I feel like I need to be a little more conclusive, that if things are too preliminary they'll be taken as if that's the answer, and that may not necessarily be the case. And this also happens a lot with our preliminary reports that we do, because, obviously, in the space of two months you really are not even able to see everything clean that you excavated that summer. So the reports that we write are so preliminary that even when they come out after a couple of years they're already out of date. We've already moved on and are probably thinking something else. And that's part of the problem with the whole system. But the same thing can be said, that if you put something right out there on the Web right away, it could end up being wrong. But people might have absorbed the initial announcement or the initial report, and then it's very hard to change that later on. And that's one of the things we think about: "How soon should we put things out?" "Does it need time to gel?" And I think, "Yes, a little bit," although I think we're way too slow in everything that we do.

Other scholars who refrained from openly sharing work-in-progress cited the potential for their ideas to be stolen or otherwise not attributed correctly. These concerns seem particularly prevalent among young and pre-tenure scholars. In this case, tenure and promotion may indeed be "the tail wagging the dog." As one scholar pointed out, the problem is that archaeology has a culture of ownership of ideas as property, rather than the culture of a gift economy.

> Some of us, including myself, put our ongoing research on our websites. I would say that most junior scholars, or scholars junior to me, would think that's too much of a risk…Actually, I would say there is among all of my colleagues a reticence to put material out early. I have been less reticent than most and have not been burned yet in any way that I'm aware of. But I am sensitive to the notion that I'm putting my results out, that they could feed into other people's research…that by the time I publish my book, it's common knowledge, as it were, and people forget that it originated with me…I advise my students and junior colleagues to be pretty tight-fisted with their research, even though I know they're struggling with the issue of getting themselves published in monograph form. And they are very worried that that may fail and then their work will be unknown to people, entirely unknown to people, because they didn't put it out in any other form. But for the moment I don't think that the benefits outweigh the risks for untenured scholars or for scholars who are plowing a new field that hasn't been fully evaluated. In my case, I just don't feel that way. I'm at the top of my profession and I just don't worry about it as much as somebody who's still seeking promotion might.
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> I don't know whether younger scholars are more willing to share their work or take more risks. I fear that the tenure process may be driving some bad practices, like a reluctance to share.
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> One of the things we published on our research center website in prepublication was a chapter from a thesis. The author in question was afraid that, before it got printed, someone else was going to pirate what s/he had found. And that's because this scholar had given something like three or four papers as public presentations. And so, in a sense, the discoveries were out there already. And this way, the scholar put a seal on what s/he'd done…And in general, that's something that we like to tell people about, is that if you have, I'll say it brutally, a name stamp and a date stamp, you actually immortalize yourself much better, although it may be more episodic and it may not be quite as impressive as, say, a 500-page book coming out all at once. But still, in a sense, it has more impact. Who's going to read 500 pages and react to it right away?

Ar3.4 Data Sharing: Motives, Models, Mandates

Archaeologists unearth and create a wide variety of data types over the course of an excavation. Teams made up of specialists in flora, fauna, osteology, ceramics, and pottery, among many other areas, are involved in the multiple stages of documentation and analysis. Digital and non-digital forms of data can include field notes, drawings, photographs, databases of artifacts, and analytic data sets. Practices around sharing any of these data vary according to the personality of the lead researcher, subfield, nature of the site and data collection, and restrictions set by funding bodies, local authorities, or other stakeholders. Few scholars are accustomed to sharing data from an excavation-in-progress beyond the grey literature and annual progress reports required by some funding bodies or other stakeholders. Some scholars do share raw or early data privately to trusted colleagues, but archival publication remains the primary means of (limited) data sharing and dissemination. One of the main objections to data sharing is a fear of losing ownership of one's intellectual property.

> Why don't people publish yearly excavation results? It's partly time pressure; partly people are waiting until they have enough data. And "enough data," I think, is an illusion. You never have enough data…It's postponement in order to know more, in order to make a better publication, and being afraid that, in the meantime, someone will run off with your information. And I think it's really based on a very old-fashioned publication model…

I think, particularly in fields where there are a lot of primary data that will have lasting value, those data ought to be conserved…But, an issue that I raised is: I've got a lot of slides and so on. I don't want to particularly put those out there right now in high-resolution forms where anybody can just publish them without crediting me. I want to have control, still, at this point, at least over the copyright. So if they can be put out there in such a way that they are, for example, low-resolution or watermarked or something…And I know about the Creative Commons, and I need to look into this more myself when I have time…But what I don't want to do is just put a lot of my hard work out there for commercial book publishers or whomever to suddenly be using my stuff…After I'm dead, maybe…In archaeology, you invest a lot of time and effort and money in going out to the field and generating the raw data to do surveys and expeditions. And I am certainly loath to just put all that data out there on the Web or whatever until *I've* had a chance to write it up and interpret it the way that I want to interpret it and publish it. I have a duty, in fact. I think it's very important that those data get archived in some way on the Web, and then paper equivalents, and so on, because once you've certainly dug up something archaeological, in a sense, you've destroyed it, you've destroyed the context. So to me that's absolutely vital. But, if I were to just go out there, as soon as I finish the field project and put up all my data, that potentially leaves it open to anybody who suddenly interprets it the way they want and I'm not interested in doing that…

My excavation has an enormous database. It gets bigger and bigger and bigger. And we're definitely going to want to be able to exchange it with other people if that's at all feasible…Yes, it's true that archaeologists don't like to share until the excavation is complete…That'll be left for their heirs to do then, because they'll be dead. That's the initial problem. I talked about sharing data early a fair amount with the archaeologists on my team, and what we have agreed is that as we publish areas of the site, we will expose the data fully, rather than wait for 100 years until we've finished excavating. And, with the Ostraka [ancient pottery used as writing materials], for example, we'll make those available on APIS (Advanced Papyrological Information System), as soon as we've finished the volume and got it ready to send to press. So, we've already got records ready, pretty much, to put up. It's just a question of going through and cleaning them up and fine-tuning them, so we'll be ready to dump that stuff up there. I personally would put it up already, but the archaeologists—you're quite right—are very unwilling to do that. They really worry about the material being hijacked. I'm less worried about that, but maybe that's because I know that nobody else can read Ostraka. It's not very many and they're all friends. On the other hand, I think probably the databases are such that if you don't know the site it's not that easy to obtain an overview quickly, so I don't really think the chances of material being hijacked are all that great, but the archaeologists are very adamant about this.

The main problem with archaeology and dissemination of information is that there's this very old traditional belief that these are your things that belong to you. You alone have the right to publication and you have to have very strict control over how that's done, and if there's any sort of easy public access then you get the shaft, basically, and all your hard work will be compromised in some way. And when there is a discussion of putting things on the Web, this immediately comes up with all colleagues of all ages…I think there's still somewhat the concern, although we all would like to have better access, we all are hoping that this is going to be a reality. There are these concerns that we haven't completely figured out how to deal with, because so much of our futures and our reputations are based on our discovery and analysis of certain things, and if they're out there and other people get to them first, so to speak, then you're perhaps compromising your ability to do things later on.

Speed of publication used to be less of an issue, and in fact one could even say that speed was almost completely discounted because everyone knew that to publish something was going to take time. The most famous example of this was the publication of the Dead Sea Scrolls. The scrolls were in the hands of a fairly limited group of people, and ironically it was

> their slowness in feeding out the material that advanced their careers. Almost every one of them advanced in direct proportion to the material that they did not publish in a timely basis. Some people called that group "the cartel." But a cartel implies that everybody got together and thought this all up. In fact, it's not like that at all. In most cases it was simply that people got bogged down and they had too much material that they weren't going to release to anybody before they had thoroughly analyzed it. They tried to do everything themselves so they didn't get a lot done. And since the culture was such that there was no push for them to get it done, it didn't hurt them. So that was the way it was. I would say it is much more difficult to make that kind of case today…
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> Some people don't like to share in case someone else might come and grab it or something. And I think that that is true, especially when you're dealing with archival research and your sole production is based on archival research. The problem is if your whole study is based on an archive or things you've found—which I think is less and less becoming the case, but it's still very important, finding documents and things like that—people don't necessarily want to share it before they've gotten so far with it…I've made a personal database of primary sources, and I think it would be great if other people wanted to work on it and there could be a collaborative effort…I think there's definitely a move toward image exchange, at least for me, talking with some other archaeologists. I think more and more people will want to share their images, especially images they've cataloged and put metatags and information on. I think that type of source sharing in the sense of images will become much more common. At least I feel that I want to be involved in that.

Data sharing as data preservation

Archaeological sites are termed "non-renewable resources" because they are often destroyed in the research process. Yet, as many scholars pointed out, a substantial amount of the raw data produced in the course of an excavation never appears in the final analysis and publication. Several scholars spoke of the need to make more of this "dark data" available for reuse by scholars in the field. According to one scholar, "You cannot re-excavate a site…but what you can do is go through the intellectual trajectory that the excavator has gone through." Consequently, it is important to record and archive the data from an excavation—what is termed "curation" in archaeology—so that other scholars can "resuscitate the excavation from all of the data." One of the fundamental challenges in archaeological research is organizing and creating access to large amounts of diverse unpublished data, including field notes, artifacts, photographs, log notes, and databases.

> But if you think about it, primary evidence becomes incredibly volatile in a way that it wasn't before the primary evidence was collected. If you're an archaeologist, the primary evidence tends to be the artifact on a site. As an archaeologist, you destroy the primary evidence by investigating it, because you dig the site, you ruin the site, and no one else can repeat it…You don't put it back together when you're done. So you destroy the evidence by analyzing the evidence.
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> The data are the only thing we have, and if they're not kept, archived, maintained, and migrated into current forms, that's it. That's a huge amount of research, work, and people's heritage that has gone down the drain. Do you remember the last scene in *The Raiders of the Lost Ark*? What happens to the ark? It's taken into this cellar that is full of similar boxes, and it's shoved into a place where it will never be found again, because nobody will ever be able to know where it is. And that's the best way of hiding something, to put it in an archaeological museum…When we publish stuff about our excavations, the publishers aren't very interested in what we actually found…well, maybe the select items of what we found. They want to know

what we think about it, but nobody wants to publish the full database…What I want to do is to actually get those data and have them running somewhere…I want my data to be used, because if my data aren't used they will die and they won't be migrated, and that's the whole thing.

Most archaeological sites, for example, are not completely excavated, and so people go back years later with new techniques and new methods, and try to excavate them, so you want all the records, the maps, the drawings, the thoughts, all that sort of thing, to be kept…You can never go back and excavate the site again. It's a non-renewable resource, so you really need to have not only as accurate and as complete as possible a recovery, if there is such a thing, but you also then need to have those data available. It's not like somebody can go back in the lab and mix a bunch of stuff together. It's a historical science like geology, rather than an experimental science, so we really are constrained and we can never go back, so there is a lot of concern about archiving. In fact, some monograph series are specifically designed to be data-rich monographs that have all those charts and tables and so on, and they've gone to CDs, digital data storage, for those sorts of things. And so data curation is a big concern, and there are working groups in the discipline to deal with it in some sort of way, and people teach courses on databases…It's also difficult to figure out how to evaluate somebody's work when they're storing their data in certain sorts of ways.

The data basically just sit there and never go anywhere. There are all sorts of data that just don't get analyzed, because basically you publish the exciting thing you found and your interpretation, and the rest of that just…It's on external hard drives, and I'm going to hopefully publish a lot of it as an addendum, maybe online, to my dissertation, to at least make it accessible if somebody else could use it, because some of it I just will never use.

…In academic archaeology, they want you to dig your own stuff because it's part of the craftsmanship. And unfortunately that creates huge collections…gigantic amount of artifacts, just unbelievable…The museums are choked, they're full of artifacts and human remains that hardly anyone ever looks at. And that is a problem in our field, which is being addressed just a little bit, but not a whole lot. There is some encouragement to reuse the sexier forms of our data, like photos, and there's a whole remixing interest in using some of our data for educators and things like that. But as far as our own practice goes, we usually generate our own data sets and ignore everything else.

I think publishing data sets is something that's not happening that ought to be. I think that there are a lot of data sets out there, even in as un-quantitative a field as antiquity tends to be, and people just have them on their own computers, and they are not being put up online for the most part. There are no standards. This is of course a very big deal in archaeology, much more than in ancient history or classics, and there have been some initiatives to try to do something about it.

Some of the people, for example, who are innovators in the field of anthropology, are archaeologists. They have a lot of data. That field has been computerized…I think information technology is such a saving grace for archaeologists because imagine all the limitations on the dissemination of, not just discoveries and discovery procedures, but even data, because of the expense of publishing archaeological stuff. There's just no money to make it possible to publish all the data, so think of all the data that is just waiting there to be made public.

Preserving analog data

The preservation of archaeological data and databases is often idiosyncratic. As one scholar described, "You have to put a jack in the mind of old professors for understanding prior work

because nothing has been recorded." One scholar we interviewed planned to create a trust to make provisions for personal archival data and materials to be donated to a large US scholarly society or a local field station. But technology has created its own crisis for scholars who must make the "digital transformation" to preserve large numbers of analog slides and materials, but do not have the funding to pay for the actual "grunt work" of digitization (often done by undergraduate students). Due to the inherent difficulties in preserving vast and diverse data forms, there is, and will be, inevitable data loss.

> …up until now, mostly the raw data are curated in my lab or in my home or wherever, and as I'm getting older and thinking toward retirement…this is increasingly on my mind. And I actually have employed in the past a part-time assistant to get a number of these projects better organized and actually into archivable boxes and folders and all this other stuff, and get photos organized…We pay for it. So the big cost right now—for example, you've got a whole lot of photographs on slides and so on—is the actual physical labor of getting those things digitized. And I don't have excess funds. Whatever funds I've got right now I'd rather put into new fieldwork or lab work…In the interim, digital technology has improved so much that I'm thinking about it. I haven't acted on it yet, but it occurs to me that I could begin to get some student assistants to digitize a lot of these documents as well. And as I have completed things and published them, it's getting increasingly feasible as storage costs go down that I could begin to actually put some of this data on my website…So I'm thinking along these lines.
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> Data storage and the preservation of data sets are all done on homemade systems…so I think quality is going to be one of the concerns. You have people who are very good on paper, who write well, but are terrible field people, and have crappy, sloppy methodology, or very bad project management. They don't know how to organize a team to save their lives.
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> I know lots of people who have lots of images, some of them analog, some of them digital, and this stuff tends to get lost when people die, and people don't know what to do with the stuff that has accumulated over the course of a career. I'm one of these people. I've got a large slide collection, and I haven't digitized most of it because I really don't know what to do with them.
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> …We have this huge archive of negatives and things from the past three decades of excavation that has not been digitized, and so one of the things we're trying to do here is digitize past work…Now, I take digital images of everything…but we have 30 years of excavation in which a tremendous number of analog images were taken, including tens of thousands of artifacts that we have in our museum that we do not have digital images for, so we're currently working on that…There's a catalog, which is essentially like a card catalog that exists on site, and we have a copy of it that has been entered into a database, but the visual material has never been put in. It's only the textual descriptions of things…And we need to digitize the notebooks from the excavation. That hasn't been done. We have only the hard copies at this moment.
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> I can tell you only personally, I still handwrite notes, so I've got file drawers of stuff, and I do less of it than I used to, but I still work in the same way. So when I write a paper or a chapter I work through primary, secondary readings, I take notes, and then I read back through my notes in order to assemble the stuff into an outline that I write from, and that hasn't changed. I published a paper that involved a fairly large database, and at the time we had no computer database capacity at all, and it's all in the form of handwritten notes, tallies. It'll get lost in the basement. It's already lost in the basement somewhere. In any case, it was idiosyncratic enough that it's not clear to me that anybody could replicate our results. We indicated how we

sampled, and since this is all published material, anybody could go back and do the same sampling and test this.

Preserving digital data

As archaeological data collection becomes increasingly digital in nature and analog materials are migrated into digital form, data preservation becomes more problematic. Scholars repeatedly complained about the need to regularly migrate data to new storage formats and the risk of loss at each stage of migration. Many scholars called for more substantial support for data preservation and storage, including larger backup capacities from their institutions.

> …I think right now, this is just off the top of my head, but I would bet you that unless something is done about this, I'd say, 80 to 90 percent of the data that's being generated now would be lost. I'm talking about the raw data, because I see nothing being done to archive this stuff centrally, and no concern about migrating data forward. It's all sitting in people's offices, garages, or whatever…Worse than that, it won't be readable, because it won't have been migrated forward. At least with old paper data, you might call up the museum and say, "Hey, would you like this stuff?" and maybe they'd take it. But what are you going to do with floppy disks and data sets where you don't even know the software anymore and you don't know the codes or anything like that? Forget it. So, I think it's a huge problem, and in a field like archaeology, it's irreplaceable, because those sites have been destroyed…I can't go back, the sites are gone, they were destroyed in the development, and that's the only record you have. It's gone, bulldozed.
>
> Physical artifacts exist, but increasingly archaeologists are taking field notes in databases and on spreadsheets, and doing various simulations, and there is a very limited physical record of the site that's not available in some machine-readable form. So the machine-readable material is highly volatile. It disappears. We have less stable evidence about archaeological research than we did in the past, because it spins on disks, which are hard to maintain over time.
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> …we're trying really hard to find places where digital preservation will work because obviously CDs last 10 years, hard drives last two years, if you're lucky, and so actually we've been degenerating because we've gone from stone tablets that last millennia, and then to paper, which can last a pretty long time…So it's actually getting worse. I'm not personally interested in that problem. I think it's very necessary, and the way that I can see to help with that is just making your information as widely available as possible and hope to God that people use it…or make it in a way that people will use it and keep it relevant, and keep it in the forefront of their mind because if the data die in people's brains it doesn't matter if you have it on a hard drive somewhere, really, because nobody knows and nobody cares.
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> …It's very frustrating, because you have to keep transferring it every few years and you buy a new computer and then you have to go to another format. I mean, it's obviously a way of getting people to spend their money.
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> One of the things I'm facing right now is all of our computer hardware is really out of date, and it's not able to handle the things that we'd like to do, and we need to upgrade our negative and slide scanner, which is a huge cost, but it will be well worth it, since this is one of the major projects we're working on right now. But it means we need to update everything to go along with it.
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> …Many sites actually do employ specialized people to run and maintain the databases, but not all. Sometimes, the data are entered. Like my excavation, the data were entered decades ago,

> and I actually migrated it myself just to make sure that I can always use it, because I want to do something with it…

Radical data sharing: The moral imperative

Some archaeologists are opening new horizons in data sharing, engaging in "radical transparency." As discussed previously, the publication of semi-raw databases online in near–real time is seen not only as a form of data sharing, but as a radically new publication model. Data sharing in this manner may potentially increase a scholar's visibility in the field, attract collaborators, and strengthen the merit of his or her published argument and personal ownership of the material.

> There was an interesting project done by a highly regarded scholar in the field…It's a home-grown system for publishing his/her current excavation…and this scholar is going for a radical transparency: absolutely everything is published online in a very rigorous manner…So, in a lot of ways, it's a model project of sorts. Other innovative projects, like Çatalhöyük, have got transparency on their data, too. It's exposing your data as a way to get attention and get noticed now, and that's one of the incentives to do it, and some of the other incentives are how you go about it, is it a well-done database system?

> I don't think data sharing is changing substantially. There is essentially a retentive mood in the field, and it's justified in the sense that you feel like you only have to show to others the finished product, your interpretation of the data. Only at that point do you publish the data. Now you can see the fallacy in this, because if you publish the data 10 years later…obviously you are going to publish what supports your finished product. And therefore there is an essential inconsistency in the documentary part of your argument; the argument holds but that's possibly because your documentation is incomplete. So it's natural that everybody would want to wait, then, until the end…So what I instead am saying is that the nature of the archaeological record is such that the placement of objects should be published immediately, within a few months of the excavation, with the understanding that any kind of future understanding of how things have come to be in the ground can change…This is called creating a "global record" because it's the total of the observations that we make, right or wrong, that should be published. But nobody in the field really thinks along these lines, and that's why I don't think that there is a substantial change. The big change that's happened is that some scholars now make databases available online, but they're mostly typological databases of objects for which there are fewer questions about observational recording, because the objects are always there so it's very objective. The thing where the objectivity of data is insufficient is where you speak instead of the stratigraphic process. And that's where we do not really have the mindset to change things…Archaeology serves a goal that goes well beyond the techniques of excavation. It becomes really a hermeneutical model, and in a sense also a systemic problem, of how do we deal with the objectivity, the truth, if you will, of the documentation that we produce.

> I would say not sharing is the rule and not the exception…because scholars have a misguided sense of where academic power really lies. Notice I say misguided. They think, if you clamp down on the data, that restrictive control constitutes power. Now some of us are taking a completely different view, and that is, ironically, if you release the data, that is where the *real* power lies. Because then everyone turns to you and says, "You're the one who's releasing the data. How do I get more data?" Everybody wants to deal with you. And that is the key to success, because it makes you indispensable. Also, by the way, if you give your data away then you can put on minor restrictions. You can say, "Don't just hand it out willy-nilly to other people, ask for permission first." People are grateful for getting the material, so they say, "Of

> course we'll do this, we're happy to do that, thank you very much."…So you strike a balance where you can release data in a responsible manner, and if you don't put unreasonable restrictions on them, people won't get angry at you and try to distribute data in an uncontrolled fashion. To the contrary, people are so grateful for getting such high-quality material, that they become all the more scrupulous about respecting the rights and credit of others.
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> This is the strongest argument in a lot of ways, that you get security through publicity or ubiquity. Security through obscurity is actually much more dangerous because then you're more likely to actually lose control over attribution. For example, say you're a graduate student and your advisor decides to publish your data from under you, you have absolutely no recourse, but if you've already put it up, then you're in a stronger position. That argument actually can gain traction…It's important to build in a clear citation protocol in a database, so it feels a bit like publishing…Terms and conditions of use have to say, "If you're going to be using this, be sure to cite it." So, there's a lot there that makes it relatively difficult to steal.

As in history, making one's primary source material more openly available may have ethical implications for the quality of research results and published work.

> …these data are never to be changed. That's an important part of establishing objectivity, that even if we realize there are mistakes, we cannot change the data themselves, because the primary observations will remain and retain their authenticity forever…In archaeology, 10, 15 years after you've excavated something and you finally understand it, you emphasize and you publish essentially the things that support this final interpretation, which, by and large, I think is correct. We have all developed a good understanding of things. But this model is really not objective. It's like publishing a text and publishing only the sentences you think fit your particular literary interpretation of the text.
>
> Oh, yeah, absolutely I can envision a time when people who aren't publishing their data are then suspect in terms of their rigor. I definitely think so.

Despite the enthusiasm of its proponents, there are many barriers preventing radical data sharing from spreading across the field. First and foremost is the tradition of ownership of data described previously, and the reluctance to share data until the formal monograph is published. Many of the scholars who do openly share data mentioned the use of a Creative Commons license or other citation protocol to protect their copyright on digital material. Willingness to share may also be higher among post-tenure scholars who, as one archaeologist put it, "have nothing to lose." Secondly, some scholars, even well-established scholars, may be self-conscious about the rigor or consistency of their data collection and recording methods, and therefore are unwilling to expose them to the world. Additional logistical obstacles remain, such as problems of data standards, data curation, funding, and time, all of which need to be solved to encourage the scalability of this model.

> I think the real problem is less people's fear of theft, than their fear of the sloppiness of real-world archaeology, the data quality issues that people are a little bit more frightened about. And that's a more difficult issue to address because people may have inconsistent recording…and I think that is one of the big delays in publication of these things…"Oh, it's not quite ready," that type of thing, because once it's out there, it's open for critique. So that kind of radical transparency actually makes some people nervous…Archaeology is built of complex, growing teams involving multiple collaborations, widely varying types of methods, and synthesizing all that is very difficult, which requires some data management expertise

> anyway. But because we've had a tradition of the dawn of this or that archaeologist being the authority over the interpretation of, typically, his site, then this sort of transparency is somewhat threatening to some people who are leaders in their field but not necessarily the world's best archaeologists…And you can't say, "Oh, it's just when the old people die." It's not like that…If anything, junior faculty are some of the most risk-adverse. They are. That's my impression. Even worse, people hunting for jobs. And, again, it just depends on people's personalities.
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> One of the fears of digital publication is that scholars are not going to be able to keep the copyright or their intellectual property integral, the integrity of the intellectual property. So one of the things that we need to do is to educate people to the idea of things like Creative Commons or Science Commons…
>
> I'm for open access and author-pays, actually. I'm really for a much more open model of access to information and communication, although what I respect are the opportunities with Creative Commons, too. It's along a continuum. That's what I'm more interested in, rather than the choices of "You can have it or you can't have it at all," and "You must get copyright release." That's the way it is now. It's a black or white kind of thing. And what the Creative Commons offers is much more of a continuum, that you can say, "Yes, you can use it but you must give credit to this or that," rather than it's just one or the other…So you can customize it depending on the nature of what you're doing, the nature of the information, and what you perceive might be done with it.

Funding mandates and other stakeholders in data sharing and curation

In addition to the lead researcher, there are many other stakeholders in archaeology that affect a scholar's practices regarding data management, sharing, and publication, including: funding bodies, universities, museums, governments, local authorities, and other institutions. Few stakeholders require that scholars publicly share data while an excavation is underway, but some require formal deposits or a data management/sharing plan after excavation and final publication is complete. In the UK, data from any government-funded excavation must be preserved and shared via centralized databases. Funding bodies in the US differ in their publication mandates. National funding bodies, such as the National Science Foundation and National Endowment for the Humanities, seem to have vague regulations governing compliance with data preservation and sharing. In contrast, the Andrew W. Mellon Foundation actively encourages data preservation and sharing. Although archaeologists in the US have idiosyncratic data sharing practices, there are examples of some scholars developing plans at the proposal stage for depositing data in Open Context, an open access resource for the electronic publication of primary field research developed by the Alexandria Archive Institute.

> …in the UK they're already required to hand over data sets pretty much immediately, and that's a term of a grant. So it's expected.
>
> In England, they've set up a formal system where you have to archive all of that data, and it's renewed with each technological change. And hopefully that will happen in the US eventually, but that happened in the UK because most archaeology is actually private, road contract firms and things like that do most of the archaeology in the US and the UK. And so they've actually set it up where all the data that the road projects do create are kept on an online database that is renewed all the time, and so every grant and every contract there has to include that within its budget, but in the US you don't…In parts of Latin America, you have to submit a request, permission to excavate, every year. You have to show you've been responsible, and

> you've backed up all the data and you've analyzed everything. But once you've done that…how responsible are you as an academic whether or not you're going to do something with it?
>
> There's a whole setup in the UK where if you excavate with any kind of money from the government you must share you data with the public…This is just starting now in the US with NSF grants. And NEH, I don't think it is yet. But it's not usual. And the Society of American Archaeology has just set up a working group that is trying to centralize, not so much the database itself, but the organization of it, so that there's one organization that is in charge of standardizing the databases so that they can talk to each other. So they have that in England, but they don't have that in the United States yet.
>
> The NSF does not really have requirements for data preservation. NSF has started to require it, but it's fairly recently in archaeology. It's only been explicitly stated in the last couple of submissions. They want you to have a data management and data sharing plan. They're now requiring a paragraph or so on that, but there's no requirement about having your data in some specific archive, or that sort of thing. Because the data are either generated or federally funded, we were supposed to have some plan, but it's pretty vague, and it's really early, I'd say, for the active life of the grant, or shortly after that. And it's pretty much up to the individual to comply.
>
> The NEH doesn't really have any guidelines for data preservation, not really, nothing enforceable. There are a couple of people referring to Open Context as their data repository in current grants…And reviewers like to see that kind of thing, but it's not mandated.
>
> Funding from the National Geographic Society means more or less that they have the rights of first refusal. So you send them a report, and they decide what if any of it they will use. Sometimes they publish a little note, this was found here, or sometimes they just ignore it because they have so many projects. And if you found King Tut, you would definitely be in the magazine. NEH wants you to publish and you're asked where you publish, but I don't think that they're as strict as the sciences about publication of data.

While some stakeholders require that data be shared (like national funding bodies), there are exceptions for "sensitive areas," where data secrecy protects the anonymity of the archaeological site from looting or other public exploitation. For preservation purposes, excavation data from sensitive archaeological sites is not shared. This may also apply to research that involves museums or cultural management stakeholders whose interest is preservation and not research.

> Grey literature is all over the place. It's usually in people's hard drives. Sometimes they have a limited run somewhere. It's kind of like dissertations—you don't necessarily have to file them anywhere, depending on your university, obviously. And there's also some secrecy that goes on in archaeology, necessarily, like issues of burial grounds and very sensitive sites that aren't released to the public because they're afraid of things. In the Southwest, a lot of the archaeology was devastated because people can go and dig holes and pull up artifacts with metal detectors. So, with some of the sites, there is that hesitation. It's not as bad as…there are some fields that very much protect and wall in their information, "I can be the only one that can publish on this." Even within physical anthropology—the really old human remains, like Lucy—they don't share their information because I guess it's a different tradition. I don't know why. They don't allow access to just anyone for their bones, but we do, in archaeology in general, unless it is considered to be a very sensitive area…to protect the archaeology.

> And the last but the most troublesome obstacle we had in our archaeological research at cultural heritage sites was the relationship with the local management and the museum stakeholders in the project. They don't like innovation and created a lot of problems. This is a big problem everywhere. They are public content providers, and have a responsibility to share archives and information with the rest of the society. Typically, they don't like to do this. They assume that they are the only owner and they don't want to help you a little bit, because they fear that you can use the same information to produce better results. I think that this resistance results from their negative perception of archaeological research, because they don't know what a research project really is, because their job is just to save and protect the monument…And particularly in the final communication process, they want to be the only owner of the information, and they don't want to share. So the dissemination of research is governed by people called "archaeological superintendents" in many European countries …Throughout most of these countries, few of the museums or local managers of heritage sites collaborate, so that's a problem of the relationship of archaeology to cultural heritage…

Complicating sharing and dissemination issues further is contract archaeology, which does not stipulate specific guidelines on data sharing, preservation, or curation. Contract archaeology, or culture resource management, as it is sometimes known, is mostly funded by private developers who are required to produce an archaeological report that, in the words of one academic archaeologist, will "satisfy the regulatory agency."

> One of the things that worries me greatly about the field of archaeology is that—as we move increasingly to digital collection of data—I'm afraid that a whole lot of stuff is going to be lost. Take particularly what get calls CRM, culture resource management. We used to call it contract archaeology. There are only a few of us who are doing academic research archaeology…but there's a huge amount of work that's going on constantly, basically funded either by the states or mostly by private developers who are required to do archaeological work. And that's really important primary data, but it's not being systematically archived anywhere. There's no requirement that it be, unless it's federal, and if it's federally funded, there is some curation requirement, but for most of the privately funded stuff, it's not. All the developer wants is a final report, which will satisfy the regulatory agency. And those reports are actually only appearing for the most part in so-called grey literature, which means there are a few copies, maybe a file here or there in agencies, or whatever, and most of those are electronically created now anyway. But only a small amount of the data gets into the report…

Cyberinfrastructure in archaeology

Data curation is repeatedly described as a funding and "infrastructure issue," and several scholars cited the need for a large-scale cyberinfrastructure initiative for archaeology akin to PubMed in biology. Support from the Mellon Foundation, in particular, their Archaeoinformatics.org, was described by many as an important step in this direction. As one archaeologist pointed out, "Now that we can no longer say that money is a problem…we can start working on the social problem of how we can get everyone aboard to get all this information together." Yet one of the biggest obstacles is the question of standards for integrating idiosyncratic data sets on a large scale, as well as the difficulties of securing buy-in from other stakeholders of archaeological data (including governments, scholars, libraries, private contractors, and museums). Various initiatives, such as the Alexandria Archive's Open Context program and the Advanced Papyrological Information System (APIS), are designed to provide users with easy-to-use online tools for database curation and publication (with a built-in

preservation component). GIS may also provide a common architecture across different databases.

> The lack of data sharing is a big problem, because it's an infrastructure problem. I'm not optimistic. I think that if we don't create new infrastructures, we can't change anything. It's a general problem in all countries…And the problem is that every project manager has a different approach and he thinks of himself as the owner of the data, so that there's no public or shared consciousness. I don't like this. I think it is very odd. We don't have yet a really public consciousness. Many archaeologists have a greater sense of the field and the public good, but we are a very small community.
>
> …we're the poster child for the under-funded…A lot of the big infrastructure sciences typically have several organizations that have to pool resources together, like the Hubble space telescope and the Human Genome Project. And for the small team projects, it's just everyone for themselves, basically…There's not an imposed incentive and also each research agenda is so particularistic…I don't know where the real research value is in pooling lots of different archaeological databases together, because you're mixing apples and oranges and pears, but maybe somebody can do some synthetic Bronze Age studies or something…It's always going to involve research and judgment to compare different sites. You can make it easier, obviously, by making the data sets available and having common tools to allow you to manipulate those data sets, but when you're actually making meaningful linkages between different data sets that are coming from these different agendas built by different people with different backgrounds and all that, you're still going to have to have a lot of human judgment in that process for it to be meaningful. It takes a tremendous amount of effort to really understand contextual relationships and what they mean by what they're recording. I don't think we'll ever get to the point where everybody's going to use a standard database that can take certain values for describing all archaeology, and we're all going to be trained upon that to do exactly the same thing…It's not going to work…
>
> The development of tools and databases for artifact documentation and distribution is a major endeavor…and the distribution of the data in an intelligent and intuitive fashion requires funds of the nature that one normally associates with projects, not in the humanities, but in the hard sciences or medicine. In other words, they are multimillion-dollar projects, and multimillions of dollars and humanities don't go together terribly well. You have to show that the work is intrinsically important, number one, and, number two, that the work can inform a lot of other projects…There are whole groups of archaeologists and scholars who are digging things out the ground every year and they don't know what to do with all that stuff once they've been dug out of the ground. They don't know how to handle the data, they don't know how to document them, they don't know how to distribute them. They don't know. So we hope to show that there is an existing infrastructure that they could clone, that is of value…
>
> Archaeologists are both convinced that they need to share, so that their data don't disappear in an attic somewhere, and also are very protective of their data…A couple of initiatives have really tried to reach out and convince colleagues that it's important to put data in a central repository with the provision that they can keep it sheltered for a number of years. One Mellon-funded endeavor, which is called Archaeoinformatics.org, basically lets people keep their data locked up from public access until they die…The whole idea of the preservation is that ultimately it would be made public…This Archeaoinformatics.org initiative wants to make something available to archaeologists who wouldn't be able to do that through their own institution…so there will be other initiatives at other universities, maybe other repositories. But what's most important is that people and databases talk to each other. So what those archaeologists who are moving in this direction are really concerned about is whether or not to have standards. Of course you want to standardize, otherwise you can't search multiple

> databases. But on the other hand, every archaeologist has his or her own ideas. It's partly also the site and circumstances that direct what kind of information you record. So it's very difficult to make something that everybody feels happy about and will adhere to. And also you don't want to stop academic development. You don't want to stop the possibility of thinking differently than we've done for centuries. It's not a good thing to try to fix. That's the discussion going on now: how much of this should be fixed and how can we do it in such a way that we keep the flexibility while enabling searches across databases.
>
> Geospatial tools already do play a role in the field, but the environment in which these things work is still stand-alone. In the last 20 years, lots of different projects have gone "great guns," developing under leadership that is discrete from that of any other project, with funding that very often comes at least in part from universities because their faculty have an interest in showing their own contribution…The result of all this is that there's a great abundance of projects that are potentially inter-relatable, but have been stand-alone from their very conception and continue to be so. The best GIS work in classics is different—more integrated and collaborative—from anything else, not because other projects were shortsighted or anything like that. One of the things starting to happen now is that teams that control text or images, or some kind of metadata or GIS data, are trying to make common cause and expose their data to each other in a controlled way.

National topic-specific research centers can play important roles in providing archivists, technical consultants, and funding bodies for digital data curation, support, and preservation. The long-term endowment of digital archive projects is essential, as is built-in flexibility. These resources may be managed by professional data curators or scholars who see this as part of their scholarly work.

> Sustainability is a huge issue, and institutions and departments need to work together differently from the way they have done in the past. In the traditional picture, the university pays faculty to generate scholarship, which the university then buys and keeps safe under a roof with the air conditioner running; the long-term costs are definable and manageable. But under the new model, faculty are producing resources that may not reside in their home institution, and whose long term maintenance and preservation may require significant demands on personnel, software upgrades, and considerable cost. Somebody has to pick up that tab, and I don't think institutions have fully solved this puzzle…Roger Bagnall, who runs the Institute for the Study of the Ancient World, is in the process of trying to gather sufficient funds to in effect endow a preservation scheme for a number of the most important digital projects and achieve a benefit and economy of scale by clustering them on common infrastructure under shared technical standards. As complicated as this issue is, though, a key feature of the solution would seem to be fairly low tech, that is, to encourage widespread use of common technical standards, and then to develop a mechanism for permanently funding projects and also a vault in which these things are detachable from persons to institutions…They need to be able to move and money needs to be able to move with them. The costs may be great, but the tasks are definable.

Ar3.5 New Technologies for Sharing

As with music and history, new technologies for scholarly communication are generally used passively by archaeologists. Scholars read "bits of stuff" on a daily basis to keep up to date, including listservs, but seldom blogs. Social networks are used by some scholars and graduate students to maintain informal networks with excavation collaborators, but this practice is not widespread.

Listservs

Listservs and email subscription services are an important way for many scholars to keep up to date in the field, but are not generally used for scholarly discussion, to ask questions, or to share work-in-progress. As with email more generally, reading informational listservs can occupy too much time for some scholars.

> I think listservs play a larger role in keeping up to date with new work and events than actually sharing research information. You can find out a lot of information about what people are working on online and in newsletters, so listservs are based more around keeping up to date in a general sense.

> I'm on a few listservs, but not a lot, actually. Again, it's just a time thing. I was on some of them a while ago. We had a listserv on archaeology and linguistics. God, you get ten, fifteen of these a day, and I said, "Take me off."

Blogs

Few scholars read blogs as a way to keep up to date in the field, or view blogs as a viable dissemination outlet for scholarly material. Lack of time and interest are the primary reasons that scholars do not consult blogs. Two scholars, however, did report consulting specialized blogs outside of mainstream academic archaeology on a routine basis for helpful and interesting information.

> There are some blogs, basically for people who are proselytizers of certain projects. But, otherwise, no, I don't think so. And, basically, there's just not enough time in the world. But that's not the reason I don't read blogs.

> Blogs, I don't look at them, I have never gotten into them…How much time do you want to suck up sitting in front of the computer? My email takes far too much time as it is. There are a few websites that I do regularly look at.

> I do look at blogs, but not as a research activity. That's not to say I don't get any ideas from them, but they're not citable. It's also a social thing. The only ones I read, and it's not with any regularity, are by people whom I know professionally already. So part of it is really just keeping up with colleagues. I'm not a real user.

> I do consult websites to stay up to date, especially on archaeological sites, but I don't consult blogs because I am not interested reading inessential information. I think there are archaeological blogs out there…

> There's a little elite group of archaeological bloggers. I mean elite in the sense that these are actually people sitting in libraries, who are interested in archaeology for the most part, or they're doing digital types of stuff, so they're inclined that way. And it's actually a small but pretty vibrant community…There's one anthropology blog that is absolutely huge, Savage Minds. There's the Stoa Consortium, and that's for classicists, and it provides lots of news about granting opportunities, comments about things…There's a free GIS tools blog. So it's mostly techie types who do it, but there's useful communication taking place…I check every once in a while. I don't get RSS feeds from them, because there's too much other stuff to do. Peter Suber's open access blog is very popular…Stanford's been more experimental with blogs; they were very interesting in new media…There are graduate students who blog.

> There are several academics who maintain blogs. There's one group at another university; I find their blog very pretentious. Personally where I think you find the really interesting stuff in my field is a lot of contract archaeologists and professional archaeologists that are telling what they can about the projects that they're on.

Writing blogs

Younger scholars, and those who are technically inclined, may be more likely to maintain blogs. These individuals complained, however, that it can be an effort to encourage others to post or comment. Email and listservs seem to remain far more effective ways to communicate with archaeologists than via blogs.

> Yes, overwhelmingly archaeologists with blogs tend to be young scholars like myself]. I might know one person over 40, maybe, but a lot of the older academics, they will contribute to something but then they think they're done. They'll give you one thing and that's all. I think that…it's not their spectrum of thought and development. They're very much interested in the end product, and that's it, they're done.

> My blog is hosted by my former research center. It's not my personal blog…I've had some success in getting other people to post stuff onto it. You just have to sort of beat them over the head to do it. Some people have actually commented, which is nice. It's nice not to just put something up for absolutely nobody…It's funny, when I was trying to spread the word about a new initiative, I put a blog post up, knowing that I'm probably not going to get any response because academics don't read blogs so much. And I got one response after a couple of days…So then I sent an email to a related listserv, which hits hundreds of people, and I was flooded with responses…something like 100 people. And it just gets you thinking that one of the best things to do for a scholarly communication, at least in this area, is to somehow tap into their email because it's the daily to-do list.

Social networking/Web 2.0

Certain scholars we interviewed were proponents of social networking sites (in particular, Facebook and Flickr) for keeping in touch with collaborators and colleagues, sharing work and images, and disseminating multimedia work to the public. Though there were examples of these applications being used for scholarly purposes, such activities were not widespread among scholars in our sample. Although younger scholars seem more eager to embrace new technologies for communication, there are examples of established scholars also experimenting with these tools.

> I worked with a decent amount of professors who barely use computers. I'm surrounded more by senior people who are very savvy, but you forget that there are a lot of people their age who have totally shunned technology. So, I wonder…how these older people see the scholarly communication problems…whether it's that they're just going to ride the storm and just keep doing it their way, or if there's some way to really have an outreach, because I think so many times I've been put in a situation of, "Can you help me make a PowerPoint?" And, "Yes, I can, but maybe we should teach you how to make your PowerPoint rather than doing the triage method of me making your PowerPoint for you." Otherwise, older professors, who are amazing resources and who have so much more knowledge than myself, aren't able to really get that out there or really are isolated technologically…

Facebook

Facebook is employed by a small minority of the scholars we interviewed as a collaborative tool, as a way of staying in touch with excavation colleagues, and as a mechanism by which to share information (including pictures and film as well as documents).

> Facebook…is really good for people who work together on excavations. I was on a project with people from several different countries…Usually we'd just say good-bye at the end of the summer and then pick it up again the next summer…But we all joined Facebook this summer, which lets me keep track of these people that I don't usually communicate with much. I can keep in touch by proxy. It's also useful for finding older contacts, like I found someone from a grad school class who is a professor now and invited me to go talk as part of their lecture series…The cool part of Facebook for me is that I'm able to have it as a hub for a lot of information. I can upload documents if I wanted to, I can post my C.V. there…I can upload photos, films, etc.…So it's personal and academic…you can leave it completely open so everybody can look at your stuff, or you can lock it down to a greater extent…One of the really interesting things for me is that you can host very short films on your profile and a lot of people see them.

On the other hand, one scholar likened Facebook discussions to Twittering, and suggested that the constant of barrage of communication prevents deliberate and sustained argument. Another young scholar suggested that social networking applications may be sustaining exclusive social networks for younger generations.

> I've been dragged into Facebook…Is it useful to me? There's this research group in my area and, for some reason, they're really into Facebook. So they want to do a lot of discussions on Facebook and that type of thing. But I really just don't have time. It's like Twittering. I just can't…There needs to be a little bit of space where I can actually think about something. And I think for some people, they're just wired in such a way that they like that constancy, and they are also able to actually say something intelligent quickly. And I'm not like that. I have to be a little bit more deliberate and think about things a little bit more. And so I can't Twitter…I need some time to reason…So, no, I tried not to get into the habit of responding immediately. And then things sort of slow down…
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> There are Facebook groups for the World Archaeology Conference and things like that. Someone asked me if I was going to join recently. I said, "I have a kid. I think I've moved beyond the Facebook stage of my life. If I were still looking to date, maybe." But that's just my opinion on those sites. I wonder if new networks of future old boys are being created, sometimes on Facebook.
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> You mostly find innovative social technology use among scholars in new media, and they're having a lot of fun over there. Some younger graduate students and lots of undergraduates, actually, are experimenting with Web 2.0 use…but they still see it as differing *magisteria*, like "This is my personal life and this is my professional life and I can either be personal or professional online." And actually having that integration is very difficult, and I don't know how successful I'll be at it in the long run. But you get some people like…my friend, who is fascinated by new media. S/he uploads pictures and videos and has a lot of fun with it…But we're still a minority. I think that as technology weasels its way even more into our lives, I'm not sure if the percentage will go up or down.

Flickr

As with Facebook, one scholar cited Flickr as a helpful way to tag, share, and discuss photographs among geographically distributed networks.

> Flickr is a photo-sharing website that allows you—especially if you pay the professional price of $20 a year—to upload huge amounts of photos and basically raw images, which are enormous 20-megabyte images, that you can tag to make searchable, you can write notes on them. And so that's been really amazing, actually, for archaeology, just that we're able to…Usually I can show you a picture of a square dirt pit and it doesn't mean anything to anyone who's not an archaeologist. But here, on the picture, I can actually draw squares around things and interpret the picture for people…You can also tag things with descriptive terms on Flickr, and open your license to them, so people can reuse them, like educators. Other academics very often will just completely steal from Flickr, which is great, I love it…I released my copyright to them. I have it under Creative Commons. They can't use it for commercial purposes. They have to attribute it to me and say I did it, they have to use it for non-commercial applications, and…if you make a product out of this you have to share that freely as well. Some people don't necessarily do that. But there's always a problem with corporations trying to appropriate your information. So, ideally, institutions and academic public educational facilities would do a lot of these things for us so we wouldn't have to necessarily worry about AOL stealing our photos or something.

The formalization of informal networks: Specialized Web forums for scholarly exchange

Finally, two graduate students voiced a call for some kind of dynamic mechanism to share research ideas, data, and bibliographies-in-progress. In particular, they proposed using existing social networking platforms and technologies to facilitate scholarly communication between informal networks of students and scholars working in a common area. Along this line of thought, highly specialized research networks may be introducing intimate, formal sharing practices in some research areas. For instance, though there is not a strong tradition of sharing at large, online technologies are enabling increased sharing practices among some international scholars.

> I think more and more, I would love to have some sort of online forum of ways to share information, especially in the nascent stages of projects…More online interfaces is a big need, especially among students. I don't see why Facebook technology, that type of thing, why people can't have groups of people who study the same things and have some sort of other forum of graduate students. I know, for instance, a lot of professional organizations have listservs, which are great, but I don't know many students who are really excited about sending their questions among their faculty. It's that way. I think there needs to be something that students can use that they can share with other students. And, among the field, it would be great if there were something in the field where everyone can share, in a more interactive way than a listserv, which tends to just clog your email and you need to read everything.

> I think what will happen will be that we have a large number of *very* focused professional groups that are specialist interest groups. So there will be a group in British studies and there's a group in Netherland-ish studies, or a group in Indian studies, and these are international scholarly networks. They used to meet face to face in their own little mini-conference at the big national conference of our professional association. But, increasingly, I'm aware that those little operations have started mounting interactive Web fora and are beginning to publish pretty substantial newsletters of the activities of their membership, including research reports that are pretty substantive. So they're sharing among themselves,

> at any rate, and they may feel more comfortable with that because you have to be a member to get into those and you know whom you're having your conversations with. They're really fellow specialists in your field. They're not random people from anywhere who just asked to see your stuff. Still, there's a risk there, of course…Now these are uneven phenomena, too, and they're springing up everywhere, but some of them seem to be better organized and more attractive than others. Some of them are really just newsletters for a given specialty…You have to sign in to get access to some of the groups, so there's a gate-keeping, and the membership of these groups is typically quite small. So these groups, we're talking about 100 or a couple of hundred people for the very biggest. I've been part of some of these groups off and on for years, and I actually just don't have the time to go through all the stuff that comes in. But I know that some of my younger colleagues use these as their primary mechanism of sharing work, but also they talk about what jobs are out there and movements in the field, and what hot new books have been published. They share a lot…You take a look at this website, especially junior scholars who do want to know where the conferences are happening and is there a job being posted in Germany or whatever. They want to know that, and they're increasingly using that mechanism to put more substantive materials up. The virtue of it is that they can of course put images up in the form of PDFs or JPEGs or whatever, and there's pretty high-quality transmission of that kind of thing.

Yet new forum-like outlets for scholarly exchange are not necessarily likely to trump the traditional, private process of circulating drafts of work in informal networks. This seems largely due to fears by young scholars that, even in these "closed" fora, their work could be poached.

> I think most likely a young scholar would send a working paper by email to close colleagues, mentors, people they've done some work with, friends. Putting it in this Web forum would be a slightly bolder and a more risky thing to do, and they probably wouldn't do that unless they already had a pretty clear idea that their thing was going to be published, and they knew that it was coming out as a chapter in their book or proceedings of a conference, and so they were just putting it out there to sort of get a jump on the time lag.

> One conference featured a discussion forum where people were invited to post their papers if they were unable to attend this conference…like a blog sort of thing. And it was very interesting to see who would and who wouldn't. There were social anthropologists, biological anthropologists, archaeologists, linguistics, and other fields. Mostly, it was archaeologists who would post their work. They were used to it. The linguists are often very computer savvy…they're the other group who deal with a lot of data…And we had big discussions of graduate students that a lot of them wouldn't post their stuff, because they were afraid it would be "stolen," that this would be it and their lovely ideas would be taken. And we kept trying to dissuade them…The conference didn't want to do it again…But now the Society for Historical Archaeology is going to do the same. They're very interested in the model.

4. HOW DO YOU COLLABORATE WITH OTHER SCHOLARS? AT WHAT STAGE OF RESEARCH?

In archaeology, multidisciplinary, collaborative teams are necessary to gather and analyze the wealth of diverse data forms recovered over the course of an excavation. As one scholar stated, "You could call archaeology a discipline, but it's so inherently interdisciplinary that you have to cooperate with others." Scholars may also collaborate in the archival study of documentary remains from multiple archaeological sites. As research projects grow in size and sophistication, technical experts play an increasingly important role in organizing and supporting collaborations.

Although conventions for assigning authorship are generally well established in the field, they may be insufficiently nuanced to attribute credit in close collaborations involving the co-analysis or reuse of data. Throughout the field, a variety of remote data manipulation environments and real-time communication tools are used to discuss and analyze data with collaborators distributed internationally.

Ar4.1 The Nature of Collaboration

Research archaeology has evolved in such a way that no single expert possesses the time and necessary expertise to process the complete range of data excavated at a site.[45] A site or dig director, who is often a ladder-ranked faculty member, employs a large team of specialists ranging from photographers, drafters, and ceramic analysts to specialists in flora, fauna, geology, and osteology. Post-excavation collaboration in the laboratory can involve additional specialists analyzing varied data and artifact types, including pollen, soil samples, lithics, ceramics, written evidence, and architectural elements. More recently, collaboration with technical experts, software engineers, GIS specialists, and artists has become an important aspect of site excavation, analysis, and description.

> More and more we are realizing that not only is archaeology by nature interdisciplinary, but that we really need to be including specialists in all of these areas in everything that we do, and that one person can't possibly be responsible for all of the questions that we ask. In the old days, we weren't asking these questions, we didn't care about the botany or the skeletal material. But we're finding that, in fact, there are very interesting things coming out of these other pursuits, and we need specialists to do that.
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> …in the final analysis, the more interdisciplinary you are, and the more you can pull together people in interlocking disciplines, the better off you are.
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> There are a lot of technologies that have allowed us to get much more fine-grained data. The corollary of that has led to some specializations. Take, for example, what we call paleoethnobotany…People are working a lot now on starch grains that get preserved in soil. So, our ability to extract more data out of that dirt—often at a micro scale and sometimes at a macro scale, if you think about things like GIS—has generated lots of new kinds of data, but it also results in subspecialization, so that you're not just an archaeologist anymore, you're a zooarchaeologist or a paleoethnobotanist or a ceramics specialist or a GIS archaeologist, or a geoarchaeologist. These are all specialist archaeologists, different sub-disciplines…
>
> The dig director is typically going to be ladder-ranked faculty. There are some parts of the world and some smaller projects where you could have a graduate student actually be the director. Or occasionally there might be a museum team or something like that. But, for the most part, it's ladder faculty…A team might have somebody who's in charge of the GIS, and that'll be the informatics position. Then a field project is typically going to have most of these different kinds of scientific specializations, like a zooarchaeologist, someone who has zoological training or specific zooarchaeological training. They'll know how to identify bones and identify research questions that you can ask with bones. The paleoethnobotany people will do that for plant remains. And they all are trying to work together…The data analysis is done

[45] There are different types of archaeology, with different purposes and modes of operation. For example, "rescue" and "contract" archaeology, which can refer to academic or commercial work, concerns excavating a site of archaeological interest quickly prior to a pre-approved construction project. In contrast, more "research"-oriented archaeology is largely university-based and may take longer, involve greater numbers of specialists, and be more innovative with regard to technology use.

by all sorts of different specialists…zooarchaeologists, people doing pottery analysis, lithic analysis, different kinds of chemical analysis, people looking at different bone sets, botany, soil chemistry, and it goes on and on….

You also need an expert in osteo analysis. Sometimes you have one person who can do both animal and human; depending on whether you're working on a settlement site or a cemetery site, you might split those specialties because they have so much material to look at. Who else have we worked with? Geologists are more obvious…It's nice if you have people who are actually working there and mapping materials for you and who are also working on the computer analysis. But you can put the materials together yourself and have someone else look at the results. That's certainly a possibility. And then, nowadays, we have specialists in different materials as well…some people who work particularly on glass or ceramics, for instance, or metal.

Yes, I am collaborating. I have a field project with another archaeologist, a zooarchaeologist, a specialist in ceramics, a flint specialist, a geophysicist, a plant specialist, a number of collaborators, and then students from several institutions. That's a lot of email…We also have one person who specializes in remote sensing, and we're open to anybody who has the technical skills to do any of this kind of stuff.

…we have big teams. For instance, at the site where I work, there's a team of about 80 at any one time working in the field. And then people will go back to their various institutions and work on their own data and maybe write articles. So we have a lot of help. It's not just students. I take some students there with me but there are other specialized people who never dig; they'll just look at the animal bones. They will be there the whole season and just look at the pots, or they'll just do the plants.

The size of the team depends on the project. This project was big for archaeology, where you typically have 20 or 30 people collaborating. But there are very few working for two years without stopping…there are usually temporary collaborations instead.

I have in my project about 35 different specialists, and that's not counting the people who excavate or any of the students, so we have a team of about 50 people. We have zoologists, botanists, geologists, geomorphologists, geophysicists…a lot gets preserved. We've taken those specialists who have basketry skills and metal specialists and…I'm forgetting a lot of others…Then you have people who research pigments, who study art.

We've been working with geographers as well, using different kinds of information recovery systems. The geographers have developed some interesting computer mapping procedures and also statistical analysis for what we call "site catchment analysis" and settlement patterns. These are things that they often apply in a more contemporary sense, but they can be used very effectively for ancient cultures as well. The geographers are just better at preparing the computer programming that's necessary.

We also work with engineers, both software engineers and hardware people. We've got a great guy who builds hardware for us…and the great thing about him is we can say to him, "Build this for us," and he can do it. We've built all kinds of contraptions to make things work.

High-tech collaborations in virtual modeling

Recent developments in 3D modeling or the virtual reconstruction of archaeological sites require expensive equipment run by specialists. This work involves large numbers of additional collaborators, including professional digital labs, composers, artists, computer programmers, and

post-production companies or 3D modeling companies. Private companies or corporations, such as Leica Geosystems and REGAL, may be interested in providing sponsorship for this kind of work.

> Art history is predicated on the idea that the visual inspection of the visual world with the naked eye is what we do. We use our eyes to assess phenomena. But this is only applicable to a limited spectrum of artifacts, because there are other artifacts, for example, cathedrals, where in order to study the stresses of engineering and how the masons dealt with weight distribution, you need to know a lot about the building that is not visible to the naked eye. But these details could easily be picked up through all kinds of digital surveys that will give you very precise measurements and let you see if there's a crack here and a stress over there…And we're beginning to realize that having these prosthetic devices to measure and judge spaces will enable new research to be carried out and old questions to be solved…I think these technologies are going to result in a more collaborative way of working because the equipment is very high-end. There are $100,000 digital survey cameras with built-in photogrammetric software to digitally measure the entire structure and spit out a perfectly calibrated virtualization. You need a team of people to run that thing. It's like a conservation program that needs a specialist in radiography to operate the equipment and interpret the data.

> Typically, my collaborators are scholars, but, for example, sometimes I also collaborate with composers and artists. This work is wonderful because it's able to bring together so many diverse backgrounds…And we also work with professional companies. For example…we created the storyboard for the movies, but they were post-produced externally, because it's much quicker and more convenient…and that's a genre of design where a particular kind of expertise is required. There are also particular digital labs that specialize in character modeling…During the fieldwork, some archaeologists working in this area collaborate with or are sponsored by private companies that provide the equipment…These companies realize that supporting research in education is not a lucrative business, but it's good advertising for them. They like to put their brand in places like Machu Picchu or Chitzen Itza…

Collaboration in archival research

Individual specialists, particularly in the study of cultural artifacts or documentary remains, work with collections of artifacts, texts, artworks, and architecture that may span several excavation sites. As a result, scholars can be highly collaborative in how they locate and work with these materials in order to extract as much information and detail as possible. This collaborative tendency is reinforced by the close-knit community culture in some subfields.

> I would say collaboration is still relatively rare in the literary side of the classics. Not that many people will coauthor articles on Socrates…This may be different for projects with more technical components, like archaeology, papyrology, or epigraphy…In those areas, there are a lot of projects that require collaboration…where you're putting together bits and pieces that somebody dug out of the ground and there are different bits of it in three or four different libraries, and you're working on a particular angle of the material, or other people have worked on other stuff like it. I would say that those particular fields—epigraphy, which is reading rock inscriptions, and papyrology, working with bits of papyri—are enormously collaborative…I also think classics, on the whole, has not done too badly in embracing other fields…or at least certain practitioners of classics have gone out there and hooked up with colleagues in various disciplines and brought things back that have continued to expand the field or expand the range of things we can do.

> People who work with documents do tend to collaborate…Partly, it's that often documents are very challenging things, and there's comfort in company in being able to show a text to somebody unreservedly, and not having to worry either about the person contributing so much that you then say, "My God, I've got to acknowledge this contribution," or worrying the person will steal it from you. It's nice to be able to work unreservedly with somebody in hopes that we can come up with better editions. I think partly it's the culture of the group, which developed over a very long period of time and was fostered by the fact that fragments of the same text could be found in multiple collections. So, people would tend to work together, and I've certainly done so all my career. This is more the case among papyrologists than epigraphists, I would say. Not that it's always easy. It certainly isn't. But there is something of a tendency in favor of it…To me it's one of the most rewarding aspects of scholarship…Some of my most exhilarating intellectual experiences have come from collaborative work, usually with somebody who wasn't quite the same as I was, who just brought a different repertoire of strengths to the project.

> We get a steady stream of people coming to see us saying, "Show us how to do that," because we've developed a lot of techniques to analyze these materials…There was one case where I gave visiting collaborators an artifact to work on that was terribly difficult for me to read, and I was absolutely floored by the amount of data they got out of that thing…I think this is the way forward. In other words, the more we collaborate, the more we can give our students the opportunity to use these very exciting tools that were not available even a few years ago… Sometimes I've said that if this is a competition, then I'm very happy to lose, because if losing means that someone's got a better idea than I do, I just want to learn from him or her what that idea is. You've got to be open to it. You've got to be willing to lose.

The nature of what a scholar is working on also influences collaboration. For example, scholars may work independently on the close study and interpretation of documentary remains, but they may collaborate in the creation of scholarly editions, exhibitions, or digital projects.

> Collaboration is not the norm in art-historical research, but it is the norm in curatorial art history, where people work together in teams to mount big exhibitions and where you need specialists in several different parts of our field to come together—conservators, archaeologists, historians, and so on. But in the university art history departments, collaboration is rare.

> So far, collaboration has taken a lot of forms for me. Sometimes a project is very much an individual thing, even if I'm collaborating with someone. For instance, on this current exhibition, I'm doing some parts, my collaborator is doing other parts, and it's like a parallel collaboration. We haven't necessarily intersected too much as of yet. But other times, like with a larger-scale digital project, collaboration is the whole thing. There's very little you do that's just by yourself…I guess sharing and collaborating are different in my mind, because collaborating is shared work on something instead of the sharing of information…

As more curated data are made available online, several scholars predicted the growth of Web-based collaborative communities that take part in common projects organized around online archives.

> I think we'll see more work toward developing a system of collaboration with the intention of creating an electronic community of contributors, probably multi-level, in terms of people at the top of the editorial chain, people further down, people who can propose things…That kind of a model of an electronic community, where you've got some small degree of differentiation and a wide variety of people scattered around the world taking part in common projects, is the sort of approach that I'd like to see…

> I think increasingly faculty will do all of their research sitting at their computers in their offices. I think that these interactions that lead to collaborative work will become more Web-based rather than conference-based, not that conferences will disappear, but I think there are ways of finding other interested people in more systematic ways through the Web…I think it's starting to happen. A colleague was talking about antiquarian work and about the ways in which a Web-based community can do commentaries on these antiquarian texts that then can be shared with colleagues anywhere in the world. So I can imagine that happening. It's starting right now.

Ar4.2 How Do Collaborations Arise and How Are They Sustained?

Collaborations among scholars working on an excavation arise in a variety of ways, often through informal networks. Specialists may be recommended by colleagues or may put themselves forward with expressions of interest. Additional collaborators may be found through local searches near the excavation site or networks of institutional partners (including museums). The site director spends a considerable amount of time engaging in project management, and some directors added that it is helpful when collaborators are supported by their own funding sources and do not need to be paid out of the project funds.

> Some of the process of finding collaborators is just communication and correspondence with others. You have colleagues who have worked on different projects who would recommend, for instance, "I worked with so-and-so who did a fabulous job on our skeletal material. You really should see if she's got some time." In addition, other potential collaborators have to be very proactive in putting themselves out there and introducing themselves. I get emails from people with their resumes. I have someone who's working on a particular building technique and had heard through the grapevine that I've been finding evidence of this technique, and expressed interest in working on it…And it's great if collaborators on a site come with their own funding, as well. That really helps, because of course funding is always a problem for us at every stage.

> There are some local collaborators we locate through a public selection process…And a second step, typically later, is what we can obtain from a network of institutional partners. Sometimes, we create agreements with other institutions, because it's otherwise impossible to cover 100 percent of what you need in the whole archaeological process.

Similar to archaeological excavations, collaborations in archival research can arise from existing relationships and informal networks. Intergenerational models for collaboration may help to extend existing collaborative relationships. In some cases, funding requirements can mandate collaborative scholarship, which is increasingly the case in Europe.

> When we'd first go to work on these projects, I targeted a lot of very smart people, people who originally were young like me, and said, "You know more about such-and-such text than I do. Let's work together." I brought together a whole group of people, maybe 20 to 30 people, who started working with me when they were junior professors themselves. Over time they became senior professors. So now we have a network of people who are used to working together, who collaborate, and who have built their careers to some small degree on the data that we have produced together…What's happening now is that their students are completely inculcated into this whole way of thinking, and they're the ones who are going to take over. We're handing it over to the next generation who has grown up with the concept of collaboration as the norm.

> Collaboration is clearly a question of preventing the reinvention of the wheel. It tends to be this way in the older generations. But I think the younger generations are more and more collaborative, more than the old. And, again, I think the old people have much to learn from younger generations and vice versa, so the more intergenerational we are, the better.
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> I sense that there is greater collaboration among my European colleagues, in part because the European universities have mandated more joint or networked activities as part of funding scholarship. Everybody has to belong to a group…and you have to show that you are working with individuals in other EU countries…They're even requiring their graduate students to have a certain number of semesters training in another program, so it's more of a science model. And I think that we will probably move somewhat in that direction, again, partly through the activities of pioneers…Some disciplines in the United States are fairly resistant to this model, but there'll be more of this, especially for those of us who hope to have international projects, because we have to plug into these networks. And whether the US research departments do it or not, to be signed up for an international project, you have to go into one of these collaborations. So I'm joining a collaboration as we speak, and it's going to make possible exchanges of Ph.D. students, having some collaborative conferences, and so on…funded by one country's government and the EU. And that'll be at a very high level. It will be a very large program with resources to move full professors all over the globe for several years to do work together. It's a big-scale thing.

Challenges for sustaining collaboration

The highly collaborative nature of archaeological research means that archaeologists, especially site directors or principle investigators, have to be "Renaissance men and women." They need some working knowledge about each specialization and subfield in order to organize the collaboration and then synthesize different data sets and evaluations in the final analysis. Some scholars complained in particular of being held up by slow-moving collaborators and securing buy-ins from all stakeholders (particularly local municipalities and museums).

> I think that with archaeology, one of its charms is that there is quite a broad range of methods that are actually applicable to the discipline. You realize that you can't learn them all, but you have to know enough about each one to evaluate it. So I think that the increasing specialization in archaeology is more linked to the increasing numbers of methods and the fact that certain small sub-specialties are necessary in modern projects, and so everybody has to have a little knowledge of what those options are, but they don't really have to be able to do them.
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> Think about two coordinates on an exponential line. That line is the amount of information that's being generated; it's the number of journals being published, the number of papers being published, etc. I say to my students, "You're here, you've got this huge amount of stuff to try to absorb and make sense of. When I was in graduate school, I was here." There were a few key journals that I had to read, but the journal *Geoarchaeology* didn't exist. All these new journals have been created in my lifetime, and I can't read them all…How do you deal with this? You sub-specialize…I don't see any other way, but the more that we specialize, the less we talk to each other across the whole field, let alone talk to other fields, and so this calls for the need to somehow be able to synthesize properly.
>
> Data collection, and the fact that you have these disparate researcher teams coming from multiple universities, means a dig director's going to want to see progress and analysis of something, so they'll contact the archaeologist and say, "Can you send me your database," just to see that they're actually doing the analysis. People lose interest, they drop out, or they

> could be sloppy, that type of thing. The dig director is typically responsible for trying to integrate all of these things so that there are some common keys with which different data sets are mapped together.
>
> Collaboration can be tough. When you're dealing with so many people, disagreement is inevitable…But in the end, something is resolved, whether one point of view is taken or another completely different trajectory comes from the two different perspectives… Collaboration can take many forms, and I think with a large structure, it becomes more and more complex. The setting of deadlines is helpful. I think that's when everything has to come together in some way…I think that gives you a lot more freedom of who can work on what and helps you to make collaborations that actually work, because if something has to be done by X date, in the end, you do it yourself because there's only so much time. But then again, when you have a freer form of collaboration, you can embellish, and the differences and the conflicts can turn into something great if you're not crunched by what needs to be done.

Collaborating with computer experts

Increasingly, collaborations in archaeology involve technical personnel who are integral to the success of a project. Yet several scholars noted that technical experts may understand little about the nature of archaeological work, and that archaeologists should learn to use technical tools themselves.

> If you talk about collaboration now, you are also talking about collaboration between technologists and archaeologists. There's always the discussion, should we involve technologists or should archaeologists become technologists? And I think you need both. You need people who help you develop things, but as soon as something is understandable and more or less user-friendly, archaeologists should know how to use that. It's just part of what you should learn, so that you can make use of all these things without being dependent on someone putting up your website or doing your GIS.
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> We try to train our students to be computer savvy, so at least they can enter data…because if you rely just on a specialist—an electrical engineer, someone in the computer science department—and you don't know what they're doing, you've got a separation of knowledge and it doesn't work very well, because often the computer person doesn't know what you really want to do. It's the same with photography—if you have a professional photographer taking a photograph, it will be entirely different than if an archaeologist trained in photography does it…And I think to a certain extent technical help is needed, but I'm actually very much in favor of people wanting to do it themselves…You've got to learn how to use this stuff to your advantage and know what you can and can't do…So you can tell, we do it ourselves. We have to be self-sufficient, because we make no money out of our stuff…Archaeologists are real Renaissance people.
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> The other thing is that sometimes even professors of computer science will say, "All right, I'm too important to do the techie stuff, so here's your own techie who doesn't know your field, who will do certain kinds of scut work," but this scut work adds something to the publication that should be internalized by the scholars themselves, and they should not be dumb users. They should be learning to be less dumb…How do you keep the flame going? One way is intergenerational models. But we can't expect everything to magically change with a new class of younger scholars coming in, because they get socialized into established expectations and patterns of working.

Intergenerational models and "technological ambassadors"

Several scholars (many senior, but not exclusively) perceived new technologies as overly complicated to use. Yet, when given support from more technologically innovative archaeologists, some find these tools to be quite valuable for their work. Collaborating with technically proficient colleagues (including postdoctoral scholars and/or graduate students) frees these scholars to focus on their work of interpretive analysis. Indeed, some scholars who specialize in such areas as "virtual heritage" consider themselves to be "methodologists of archaeological research" or "technological ambassadors," rather than particular experts in a specific period or culture. Moreover, some scholars with dual archaeological and technical expertise may turn to parallel career paths, and may play an important, often central, role in creating the infrastructure for successful scholarship.

> The people who play probably the most important role in maintaining and contributing to our GIS-based excavation database have been the postdocs and the grad students, because they're the most intensely involved in it. The PIs, our role is more at the interpretive level, and, certainly in the field—this project is both field- and lab-based—our work with these individuals has been highly productive.
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> Back when we began this 3D computing work…I was disappointed that my students couldn't learn how to create and author applications using simple programs…No one could understand what I was doing. But now digital technology is becoming very ubiquitous. Some people are pessimistic because none of the top Ivy League scholars are using digital technology…But when I approach professors at top research institutions, even though they've never done anything like it before, they say yes. In fact, no senior scholar anywhere whom we'd ever tried to recruit to a 3D modeling project has ever said no. They all get it and support it. They may not be able to do it themselves because it's very expensive and it takes a lot of time, but if you make it easy for them, invite them to be part of a team, they say yes.
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> You have to take very seriously the work of traditional scholarship. What we try to do is give traditional scholars more tools to play with. What I found so interesting is that even older scholars are very quick once they understand what this means. They're like kids in a candy store. But it's wonderful for me to support the work of people who, if I study for 30 years, I couldn't get up to their level in that particular research area. And yet I can make their work so much better by giving them the materials they need…Instead of saying, "I'm going to keep it for myself, however inadequately I will do it," I say, "Look, I'll give it to you because you can do it better, but I can help you understand how to do it." It's like if you make the bed for them, they'll jump right in. It seems to me that that's the way to do it.
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> I would guess that I'm more tech-savvy at things like photogrammetric software or CAD than most of my colleagues. They're a little intimidated by all of that—when a job candidate comes in and up goes the PowerPoint, but more importantly, up comes some complex program in which we're flying around ancient Rome or something, their eyes glaze over. They're impressed by what you can do, but they don't see how *they* could do it. They realize it would be a high hurdle for them. But, again, there's more and more of it, and younger people are more and more savvy with it, and as the generation turns over, it will be standard…
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> In my experiences so far, I've taken two different roles…With some projects, I was the help brought in—"We need this done." There's a clear hierarchy of who does what. The principal investigator is the oversight and then there are other people who are next in line. With other projects, I played more of a central role as someone who was both organizing and working and researching, and making sure collaboration happened…I came to one digital project with a

> background in and knowledge of the archaeological site and a knowledge of computers, but not necessarily a background in GIS. So when I came onto the project, I learned GIS and worked with the people to develop a system to use this technology to best serve the concept of the project.
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> There are a lot of graduate students very interested in GIS. There's a practical reason for this, too. GIS you can use in anything. You can go off into urban planning. It's a great skill set to have. And it's one of these few skills that a graduate student can pick up and do interesting, high-paying work, if they don't get a tenure-track job. So it's a risk reduction strategy to take.
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> A number of the scholars whom I regard as really breaking new ground are collaborators who are not in academic departments, but in support roles in institutes. Some are scholars who went through the Ph.D., but then left academia and took a parallel route. They have the training but they made a different choice, and I think my most productive scholarly relationships have been with this bunch. I think in particular of a trio of scholars who are revolutionizing the field of ancient documentary studies: Tom Elliott, who is the technology director for the Institute for the Study of the Ancient World, Hugh Cayless, who works for the Digital Library at NYU, and Gabriel Bodard at the Centre for Computing in the Humanities, Kings College, London. They were trained in ancient history, Greek and Latin literature, and Greek epigraphy, and much of what they're doing is developing what will become the common standards scholars will use for the markup of texts, whether they're Greek or Chinese, etc. It's the sort of thing that might sound trivial to some, until you actually get down in the trenches and realize just how sharp a mind you have to have in order to be able to create plumbing that will last for 100 years.

Ar4.3 Judging Multiple Authorship

Traditionally, archaeologists collaborate on data collection and analysis, but do not coauthor publications. Instead, scholars publish sole-authored books, articles, or book chapters examining distinct facets of an excavation or artifact. Yet several scholars described recent experiments with multiple-authored publications (including occasional coauthorship with graduate students to augment their academic portfolios). This variation may be due to personality. As one stated, multi-authored publications can be "great fun to work on but enormously time consuming."

> Because I have partly a science background, I know that collaboration can work very well, but I, personally, don't engage in collaboration if by that we mean coauthorship. But anything up to coauthorship I've found to be quite productive. And even my colleagues, who are the utmost in collaborative, don't write their books together. They participate in groups and out of the group may come three or four different books…
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> If you look at most archaeological publications, they have a main author and then some single-authored sections by specialists. The conclusion is written by the directors. But archaeology as a discipline is inherently cooperative, which I think should be reflected in publications…I hope that things will get more and more integrated. As an experiment, I wrote an article with a whole bunch of collaborators…I'm happy with the result…Now, many of my publications are multiple authored.
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> Oftentimes, helpful advisors in archaeology will be directing a project. They will be on it, so they'll write an article and you will become a coauthor on it. Most articles are single author, but some of the better faculty members help their students out by coauthoring things with them or especially in edited volumes, giving them chapters, things along those lines.

> For my part, I don't really want to get in the way of my students' own intellectual independence and development, and I would rather give them tools than give them projects. I've published with students before and I did it as a way to help struggling students gain some confidence, get a foot in the door. So these were marginal projects for me that I'm deeply proud of because of the help that they gave to a student, but I don't contribute that much knowledge.

Some scholars claimed, however, that the tenure process is insufficiently nuanced to judge multi-authored publications or work that may draw on contributions or research by other scholars.

> For purposes of review, we are asked to report the percentage of work accomplished by the partners in multi-authored scholarship. This might work well in some fields, but it seems awkward in many corners of the humanities, or in any project in which coauthors really work through every bit together. The tenure process can have an insufficiently nuanced way of defining value.

> I think the open access movement has affected people's publishing habits regarding data and analytical results…So if a scholar feels that s/he's done the laboratory tests and so on, but is willing to put the work up using Science Commons where somebody else may use it, then what does this mean for the evaluation of that second scholar's work? I think we're running into some of these intellectual property issues. So how do we move away from the emphasis on the individual and begin to understand much more collaborative kinds of work, or what we call distributed knowledge production? Of course, this gets back to the fact that all along, when we've jointly written an article with somebody, we've always had to put forward how much each of us did, what percentage, 20 percent, 80 percent, whatever. But how do you do that? What if we both did 50 percent? So, this is escalating those problems of evaluating who did what, and how to evaluate that part of somebody's work. Of course, this has always been a part of the science world, with their laboratories, but I think we're coming into some new arenas with this in archaeology.

Ar4.4 Mechanisms for Collaboration

On-site collaboration is facilitated by face-to-face contact, but the scholars involved in an archaeological excavation can work on very different timelines and be located around the world. The complexity of this collaborative work means that many scholars use a variety of tools and technologies for communication and project management in the course of site analysis. In particular, scholars commonly mount shared databases and materials on password-protected Web-based platforms, and various wiki and/or Google Office tools are mentioned as helpful for organizing collaborative discussion. Email and Skype are also seen as useful ways to communicate with other project team members.

> One thing that has really changed my life in terms of managing collaborative projects is free Voice over Internet Protocol, Skype, videoconferencing, and also the variety of online real-time, multi-editor authoring tools, like Google Documents and Google Spreadsheets, and free wikis that you can use. Over the past few years I've been having regular voice conferences with people collaborating on a project, in five different countries in four different time zones; this was just unthinkable over the telephone. And because Skype lets us know who's online, you can have the sort of casual, "Oh, I just thought of something, what do you think" conversations that half the time result in nothing, half the time result in something great…That's a little optimistic, maybe a tenth of the time they result in something great. Now these are daily happenings, whereas before I would have to think to pick up the phone, which

> costs money, which I'm opposed to spending. So these simple little things, all of which are free, have been really revolutionary for me.
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> In terms of a single thing that has really had a profound effect on the way I work day-to-day, it sounds silly but it really is Skype, and it's just a fancy telephone. We use it all—wikis, email, attachments—and often we're using Skype at the same time. We have regular meetings for a collaborative project of mine—we'll all be voicing and/or videoing, somebody will be keeping minutes in the wiki, somebody else will be storing information in a Google spreadsheet that we're all using, while somebody else is sending documentation by email—and that's now pretty normal for us.
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> We've been collaborating for many years now, and we do most of that by email, except when we're in the field in the summer. We have a webpage for publications, and another webpage hosted by my institution with a private password, which has a bibliography and things like that of interest to us…dissertations that are currently being written or have been finished, other things that connect with the project. I think there are a few other little things on it, but it's mostly working information for the project members…
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> As for communication, mostly it goes through me, as the PI. People write a report to me and then I notice that there's something that somebody else needs to know. Then all those reports also get uploaded, but I then alert them to that or send reports directly to them by email. The only thing we use quite a bit—we don't have a wiki—is Google Docs. So if there's a spreadsheet we work on together, we upload it there, and then you have a little checkbox on the side, so we discuss what to do and then one person or everybody can change it. The spreadsheet function works especially well in Google Docs; the document function I don't like, it's too cumbersome. I've thought about a wiki, but somehow it's just another thing that you have to keep track of, and I haven't even updated our webpage…I think that most archaeologists are not very fancy with the tools they use for sharing and collaborating.
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> Some team members will go up to the excavation…and then we talk, and we write down notes and so on, so there is some communication. But on other sites, the animal bone person may never go up to the site, and on some sites the animal bone person will be in one country and the site is out in another country. So, yeah, we do need help organizing the site communication.

Editing and coauthoring papers

Although wiki-based technologies are useful for tracking ongoing analysis and project discussion, most of the scholars we spoke with prefer to author and review manuscripts using the tracked changes function of traditional word processing programs. These manuscripts are generally passed among collaborators using email or FTP (for larger documents).

> Instant speed is an aspect of scholarly communication. That is very important. So I've got one, in particular, big collaborative research grant going…Now there's no doubt email has vastly increased the ability of this interdisciplinary team that is based at all these different universities to interact very rapidly. And that's great…I do use an FTP site, just for data and drafts of papers and that sort of thing. We were doing a number of grant proposals to get on this team, and you basically couldn't do it without email, without Word's tracked changes. We just rapidly shoved them back and forth.
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> Of course we use the Internet and we pass files back and forth to our collaborators, through email attachments, and I also have a special little portion of the institutional server where large files are kept that we pass back and forth. So that's more or less what we do. We review

manuscripts that way…Right now I'm working on a volume surveying the region. I finished the introduction, worked on two of the chapters, and now I'm waiting for people to send me their chapters. I've edited one chapter already from other collaborators…and we just use email, basically.

I have collaborated with other archaeologists in a number of venues, including emails, blogs, Flickr, and Facebook…at all stages of research…I was really into wikis a couple of years ago. They have just been such a disappointment in a lot of ways. As far as collaborative work goes, it's almost better just to do it in Word, send the document back and forth, and have your notes written on it…because people don't know how to use wikis very well. If they're going to be open at all, they're going to be destroyed by spam, and it's very sad…poor, poor wiki…I think a lot of places just said, "Oh, let's have a wiki. Here's our Web page, here's our stuff, and here's our wiki." I think a lot of those things have either died or have been taken offline.

We have a joint paper we're writing right now that we posted on a Google-based blog, so you have to have a password to get in…We all type our thing and paste it into our section, and then people can comment and you see when they comment and what they changed…Basically, once everyone has submitted their stuff and you've done all the editing, you just have to make a decision and do it. And I find this far more efficient…We just published a joint paper in a small working group in my lab, and that was everyone sending the Microsoft document around in a circle, and the person organizing it, the professor, was not as technological. That just seems slow and unwieldy because someone will send the wrong version, and when the paper has 25 versions it can quickly get confusing…Then again, I've been teaching on the side at another institution, and I'm amazed that some of my students don't even know you can do these things within Word. So it's sometimes odd how familiar people are with different levels of technology.

Virtual workspaces for collaborative artifact study

As previously described, many scholars who work with archival materials collaborate in the analysis of particular documentary remains. Several scholars predicted that Web-based shared workspaces will play a growing role in enabling real-time collaboration across long distances.

It would be nice to be able to have a more convenient way of looking at images all at the same time and manipulating them. We can now do that with text pretty easily, but let's say a few of us are working on an edition of a papyrus and we want to discuss some particular feature in a high-resolution image of it. The only thing we can really do very easily at that point is to all look at the same webpage or to pass the image around by email and give verbal cues to navigate to a particular point. There is no common blackboard—that I have access to, anyway—onto which three people can throw the same image and play with it. Maybe there are such things, but I don't know of any free options. We certainly don't use them if they exist.

There are researchers working on creating shared workspaces, so that people in multiple locations can be looking at the screen, sharing text, sharing images, having all of them see what each of the others is doing…I'm pointing to something on the screen and saying, "Here's what I see in Alpha," that kind of thing. It's still in the relatively early stage, but they've been working on it quite energetically, and it's linked, of course, to existing technologies like videoconferencing, which I think is also going to be a part of what we'll do.

5. WHAT DO YOU NEED TO CONDUCT YOUR RESEARCH?

Archaeology combines scientific and humanistic methods of inquiry. Archaeological research involves the excavation of material evidence at a site, as well as significant interpretive work to draw conclusions about the nature of social life and the environment based on available evidence. In the process, archaeologists uncover and produce large amounts of data in multiple digital and non-digital forms, including: recovered artifacts, field notes (written observations of what is seen and found, descriptions and line drawings of the excavation, and preliminary analyses), photographs, and sometimes virtual models of excavation sites. Scholars also produce substantial databases with quantitative counts and measurements of evidence such as animal bones, soil samples, plant materials, papyri, and clay figurines. Advances in spatial analysis, virtual modeling, and artifact digitization are opening up new methods for the study of archaeological sites and documentary remains. While new technologies enable archaeologists to extract more information from sites, scholars require extensive technical support and training in their use.

Ar5.1 What Do Scholars Do in Their Research? How Is What They Do Changing or Not?

Data collection

In the excavation process, archaeologists carefully uncover and document the position of various artifacts, objects, and environmental features in the earth. Photography, sketches, maps, and other visual representations play a particularly important role in recording these varied data. Noting the location and contextual relationships between these features is also vital for reconstructing the archaeological site in later analysis, for instance, through stratigraphy. Spatial tagging has increasingly become the standard means to geographically reference excavation data to their site loci, and new technologies in satellite imaging, remote sensing, ground-penetrating radar, and 3D modeling are enabling the collection of geophysical survey data with less physical excavation.

> It starts with our use of images and materials…we're a very touchy-looky, sensory group…We dig stuff out of the ground, and we handle it. When we find something, you can see it. Of course, you only see part of it. You don't see all of the living stuff around it, but, still, we are very dependent, at least we think we are very dependent, on images. And video is certainly very, very important. Both moving and still images are very important in addition to the whole textual thing.
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> We're a discipline that's very rich in images, obviously, in artifacts, visual images, but other kinds of data as well. We measure and count things, so we also generate text. Everything is there.
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> Archaeologists want to consider themselves both historians and hard scientists, so there are gigs upon gigs, if not terabytes, of data, of all these images. So every piece of pottery that comes out of the ground you take a picture of, and every one is two megabytes or something like that. That adds up very quickly when there are tens of thousands of them.
>
> With GIS and other technologies, a lot of archaeologists do less digging and more surveying now. You're going to be using things like GPS, a global positioning system. You get digital data out of that and it goes into a database, so typically like GIS. Your instruments, in a lot of

ways, are all centered around digital data. When you're digging, most survey equipment now produces digital data and is managed with digital data management systems, databases, and GIS. So the whole toolkit has basically switched over. Your photography is all digital, and you have to manage all those pictures.

GPS is great. Everybody uses GPS. The good thing is it's becoming more accurate, because for a long time it was basically a joke. It was like, "Oh yeah, we have this on a GPS point so you can find the site easily," but within five meters sometimes it's actually quite difficult to find sites, especially years later.

Some subfields of archaeology are more innovative than others, for example, processual archaeology, which comes specifically from prehistorical studies. Not classical studies; the classical is very conservative. Prehistorical work is innovative, probably because archaeologists working in that discipline were pushed to use much more innovation for squeezing information out of sites that were less well preserved…The pioneers who started GIS applied it in prehistorical archaeology…It seems that when something's missing, the discipline is able to find new ways to fill the lack.

That's another use of the Web, actually, because agencies like USGS and NOAA have created big data sets on the Web where you can download a lot of data that are relevant, like rainfall data. The Web-based databases coming out of these agencies are certainly making it a lot easier for us to compile large data sets and do things that we probably couldn't have done 20 years ago.

Organizing excavation data

The "rough and dusty" conditions in the field lead many scholars to create records by hand, and then enter them into a database post-excavation. Additional specialists working in the lab on bone or soil analysis, for example, create further data to be included in project synthesis. Computer database programs, such as Excel, Filemaker, and Access, are readily embraced for organizing these large amounts of diverse data. GIS (notably the ESRI software platform) is now described as the "standard" by many scholars for handling large geographically referenced data sets. Yet GIS systems may not sufficiently handle "bulk finds" of large numbers of objects, and more sophisticated archaeology-specific database software is needed.

When we are in the field, we're writing things down with pen or paper or whatever, we're drawing things, and then we're having to take them back, and at some point we're having to enter them into a database and sometimes we digitize them. And people have tried to tackle this so-called problem for probably 15 or 20 years now in trying to bring little handsets on site and laptops and all kinds of things, but to be quite honest, I have yet to see a cell phone that will last in the field for more than six months, much less a computer. It's just dirt, the wind…when you dig, you're dirty all the time. And so are you going to go try to wash your hands every time you have to enter data? It's just a problem. But people continue to try to adjust that, probably not me.

Archaeology first became very digitally aware and digitally savvy because we find so much data, it was a way of organizing our data and getting a handle on it, and being able to deal with this massive amount of data in an informative way. So that's where it started. At first, I was using the whole awful UNIX database stuff, but I hated computers then. But when the image stuff came in, in the '90s, then I loved it, because I'm more of an image person…But archaeology has always been involved with computers, and now it's coming together.

> Because each discipline has its own kinds of data that we bring to the table, we are still pretty much generating our data sets by discipline and then sharing them. They go into Excel files or Access files, or all of our stuff now is based on GIS information systems. For example, that map up there was generated by GIS…every point on the map has behind it a lot of data. The soil guys will put a bunch of points up there, I'll add the pieces I've created, and more pieces come in to form a larger data structure…and then we try to figure out what it all means.
>
> What we do at the moment is link all databases. Specialists in my project are completely free to do their research how they want to. Of course, you talk about the content and it has to be related to the interests of the project. But I don't mind what they do, how they want to build their database, as long as there is the identifier that ties it into the rest of the information of the project. So all the specialist databases at some point…will end up in the big databases of the project hosted in my lab.
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> Some of the big problems are synthesizing these different data sets produced by different specialists on the excavation team…There's got to be some way to relate them all, and typically that's going to be done though context. Everything doesn't necessarily have specific spatial coordinates associated with it, because a lot of times you get what we call bulk finds, which come from this lot or this locus, which is going to be marked as a contextually defined little unit…And so even though everything within it doesn't have an individual tag, that context is going to be one of the important keys that links up these different data sets together. And that enables specialized database software to be able to serve so many different kinds of things because it is all built upon the idea of spatial containment, even though the finds contained within these things can be described with completely different types of properties.
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> We use some forms of GIS…but we really need more than that, because it has to be tied into every single specific observation, which is also typological. Everything that relates to a piece that is in contact with another piece has to come together. That is a fundamental thing, because once it's observed it's also destroyed. The moment you detach the two things from their physical connection, they are no longer together. So, yes, you have the coordinates and the spatial location, but more than that, you have to have the type of contact that things have, and there are tens of thousands of these pieces that are in contact with each other. So it's really more complex than just GIS.

New technologies for data analysis: tools or transformations?

The discovery of new techniques for data analysis can have a transformational impact on the nature of research methods and the questions pursued. These techniques include spatial analysis, the 3D modeling of archaeological sites, advances in artifact imaging, the growing sophistication of DNA studies, and even the incorporation of biological theories of self-organizing systems for the computational analysis of human societies. The danger, according to some scholars, is that new technologies are not always seen to be employed in the service of archaeological scholarship, but rather, the other way around.

> I think in archaeology, technology is always playing an important role, because archaeology is one of those fields that, because we rely on material evidence and we always are interacting with colleagues in the physical sciences, biological sciences, and so on, we're kind of leeches, and…we are always ready to glom onto some new technological innovation. I think, for example, of how radio carbon dating revolutionized archaeology. Archaeology changed dramatically from late '40s and '50s to '60s and '70s, and this is often not recognized. I try to tell students…that sometimes this is described as if it was just some natural evolution…and it's not…because before Willard Libby invented radio carbon dating, archaeology was hugely

> concerned with chronology. Ninety percent of archaeologists' work was all about pottery types and sequences, and it wasn't because pottery types were so damn interesting, it's because it's what you needed to do…The work of building up worldwide time-space frameworks, where you could actually talk about these cultures, *that* was hard work, and it took this minute evidence of pottery, or whatever, to do that. All of a sudden radio carbon comes in and within fifteen years—though there are still some people who, because they happen to like pottery, will focus on it—you don't need to do that anymore to get your chronology. And what happened is that the field started to focus on all kinds of other interesting questions, like settlement patterns, social organizations, ecology, and so on. To a certain extent that's because we didn't have to do this other stuff anymore…I think the invention of radio carbon dating was really important because it got to the core of the discipline.

Spatial analysis

In the spatial analysis of data, GIS is cited as transformational in its quick and facile ability to permit spatial analyses of multiple layers of data. Yet GIS is also seen to lack the ability to handle data coordinates in the third dimension, depth, and is not designed specifically with archaeological research needs in mind.

> Basically, GIS is a map, but the GIS itself has layers, so out of any space that you're looking at, you have a soil layer, other layers, and to the extent that those things are quantifiable, you can do things like ratios or indices between them, so you can create new kinds of quantities, new layers based on relationships between layers, and that was hard to do with physical paper maps—not impossible, but hard. And fast, the thing is you can do this stuff so fast…once you collected the data, anyway, and you have them in data layers…
>
> I think that GIS is wonderful. I wish I had had more access to it earlier on. I wish I had had more training in it. I'm trying to get up to speed on everything now. It's like learning almost a new language, in a way, rather late in life, but I think it's incredibly important and I've encouraged all my students to look into getting some training and experience with that in mind.
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> There's a big debate or argument: whether GIS is a set of tools or technology or whether it actually has any theory that's independently associated with it. And I don't really think it does. To me it's very powerful technology but it doesn't really do anything that maps didn't do before.
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> I think that archaeology is becoming a more technical field because of the accessibility of things like remote sensing, visualization, and GIS, but those would be the tools or the message, rather than the theory behind archaeology. So I guess that the theory somewhere…has a somewhat different trajectory, and I think in the next years we'll see that the theory and its new tools are working more closely together, but right now I think there's still a separation between them.
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> GIS is a beautiful example. That is something that neither archaeologists nor geologists have been involved in sufficiently because it's great for x- and y-coordinates but it's lousy for z-coordinates. Well, everything we do has to do with depth and stratigraphy, so if we can work with GIS developers in really focusing on developing the depth in GIS, that would be very, very important.

3D modeling

3D modeling—based on the laser scanning of archaeological sites, the photogrammetric analysis of excavation photographs, or other virtual modeling techniques—provides unique opportunities to virtually represent archaeological sites. These virtual models do not yet provide a facile publishing platform, but they may allow scholars to run experiments or test claims made in the scholarly literature. Although 3D modeling is a new dimension for archaeological research and dissemination, it may not be suitable for all applications (such as poorly preserved archaeological sites). In addition, some scholars observed that the focus on 3D modeling as a new technology may come at the expense of close attention to physical and cultural research. One scholar called for the development of an easy-to-use toolkit for virtual modeling to enhance its scalability across the field.

> On the level of archaeology and the visual, technology is allowing us to, in effect, rebuild buildings that you could theoretically rebuild if you had $500 million and a lot of time and support, which we don't…For example, in the scholarly literature there are all these claims about how the Coliseum is a great people-mover; some people argue that you can get in and out of the building in three minutes…There are never any arguments supporting any of these numbers or claims. Once you have the physical model you can populate it with AI figures, little Romans who are going in and finding their seats and getting up and going out. You could test it, you could time it…you could also see a side of this that most scholars have never seen before because, for instance, the Romans had to go through these very narrow, dark corridors that nobody ever thought about before because the corridors have largely vanished and they don't let you in what little remains of it because it's dangerous. Once you have the model as a knowledge representation, you could run experiments, which we could never do before.
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> I've got colleagues who use CAD programs to make three-dimensional mock-ups of spaces that were pictured two-dimensionally in previous images using photogrammetric software. And we can walk through architecture, we can reconstruct sites…and navigate around them. I saw it as a fabulous teaching tool the first year I got into it, but now I've begun to orient my research to the questions that I can ask and answer given this technology that I wasn't able to address with the two-dimensional reproduction. And it's enabled a lot of exciting work. Graduate students have come up with new projects that I wouldn't have been able to do 10 years ago. I might have thought of that idea but I wouldn't have had any way to carry it out…I'm very excited about the ability to reconstruct the virtual spatial system from a few hints, clues, or little measurements…
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> The risk in terms of infrastructure is that you use archaeology as a base…for demonstrating the quality of the technology. I understand why this is, but I think it should be the opposite. You have to work on cultural questions first, and then you should be able to choose technology to help. For example, the most important framework program for looking at digital technologies in cultural heritage was EPOCH. After four or five years of the project, and 20 or 30 million Euro invested, there have been no real results. I think this is because too much of it was invested in management and technology, and too little in archaeology and cultural studies.
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> I do have to give the caveat that I think there are certain things that get lost with the advance of technology…People tend to think that the replica or the recreation is the reality and that, "If I've seen it, why would I need to go there?" And especially with architecture, which is a spatial environment, it involves the movement through space and physical reality. Virtual reality can help us experience that, but it can't replace the sensation of being there and actually

> understanding what something especially was designed for. It was not designed to be in virtual space, it was designed to be in real space.
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> What I think would be really transformational are reusable components that allow you to do visualization without it being such a craft, or such an artisan type of a thing, where you invest a huge amount of intense manpower, expertise, money, and effort into doing a small reconstruction of one specific site where nothing can be reused for any other type of project. So there could be a place for 3D visualization and walk-throughs and reconstructions and all that kind of thing, but it has to be database-driven, connected to databases that are much more interchangeable with different types of projects…Essentially we need a revolution, like a printing press, for doing those visualizations. It's already happened with the maps, GIS. These things will be much more powerful when you can play with them more…

3D modeling is one of many potential multimedia applications in archaeological research. Other scholars spoke of innovative work involving imaginative reconstructions of archaeological sites and the biographies of their residents. While these scholars are seen as "pushing the envelope of what is considered a legitimate archaeological pursuit," they are also described as giving more transparency to the process of archaeological interpretation.

Imaging technologies for artifact analysis

Like the virtual modeling of archaeological sites, advances in imaging technologies are breaking new ground in the study of three-dimensional artifacts. In the field of ancient inscriptions, for example, imaging technology is giving scholars access to minute details not available to the naked eye. Combined with computational algorithms, these three-dimensional imaging technologies can also aid scholars in the reconstruction of large artifacts excavated in fragments (such as clay tablets or mosaics).

> In the last two or three years we have come to depend on tools that were not available to us before then, and they really remake the way we work…The scientists at Hewlett-Packard developed something called polynomial texture mapping, which is the ability to image any object from any light angle that you want. They originally demonstrated it to me using an image of a bowl of rice. You could turn the light this way, you could see the rice grains from one angle or from another angle…And now we're doing those precise types of images with cuneiform tablets. We're getting better images of those texts than have ever been possible before and it's going to revolutionize the way people read these texts. It has to, because it's better than holding the darn tablet in your hand and looking at it with your eyes. It's a revolution that will probably be going on for quite a long time…with higher and higher resolution images…It's not the world of books and paper and murky images. Everything in this field is driven by better images, and the better the image, the better you can do things with it. It's just the name of the game…If you can increase the amount of data or appreciably change its interpretation by five or 10 percent, you can change the world. It's so often the case that you get one more letter on a given inscription and it's the key that changes everything. Whole matters of history can change on a single letter. And that happens frequently, but it always requires better data to do this. What we are standing on, in my field, is the edge of a tremendous opportunity to remake the field, to remake ancient history, to be sure, but history nonetheless.
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> I do think that artifact imaging is an area where new digital media really are going to interact in important ways and have interacted. For example, Jennifer Trimble is doing this really interesting project on reconstituting an ancient map of Rome, which is something that could only be done with computer-assisted algorithms…the whole fitting process, figuring out how

> the fragments of the map might fit together, is, as I understand it, critically dependent on computation. I'm not the best person to tell you in detail, but certainly it does entail partnerships with computer science.

Digital versus analog archives

Scholars of ancient history study particular documentary remains (such as inscriptions, papyri, ancient maps, classical literature and drama, and art and architecture) to examine early societies. These materials may be excavated from multiple archaeological sites, and are generally found in archives. While documentary editions have traditionally provided scholars with wider access to archival sources, the growth of digital archives is perceived as a great boon. On the one hand, digital archives are allowing scholars to search, study, and make connections between more archival materials. On the other hand, different archival materials are being digitized at various rates, and looking at a digital surrogate may not replace the value of seeing the physical artifact. The "next generation" of digital archives, according to some scholars, will integrate archival materials with computational linguistics and other text-mining capabilities.

> I certainly would be the last person to argue that the text world and the archaeological world are hermetically sealed from one another. If you do that, it's at your own peril. They need to be seen in a holistic fashion. You have to be able not only to read a text, but also to know where that text was found, and what was it found next to. All these things are crucial…there's obviously a crossover between my archaeological colleagues who deal primarily with material culture and people like me who deal with written data. First of all, most of the stuff we find has an archaeological context, or let's hope that it does. So being able to locate things physically within a given area is extremely important, and being able to look at text in the context of the material culture is an essential matter. GIS is a very important aspect of this type of work in archaeology, and mapping technologies have even been adapted to the study of written data. For instance…say you're looking at a given ancient inscription, you might have 300 or 400 pictures of it from various angles and time periods in the database…Well, which of the 300 or 400 do you want to see? So now you can do what's known as a text spatial search, and what it does is give you a reference shot of, let's say, a face of a tablet. With your mouse you can draw a little rectangle of any size you want on that…and it will give you everything that's in the database that intersects that rectangle…It's kind of a mapping system and to some degree it's inspired by what you can do in GIS…Of course, this text spatial search could also be adapted to the archaeological environment, so that you could look at a tomb, for instance, and say, "Let me see all the artifacts that come from this particular area."
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> The accessibility of databases in electronic form has already made a huge difference in terms of how you can search for certain types of data. Both within Greek and Latin texts, you can do word searches and things. That's been around for 10 or 20 years, and that's certainly made a big difference for certain things…Papyri have been magnified and are in different shades. It's digitally available to the whole world…Epigraphy is a little bit behind, but they're getting there. And I would say that in those areas of archaeology, where looking at the object is absolutely crucial, you can't really tell enough from a photograph, but you can tell much more from a digital image in color that you can blow up and look at from different angles and so on…That's already made a huge difference to the sort of dimension one can work in. It's not a replacement for visiting the site itself or going to the library where the thing may be, but it certainly goes a long way toward that.
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> Image databases are also a tremendous resource…I've used a decent amount of things from an online database…The interface is really difficult to use, but it provides digital images and some textual information about drawings of antiquity…Every manuscript around the world,

> ideally, will be in this and will have digital images and will be linked. So being able to not have to go to, say, 16 countries to study these manuscripts for a small project, there's a huge benefit in that. You're allowing people access to view these images and compare and assemble arguments and whole conceptions of culture based on things that are reproduced digitally. So I think, optimistically, that more and more things will go that way, because the access to knowledge is just so great that I don't think anyone could see a negative side to it.
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> There is a visual resource collection in my area that is being digitized, but very slowly. So there's a huge need there. But what we have access to with ARTstor is going to change a lot, too. It's a databank of 400,000 images. And they have some examples up of QuickTime videos of archaeological sites…So you can click on the image and with your mouse essentially move your eyes around the space in three dimensions…This is really interesting for research because each of the images has with it a full bank of information relative to research questions, everything from the exact dimensions of the image to information about the artist, the site. So it's a research archive as well as an image archive. It's really important.
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> I think there is a movement away from, not necessarily away from archives, but away from, "I found this great document in this search for the unknown," just because so much, especially in our field, has been discovered. But I think archival research is still the touchstone of the field. I think people more and more now just work on theory and constructing arguments, not necessarily based on new archival research. But I don't think you necessarily can get away from working on the archives and being in a physical place or seeing the physical documents yet.
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> Pretty much everything I use is published, so it's not an issue. There are still volumes, like collections of inscriptions, that are not available digitally and it's important to have them available, and I would say available conveniently. I would be really disappointed if the library sent those off to storage facilities…The digitizing of antiquarian materials is going quickly and it will surely continue, but I don't know at what point it'll be sufficiently exhaustive that people won't have to fly anywhere to do their research…

The creation of databases of archival materials is also helpful for scholars of ancient performance, who need access to information and recordings of productions of ancient drama.

> Ancient performance is not a hot item, relatively speaking. There are one or two great productions known to people at large…but they have gone out of VHS distribution and are tremendously difficult to get hold of. And on YouTube, I've only seen one or two bits and pieces of something from the Edinburgh Festival…There is now an archive for performance that they're putting together in Oxford, called the Archive of Performance of Ancient Drama…Their aim is to be a database of every known production since antiquity of any particular play…So the documentation of what exists and the coordination of what otherwise would be a whole lot of separate archives in different universities and cities with theaters and so on, that's certainly proceeding.

Advantages of digital archives

In the study of documentary remains, then, the general conclusion is that digital surrogates of archival materials allow scholars to compare and interact with larger numbers of objects. As one scholar described, this "makes the scholarship richer when dealing with more data," and may also give scholars an incentive to broach questions that would previously have taken too long to answer.

> In terms of the Web, of course, we use searching capabilities on text and on databases. But none of that has changed our conceptual frame of mind. The effort should be more conceptual and with less emphasis on state-of-the-art technology, not that state-of-the-art technology isn't great—of course, it's wonderful—but it does not necessarily affect our conceptualization of things, and it's often out of reach because of cost…From my use of the university resources, we get the wonderful databases with immediate access and search capabilities and whatnot, but there is really no impact on how the argument progresses. We just perceive it in the same way as we have done before.
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> What I see still is mainly people being able to do much more of what they always were able to do, and do it faster, and in some cases better, with the tools. I don't see yet that the technology is fundamentally changing the nature of what people are doing. That may be my blindness, or it may be that I'm too old to change. I don't know. People sometimes get upset when you say that, but so far…people can find parallels to texts faster. If they have a fragment of something, they can figure out what it is. They can find a picture of something and check it on a database. They can see what a place looks like…all this kind of thing, whereas before you wrote letters or wrote off for black-and-white photographs, or you had to wait until you could go somewhere, or whatever. But, all those things are not different *in kind*, they're just different in scale and quantity. And that, of course, does mean you may take on questions that you wouldn't have taken on before, things that would've just not been worth the time to try out before. That to me is probably the biggest qualitative difference: the things that I would've just said some time ago, "Oh, hell, I'm not going to try to look that up…it would take me five hours to do it and the chances of it being interesting as an outcome are one in 100." Now I can do it in 30 seconds, so it's worth doing…So the reduction of work in that sense, even while you may need more of it in some other areas, does rather transform one's risk-taking…it could be searching databanks of Greek text. Or it might be looking something up in a bibliography or pulling up an image to check it…
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> In my field what you can accomplish with technology is you can, in effect, read a million books in a second and you can ask a question and get an answer back about what's in those million books. So, obviously, you could never do that before. I don't know if you could read a million books, but if you could it would take years and years and years. And it would be very hard to persist in that effort; it would just be about physically and mentally impossible. Of course, when you get the answer to the one question, that raises another question and another question and another question. It's coming back very quickly and it is allowing us to understand things, and having insights that would be impossible otherwise. That's on the level of text and language.

Search and discovery of secondary literature

Access to electronic literature and databases is highly valuable, although not all journals and other forms of secondary literature are available online. JSTOR and Project Muse were given as examples of online resources used heavily, as well as more specialized bibliographic sources. Additionally, one scholar found Google Books to be a surprisingly useful resource to access antiquarian documents. Regardless of whether scholarly material is accessed online or through a personal subscription, reading work in hard copy is preferred by most.

> …in the ancient world, we can have every source we need up there…To get to your source, the thing that you just now this minute discovered you need to get to, that's wonderful…This is very special for a classicist, because the number of texts available in ancient Latin and Greek is so small that you can have all of it on the computer, and they do. So anytime I want to look for a text in the original or in translation, I can get it. It's almost inconceivable how much time

> that saves me. Because I started with no technology and I'm here now, I've experienced every step and that is a fantastic gift and that's just the most elementary thing you can get. For all scholars in the humanities, having access to written work, whether it be original text or commentary and criticism and so on, that's what you've got to do. If you don't have to go to a library, that's wonderful.
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> Increasingly I go for the electronic versions of journals in my field, because fortunately we have institutional access, and because otherwise you've got to pay for those things. But for certain core journals in my field, I still subscribe to the paper copy because I want to actually have the journals, so that's about probably 10 journals that I actually still subscribe to and pay for. It's part of paying your dues for the association. Beyond that, increasingly if I want an article, I'll get it off the Web, and I'll print the thing out because I usually want a paper copy to read, and I'd rather not read it online.
>
> I want everything that's ever been published to be online and searchable, please…Obviously, I would love it if all the academic publishers would open their resources, especially since it's so locked into top institutions. And scholars from institutions that do not have as much money or whatever can't access those resources, so it definitely puts them at a disadvantage.

While digital resources are useful, many scholars also mentioned concerns over selective digitization. Google Books and Google Scholar, in particular, are not seen as being a "completely integrated searchable database of articles and book chapters," and are criticized for only searching Latin-based sources. Several scholars worried that students' search practices seem to be biased toward digitally accessible work.

> I think my worry, and probably a fair number of people's worry, would be…that the kinds of articles that would be digitized and made readily available would be of a certain size and nature, and the very technical ones, the very short ones, the very long ones, other kinds of things, or things written in other languages, might not get digitized, and so there would, in the long run, be a reduction in the number of things available. That would be my concern.
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> I was noticing when I was doing the admissions files this year for graduate applications, they have a writing sample, and I was just amazed at a couple of the papers…they were citing papers from 1927…But this issue has been discussed much more recently by some very important scholars, and I realized that they were citing these curiously old things because those are all the volumes that are available on Project Muse and on JSTOR. So if they didn't go to a library or didn't actually do research about what is the latest or best scholarship on this issue, they could just search on a particular topic…and this would pop up because that series of journals has been placed on the Internet. And there might be much better articles, more recent, that are not on the Internet or don't have the keyword. The digital becomes a crutch and they just take whatever comes.

Consequently, several scholars remain invested in the occasional trip to the library. As one scholar described, "I love being in the library, the serendipity of scanning the shelves, and finding interesting things next door to what you're looking for."

> For me it really is just waking up early, going to bed late, coming in every day, walking the stacks, shelf-reading, etc. Google is an aid to certain things, and certain digital services that the library now offers—like sending over PDFs—cut down on the time spent physically walking over to the library. There are efficiencies like that. But it's certainly nothing like my colleagues in other fields, who rarely go to the library because all of the content they need is online, searchable, aggregatable by 28 different criteria.

> I know what journals are key to my field and of course I'm blessed to have a nice library here. We have a section of recent journals and you can just go and browse. I often go to the library. If you want to get the newest journals in our field, it usually takes about two to three years for them to actually be available online. For example, with the *American Journal of Archaeology*, I believe that everything up to five years ago is online, but if you wanted the most recent issues, I don't believe they are…Also, when you go over to the library and you're looking for a book, you always see something else that you didn't think of. So if you do that enough, then you learn a lot. If you just do an electronic search for such and such that you want, you'll also learn a lot of other stuff maybe that you didn't need to know, so I think that it's kind of a wash. Personally I like going and browsing in the library, but that's just because I'm old. I could see that you could find a lot of stuff on the Internet if you browsed systemically through.

Email lists also play an important role in circulating book reviews and bibliographies of new work. In classics, the *Bryn Mawr Classical Review* is a highly valued source for the rapid dissemination of book reviews. Many scholars subscribe to these reviews by email as a mechanism to keep abreast of new literature in the field. Listservs, maintained by key academics in the field, can serve to further distill bibliographic information in particular subfields.

> One thing I enormously appreciated is that there's an online reviewing journal for classics, the *Bryn Mawr Classical Review*, which gets sent an enormous amount of stuff, and reviews an enormous amount of stuff. If you get it on the website regularly, or as I do in your email, about 95 percent of it I trash because it doesn't interest me and I don't have time, but I do read things that interest me. They've invited someone to write these reviews…You can volunteer to be in the list that they consider, but there are also about 40 associate editors…They often have fairly junior people doing the reviewing. But they do usually a competent job, good enough for you to know immediately whether that book is one you want to look at…And they come out, what, within six months of the book's appearance…So that's a real plus.
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> The *Bryn Mawr Classical Review* is usually much quicker than any other journal for reviewing new work.
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> One of the best Middle Eastern bibliographers, David Hirsch, keeps us quite well informed of anything new. And then there's an Ancient Near East list managed by Jack Sasson of Vanderbilt University, and many of us get that and we're able to order books via that list. Well, it's got all sorts of things, but anything that's noteworthy really gets onto that list. There are also some other lists, but I think the Sasson list is probably the one that people tend to use. Then we have an agreement with our bibliographer pretty much, as far as the budget goes, to buy anything that appears on that list.

Access to digital archives

Institutions are increasingly under pressure to provide scholars with greater access to primary and secondary sources, but this requires extensive resources for digitization. Existing projects, such as ACLS Humanities E-Book, may be a way to outsource some of this work, but several scholars complained of difficulties locating and accessing digitized materials. Libraries are called upon to play a more visible role in organizing digital resources and making them accessible.

> Making our library fully online would be great, but I think that's probably going to be for the next generation to do.

> Certainly the pressure to have access to everything that's out there is real…We can either deal with this by ourselves, by digitizing texts here, or by giving money to existing projects to digitize resources and put them out into the commons. For example, I expect some places to plow a significant amount of money into the Humanities E-Book Project, to increase their rate of acquisition of backlisted material. That benefits everybody…Of course, we also have to get a grip on what exists, because there's so much that people have digitized without putting it in the standard repositories or creating machine-readable cataloging copy for it, and so you don't know that it exists. With the Humanities E-Book, they create marked records for everything, and they give them free to every library that subscribes. But I was at one library that just hadn't bothered to put it into their database, so the students there had no idea that they owned these books in electronic form…So librarians need to develop a portal to guide students and faculty to what's out there, to make it possible to find these things.
>
> I think this is where some of the knowledge that libraries have about how to use databases, what databases are out there, and so forth, is something that many faculty need to participate in…As we shift to getting a big chunk of information that way, people are not necessarily as enabled to access it…Even just accessing all of the articles that are now online, I there are people who don't know how to do that yet…It's not quite like looking up things in the card catalog and going to the shelves that you've gone to all of your life to look for things. It's just not the same. So I think it requires a lot more resources and training to even begin to be involved in the collecting of scholarly information. That could put certain faculty at some disadvantage.
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> For primary sources, I find search and discovery to be one of the more difficult things, and I wish it were easier. I want to mention, there's so much that's been digitized out there, primary source information or historic text and whatnot, but that information is often much more difficult to find, like what archives have been digitized, what libraries have been digitized, what collections have been digitized. Even when you do simple searches online, it's often hard to find that because they're often buried in library catalogs or things like that. There seems to be, to me at least, no online forum where all the kinds of digital initiative projects exist. That side of it could be a lot better. Primary sources online, I think that besides Google Books, a lot of other things aren't known.

Ar5.2 What Do Scholars Need? How Are These Needs Being Met or Not?

As archaeologists become increasingly sophisticated in their data collection and analysis, there has been a rise in needs for additional institutional support and infrastructure. Particular problems include a lack of resources and support for the storage and preservation of diverse data forms, as well as a need for local technical expertise and training in the use of new technologies. In sum, much of what scholars need to support their research comes down to the issue of available funding.

Funding and institutional support

Funding in archaeology can come from a combination of sources, including private donations and endowments, grants from longstanding relationships with private foundations, federal grants, national centers, and museums. In certain countries, funding can open doors for access to archaeological sites, and some mentioned problems with local corruption. One scholar also complained that funding tends to be more easily obtained for technological innovations than for traditional archaeological research. The funding a scholar receives for an excavation, however, may not support the necessary and lengthy process of data organization and analysis post-

excavation. Local scholars turn instead to their universities to provide some of the staff and infrastructure for this work, which often means undergraduate research assistants, shared imaging facilities, server space, and so on.

> The person in charge of the individual excavation unit must have two, three months' time after the excavation, and for this I need to get funding, because all of our people don't get paid on the excavations. Many do analysis in the lab only, but I cannot expect them to not get paid…they have to live. So I have to find some kind of grant that allows the directors of the units to work on the completion of the book after the excavation. That's the one thing that still is not fully in place.

> When I talk about staff, what is fundamental for me, in terms of the institutional support, is simply the server that we have on campus, in my lab. Through the server we are in contact with the staff in the States and in other countries, including where we are working, so that we feed material constantly into the website, we update it, and we always have that as a point of reference, just as we do in the field, where we also have a local area network, an internal LAN in-house, and so everybody is always in contact with every else. So we are able to do it, through the server at the institute, worldwide, and that's really fundamental support.

> My data are mounted here at my institution. They are, at the moment, on my own hard drive, an extra hard drive in the lab, and on the server, because we work with a large international team…ultimately it will be in my institution's digital library. But I think they have backups there…

Data preservation

As described previously, the degree of preservation of archaeological sites and their artifacts is generally dependent on location, budget, the tourism goals of the local government, and the size and nature of the architectural elements unearthed. Sites are commonly preserved by back-filling, sometimes with sand (to allow for future excavation or re-analysis, and to prevent tampering). Some artifacts end up in museums, libraries, warehouses, or are even re-buried when there is no space for proper storage. The preservation of archaeological artifacts is itself an enormous field of interest, and this task is generally overseen by professional archivists and curators.

Training and support for the use of new tools

The role of young scholars

Although some younger scholars play an important role as technical experts in archaeological collaborations, others are described as incredibly conservative with regard to new tool and technology use. Some scholars observed that graduate students and younger colleagues do not necessarily seem to be attracted to new initiatives and digital technologies, for fear that they do not constitute part of their "legitimate archaeological training." Indeed, one program is in place to inform graduate students about technology use in scholarship, and, in so doing, "seed the community with people who understand technology."

> In 1993 and 1994, there were a lot of controversial discussions and critiques of a book titled *Virtual Archaeology*. Does it make sense to title a book *Virtual Archaeology*? Now, the term is very common, but that first battle was difficult because of much resistance. It was interesting

> because people who, in theory, were conservative like Colin Renfrew were some of the first supporters. Renfrew wrote a wonderful presentation on the book. So having an open mind about new views, I think, is not correlated with one's age or experience. It's everywhere. I met a very old professor with an amazing, innovative mind, and he had younger colleagues who were so conservative…
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> I was at a meeting last week with someone…who was out proselytizing for a new initiative…But the people who attended this meeting were all the same old usual suspects, people who for the last 20 years, if we've ever had a meeting about humanities computing, were always in the room…And we said, "Well, isn't there anyone else out here? We're all getting kind of gray."…So this is one problem: do we have any expertise or interest among our younger colleagues?
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> My undergraduates tend to be more adept at using new technologies. My graduate students tend to be the opposite. It's rather alarming how uncomfortable with technology they tend to be. I don't know why this is.
>
> The graduate students do not necessarily come in with specialized new skills. You would think that they might, but still not everyone is getting exposure at the undergraduate level to the computer skill sets that they're going to be required to do later on…Graduate students pick up these skills mostly by osmosis and by volunteering and getting involved in the various different things that we do and learning by hands-on activity, which is pretty much what the undergrads are doing, as well. Occasionally I'll get an undergraduate who applies and says, "I've worked with these database programs before." And that's great, but it's not always the case. But none of them are so complicated that you can't learn as you do it…Graduate students, too, need to accumulate some of that as they go along, but the idea is it will pay off in the long run.

On-campus technical support

Scholars interested in taking a "digital leap" in their work need extensive training, orientation, and technical support to learn about the possibilities and uses of new tools. Many look to their institutions to provide them with support and resources for digital scholarship, but are unable to pay for the services of local technical staff. Digital humanities facilities at some institutions support innovative scholars, but these institutions may be too advanced for the needs of many of the scholars we interviewed and, consequently, have limited uptake by faculty. Some scholars, however, observed that it is easier to get technical help from their institutions if the projects might produce transferable tools and technologies.

> We need help from computer people, which mostly we get out of the goodness of their hearts…On campus, I don't have anyone helping me…So, the help on the campus, what can I say? If I've had any help I've had to pay for it, and we don't have any money.
>
> I have argued for years here that we should have more technical support from a campus archaeological research center, but unfortunately that's never been as popular an item. I would love us to have people who were on staff who would offer us technical assistance for things like geophysics, GIS, paleoethnobotany, paleozoology. That would be wonderful, but unfortunately now we have to subcontract for and find people to fill those roles on our projects…We have some assistance on certain projects from a campus conservation program, but it's very limited.

> Oh yes, GIS is vital…We record the data ourselves. We have a handheld GPS with us in the field, and we have a Doppler station. We collect spatial data, then I have a couple of grad students who are quite well versed in GIS, and I've done a couple of courses as well, so the simple things I can do. When something is more complicated…for instance, now I'm in contact with the GIS specialist here at my institution. S/he's employed by the technology support unit, and helps me with specific questions.
>
> …we have a lot of colleagues who are not able to take the steps to do multimedia, e-publishing initiatives on their own, and there aren't very many resources other than nabbing a graduate student or somebody to help them with these sorts of things. So it would be great if there were a designated faculty research support laboratory to do that. I was recently visiting my undergraduate alma mater, and they had just put in a whole new fantastic student laboratory for alternative means of communication, and they have a lab specifically for faculty where it's staffed 10 hours a day, and faculty can go and say, "Look, here's what I want to do," and they can sit down and just show them how to do it. To the best of my knowledge, something like that doesn't exist here.
>
> There's a huge problem of support…There's not necessarily a place where people can go and say, "I'm interested in technology and I just don't know how it would be useful." Virginia's IATH is a very rare instance of a really dynamic, well-built infrastructure of people who do advanced technology in the humanities. But at smaller schools, you might not have any support from library or technology services. So I think the big organizations need to take that on and say, "Well, what are we here for? Are we here only for our own benefit or are we going to do some sort of outreach in order to make this available to a wider variety of people?" I'm hopeful that would break down a lot of walls of how technology can be used by people.
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> We have a humanities center now, but that's for more specialized projects… There's a limited number of people using it…Just about every year we send out an invitation to every humanities and social science faculty member and ask, "Do you have a project that you would like to use our digital facility for?" And we get very few applications, so it's either that the people are completely satisfied with what they now have in their own office or, I suppose, they're not interested.
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> I've gotten an enormous amount of help from different entities on campus…As long as what you want is not completely project based—only used for you, the researcher—they're very willing to put time in it. So it's really important to think of your project in a much broader sense than just something that's useful for your particular situation. For example, with this online database, they saw that it was useful because it used standardized recording methods and anyone could just take this and use it, and it's allowed. So if a colleague says, "I really would like to have a good system," then I say, "Just have a look at this and if you like it, take it."

6. TO WHAT DEGREE DO YOU OR YOUR COLLEAGUES ENGAGE WITH THE PUBLIC? HOW? WHY OR WHY NOT?

Archaeology has an "Indiana Jones" and "Golden Idol" panache that results in a relatively widespread public appeal. Yet scholars note that public engagement requires extensive effort to explain what their work is about and to educate the public about the cultural value of archaeological findings. Much of the public engagement in archaeology attempts to create public awareness of issues of archaeological import, including cultural heritage and preservation. Archaeologists engage with the public through media interviews, lectures, educational

workshops, and through interactive work, such as enlisting volunteers to process artifact collections. Advances in digital media technologies are enabling public outreach in new and exciting ways, such as online exhibitions, virtual recreations of archaeological sites, and Wayfaring. Some scholars, however, called for more institutional support and easy-to-use online tools to promote ongoing public engagement with their research.

Ar6.1 Why Do You Engage with the Public?

Archaeologists frequently engage in public outreach for very practical reasons. Given the inherently public nature of the funding and preservation of cultural heritage, many archaeologists felt that it was in their own best interest to promote a general awareness of the value of their work. Such awareness can be developed by speaking to local populations about the importance of reporting and preserving archaeological materials and sites, forming relationships with indigenous populations, and disseminating an ideal of the "international global value of cultural history." In this light, several scholars noted the importance of archaeological outreach to school-age children. More fundamentally, another scholar saw public engagement as an important way to impress current and potential funding bodies.

> I find that the US public is pretty receptive to the kind of work I do…It's the Indiana Jones thing. People say, "Oh wow!" And you don't want to bore them by saying, "Well, it's not really that exciting…" Archaeology is something that people are very attuned to in one way or another, but they really have no idea what it's actually about. So one of the things that I get out of outreach is the fact that people suddenly are really enlightened and realize that our work is much more complicated and difficult than they thought, and they also see the fascinating things that we can learn.
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> Our continued existence and well-being depend on the public's interpretation of our results, and we can't tell people to preserve the past without having them at least understand why it's important. So with that greater, loftier goal in mind, we do a lot of outreach in small ways.
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> I consider public engagement to be an important part of service…I wouldn't say that it's number one on anyone's list of things that you necessarily have to worry about, but I consider outreach very important, mostly because these are potentially the future people of our field. I also think that archaeology feeds into our need to learn from the past to make a better world for the future. Additionally, I've done a lot of public tours and public lectures in the country where I excavate, because the materials there are really in jeopardy, and people are not educated growing up to not rob the antiquities. They're trying to incorporate more educational work now to stem some of the illegal activities that are so rampant…Illegal archaeological activities are a problem all over the world, really. Particularly in poorer communities, people find artifacts just under the surface of a field when they are farming, for instance, and they know that they have value on the black market…Some people turn them over, but there are a lot of people who don't. And some countries finally realized that by starting education in the schools, kids will both grow up knowing that this is wrong themselves, as well as inform adults in their lives that this is wrong…I don't think it hurts to have kids understand the international global value of cultural history, and it doesn't hurt to know that we've come from all of these different places and distant times and this makes up who we are, and that that's just important.
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> I try to do some public engagement, and I think it's almost snobbish if you don't. If you don't try to engage the public, what is your role? You're already in an insular field that people don't necessarily understand, asking you questions like, "Why study ancient history?" So I think it's

> important to get out there and show how important art and architecture are to culture in general, and to the history of mankind. It's also important get out things for people to see, such as prints and drawings that are often shelved away at some museum and don't necessarily make it out to a broader audience.
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> I engage with the public all the time, but I try to do it in a responsible fashion. Also, to be perfectly frank, if I can get public support it helps me impress funding bodies that what I'm doing is intrinsically important so they might give me some money. People like me, our first reaction is to retreat to our little ivory tower, do our work, and not be bothered. But unfortunately to do the work that I need to do, I need money. Projects that I'm involved in require a lot beyond just me: my university, private foundations, and even the occasional local governing committees have to agree to support me. And they have to see the work as being not only intrinsically important to my narrow field, but also exportable to and valuable in other fields. In other words, they have to see the projects as having intrinsic importance. So sometimes I get on television or let people interview me for magazines because, first of all, it gives me a chance to educate people in a proper fashion. Then second of all, I never know who's going to see that and think that what I'm doing is worth throwing some money at.

Why not: The contested nature of the "public intellectual"

Not all scholars engage with the public on a regular basis. Public engagement does not weigh heavily in tenure and promotion decisions, and the degree to which it is encouraged (among young and established scholars alike) varies by institution. Some scholars engage only out of a sense of "obligation," while others find it difficult to communicate the social impact of their work to the broader public.

> Public engagement does not count for tenure, although universities do like it …We're asked to attend seminars to learn how not to sound foolish in front interviewers …They're very keen on it, but I would guess that it would never count towards tenure …That said, my colleagues and I do some public engagement. I would say a minority in the department have. We mostly do it out of a sense of obligation, but I suspect that few of us like it much. I mean TV shows and the like; outreach to local primary and secondary schools is another matter, and much more rewarding.
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> The social impact of research here is very low…there is not a tradition of public engagement. It's the researcher's own responsibility to try to show the social impact and benefits of their research in daily life. But it's not easy. It's not like medical research where you have cancer, you give me money, and I can save you…

The public misinterpretation of archaeological knowledge

Some archaeologists regretted the tendency for members of the public and media to sensationalize certain aspects of archaeological research in support of their political and personal beliefs. In these cases, archaeology can be used to legitimate certain social or cultural perspectives. Most archaeologists prefer not to involve themselves in these debates lest they be misunderstood or feed the controversy. As one scholar observed, "Just leave it alone and go back to your work. Eventually people will forget all of this…"

> People get attracted to our field in strange ways, and things get sensationalized…In biblical studies, for example, people will take things and blow them out of proportion, or take some small aspect of what you're doing and call that important, which from your standpoint was not

important at all…I'll give you an example. Some time ago, a group of scholars worked very carefully on a small inscription…that quotes a prayer that is also found in the Bible. This was a pretty sensational thing because it was the oldest artifact to cite a text in the Bible…The popular press grabbed it and said, "If this text is quoted from the Bible, that must legitimize the Bible, and then if the Bible is legitimate, then the things in it are true." You notice how there's a daisy chain of assumptions built on assumptions…The Bible was an important historical document and is an important religious document, but the reality of the Bible is something I just can't talk about as an academic…You just let it go because the more you respond to a debate, the more you feed the fire. Even if you raise a proper, academic point to a popular article…you get attacked because you are spoiling the story…All you're doing is building the controversy.

"Cultural heritage" refers to the idea that archaeologists do not just produce facts about the past, but that we actually construct history ourselves…We make certain places more important than others, and we're the ones who give them that importance…For example, the place where I excavate now…the local people knew about it long before it was "discovered" by archaeologists in the 20th century. But they excavated it, brought it to the rest of the world…and through their own images and everything they published about it, they made it very important, even though in pre-history it probably wasn't that important, it was just one of many villages…And now it's a heritage site for the nation. They're proud of it, but for many decades it was nothing. So, different people in different countries can project themselves onto archaeology. People use archaeology to say, for instance, that goddess worship should be more important today…Archaeologists look at all these little figurines that are dug up and decide that those mean that the goddess was important and women were important in that culture. Actually, that's just an interpretation, but people take it as fact. And then it's used as a legitimation for the rejuvenation of goddess worship. Now that's fine if we want to reinvent goddess worship, but we shouldn't use archaeology to somehow "legitimize" this.

Ar6.2 How Do Scholars Engage with the Public?

Archaeologists engage with the public in various ways, including public lectures, interaction with historical societies, K-12 classroom projects, exhibitions, interviews in popular magazines or newspapers, public television appearances, and internship programs for members of the public to process excavation collections in departmental labs. In some cases, scholars actively seek out opportunities for public engagement. In others, outreach may be solicited and managed by a university press office or department coordinator. Scholars also described the logistical problems of dealing with the media, such as playing "phone tag" with reporters.

Whenever we get a grant or have a big development in our research, the PR machine here works hard without our request, and so news trickles down to local media.

I go to local elementary schools, and some of the graduate students have small, isolated outreach projects…We have an official public outreach person that coordinates all of this…Last year, for instance, I taught a class in the community. It was an incredible experience, and it was actually really good for me because…we weren't allowed to use PowerPoint, computers, or anything we're accustomed to. We could only use slides and show video on VHS tape. So it was very much a lecture-based, dialogic experience that is rare these days since we're so addicted to PowerPoint. Going back and being able to construct a narrative in that way gave me a greater appreciation for how things have been traditionally done…But, in general, I'd say the graduate students have trouble doing outreach in very meaningful ways…they feel unsatisfied in terms of getting any kind of message out. Trying to find a balance between research and public engagement is always difficult.

> I do a fair amount of public engagement, in addition to lectures and other things that we do on campus…Some faculty lecture for the Archaeological Institute of America, which sends you around to various parts of the country to talk to local societies, which are mostly made up of the interested general public. I have done some things for school programs…at both the elementary school and the high school level, going out and talking about what we do.
>
> Our institution provides a number of outreach activities. We have a yearly open house, and a large number of school kids come through our labs. We have a lecture series and various open projects, which accept volunteers…since there's always work to do in the labs. There are some volunteers in field projects, but for the most part the volunteers work here sorting collections.

Museums also play an especially important role in the public communication of archaeological work, but many face serious funding shortages.

> I think museums have a greater outreach component than universities, particularly in how they see technology as contributing to innovation in scholarship as well as communication between scholars and the public.
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> I read a recent study on museum visitation in Rome, where out of almost 300 museums, only *five* receive more than 30,000 visitors a year, just because they are well known. The others only receive somewhere between a few hundred and one thousand visitors a year…So there are serious faults in museum management and communication…The big problem is that museums in some parts of the world are at risk of closure because of unsustainable management costs. On a cultural policy level, every country now invests less in comparison with the past…In Europe, state funding is still very important, but in the US, for example, cultural heritage work is supported in a more decentralized manner by non-profit groups, associations, donors, and volunteers.

Digital media and public engagement

For some archaeologists, new media technologies create new and exciting possibilities for public engagement. One scholar described writing a blog as a form of "online outreach." Others spoke of disseminating their work through photo sharing websites, online exhibitions, films, virtual reality projects, and 3D reconstructions of archaeological sites, for example in Second Life. While sophisticated virtual models of archaeological sites have the potential to provide a unique way to explore cultural heritage sites, their development and use are currently limited to specialized virtual reality labs and a few museums.

> The increasing availability of video and Web self-publishing tools is really great. Finally, we're able to make our own movies, instead of having National Geographic or the Discovery channel coming in and changing our words to make what they feel is a more compelling story. There are also things like Second Life, where you can build a virtual dig.
>
> Public engagement is an issue that's addressed very little in my field, which is a real shame because it's a very important component of the field that has been lost in past decades. For me, the two ways I see public engagement happening are through websites and exhibitions. Of course, exhibitions can take the form of a website. The more I've gotten involved in the field, the more I realize it's very insular and people don't necessarily get involved. But at the same time, I think all the very well known scholars in the field often put on exhibitions and try to get their work out there for a broader audience…I'm currently putting together an exhibition on a set of archival materials I've worked with, and I'm hoping to create digital facsimiles of these things to get that archival experience to the public…I think online exhibitions are one

> area that scholars could really expand as an outreach effort…and you see computers being used a lot more in archaeological exhibitions, or even just LCD screens with information. But I haven't seen a lot of people trying to push the technological envelope.
>
> Virtual reality and 3D reconstructions seem to be potentially very important for public access. As students and scholars, we learn how to look at a flat plan, reconstruct it in our minds, and imagine what it looks like in real terms. In terms of public education, though, it's hopeless to expect anyone to figure out what's going on in a flat plane. But, I've seen some amazing projects—especially in Rome and in Italy—that reconstruct spaces in three-dimensions. If we could all have access to that kind of technology, I think on a worldwide scale it would help tremendously with the public recognition and education of archaeological work.

The applications of digital technologies to public engagement described previously use computers and the Internet as portals for virtual archaeological exploration. In contrast, another archaeologist described Wayfaring, or the creation and sharing of personalized maps, as a potential way to bring members of the public out from behind their computers and into real contact with archaeological sites. Similarly, another scholar described experiments with GPS-linked wiki technologies enabling visitors to contribute personal annotations to the history of archaeological or historical sites, in the manner of crowdsourcing (although the scholar noted that this was likely to be overrun with advertising schemes).

> Some people are starting to play with the public outreach aspects of GPS, like Geocaching…Archaeologists aren't really interested in Geocaching, *per se,* but some scholars are using global positioning technologies in archaeology to create a greater awareness of sites, which is called Wayfaring. With Wayfaring, you give people a clue and they find the location the clue refers to—like an inscription on a statue, for instance—and then they could message back the inscription and receive some points…There's already a large Geocaching community because people think it's fun, and so this would be one way to tap into that to create interest in archaeological sites.

The need for more outreach mechanisms

Scholars blamed the comparatively low level of public engagement in archaeology on the lack of outreach infrastructure in archaeology departments, digital humanities centers, and individual excavation projects. Archaeologists simply "cannot do everything," and called for more integrated mechanisms of public engagement with ongoing research. Suggestions for facilitating public engagement included developing networks of people beyond academia to act as "interpreters" between researchers and the public, integrating personnel for public outreach into digital humanities centers, and encouraging scholars to use existing social networking tools (rather than custom-built websites) to share work publicly.

> One thing that research centers could do is create worldwide networks of people connected with their work—people in different walks of life, like journalists and professional writers and so on—who could help to bring their work to a broader public. I don't think we can do everything, and the belief that we must do all aspects of outreach ourselves seems to be a great obstacle to getting it done.
>
> I don't think there is a lot of outreach to kids, and there could be a lot more…I have to imagine that's something digital humanities organizations would be interested in. But at the same time, I don't know that anyone is willing to put the time in…There just doesn't seem to be a built-in outreach component in some of these organizations, whether it be a university or

> institute or something else…They might have an outreach component in the sense of getting things published in magazines or newspapers to get their name out. But I had a lot of friends in engineering who did things with kids and schools all the time, and I've never gotten a sense that really exists in ancient history, or the humanities in general.
>
> A lot of archaeologists are still building islands, in that they have an end product mentality. They go and build their website about the research site, and that's it, they're done. They don't maintain it, and it dies…The links start to go bad, the pictures, and then their hosting funds run out. And who cares? Nobody…I don't visit archaeology websites, I don't care. There's no living breathing part of it there for me…I want something that is ongoing and is kept up. But in archaeology, knowing how to do video and photographic work is still a real specialization that very few people know how to do, let alone making websites. No one knows how to make websites. And so it's better, in my opinion, to use existing social networking tools to integrate our research into the broader domain where people will find our work, be interested in what we're doing, and have access to our information. They're not going to search, necessarily, for a dig site and then find you by proxy. It just all needs to be integrated with existing technology.

SELECT RELEVANT LITERATURE AND LINKS

This is not meant to be an exhaustive bibliography; as a courtesy, we are providing some of the literature—scientific and popular—that we have collected over the last few years. Please see the main Relevant Literature section and various footnotes for additional citations.

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CHAPTER 3: ASTROPHYSICS CASE STUDY

CONTENTS

INTRODUCTION AND OVERVIEW OF THE FIELD

Astrophysics, the study of the physics of the universe, provides a fascinating case because of its dependence on large data sets, the importance of complex visual data, the ubiquitous use of a preprint repository, the convergence of collaborating scholars around large and expensive telescopes, and its popular appeal stimulating significant amateur participation. Astrophysics has two primary branches: observational astrophysics (representing applied research, such as infrared, optical, radio, and gamma ray astronomy) and theoretical astrophysics (the study of physical cosmology, including galactic structure and the dynamics of stellar systems). Department organization varies by institution, although most departments encompass both branches. Astrophysicists can also hold positions in academic units including observatories, laboratories (such as the Space Sciences Laboratory), or can perform civil service roles at NASA.

Astrophysics is a relatively small, high-paradigm, fast-moving field in which the refereed journal article is the primary means of final publication. Journals are typically society-owned, are few in number, have page charges, and display high acceptance rates. The field has a strong pre-publication tradition that functions in parallel with formal publication. Well-developed papers are generally disseminated through the open access preprint server, astro-ph (the astrophysics section of the arXiv), in conjunction with journal submission. In addition, early work is shared informally with a trusted network of colleagues to elicit feedback before being presented at professional conferences for further refinement and to stake a claim. Because early sharing of well-developed research is prevalent, there does not appear to be a need for online and open access journals.

Although astrophysics is a well-funded field in the US, astrophysicists who conduct research using data from NASA's flagship space missions were noted as being better funded than those engaged in theoretical astrophysics.[46] The application process for telescope time can be variable and highly dependent on a scholar's home institution. New technologies enable the possibility of remote observing, although a preference was expressed for doing such work on site, particularly since stable Internet connectivity can be a problem. Complex large collaborations at national facilities are commonplace, many of which are multi-institutional and intergenerational, and result in the publication of multi-authored papers, sometimes running into the dozens of authors. Although astrophysicists use several methods to collaborate, including video-conferencing and Internet calls, most work is facilitated through wiki use and email networks. Face-to-face interaction remains an essential part of the collaborative process.

There is an array of digital data types in astrophysics and reliance on bibliographic and observational repositories is widespread; the Astrophysics Data System (ADS), a NASA-funded bibliographic database, and the arXiv are used heavily to keep up-to-date with the field. Since data are unique to their observed point in time and data capturing techniques are becoming increasingly sophisticated, data growth has been exponential. Public-access data archives, such as those associated with whole-sky surveys and NASA's space-born observatories (including, among others, the Hubble Space Telescope, the Chandra X-Ray Observatory, and the Spitzer Space Telescope) are fast becoming the bedrock of observational astronomy.[47] The field may be witnessing a move toward virtual astronomy where individual scholars, and even the public, can

[46] Astrophysics receives significant support from NSF, NASA, private foundations (including the W.M. Keck Foundation, the Alfred P. Sloan Foundation and the Gordon and Betty Moore Foundation), and universities. Funding is awarded across institutions and national facilities.
[47] These data become publicly available after a twelve-month embargo period.

mine data archives and access free software that is increasingly available online. While the "lone" researcher is well positioned to make a scientific discovery—by taking advantage of the mass of available resources—complete independence from a project team may impede a full understanding.

Data sharing among scholars is widespread, though demand for more comprehensive and mandatory guidelines is prevalent. The International Virtual Observatory Alliance is working toward providing access to global astrophysical data by developing consistent data standards. Refined or raw data can be posted on journal websites as supplementary or supporting online material, on personal or project websites, or made available upon request.

Astrophysicists have limited engagement with Web 2.0 technologies; Facebook, LinkedIn, YouTube, and other such platforms are not frequently utilized for scholarly purposes. As a rule, blogs are rarely consulted, though a few renowned academics write them; listservs, the arXiv, and "telegrams" are more widely used. Scholars utilize a variety of avenues to engage significant public interest—these include the popular press, observatory talks, and school outreach. Astrophysics as a field has high rates of amateur participation and boasts a growing role for the citizen scientist, particularly as online sites, such as SETI@home and Galaxy Zoo, encourage involvement by the general population in processing data. Google Sky and Microsoft's WorldWide Telescope enable exploration of the cosmos by turning the home computer into a virtual telescope.

In sum, astrophysics is a small field with little to no commercial potential, and the publication system is well-adapted to the discipline's needs. The astro-ph preprint repository and other scholarly communication vehicles serve a variety of functions to get ideas, announcements, and well-developed papers into the public domain quickly. There are only a few journals (which are society owned, but often outsourced to commercial publishers) and acceptance rates are relatively high. Correspondingly, there appears to be little discussion about the need for open access publication outlets among astrophysicists, despite the fact that scholars in physics—a close disciplinary neighbor—are participating in the Sponsoring Consortium for Open Access Publishing in High Energy Physics (SCOAP3), an open access publishing initiative. Demand for an improved computing infrastructure is widespread. A major challenge facing the field is managing, moving, and preserving the ever-increasing volume of data generated. As data collection becomes more complex, training astrophysicists in computer science and the use of new technologies and tools likely will be widespread.

1. REQUIREMENTS FOR TENURE AND PROMOTION: WHAT ARE THE QUALITIES OF A SUCCESSFUL SCHOLAR?

Making important scientific discoveries and assuming leadership in the field are prerequisites for earning tenure and promotion in astrophysics. Scholars at top-tier universities typically publish in flagship society journals, which, in tandem with citation indices, inform the tenure and promotion decisions made by review advancement committees. Increased reliance on citation indices, as a substitute for reading actual articles, has been met with criticism and resistance by many in the field.

In addition to a record of significant publications, securing extramural funding is essential for success as a scholar. Presenting research at conferences is important for making a name, but appears to count little toward achieving tenure. Developing astronomical instrumentation and

software, posting announcements in the form of listserv-based circulars and telegrams, and database creation are considered "support" roles and are usually ascribed a lower value than publication in advancement decisions. Furthermore, it is acknowledged that judging scholarly activities falling outside the traditional realm of publication can complicate evaluation for tenure and promotion committees. At elite research universities, teaching and service constitute part of a tenure package but count for less than one's publication record. Young scholars are generally advised to avoid spending too much time on non-publication activities at the expense of their research.

Ap1.1 A Suite of Achievements Anchored by High-Impact Publication

Many criteria are used to judge scholarship holistically. They include scientific discoveries that advance the field, high-impact peer-reviewed journal articles, securing research grants, invitations to present at conferences as a keynote speaker, and attracting graduate and postdoctoral students to study at one's home institution. These, in addition to other intangible criteria such as research dynamism, are "difficult to quantify."

> This research institution is a very special place; it does have this aggressive atmosphere where people are trying to always be the leaders in their field. So this creates an atmosphere where just putting out the requisite number of papers per year isn't enough. People are looking for discoveries, attention, articles in magazines, press releases, keynote talks in conferences…I think the main qualities of a good scholar are research dynamism, ability to do big projects, bring in grant money, leadership of projects in astronomy, and the ability to build a group of postgraduate students and postdoctoral workers. And then teaching—I would say is somewhere on that list—but not very high. So visibility in America is a very big thing; visibility of research record and press releases. We have individuals here who are somewhat frowned upon because they're trotting along and putting papers out, but it's not spectacular enough.
>
> If you're in a top-notch research school, people don't count papers. They look at: have you done transformative advances? Have you discovered something really important? Have you made a homerun or two, or three? We aim to hire the very best people in the field, period…So the essence is really about scientific achievements, and I suspect that, as you go down the ladder of prominence in research, people go more into counting-the-papers mode. People always count papers at some level, but what I know is—in my mind and in the minds of my colleagues—when we look at these cases, we never count how many papers this person has written. But rather, we ask, "Do I actually think that they might make a major discovery?"
>
> I suspect as you go up and down from the top of the scientific pyramid, people simply have to rely on some kind of statistics—citation counts, paper counts, and so on—which is not good…personally I never bother with citation rates. I can imagine a place where you have 5,000 professors. You may naturally be tempted to go for…some bibliometric measures. I am suspicious of such things. I am suspicious, especially in terms of funding, because, in some sense, it represents both intellectual laziness and unnecessary bureaucratization…I don't think that the richness of intellectual achievements in science or any other field…can be reduced to any scale or value, or even to two or three of them…We're dealing with very complex, multidimensional, often very difficult-to-quantify phenomena. And they're simply not reducible to some small set of numbers or one number…So the essence is scientific achievements.
>
> Nothing's ever written down in the sense that it's one of these things people will know—if you've been successful—when they see it.

Although at top research institutions the emphasis is on the "quality" of publication rather than "quantity" *per se*, a substantial publication record is still important in this highly competitive field. For example, reliance on bibliometric measures, including quantity of publications or citation counts, to judge the quality of scholarship and gauge its impact on the field is not uncommon.

> I think at the end of the day you get this large list of papers that were written…and you just don't pay that much attention. It's the number of citations that are important. If, in a poor journal, a scholar got 1,000 citations, I don't care where they are published…I wouldn't say that we have any other obvious way of gauging the impact of a paper…This has been a big change in the last five years. It used to be it was very difficult to get citation numbers. You publish papers, other people write papers, and they refer to your work. And we probably put too much weight on that citation index—how many cites do your papers get as an evaluation of their importance. We follow it really closely…It's often part of the letter and part of our discussion when we look at advancement or hiring…It's probably the number one discussion for hiring. And once it's the last round…it's a bar…I know this will vary from person to person in a big way, but in my mind it's a bar at which below that bar I'm not going to even consider those candidates, and above that bar maybe it's less of a gray area. They're all in one boat together. That's often how I treat the situation…At a research-level institution, it's certainly publication…not just the number of publications…but also the impact in the field. So there's some balance between the size of the body of work…as well as the number of citations that are garnered by that body of work. And there's no tried-and-true recipe. Someone can have one or two very influential papers that are plenty sufficient for a tenure case, or alternatively one could maybe be more broad and have fewer high-impact papers but just more papers overall.
>
> Ten years ago all we knew was people published papers—and they published a lot of papers or they published few papers. Then we started to have easy access through the astrophysical data service and it actually listed citations. It kept track of all that stuff, so anybody could find out how many citations their paper had at any time. So all of a sudden citations became very highly weighted.
>
> It's very nice if you want to learn about somebody. You know, "Oh, here's someone. What have they done?" So you can just see what their most popular or influential papers have been. And I find that this doesn't exist in other fields. For example, I'm involved in nominating people for prizes in a certain field right now. It's imperatively much harder to find out what these people have done. So citation indices are a marvelous tool. We're totally spoiled.

Observational and theoretical astrophysicists are acutely aware that sustained high-impact article publication is necessary both to advance the field and their own careers. They typically publish in flagship society-owned journals including the *Astrophysical Journal, Monthly Notices of the Royal Astronomical Society,* and the *Astronomical Journal.* These publications "remain the gold standard for scholarly communication and academic advancement" and undergo stringent peer review.

Visibility in the field

Making a name in the field requires more than a sustained record of publication. A highly productive career trajectory cements external reputation and serves to inform external letters of reference; as in other fields, external letters of reference are a key piece of a tenure and

promotion dossier. Being invited to national and international conferences and meetings as a keynote speaker contributes to establishing one's reputation as a leader in the field.

> Sometimes, scholars are so young that it may be too early to tell if they might make a major scientific discovery. So I wouldn't necessarily know whether some young string theorist has done something fantastic. But I judge from people who know.

> Letters are sent out to external referees and they essentially have to come back uniformly good. Maybe you can have one three-sigma letter. But they all have to say that you're a leader in your field. It's not good enough to have done a good job. You have to come back with some kind of superlatives…we might like one of our colleagues within a department a lot, but there are several other hurdles that are there to maintain the overall quality of the institution…so that's why what we think doesn't matter all that much. What matters is what the outside world thinks. And I think there is more than one way to come back with good letters like that. One is to write very good papers and another is to travel a lot and have your face out there all the time…In this department we have zero so-called "deadwood" on the faculty. We have several faculty that are nominally beyond retirement age who are still getting as much done as anybody else in the department. So the expectations about being productive are very high—and even if you've already received tenure, you're expected to continue along that road.

> I write letters for advancements of other faculty. One of the considerations is international visibility and recognition. If they've gone to conferences where they are the invited speaker or prime speaker, or a reviewer, I think that is worth something. So it's not quite true that conferences are worth zero…I'm saying that conferences have value.

> The writing time for giving papers and conference proceedings competes with journal time…The invitation itself is a sign that you are held to be an expert in the field. If you are invited to present at many meetings, you are clearly a leader, and if they're international meetings, you're an international leader.

> The coin of the realm is journal articles, but presenting work at conferences successfully and publicizing them is worth more and more.

While presenting work is a mechanism to publicize one's work and gain recognition, it was noted that final archival publication takes precedence.

> Conferences get classified with abstracts of talks you gave at meetings, which have very low weight compared to a peer-reviewed journal publication, traditionally.

The importance of extramural funding and postdoctoral fellowships

The ability to secure extramural funding in astrophysics is an important indicator of successful scholarship and is often critical in the hiring and advancement process, particularly for pre-tenure scholars.

> You need to start bringing in grant money to the university, at least in my field. So you need to start thinking about big projects and getting funded from outside sources. The more outside funding you can get, the easier it's going to be to get tenure.

Astrophysics is mainly funded by federal grants and private foundations (including the W.M. Keck Foundation, the Gordon and Betty Moore Foundation, and the Alfred P. Sloan Foundation.) The

types of research supported by NASA and NSF differ significantly, with a substantial proportion of financial support from NASA awarded to research associated with space missions. Consequently, we were told that there are some subfields lagging behind in their ability to win funding, particularly theoretical astrophysics.

> As a theorist, it is very much the case that funding is difficult to secure. It seems very difficult to apply for funding to study some idea without already having done the study to show that it actually works and, therefore, that it's worth funding. It seems like you're stuck in a circle. Occasionally that circle is broken, but that does seem to be the case.

Postdoctoral fellowships, in particular, are highly competitive and perceived as a boon to one's resume, according to a director of a research center.

> The graduate students are, of course, primarily working for a professor. But then we have two categories of "postdoctorate," which are very different. There's what I would call a grant-funded postdoctorate, which is: you're working in a group with a pre-assigned task. There's some flexibility depending on the professor. But then there are these prize postdoctoral fellowships, which are highly sought after, terribly competitive, which give you freedom for three years with a reasonable travel budget. So, these prize fellows have all the time in the world and, of course, they're in their late 20s, early 30s, so they're full of beans and energy. So they are the ones who are whizzing around to all these conferences, listening to everything and it's a great time in their lives. And people desperately want this freedom because they know that this is their chance to get tenure if they go through one of these three-year positions. It's having a negative effect because there are only maybe 20 of these in the US, and every year, we're churning out many more Ph.D.'s than can possibly get these positions. So there's now this air of despondency that if you don't get one of these prize fellowships, your chances for tenure are doomed. I mean these are 26- and 27-year-olds thinking that they're at the end of their career because they didn't get one of these prize fellowships. I try to dispel this and give examples of people who never got these fellowships—but then became successful faculty. These are national space telescope fellowships—Hubble fellowships, Spitzer fellowships, Chandra fellowships. Then each university has a few others—like the Miller at Berkeley. Unfortunately the demographics are exactly as the young people fear. If you are a prize fellow, departments tend to look very favorably on you as a possible tenure-track hire. It looks good on your C.V. and it's an early distinction in your career.

Because securing funds can be too onerous a task, some young scholars turn to alternative careers.

> The best graduate student I've ever had—could have basically written his/her own ticket to a faculty position anywhere—decided to leave the field because s/he just didn't want to be nickeled and dimed the rest of his/her life…it's quite fun being a graduate student and a postdoc. But then, as a professor, you actually can only spend 15 percent of your time doing the things that you thought you were going into the field to do…We try to compete with institutions and organizations that have much more in the way of people resources, but maybe not the same level of financial and infrastructure resources. And, I've found it to be a satisfying but extremely stressful environment, in that sense.

Ap1.2 Evaluating Other Scholarly Genres

Additional forms of scholarly contributions include announcements, astronomical instrumentation, software development, and the creation of data archives and virtual organizations. Many scholars engaged with these types of activities are drawn from

observatories, institutes, and NASA research centers, as well as university departments of astronomy and astrophysics. Yet, since the rubric in science is being "creative," scholarship beyond traditional publication counts little and can be a challenge for tenure and promotion committees to evaluate.

Announcement posts

Announcement posts (listserv distributions of circulars and telegrams), are playing an increasingly important role in the field by alerting scholars instantaneously to exciting new events and phenomena. These types of scholarship can be a challenge for advancement committees to evaluate, despite their value to the academic community as a whole.

> There are mechanisms to notify astronomers very quickly that something interesting is happening—a gamma-ray burst, a supernova, a comet, or something or other—and there are forms of telegrams or circulars. And those words are inherited from the bygone era when people were actually sending telegrams or mailing little cards and things like that. Now it's all electronic and they come instantly. There are the Astronomer's Telegram, IAU circulars (Central Bureau of Astronomical Telegrams), gamma-ray burst notices…there are the virtual observatory event messages…None of this is refereed, of course. How can we? You have to react to them in seconds or minutes. They're all saved somewhere and they contain extremely useful information, but they do not fit in any rubric of anything else that we ever had…they just don't fit in traditional formats at all. And then how do you value that output, say, in a young astronomer who's really good at doing this kind of stuff? That person may have produced 200 of these little electronic circulars and telegrams—and created new exploding things in the sky—versus one or two papers in the *Astrophysical Journal* that have gone through the traditional path. It's all valuable. How do you weigh things? So we just don't know how to do this.
>
> It's a question of new kinds of expertise…people who spend the time and effort doing it, how do they get credit? Because these are not the astrophysical journals; this is, say, the Sloan server. And that's something that the community is trying to understand. Or how about numerical simulations? You can write a paper describing a final outcome and interpretation, but who reviews algorithms or the code? Or, do you preserve the output of the whole performance simulation, which is, again, terabytes and petabytes worth of stuff? Or do you just save a few steps and show those? With this exponential growth of data on the experimental side, not only do you have instrument builders versus users or observers in astronomy, but now you have to have database experts and data miners, and all kinds of stuff like that. There are all of these new groups and branches that grow, that respond to technological growth, and that simply didn't exist before. And because academia is such a closed club, they tend not to be validated very well.
>
> From the standpoint of tenure and promotion committees, non-refereed papers are a much lower coin in the realm. They're much less valued. So that is a problem.

Astronomical instrumentation and software development

Within astrophysics, scholars engaged in building instruments have historically been relegated to a secondary status compared to their "academic" counterparts, despite their crucial role in the overall productivity of the field. Their publications can be the product itself, in the form of an instrument, or can be published as conference proceedings that do not undergo peer review in

the traditional sense. Astronomy instrumentation may be suffering as a result of its ascribed lower status since young scholars are simply not attracted to the endeavor.

> There's another culture, the instrument builders…the observatory people build things; their publications are often instruments. The society associated with photo-electronic instrumentation has enormous meetings twice a year, with sessions devoted to astronomy instrumentation and published proceedings in hard copy and on CD. That's where all their papers are published, and none of them are refereed…These people are not traditional, their publication is the thing they built, not words. The test is how original, advanced, and creative their things are. Someone here developed instruments from scratch. I may have to get letters saying, "These allow us to do things that nobody else could, they are ingenious, etc." The publication is a square inch of silicon, but it's as valid as a paper, because it required creativity.
>
> Here, we've always had a problem—a lack of good, young instrument builders—because the astronomical community didn't value that skill very highly. It does now. But, it takes time to grow a new generation of good, young instrument builders.

Even within the realm of instrument building, there is a distinction between developing an instrument based on an original concept, as opposed to building one already conceived.

> Building an instrument counts for absolutely nothing…You don't get intellectual credit for doing it…you can get intellectual credit for developing heterodyne submillimeter spectrometers and things like that…The instrument that we're building is state-of-the-art, but the *concept*—people have known for a long time how to build one—and at some level, it's an engineering project. And we could never hire a faculty member here to do primarily instrumentation…Some institutions have many people where this is what they do, this is why they were hired. We can't do that here, because it doesn't seem like science to the people who are passing judgment on it.

According to one professor, tenured scholars may be less constrained and free to pursue their non-academic interests, such as instrument building.

> I build instruments out of a sense of obligation to the observatory, knowing that if I didn't work on this, it wouldn't happen…And I feel like I'm at the point in my career where I can…I like learning new things and this is an opportunity. I started getting involved in instrumentation years ago and I quite enjoy working with engineers. But I don't expect any pats on the back from my faculty colleagues. They'll go and use it when it's done. But that always made me feel uncomfortable—going and using equipment that was conceived and built by other people. And I felt like I needed to contribute.

Similar to bioinformatics specialists in biology, scholars in so-called "support" roles, such as computer science staff and software developers, tend not to receive equal credit for their efforts when compared with traditional researchers.

> The astronomical community still doesn't value anything to do with computers and software. And that's going to come and bite us in the long run…You have to reward people for making all of this possible, who make sure that bytes go from the raw instrument into something that scientists can use. And we do not value those people very well now at all. So this is a real problem. Academia is a hostile environment to any truly interdisciplinary effort… I'm seeing some great young people, who are trying to bridge gaps, get squished because they're neither this nor that. I had a great postdoc who was one of those computational astronomers, who

was good in computer science and good in astronomy, but wasn't great in either one. It took a long time to get this student a decent job. And it's people like that who should be extremely valued.

Blogs

Although writing a blog is a discouraged activity, especially at the pre-tenure stage, some scholars suggested including a metric for measuring its impact as part of a tenure dossier.

> My position here…is an interesting position. It's basically like being at a national lab. It's a research position. I am a faculty member. I get all the stuff that faculty members get. I get to go to faculty meetings, I supervise graduate students, I teach if I want to, and I don't teach if I don't want to. And I get paid like a professor, which is very nice. The only major downside is that I don't have tenure. So they can fire me. So I would like to have tenure for various reasons, but right now I'm very much enjoying this position that I have and am taking advantage of it…There's certainly more than one senior faculty member who has said out loud that they would never vote for tenure for someone who has a blog…when research-level, top-10 universities come to give people tenure, the only thing they care about it is the quality and amount of research output. And you can have the best teaching evaluations of anyone in your department but it is completely irrelevant.
>
> So if a well-renowned blogger worked for me, and I was writing up his merit increase, I'd have his blog in there for sure. I'm sure there are some statistics stating that 20,000 people a week read this—and I would absolutely try to make that case.
>
> I know some people in our department would put in their resume, "I was referred to as having the most important paper, or most cited paper, or whatever." And those types of things will happen if you open the tenure process up. It has not yet happened. This is dangerous…I can claim to be anybody I want, of course.
>
> How do you preserve blog and wiki content that's not appropriate to publish in any traditional sense? So it's low-grade, useful, process information that should get credit in some sense. It's just daily life, but it's useful information.

Ap1.3 Teaching and Service

Several scholars noted that although publication, teaching, and service are all considered in advancement, publication is deemed most important.

Teaching and textbooks

> There's no question. It's publication first as far as tenure cases go. And I say this without having sat through a tenure case. I'm only recently tenured, so I guess I don't know this for a dead fact, but I'm pretty sure that's the expectation. Teaching quality isn't that highly regarded. It's certainly a bar you've got to get above, but I don't think it largely informs the case—unless the performance is very poor.
>
> In astronomy, research record is dominant. If you are absolutely hopeless at teaching, it will hurt, but it's surprising how much tolerance there is to poor teaching in the US. In the promotion and hiring at Oxford, an exam question is given to the candidate. So we're talking about an interview where somebody has to actually do and explain how they would teach an undergraduate a particular project. I haven't seen that in the US at all.

> In astronomy and astrophysics, at least in research-based universities, of course, research is what counts. We all pay lip service to teaching, and some people actually care about it, but, in reality, it's the scientific achievements that really count.
>
> To earn tenure and promotion, a scholar must demonstrate significant research productivity, adequate teaching skills at the undergraduate and graduate level, and some degree of usefulness to the specific institution and the outside world—although this can be moderate at that stage of the career.

Textbooks play a negligible role in the advancement process and, as in other disciplines, may work against a scholar coming up for tenure.

> Many of my senior colleagues wrote textbooks, and it's okay to write textbooks when you're long past getting tenure—but the hiring committee decides, if you do it before you get tenure, it's not considered a good sign.

Service

Young scholars may be overburdened by professional and campus service. Too many service obligations can be particularly problematic for postdoctoral scholars trying to increase their publication productivity. In addition, with the pressure to achieve gender equity, women may be called upon even more than their male colleagues.

> Most institutions will pretend to try to protect you while you're still on the tenure track from things like service. But, in reality, it's not the universities that are the problem…A graduate student of mine was offered three faculty positions within about six months of starting her first postdoctoral position, which was way too early and unfair, I thought, for the universities to be putting that pressure on her. She didn't get to enjoy the postdoctoral time in the way that you should—where you don't have to think about all these other things. I think that's a significant problem and I don't know what to do about that…And it's particularly problematic for women faculty in this field, and probably physics, because everyone wants gender balance on every task or committee or panel. And women constitute only 15 or 20 percent of the field, so they get asked three times more than anyone else does. I've had two very successful women graduate students and I was trying to put myself in their shoes—you have to be so good at saying no, or else you're just going to get completely reduced to nothing.
>
> I think it's great to change the world, but not until you hit tenure, right? One of the things being talked about a lot on our blogs is the issue of women and minorities in science. We think it's really important. I would tell a young woman looking for tenure not to spend her time agitating about the position of women in science, because it will be counted against you. You're not doing research when you're doing that. And there's no protection for that kind of thing. Therefore I don't necessarily think it's going to change because I think that most people still have their eyes on the prize—they want to get a tenure job, and those jobs are very few and far between—and just like any scenario where resources are scarce, if there's a reason to exclude you, it will be taken. All else being equal—someone who spends time as an activist in some way, is going to be looked at with suspicion. The incentive structure, in other words, does not encourage young people to branch out in these ways. And I don't see how to change it, actually, as much as I would like to.

Ap1.4 The Pressures of Academic Life

Many scholars feel oversubscribed in their academic obligations and commitments, in part because academic job parameters are so vague.

> I think it's a particular problem of academia that one is always uncertain about how far one's responsibilities actually go. And so you're never finished. You don't have a job description, really. I find that I spend 40 percent of my time doing things for other people who ask me—proposal reviews, sitting on committees, all that kind of stuff—at least that much, maybe 50 percent. Even if you say no to 80 percent of those things, on the grounds that you're too over-subscribed, you're still too over-subscribed.

> I look at our students and…everyone's rushing around trying to do the latest, greatest thing, publish, get on top of astro-ph, whatever, and are lacking the care that's needed really to be scholars in many ways. It's a blanket statement that is, of course, not true of everybody. But, as a general sentiment, there's less understanding and more rushing. And if you're out to make money that's fine, because there's a goal, that's well-defined…All these companies, everyone's goal is to make the most money and have the highest stock price, and whatever. The currency is known. But the academic currency is much more diffuse…But, we're caught up in this rat race and I don't know what we're chasing.

2. CHALLENGES AND OPPORTUNITIES FOR DISSEMINATING RESEARCH: WHAT ARE YOUR CRITERIA FOR CHOOSING A MEDIUM?

Observational and theoretical astrophysicists choose to publish in the most selective peer-reviewed journals appropriate to the desired audience. Given the small size of the field, astrophysics has relatively few refereed journals. Most of the journals are published by professional societies and, compared to other fields, have high acceptance rates. Similar to economics, a strong pre-publication culture enables scholars to get well-developed articles into the public domain. The arXiv, an online preprint server developed by Paul Ginsparg in 1991, serves a number of fields, including physics and astrophysics ("astro-ph" is the astrophysics section of the arXiv). The arXiv runs in parallel to traditional journal publication, though the journal article still remains the formal, peer-reviewed version of record.

The scholars we interviewed did not identify a crisis in scholarly communication in astrophysics. The preprint system precludes the slow dissemination of work and turnaround time by journals is relatively fast in the US. There were some concerns that the formal editorial and peer review process is overburdened. Preliminary peer review by the academic community can be elicited on papers posted to the arXiv. Publication of data sets and high-quality graphics is common practice, often produced in supplementary online material. The launch of a few online-only journals has had little impact on the field, probably because astrophysicists do not appear to face difficulties publishing through traditional means. Open access has long been integral to dissemination practices, so concern about open access as a final publication model is deemed irrelevant.

Ap2.1 Criteria for Choosing a Publication Outlet: Prestige, Peer Review, Audience, Speed

Prestige

Astrophysicists choose to publish in the most high-impact prestigious journals. The more select a journal, the more stringent the peer review is perceived to be. The flagship society-owned journals have a high level of integrity, according the scholars we interviewed. There is substantial agreement regarding the ranking of top-tier journals, which include: the *Astrophysical Journal,* the *Astronomical Journal, Monthly Notices of the Royal Astronomical Society,* the *Astronomical Society of the Pacific,* and *Astronomy & Astrophysics*.

> Astronomy is unusual in having so few journals…there has been a definite pecking order internally about where you publish to establish your place in the field. And globally the place to publish has always been the *Astrophysical Journal* published by the University of Chicago Press…approaching the same distinguished level is *Monthly Notices of the Royal Astronomical Society* in England…The *Astrophysical Journal* is considered the top level…there's very strict peer reviewing, and a paper published there is considered to have gone through the gauntlet. The second journal in the country is the *Astronomical Journal* published by the American Astronomical Society, and it's not quite at the same status, and then there's the Astronomical Society of the Pacific…And they have a journal, and that's definitely the third rank, and that's it…There's some little journals that are not of much significance. In Europe, there's a journal called *Astronomy & Astrophysics*, and again, that's next tier. Then there are some regional national journals, for national prestige or whatever—the *Japanese Astrophysical Journal* and one in Australia. Mexico has a journal.
>
> Astronomy is blessed by the fact that it has very few active journals. There are about five of them and then you add planetary sciences and that adds a few more. There's not exactly a big choice…there are two journals that have a little bit more stature than the others, but they're all respectable. In the United States, if you have a major piece of work, you publish it in the *Astrophysical Journal*. That's our premier journal here. And if you are working abroad, you might choose either the *Monthly Notices of the Royal Astronomical Society* or *Astronomy & Astrophysics*, which is a European journal. Then there's the *Astronomical Journal*, and finally a distant fifth is *Publications of the Astronomical Society of the Pacific*, which is for shorter, less consequential things.
>
> The journals in astronomy…they're pretty well known for research and, for whatever reason, have a label of high integrity…So there's definitely a hierarchy of journal quality within, say, astronomy-specific journals and I think *APJ* would be at the top. *AJ* is second and…somewhere in there are a couple European journals, and that's about it. Astronomy is not a big field…it does not have a big list of refereed publications.
>
> Even though there are only a handful of journals, I think there are definite, perceived levels of quality. I think that I tend to go for what are perceived as the upper level of top-tier journals.
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> I'm sure there was a premier journal for these guys [looks around the room at his established colleagues]…There's certainly a historic and continuing perception towards different journals of quality…There's the *Astrophysical Journal*, which has the letters and a main journal, and a supplements version, but they're all under the one umbrella. And then the *Astronomical Journal*, which I guess just has one standard format. And a third one that I've published in a little bit is called *Publications of the Astronomical Society of the Pacific*.

> I think that astrophysical journals have become the stamp of approval that this paper has become kosher—that it's passed peer review, and it's introduced into the official archive.

One young scholar privileges quantity of publications over publication venue, which may be because of the selectivity of most journals.

> I probably would be more concerned about the number of publications I was producing. I don't think I worry as much about where they're being published.

Audience

Ensuring that the content of an article is a good fit with the mission of a specific journal is deemed crucial and often the country/continent in which a scholar is located feeds into journal choice.

> There sometimes tends to be a small difference between the US astronomers and the European astronomers—in terms of which journals they publish in. If your team is very Eurocentric or US-centric, or if you have huge supplemental tables, then it goes to the supplement series or otherwise the main journal. If it is a paper related to techniques, you tend to publish in something like the *PASP*, which is the *Publications of the Astronomical Society of the Pacific*.

> I do a lot more astrophysical kind of things so I tend to publish in the *Astrophysical Journal* without giving it a whole lot of thought, to be honest. If I have a much more astronomy-related project, maybe I'll put it in the *Astronomical Journal*. If it is a student project, sometimes I'll put it in the *PASP*.

Occasionally, a paper will appear in *Nature* or *Science* when a scholar wishes to reach a wider, more general audience. Although publication in these prestigious outlets is ranked highly by some scholars, the small publishable unit can be a constraint for developing a detailed argument.

> I didn't mention *Nature* and *Science*. Once in a while there's an astronomy paper in those journals, but not very often.

> In the United States, there's a bias among scholars for the few United States periodicals…I'm writing a paper at the moment that we'll probably submit to *Nature*. People reach a more general platform publishing there.

> The size of your paper is a big limitation for us. If you want to get something into *Nature*, you really have to boil it down to one or two pages. A lot of the time in my research, I find that you need at least ten pages to explain what is going on.

Speed and acceptance rates

Similar to the biological sciences, competition and the fast pace of research in astrophysics (especially given the speed at which astronomical events occur) make speed to publication important. Long lag times are not a problem due to the coexistence of interim and final publication platforms. There are very high acceptance rates of papers in astrophysics compared to some disciplines.

> In other fields, it can take years to get a paper out. They are one percent, sometimes, to acceptance. I think astronomy has 95 percent acceptance, even in our most prestigious journals. We do not have difficulty publishing. Usually, it's just going through the rounds.
>
> The acceptance rate is very, very high, which is completely different from other fields where it really can be a few percent.

The publication process—from manuscript submission to actual publication—moves relatively quickly in the US. Journal editors have made efforts to decrease lengthy review processes by placing pressures on scholars to conduct timely reviews. Also, as a result of increasing speed to publication, scholars are reluctant to publish conference papers.

> There's a very fast turnaround time compared to other fields, is my understanding. Well, much faster than it used to be.
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> Journal editors are really concerned about the world changing—and they're not changing at the journal—so that's partly why they've pushed so hard to speed up the publication cycle. They realized that very slow turnover was hurting them. People simply publish things in astro-ph.
>
> Now you submit your paper and usually within a month you have a referee report back. If you respond to it in a couple of days and everything works, you're out there within two months, often. The process used to take a year…You get pressured a lot more upfront, "Do you agree to referee this by this date?" And then they start pestering you pretty hard. So our culture has just slightly shifted. I used to hang on to papers forever.
>
> The rate at which people are publishing genuine papers in refereed journals is so fast in astronomy that nobody can be bothered to write conference talks anymore. The feeling is nobody reads them. People go to the conference, they listen to what you have to say, but they don't read anything that you write down afterward.

In addition, the field has witnessed a move by one flagship journal toward more frequent publication.

> The *Astrophysical Journal*, though, finally is now coming out every two weeks. It became a very big and fat journal, hard to keep up with, and about four years ago, it had to finally issue a second version, "Part 2," which is letters for faster publication. "Letters" means a nine- or eight-month turnaround. The main journal is a year. So this led to enormous preprint circulations, which, for many years, was by regular mail…But, now, of course, all of that is done through the Web circulation of preprints.

Nonetheless, according to a graduate student we interviewed, lag time is slower when submitting to the larger, more prestigious journals.

> There are a couple of famous journals—*Astrophysical Journal*, *Astronomical Journal*, and there are also some smaller ones, like the journal of the Pacific Astronomical Society. So those are the big ones and the small ones. There are pros and cons for submitting to the big ones and small ones, depending on how fast you want to get it through the review process. The big journals usually take longer…Time turnaround is a big issue.

Ap2.2 Perceptions of the Publishing Environment

Peer review

Archival publications remain the version of record because they have undergone stringent peer review. As in other disciplines, the peer review process can function as a filtering mechanism for selecting what to read. Peer review often begins with a posting on the arXiv, but final formal peer review is still seen as essential by most.

> Fraud never happens in our field. What would be the percentage of my publishing the wrong number? "People are going to find that out. I will be exposed quickly." Even if the result is boring, in which case I don't profit, or it's a very exciting result, in which case it is quickly checked. There's no win. But, in these other fields, I think you can stir up controversy…I think there is still a need for the refereeing process. It keeps us honest. It's like the policeman on the road. If we took all policemen away maybe somebody like me would be a less good driver. I hate to admit it. So we do need the occasional kick, to keep us on track, but we don't need constant monitoring, which other people in other fields seem to need.

Established scholars often make their own judgments about new scholarship without relying on the prestige of a journal, citation indices, or the like. The small size of the field facilitates this process. Finding a balance, however, between filtering scientific research findings without quashing new talent is important.

> It just makes no difference whether papers appear on the arXiv or are published anywhere else, and whether they are refereed, because I use my own internal refereeing process to decide what's good and what's not good, because I'm an expert. I know who's who. I know this guy's a crackpot and this guy's great, and so I judge for myself what to believe and what should I read.

> In a sense refereeing goes on now at the individual level. As far as progress in the field, you read a paper and you referee it yourself in a way. If you're working and doing research in the field, you look at it. If you think, "There's something wrong here," then you write a letter or send an email to the author and say, "I don't understand why you said this. What's going on here?" So papers are sort of instantly refereed by maybe 50 people who are working in the field, who will say, "What's going on here?"

> You somehow need to distill down publications. On the other hand, there is this potential of missing important new things from somebody unknown—an obscure person from an obscure place. On the one hand, we say, "Isn't this great? Technology is flattening the world. So then smart students in Bangalore and North Dakota and wherever do just as well as students at Caltech or Harvard or Berkeley." But, on the other hand, how are we going to know? They can submit their preprint to arXiv server, but we'll say, "Who is this person?" And that may be a new Einstein. This is where the old boys and girls club of peer review will fail…So somehow we need to allow for the penetration of genuine new ideas—because technology and data explosion are flattening the playing field. The talent is spread much more widely than money. Somehow, we need to do something about it…Suppose there is a brilliant young fellow somewhere in China, who is just writing first-rate papers, and I've never heard of this person, and, consequently, I won't read it. We need some new way of validating quality or interesting publications that would actually work.

An overburdened peer review system

The numbers of scholars and papers have inflated in recent years, adding more pressure to an already over-stretched review system. As a result, scholars often lack the time to perform refereeing duties and the referring process itself can be slow and uneven with some poorly written reviews. Despite criticisms, peer review is seen as "value added" in most cases. Younger scholars may be more dissatisfied with peer review than their more established colleagues, however.

> Peer review, by all accounts, has been declining in quality and utility for many years now. And I would say a large part of that has been the inflation of the number of scientists— and papers per scientist that they have to write. Then there are the usual problems: Some people are sloppy and others are a little too nitpicky. And editors, of course, have to suffer through all this. So there are all these problems with peer review. But once there is an effective communication venue that everybody looks at, like an arXiv, who needs peer review? Now, this is, of course, not true, right? Peer review should be scholarly quality control. But the way it's been conceived does not scale to the production levels that we see in sciences today. People are just too damned busy to do it right, and this is a real problem. Now, I can judge what's interesting and what's not in my field, or what I should trust and what I shouldn't trust. But a young graduate student doesn't have that experience and doesn't know who to trust. That's one problem.

> Peer review is intense. Everything is peer reviewed. All of these journals have referees and we've all been referees. And sometimes they're good and sometimes they're infuriating.

> A lot of my generation is not happy with peer review. I'm more of a tough guy. I prefer it, I'd say, more than most of my generation. They are not happy because of the absence of quality refereeing…For me it's that…not even by 50 percent do I get value added. I get more value by posting on astro-ph ahead of time and distributing it by email. When I submit it now I definitely take the advantage to submit it to the top ten pundits in the area and say, "If you want to comment, feel free." I think my level of griping over peer review is not that different from anyone my age or older. I think most of us now are used to seeing just a range of referee reports and acknowledge it's an imperfect system.

Peer review has deteriorated over recent years due in part, according to some, to a lack of editorial involvement by some editors. Similar to the biological sciences and economics, rejected papers can be submitted to different journals until accepted. High acceptance rates in astrophysics, however, makes this process rare compared to some other fields.

> Peer review is stochastic. It's entirely unpredictable. I've got over 100 papers written and published. I can't predict when I submit a paper how it's going to be judged, and that's because of just how random the refereeing process is to some degree. Sometimes you get very positive, helpful comments on a paper that I thought was very controversial. Sometimes a very benign paper is seen as stepping off the deep end. It's not really disillusion, but it's stochastic and random enough that there's no guarantee that going through the process is going to improve the paper. And I think on average you have some improvement, but there are plenty of times where you've got to struggle with it—what is probably an un-expert referee—and it's just not that fun. It's also tough for the editor; a lot of papers are written, a lot of people have to serve as referees, sometimes not in their primary field, and they don't always get the right match. I think maybe what's lacking to some degree these days is a more powerful editor system. The editors of these journals are pretty knowledgeable astronomers. They don't make as much of an effort to impose themselves as they could—and as I think they

> used to in the referee process. They're more apt to rely on the expertise of the referee and whatever he or she says, they accept that at face value. I don't know what has set that policy for the past decade or two, but it would certainly help the system if the editor took a stronger role in the process.
>
> In my own experience, most reviews are mildly useful but contain many red herrings as well. A strong journal editor with good scientific judgment can make a huge difference in how painful the refereeing process is for both the referee and the author. The worst case is when the editor just lets the referees and the author slug it out over multiple reviewing cycles, without intervening.
>
> Sometimes the scientific editors play a big role in determining a publication venue and their experience with the refereeing process.
>
> It's hard to make the peer review process faster when you only have a certain amount of experts in the field.
>
> Peer review is basically an endurance test, at least in my field, where if you are willing to resubmit your paper enough times, it will get published no matter what. If you wear out referees enough times or wear out the editor, anything will get published. The publication rate to the fraction of submitted papers must be very high. The only papers that don't get published are just authors who decide it's not worth pushing it anymore.

Ap2.3 Alternative Filtering Mechanisms/Pre-Publication Peer Review/The arXiv

The premium placed on speed in the field has enabled the arXiv (which includes astro-ph, the astrophysics section of the arXiv) to robustly support informal communication practices; it enables scholars to circulate current findings online for comment and keep up to date with the most recent scholarship.

> The reason why people go to the arXiv preprint server, and don't wait for the review in the real journal, is that the preprint is available now. The printed version will be available a year from now, and who cares? And time is of the essence. So you have this extra hurdle that, if you're going to have real peer review that's actually useful and meaningful, it has to operate in real time. And, if somebody were to call me or to email me and say, "Hey, can you please referee this one today?" I would say, "Sorry, I'm too busy. I'd love to help. Maybe next month." That won't work.
>
> The majority of people working in astronomy find new publications from looking at the preprint arXiv instead of from published physical journals anyway. So, for probably 95 percent of the papers that I read, I have no idea what journal they've either been published in or submitted to, because that's not the way I find them.

The advent of an online preprint server has resulted in a democratization effect on the field; hard copy preprints that were traditionally mailed to a select "few" have now been replaced by wide dissemination.

> So the arXiv has really made communication a lot easier, especially because before there was a preprint system where you mailed preprints to people, you had to be on the list. And there was an in-crowd that got the preprints, and now everybody who has an Internet connection can get them. Even when I want to look up one of my own papers, it's much easier for me to

> get it from the arXiv than to find it in one of these stacks of papers. So that's made things tremendously easier.
>
> The arXiv has really transformed scholarly communication as far as published papers in physical sciences. There are obvious things—like access—so that people in a small school in India can easily go and see what's going on, that kind of thing. The world really is much flatter because of all these technologies.

Pre-publication peer review

One benefit to sharing work on the arXiv is the early ongoing review conducted by the community. This can act as an intermediate step in the peer review process before papers undergo "expert" peer review provided at the journal level.

> The arXiv is seen as the answer to how we might move scholarly communications forward…arXiv was an addition to peer review. It's more the preprint stage than the journal article stage. While those two things—the journal article and the preprint in most cases—are the same, the people who publish in general think of them as two different items. Publishers now have started—and this has been going on for some time—accepting preprints via the arXiv as submissions into the peer review process. It's not a replacement for peer review, is really just another step in the process.

Preliminary review is not a complicated process; the author of an arXiv paper can solicit public review by the academic community by providing an email address. There were differing opinions about the degree to which feedback by the community is helpful in the revision process. The introduction of a commenting function on the arXiv could be a step toward more public vetting.

> You just send me an email…there is not the public vetting…so somebody can't comment on the comment. You don't get Joe Schmoe, who is in some completely differently field, sending an email saying, "I think you need to include my latest theory of cosmology" or something. You get people who are in the field sending you emails and that's usually useful.
>
> What's nice about astro-ph is, to some degree, if you post your paper at an early stage—while it's being refereed, say—all the experts in that community can read the manuscript and offer, not anonymous, admittedly, but comments directed to you, and those often prove to be as valuable as the anonymous referee comments.
>
> I always submit my article as a preprint to the arXiv as I submit it to a regular journal, because usually I get more interesting feedback from other interested people who are reading it, than from the referee who is actually assigned to referee the paper. I guess that's the way I proceed.
>
> I put something on the arXiv and within a couple days I get interesting comments from people. Some of them just want to be cited but others actually find something interesting to say.
>
> Usually there are a few emails that are mildly helpful. I haven't had any a-ha moments because of the emails, but they've been helpful.

High levels of accuracy in publications

In this high-paradigm field, the vast majority of material posted on the arXiv is considered accurate. The quality of the preprint papers can be equivalent to those published in archival journals, though peer review improves the paper somewhat. Although papers posted on the arXiv go through a minimal review process, questionable content can still be posted.

> Ninety-nine-point-nine percent of the stuff on the preprint server in astro-ph is correct. So it's nice to have a refereeing service to catch things and improve papers, but the field would not fall apart through people publishing wrong stuff. The biologists didn't think that was true; they thought there was a significant fraction of wrong results, and therefore their hierarchy of journals is important. Our journals are flat, because everything is correct. Their hierarchy of journals represents the most reliable researchers and results at the top. I think there are huge differences between the biological scientists and the physical scientists.

> This sort of self-policing of the preprint arXiv and server has worked in my field. There are very few junk papers…You occasionally get some crackpot posting his paper there, but I really don't think there's a significant difference between the quality of things that get posted on the preprint server and what ultimately ends up in peer-reviewed journals.

> There are some people who think the arXiv is ridiculous, and just incites competition, and refuse to post their papers there. So a lot of this culture…is the younger people who are slaves to it. I don't read it every day. As I said, if I have time somewhere, I'll sit and look at what I've missed, once a week barely. I think that's pretty good, but, I have my own science and my own things to do; I can't be so caught up in what everybody else is doing all the time, whereas I think you see that culture, particularly in our graduate students—there's so much crap on it.

A recently tenured scholar posed the possibility of forgoing the traditional route of formal publication in favor of the arXiv postings. But such a strategy would only be possible for scholars unconstrained by tenure requirements.

> The decision that we haven't talked about yet is…like physics we have an abstract server, run through the Internet, where people post their paper at various stages of the publication process. They might publish it there before they even submit it. They might publish it when they submit it. They might publish it after they get their first refereed report. They may wait until it's been accepted. And some people have started to say, "I'm not going to even bother ever publishing in a journal again. I'll just post it to astro-ph and let that be."

The role of endorsement and voluntary moderators

In order to post a paper on the arXiv, authors have to be endorsed by a member of their community to prove they are a legitimate scientist. Voluntary moderators, representing various subject communities, then perform a review of posted material. This is not peer review *per se*, but a first filter and a check that a paper is not pseudo-science.

> The endorsement is part of that system as well. Essentially arXiv represents the community of scientists that are involved in those subject areas. So in that sense it's kind of like a bulletin board in that it's a community affair. The endorsement system involves people who are answering essentially to the community. We ask that if they have not submitted in the past,

that they get an endorsement from someone who is a member of the community. In this case, the endorsement has to do with, "Is this person a legitimate scientist?"

First you have to register in order to submit a paper, so you can't just be any old person, writing obscenities or anything. And they will block papers. There are instances where you could write a paper that aggressively challenges an earlier paper and I don't know the details, but apparently such papers are filtered out. So there is some control, but it's remarkably loose. If it's a scientifically valid paper that's not been refereed it will appear there. But that's the only thing that goes there.

There are moderators, which is not a well-known fact. People don't know about the moderation process that takes place. Volunteers from the various subject communities take a quick look at the material that's submitted to arXiv to ensure that it really is good enough science. They're not doing peer reviews, they're not saying this is good, this is excellent, or this should be published, but they are checking to ensure that this actually is science, and not pseudoscience. The material is submitted through the arXiv software, and then—this maybe is changing—there are several people in each subject area who take a look…so for example, at the author or the title, something like that, some parts of the submission to ensure that it is an appropriate scientist and the subject matter is appropriate to their area. A number of people who submit, who think that they should have all their material accepted, have not had material accepted.

Now, submitters can choose whether they want to post a paper as soon as they submit it to a journal or wait for the referee's report first—or whatever. Of course, some people can try to put out papers on UFOs or whatever, but they filter who can submit. If you come from a .edu, you're probably okay. And sometimes crackpots do post things, but, by and large, the system seems to work okay.

The utility of a preprint repository and a glut of information

Some form of peer review is necessary to cope with the abundance of literature, which is exacerbated by a growing preprint culture.

The arXiv has just revolutionized how we communicate, because it takes months or a year to publish a paper in a journal. You can literally go to the library these days, to the associated physics department, and you can see that the journals changed color around 1992 because before 1992 they were heavily thumbed through. No one reads them anymore. It's nice, and it's good for tenure and promotion to get accepted by peer review, but everything is done through the arXiv online. The downside is there are too many papers. Now I have over 50 abstracts to read every day, because I'm interdisciplinary, so there are too many things to do.

By far the most effective means to get your work out there in my field is the preprint server arXiv. Ultimately, that's where you publish things. No one ever breaks out the *Astrophysical Journal* anymore, or if they do, it's only because it's a sort of archive of the final version of the paper. Everything that is current you read from the preprint server…I think it's nerve-wracking, actually; you read these 50 abstracts that get to sent to you every evening and it's just a constant feeling that there are all these things happening and you don't have time…In your ears, "Oh, I have to finish this project before it becomes past its time, and all that." And so I think the improvement in communications and dissemination of results, it probably leads to progress in the field, but…I find it nerve-wracking, compared to when I was a graduate student, where if you got preprints, you would get them by mail or you'd read them leisurely in the library. I have not gone to the library for years because there's no reason to go there anymore. Every journal in this field is available online going all the way back as far as you

> would ever need to go…I have weeks—a week or two—where I don't look at preprints at all; and then I try to say to myself, "Well, I'll go back and look at them." But I've felt like I'm increasingly at sea and just drowning in things to do.
>
> Astro-ph comes out every day, and it's tough to maintain even reading the 40 new papers, looking them over quickly every day. So I don't even necessarily keep up with that.
>
> The literature in astrophysics is not distilled yet. It probably needs to be. Roughly 35 papers are posted per day on astro-ph. I endeavor and always succeed to read the title of every posting and the abstracts of those that I find interesting. I never go to *APJ* and look at their listings. I never go to any journal and look at its listing of new papers. I never take advantage of that—the fact that papers have been peer reviewed—and what is published is therefore distilled.
>
> Like just about every active research astronomer, I look at the arXiv postings every morning. I actually get an email that gives me the titles and abstracts, but I never look at that email. I go to the website, which is linked to my page right away on the new stuff. I scroll down the page, I maybe look at 10 abstracts out of the order of a hundred or something like that, 10 percent of the total. I maybe print one or two of the papers. Then, since I printed them, I feel good about it. I might actually read them, but I might not. But that's how I get informed of what's going on…And that is market-driven. You choose what it is that you want to read…But that requires your expert judgment. That might work in a relatively small-sized community like a physical science, but in the field of biomedical science, where there are literally millions of papers published per year, that doesn't work.

The future of peer review

One scholar suggested that sophisticated online platforms for community-based peer review could be the future, regardless of the arXiv.

> I can also imagine that in the future things would change. There are now things called wikis where you can put information and can contribute—whether it's Wikipedia or whatever—where you put the paper in and people can comment…They don't have it yet…but, in the future, you could put the comments in and say, "Hey, this is wrong or this is right," and someone can debate that issue. And you can imagine just a very different flow, so it's almost got this internal refereeing…of its value, by community. For us, we've always thought that papers should pass at least one threshold.

Ap2.4 Capabilities and Affordances of Publication Models

As a data-rich field, data publication is *de rigueur* in astrophysics. The ability to access data is crucial and can take place a number of ways. Online technologies enable existing publication models to provide data sets and high-quality graphics as supplementary or supporting online material, which can be particularly attractive to scholars not wanting to pay page costs. For instance, the *Astrophysical Journal Supplement Series* is published in conjunction with the *Astrophysical Journal,* supplementing the latter and serving as a data archive.

> The main journals have online data. *Science* calls it "supplementary online material" or "supporting online material," the *Astrophysical Journal* calls it something else. It can be basic data or, increasingly, it's fancy color graphics that you didn't want to pay the page charges to print.

> Theorists have vast amounts of data that they want to publish from computations, and anybody observing has vast amounts of data. The *Astrophysical Journal* has yet another journal called the *Supplement Series*. They publish a 100-page paper and it's published occasionally. The length of the paper, and the fact that it includes a lot of data that may not be what you might call all individually analyzed, can serve as a database. So, it is in the form of an archive, but there's always analysis and discussion.

Online supplementary data have undergone various levels of refinement and sometimes peer review, and are available to readers in a reduced form.

> Normally not entire data sets are published, but only the results. But the project that we are working on, soon we are going to publish the database…and so that will be sitting on computers most likely…there'll be Web servers so people can look at it, so that is what we'll be publishing and that'll be processed.

> Usually I post data both on a personal website, but also to the journal accepting the paper…I haven't really looked at the way that's disseminated…whether they disseminate it as a table or as an actual file, I'm not sure, But they have managed to ingest, not the raw data, but the top-level end product, and so this other site is connected to the journal itself.

> The data set is peer reviewed at some level. I don't think the referee actually downloads the data and looks at it in any serious and set fashion. I produced tables and figures that summarize the data sets, but that was the degree of review that they received.

In addition, scholars posting on the arXiv are not constrained by word limits and can post papers in their entirety.

> A big change that has happened since I started in this field is…I don't know what the percentage is…50 to 80 percent of papers appear on the arXiv, which is a completely open abstract server. And I will treat most of my papers that way…Well, the whole paper is published…and that's how I access most papers these days. So even if scholars publish in *New Astronomy* there's a good chance they're going to post it on this other server in the whole form, and you can still access it and read it and cite it.

Ap2.5 The Problem of Cost/Page Charges

In the US, flagship journals tend to be society-owned and have page charges, which can act as a deterrent for some scholars. In contrast, the UK-based *Monthly Notices of the Royal Astronomical Society* and some other European journals do not require the author to pay charges. These latter options can be especially attractive to scholars without funding.

> I probably budget $6,000 a year for myself and my students. They're all coauthors. People publish color things in the journals. *Monthly Notices of the Royal Astronomical Society* still doesn't have any page charges so sometimes people go there. If you're really impoverished, you can ask the mainline University of Chicago Press journals to waive your page charges. I don't know how many people do that.

> The American Astronomical Society, which is the professional organization under which most US astronomers are aggregated, set rates that are consistent and, more or less, other, more minor journals follow that simply to be competitive. And so it's certainly an issue for smaller journals where the overheads are the same. They have a hard time charging less, but there's

> a market rate. So there is not a huge disparity, but the foreign journals and *Monthly Notices*—it's still free.
>
> Another factor is just page charges—how much they want to charge for publishing your paper—because for a lot of papers that gets to be pretty significant. There are some that are completely free ranging to whatever it is for *APJ*—$120 a page or something.
>
> For us page charges are probably $5,000, $10,000 a year. $125 a page. It's pretty pricey. And it's no longer clear what the benefit is, I have to admit. I still do it because I do have the money for it but probably only that reason. A colleague published in *Monthly Notices* because it didn't cost anything.

Most scholars use grant monies to pay for page charges. For under-funded scholars—theorists in particular—this can be a problem. Academic departments cover the cost in some cases.

> The *Astrophysical Journal* has very high page charges. It's over $100 a page. *Monthly Notices* has no page charges. So some people opt for it for just for that reason. But an additional problem is, if you were in the US, and you wanted to help your status or recognition in the field, you have to publish in the *Astrophysical Journal*—but you have to have the money. A lot of the partners can't afford to pay for, say, 100 or 200 pages of *Astrophysical Journal* publication per year, because they don't have that money in their department fund. If you don't have a grant you've got a real problem. The *Astrophysical Journal* or the University of Chicago Press, they are very hard-nosed. So they would say, "If you plead you can't afford it, okay." But they put you through the wringer.
>
> It's just the way the system has been set up. The NSF, for example, could say, "We will subsidize X number of journals." But astronomers basically publish through the referee process and that's it. NSF gives us money and assets, as well for publications. If they didn't, that would totally change everything instantly. If they were to say, "We will henceforth not pay anybody to publish papers in scientific journals that are refereed," overnight it would change.
>
> You often see theorists in the US publish papers in *Monthly Notices* because of the lack of grant support to pay page charges.
>
> There's one established journal—*Monthly Notices of the Royal Astronomical Society*—that has no page charges. If you don't have any money for a particular project, you publish there. It hasn't hurt its reputation any. It's still a very well-respected journal.
>
> Americans like to publish in the *APJ*. But *Monthly Notices* has no page charges. If you can't pay the page charges, which are on the magnitude of $100 a page, then you might opt for *Monthly Notices*, although probably you will have a longer wait. I think they have a bit more of a backlog, but they're a good-quality journal.
>
> In my experience, the cost is always covered by the department and it goes by page count. And then you have to pay extra for color figures and stuff like that.

Page charges are ploughed back into financial support for various scholarly society activities, such as raising the public profile of the field and supporting conference meetings. Publishing in online-only journals or posting on the arXiv exclusively would only serve to undermine the good work done by the society, according to some.

In astronomy, there are no for-profit journals. There's Springer, in Europe, but their journals publish more review, specialty, and interdisciplinary articles and not so much mainstream astrophysical research by US authors… The page charges that the main journals collect are used to support the activities of the profession and the society. So they help with meetings, and presence of the AAS in Washington, and various activities supporting astronomy in the public eye. So that's good for all of us. By paying our page charges to publish our papers we're contributing to the public presence, the public face of astronomy. So if everything is done through the arXiv, and if a lot of these little start-up journals take off because people don't want to pay page charges, it can be net bad for the organization of astronomy. Change the business model and you destroy the good things. It's not somebody collecting money because they want to charge you; that money actually goes to the benefit of the profession.

I forget exactly how scholarly societies interact with the journals. I don't know if they help fund them, but I bet they do. What other roles? Societies advocate autonomous astronomy policy on Capitol Hill. That's probably their main role. They organize mass national meetings, grants, prizes, and a few things like that.

Part of me says why not publish in the online-only journal *New Astronomy*? There are probably no page charges. A big burden in astronomy is we have to pay to get our research published…we have to pay a lot of money…The main impediment, I'd say, to the traditional journals are page charges. It costs money to publish, whereas this other journal is free, I believe. The page charge monies aren't super cheap. They're $2,000—or maybe not that much for a paper. And people have just gotten accustomed to writing that into their grants and having those funds available. There are a few others, a couple of European journals, *Astronomy & Astrophysics*. Those are free as well. And so American astronomers who are not willing to pay the page charges do submit to those journals…I think the turnaround time is not often much longer.

Ownership of copyright

Some journals are more stringent about copyright than others, which can be particularly problematic for a field with a strong preprint culture. Scholars' perceptions vary as to whether top-flight journals condone simultaneous online posting of a paper.

Science and *Nature*, which are in some sense the prestige quick publication journals, will have a fit if you post anything online ever because once it's published, it's copyrighted. They want you to pay to get it…They're at the extreme. The University of Chicago Press, which does several of our journals—I don't know what their official policy is—but people usually won't post a paper until they've actually submitted it. You don't post preliminary copies.

Well, *Nature* is the only one anti-authors-posting on astro-ph and they even have acquiesced at this time…There's some press rule—but aside from that, scholars are allowed to post to the abstract server…Copyright hasn't been an issue for me. Who knows? I could be violating copyright control on occasion, so I don't know those rules very well. It probably would pay to have some knowledge here, but I don't think there are copyright issues in astronomy at least. There's no money to be made in most cases.

For astronomy, copyright is not an issue because our data are commercially worthless. But you can imagine in some biomedical research, or engineering, patents are a huge, big mess.

In years gone past, there was a long-term editor of the *Astrophysical Journal* who actually elevated the status of the journal. He won the Nobel Prize. And for long-standing tradition, until it was accepted for publication, you could make no announcement of it, and, in fact, you

couldn't even issue a press release until the day of publication. The editors were very fanatical. That's all gone by the wayside now because people aren't going to wait a year.

So I think that the physicists, the hard-core particle physicists, may use arXiv differently from the way we do, because some of the astronomy journals won't let you post until it's actually published, some won't let you post until it's accepted, and some don't care.

The arXiv has run into a couple of journals, publishers who are not happy…If something has been published and then the author wants to post it on arXiv after publication, and its in PDF form, the arXiv is very careful to check what the publishers' requirements are. There have been several publishers who have suggested that things be taken down. I'm sure there are publishers who would not permit scholars to put anything on arXiv until after it was published. It tries to be very careful about copyright.

Ap2.6 New and Emerging Publications Models

Online-only journals

Publishing in astrophysics seems angst-free when compared to other fields. There are very few online-only journals in astrophysics, and those have not met with great success. Elsevier's digitally borne *New Astronomy,* for instance, has failed to attract the top scholars in the field, despite boasting an impressive editorial committee. This lack of interest could be attributed to an associated newness of the journal (which equates to a lack of prestige), the small size of the field, and/or an already high acceptance rate by traditional archival print journals.

I think somebody was trying to found an electronic journal but I obviously don't use it. It's so easy to get stuff into the regular journals that there's not that much motivation to switch.

I guess there's *New Astronomy*, which is a purely online journal. There's a new set of online-only journals and *New Astronomy* is one of them…they did everything right to gain immediate prestige equivalent to the older journals, but somehow it hasn't happened.

So we're more small-time compared to a lot of other fields. But there are lots of start-up online-only journals. I don't think many of them have gone very far. There's *New Astronomy,* which is still around…Astronomy is a small field relative to many others and there are only a few major journals; a couple in this country and a few others in select countries.

New Astronomy is not high-level. The editors are prestigious. The people involved in the refereeing or the managing the journal are prestigious…there are some online-only journals. I haven't tried those myself, but they do exist, and they're just not that popular…I think it's driven a lot by the editors. I know one of the editors has a strong background—he does computational math and physics—and I think he's had a few people in his community use that journal. So there are quite a few papers in computational astrophysics. I think he's been successful at getting some people to go along, but it's not caught on. It's been around for several years now, maybe five.

Open access

Open access publishing is not perceived as revolutionary. In fact, astrophysicists appeared somewhat blasé about the concept.

> I wish there was a culture change where physicists appreciated being followers of the Internet more than they do. There's a huge irony because physicists like to think they're responsible for the Internet. The World Wide Web was put together at CERN. And, of course, the arXiv was started by physicists. Physicists look a little puzzled when people start talking about open access publishing, like "I've been doing this for years, what is the big deal, just do it, quit talking about it."

> Astrophysics is not like engineering or biology or chemistry or medicine where there are hundreds of journals, open access stuff, and it's just about getting the word out. There are a few respected places to publish and that's mostly where it happens. That's not to say there aren't other venues, but there's a gold standard that's set, and there's no real bucking of that trend just yet…So I don't think we're in danger. There's certainly a threat of open access. I know it's huge in other fields. We're sort of immune to it now. But I must have gotten four emails last week about this or that journal, asking would I be on the board of editors of some new journal, and there's a lot of this going around. They're trying to get into the astronomy market and I don't think anybody is biting yet.

3. HOW DO YOU SHARE YOUR WORK WITH OTHER SCHOLARS AND KEEP UP TO DATE IN A FIELD?

Astrophysicists frequently share early-stage ideas and data, and sharing work occurs incrementally prior to formal publication. Scholars initially discuss preliminary work informally with colleagues and students, and circulate drafts to a trusted circle of scholars, often by email. Typically, scholars present polished work formally at colloquia or conferences. As work becomes more refined, the formal mechanism used by scholars to publicly share their work is the arXiv preprint server, often in conjunction with journal submission. The network of peers that flags papers of interest and attends conferences to discuss research is often composed of the same individuals. Data sharing is common practice in the field; data are published on personal, project, and journal websites or made available on request. Data can also be accessed through observatory archives, which typically become publicly available after a twelve-month proprietary period. Although listservs are widely used by scholars for both sharing information and keeping up to date, there is little indication that blogs or social networking sites are being adopted for scholarly practice.

Ap3.1 The Importance of Informal Networks

Before early ideas are spun into a well-developed preprint or journal article, they are shared informally with a network of subfield experts through either face-to-face meetings or email. Hallway conversations enable scholars to bounce ideas around with colleagues, and further exchanges can occur during sabbatical visits and colloquia. Since collaboration is common practice in observational astrophysics, collaborators, including (former) advisors and advisees, constitute the core of a scholar's informal network.

> It's a fairly even mixture between having people right here…having my students across the hall or my other colleagues right down the hallway, or email.

> I have a network of people often competing with me whom I trust. Obviously, I have friends, I have people who I'm a little worried about, who are competing with me. Generally I will send my papers to them for comments via email. I usually would submit it for publication first, but

> occasionally, if I feel a little insecure that I'm moving into an area where I'm not an expert, then I will get their comments first. They do the same; they send me papers and say, "Will you be interested in this?" We have sabbaticals. I go to give colloquia. If I go to a university to give a colloquium, I will do the rounds of the professors in that department. I will give them copies of my work and I'll listen to what they're doing. Traveling is an important way of communicating, emailing preprints to one another. Very rarely would I pick up the phone and discuss something with somebody, unless it's a proposal. So I think we're using email as the communication medium, and travel.
>
> Most of the things that I publish in a journal are published long after I have discussed them in meetings and acquainted the people who would be most concerned with the results of it.

Limited time can be an impediment to discussing current research with colleagues.

> I'm not saying I have a problem with my colleagues. It's just that no one has any time. You go to other places and people will sit around for an hour in the morning in the coffee room and talk about things. It's extremely rare, at least outside of the theorists, to do that because no one has time. I think part of it is just the improved communications at every level, which have made it impossible to ignore the pile of things that you're supposed to be doing at any given moment. And I find myself always playing catch up. I never feel like I have a free moment to do anything at all. So, part of that is that it takes a good solid two hours to answer email on a daily basis. And, one of the things I tell younger faculty when they first arrive is the most important skill to learn is how to do a barely passable job on 80 percent of the things that you're asked to do, so that you can do a good job on the other 20 percent. Most people are trained to try to do a good job on everything and you just kill yourself these days if you try to do that.

Some established astrophysicists consider junior scholars valued resources for keeping them abreast of the field. In addition, "journal clubs" provide a forum for scholars to get together to discuss topical papers. Both face-to-face and email communication is essential for such interchanges.

> I rely on colleagues to send me a quick email about papers that have come out. I rely on students, as much as they can, to keep me abreast of the literature.
>
> Most of my collaborators are either current or former graduate students. We stay quite close in that sense. I have one collaborator in the UK and, of course, we exchange things all the time.
>
> One thing that I did this morning, because it's freshest to remember, I saw that there were five new papers today in a field in which I'm not an expert. But I'm interested in that, and I have a colleague who works on that, so I immediately sent him an email, "There are five new papers, I don't think I'm going to get to them but very likely you are, so maybe you should tell me if there is something really outstanding." So that kind of communication also happens.
>
> So the way I keep up to date is twofold. One, I talk to my colleagues and my students. So we regularly meet and review what's happening. Once somebody goes to a conference, we gather to make a report—especially if I'm paying. And then we read the preprint server. I read it every day, so I print it out, here it is. Here's today's, and all of these are the articles that appeared this morning. I highlight the ones that are of interest and then I file them and then when I go to a conference I digest everything that's happened in the last, say, three months. Technology has changed this. I can do all this in my office. I can download these papers off my laptop on the plane. I can browse them before I go to the conference. I still regard the

conference as my opportunity to catch up and I know that if I'm going give a review talk, everybody expects me to be up to date. I'm going to give a review talk next Friday and I haven't written it yet. What I'm going to do is swallow what's happened in this area, with this preprint server, download those relevant papers, and even use figures in those papers—which I can extract from the papers—in my talk, to present as if I'm completely on top of the literature.

I think most of us look at the arXiv preprints at least once a week, if not every day, and it's kind of changed the sociology. We used to have various things that we tried to get our graduate students to do over coffee in the morning with the faculty, and one of the things that's clicked all over the country is having a morning coffee periodically, whether it's once a week or once a day, which discusses three hot arXiv papers. So that has really made quite a difference in the culture, as well as the more routine things of how you actually proceed when you're trying to do research on a specific narrow topic.

Right now I would read almost nothing, because I'm too busy. I'm relying a lot on our graduate students and postdocs. I attended a journal club here today. There were three papers that were discussed, one of which I already knew about, but I actually learned a lot more today. We have coffee here every morning, four days out of the week we're discussing papers, and I try to come to those as much as I possibly can.

I really wish graduate students did distill information. I find that it would be really nice to depend on students to be on the lookout for important things that one ought to know about, but they don't seem to…well, most of them are so busy with whatever it is they're doing that they've become very narrow, I would say. I think that it's hard to say how efficient people are now with too many possible distractions—and I include the students and myself—because you're sitting there and you decide you need to go find some piece of information. And in the meantime, you go and read the *New York Times* webpage or whatever. And, it's hard to say actually how effective one's time is given that. But there's certainly been a change. I mean, we find that a lot of our students don't go to colloquia when they're not in the general area that they're working on.

Ap3.2 Widening the Circle: Conferences, Seminars, Meetings

Annual conferences hosted by scholarly societies help scholars establish a reputation, stake claim on a research idea, and meet potential collaborators in a public forum. Conferences provide young scholars with an opportunity to establish and grow informal networks, and enable scholars across the board to discuss their research more intimately. Some scholars noted that conferences have turned into "job fairs" for young people in the field and suggested the need for more scholarly exchange.

As you get older and have more teaching and you're sitting on telescope boards, you can't possibly go to all of these meetings. And so we have to be very selective. Conferences are key in astronomy, they really are. They're the place where people establish collaborations, they're the place where young people make their reputations, and even old people go to them and try to take them seriously…Astronomy has a phenomenal number of conferences. In my area alone there's something every month and you just have to be selective, but the younger people are finding that this is becoming the way that they get recognized, especially straight after the Ph.D. Get on the conference circuit. So people take conferences very seriously and the young people put a lot of effort into their talks. The older people like me tend to just recycle the old stuff and turn up and grunt and continue. But the younger people are really driving the conference progress.

> When you're young, there's no question you've got to go out and meet people of your own age and learn what's going on in the field, to meet the higher-ups who are going to review your case, so you can come up with new ideas. There are a lot of reasons to go when you're younger. If you're moving into a new field, you want to advertise it. A lot of times the older folk are just giving review talks and they're well established and they're invited to give more of a broader perspective on some area of research that they're obviously experts in. There's not a ton of value. At my age, in my career, it's diminishing returns at this point, maybe. I'm tenured.
>
> Going to talks does serve that purpose of keeping up to date quite efficiently for me. To hear 40 presentations in a few days, that gives you a pretty quick view of what's going on, usually in a pretty select area, but still that's valuable…So there are a lot of meetings, maybe too many in astronomy right now—special meetings. You could easily spend twice a month just attending meetings throughout the year, and people do…Well, not each month, but, last year, it was a busy year for me attending meetings…I had four separate trips to Europe and a couple of those were multiple meetings. I don't know, not 10, but more than five.
>
> The twice-a-year meetings of the American Astronomical Society have lost most of their usefulness. There are too many parallel sessions, the talks are too short (talks are only five minutes), and the poster sessions are uneven. Sometimes I think that the main people who attend are those seeking jobs, those wanting to hire people through the AAS job postings, and the few invited speakers themselves. Instead, most people prefer to go to topical conferences and workshops where they can talk with researchers in their own fields on a more intensive basis.
>
> I find at conferences now that only some small fraction of the talks is actually telling me something new because so much has already appeared on the arXiv. But I certainly feel like I have to get to a couple conferences a year just to stay informed and for the networking. We keep in touch with people and start new collaborations. But also you still find out new things, because you actually get to talk to people and ask them questions and get more than is in the published work—find out what directions they're going in next.
>
> It used to be that you would find out what people were doing by going to conferences. But now, when you go to a conference, you've already heard about all the things that people are talking about from the arXiv.

Teleconferences

Despite a growth in real-time teleconferences, face-to-face networking affords a level of interpersonal interaction that teleconferences simply do not.

> A lot of people are proposing that with Internet video communication we won't need to go around giving seminars, we won't need to go to conferences, and things like that. And I suspect that's completely not true. I very much enjoy going to conferences to talk to people, to go to coffee breaks—and that's just not something that's going to happen online.
>
> I've attended a conference virtually a couple times and many talks do tend to be done in real time these days. It's not very convenient because sometimes you don't get heard and so on.
>
> The norm now is webcasting the talk and putting the PowerPoint on the Web, and that's becoming the standard medium for people who can't go to the conference. It works really well. I can sit here and effectively attend a conference in Baltimore just by looking on the

> Web. I can even ask a question. The space telescopes have been doing this for about two years now. It needs to be well managed to be effective, but I have seen it work.

Conference proceedings

Increasingly, in the US, conference proceedings appear online as a PDF file, especially since online dissemination is inexpensive and timely. Invited papers, in particular, are often published as a book or special issue journal. Although these tend not to undergo formal peer review, a low level of review does occur.

> Historically, at least, it was expected to get proceedings written along with the oral contribution paper after the meeting. That's becoming less the case…conference proceedings don't offer you much in terms of tenure or even advertisement…they're for getting your ideas out there. They're somewhat dismissed as they're generally not refereed and they're often a very short synopsis of the talk. So the written contributions are actually pretty weak. What's happening more is the talks are being placed online and some people are checking out what happened at the meeting by looking at the slide presentations on the Internet. I think the European folks still probably require it for funding…the European Astronomical Consortium, I have a feeling their funding agencies require them to request proceedings. And I've got a black mark on my name because I never do it.
>
> Until quite recently, most topical conferences published non-peer-reviewed conference proceedings, which researchers and libraries endeavored to purchase. There is now somewhat of a backlash against published conference proceedings since (a) you have to publish a peer-reviewed paper anyway, (b) they are expensive, and (c) they appear well after everyone has forgotten the conference in the first place. Some conferences and workshops are deciding to post PDF files of all the talks on the Web, rather than going through the trouble of publishing proceedings.
>
> If you have an outstanding faculty, they're invited to all kinds of meetings to give invited papers. Those papers are written up and usually appear in a book or some kind of a special issue of a journal and they're not refereed. These take a lot of time, and it's time where they present their original results…More recently, the conference proceedings and a lot of meetings in astronomy are actually published as a book, because the invited papers are felt to be like plenary session papers, distinguished addresses, and worth having as a permanent record.
>
> We actually read all the papers and do, maybe not the most critical peer review, but we do review them for obvious conceptual errors or things that don't make sense and have the papers revised.

Ap3.3 Open Public Sharing on the arXiv

As noted previously, the arXiv enables scholars to disseminate their work in preprint form to the academic community and stay abreast of the most current scholarship. As such, early sharing is highly centralized in astrophysics, but is not in lieu of a formal publication.

Timing a posting to the arXiv

Posting on the arXiv is typically not done in lieu of submission to a journal and can take place at a number of points in the scholarly life cycle of a paper. Often papers are posted to the arXiv simultaneously with journal submission and/or revisions (depending on journal policy).

> Everybody, without question, is now publishing on arXiv. The actual appearance of the article in a journal is almost a formality.
>
> Personally, I don't feel like I need to be protected from bad work by the peer review system. I would say that most people who do experimental or observational things never post on the preprint server until the paper's been accepted by the peer-reviewed journal, whereas theorists like to get feedback right away. If they have mistakes in it, they want people to point them out. But, generally speaking, there have been maybe only one or two exceptions in my whole career. Since we've been using this, I only post accepted papers. The reason to use it at all is that that's where people look. It takes six months or something like that for the thing to come out in a journal after it's been accepted.
>
> You send your paper into the journal, you get a referee's report, the referee says, "It's a wonderful paper except for the following 289 changes I want you to make." And so you make the changes and then you post that revision. In some parts of physics, people post the equivalent of astro-ph, arXiv stuff, way before it's ready for publication, and then get comments. That has not been my experience in astronomy or astrophysics, partly because of journal policies, I suspect, but partly just because it's not in the culture. I don't put a paper up on astro-ph until I've submitted it to the journal, so the revision process is mostly a response to the journal's referees, plus whoever has sent me emails in the interim.
>
> Some people refuse to put their papers on until they've been refereed and accepted. Others think—especially theorists—they often just put a paper on and say, "Comments welcomed." So the standards of peer review are being gradually eroded with this webpage. But we all read it.
>
> I think a lot of people submit their article to arXiv as they submit it to a refereed journal, so it appears there right away. I think some people wait until their article has actually been refereed and accepted.
>
> When a paper gets accepted in the journal, then I go ahead and post it to astro-ph and there it's accessible to everyone. Some people, in fact, post things to astro-ph when they haven't been accepted to a journal, so it's a little more of a wild and woolly landscape.
>
> I do put things on the preprint server, but not until they've been passed by the referee and accepted by the journal and that may be something that differs from place to place.

Strategic posting on the arXiv

Strategic posting on the arXiv is rife among scholars. Research indicates that articles appearing close to the top of the astro-ph list tend to receive twice as many citations on average as those articles appearing lower on the mailings.[48] Some scholars we interviewed noted that papers posted at strategic times could ensure placement at the top of the list.

> The cutoff, I think, is at 1 p.m. If you submit it just before 1 p.m. then you are going to be toward the end. If you do it after 1 p.m. and everything goes through fine, then the next day you'll be at the top.

[48] See, for example, Dietrich, J. P. 2008. The Importance of Being First: Position Dependent Citation Rates on arXiv:astro-ph. *Publications of the Astronomical Society of the Pacific* 120, no. 864: 224-228.
See also: Haque, Asif-ul, and Paul Ginsparg. 2009. Positional Effects on Citation and Readership in arXiv. *Journal of the American Society for Information Science and Technology* 60, no. 11 (July 27): 2201-2218.

> Posting on the arXiv depends on the order that it was submitted.
>
> The arXiv is like advertising; it's people trying to advertise their work, otherwise why is it there? And so there's all this scheming of who can be at the top of the listing. People were shocked when I told them that the way I search the arXiv or look at the arXiv, the article that they worked so hard to get at the top, was actually at the bottom. I mean, there are two ways of looking at it. There's a time, and you can go ask any graduate student here and they'll know what time to submit your paper to get it at the top of the list. It depends on whether you get the version with the abstracts or just the titles, in which case the listing is totally reversed.

Posting on arXiv can stake a claim to an idea, especially since posted papers are date-stamped.

> This introduces a number of puzzles. In astronomy, things are very competitive, especially discoveries. If somebody finds the most distant object or the lowest mass planet around a star, you know that there are three or four groups around the world trying to do this kind of work. And, often, an object will even be studied by more than one group, so certain satellites will trigger an explosion, like a supernova or a gamma ray burst, and everybody will be racing to get the first paper out from that intriguing object. So this archival server becomes the medium for unrefereed papers—that the idea is simply to put it on the Web as soon as possible, to establish your stake; it's like the old gold pioneers, just grab your stake, "I've got this." There's tremendous competitiveness. But what it does mean is that there's no standard on this archival server.
>
> Some of it has to do with the date stamping that is done. Much as data lab notebooks are indicators—or were—of whether a patent would be granted…for arXiv probably it's very important to some people because it's their idea, that they want it out, first.

Versioning concerns

Multiple versions of a paper can be posted, though only the most recent version of a paper appears on the arXiv. Authors are responsible for stipulating, via a statement, any changes or status updates (i.e., if it has been accepted to a journal).

> Once a paper posted on arXiv gets published in a journal, it's pretty unambiguous at that point, that that's the final version. That's up to the person to indicate on arXiv that it's been published in a journal. So, if you submitted it before it was actually accepted to the journal, then you probably have written into astro-ph that this is the submitted version, and whether you go back and put in the final version on astro-ph, or whether you say "no, it's been accepted," that's up to the submitter. I haven't been keeping up with that myself. I have papers that are submitted that are now fully in the journal and are accepted. So I do have multiple versions of papers out there in the online literature…I look at whether a paper posted on arXiv has been submitted to, or accepted by, a journal. So, yes, I absolutely take that into account.
>
> Basically astro-ph is just a repository of papers where the most recent ones are presumably submitted for publication or haven't been published yet. But people leave their papers on there endlessly, so most of the papers in previous years have appeared officially in journals. And there's a little notice there that says, "appeared," "was published" or something.
>
> Papers just stay on arXiv post–journal submission. Almost never is anything removed. And then usually the author indicates where it has been published. There are ways to tag that entry that says there's a new version of this.

> If there are any changes that are going to happen, then you need to resubmit and update your submission, and typically the resubmitted version appears towards the end, which I think not many people read—so you tend to read the fresh ones, and so if there are substantial changes to your paper after you've first submitted it, maybe they'll be lost on many readers.

Ap3.4 Data Sharing

Sharing data in astrophysics typically occurs post-publication. Derived (and sometimes raw) data are shared in multiple ways, including personal, project, or journal websites, or are made available upon request. The absence of mandatory data sharing guidelines, in addition to institutions being allotted varying observation times, means that data sharing practices are often dependent on personality and department; certain factions of the field are notorious for sitting on data.

> I have not made my back-end data available. It's an interesting set of issues. We are doing a project now and we are making the data available on a website—both the raw data and the reduced data. So that's me sticking my toe in the water. But I wouldn't do it, and I haven't done it, for studies of individual objects. What happens is, I write to somebody, or somebody writes to me, and we say, "You know, gee, I really like your paper on blah, blah, blah. I've got these new observations with whatever, some completely different instrument, and I'd love to compare your data with mine and register them, and blah, blah, blah." So we exchange the data files informally, just one-on-one, and that happens a lot. And then you acknowledge the person in the paper.
>
> Even after we've published the paper, we will make that data available in its reduced form, which means in its processed form, so that other people can instantly access it on a webpage. And that webpage then becomes highly sought after as a record of what we've done, that others use…Of course, it's up to each individual whether you want to make this data available.
>
> It depends where I publish data. If it's a little table, it goes in a journal, and if it's a bigger table, it goes on a website. If it's a huge data set, it's in an arXiv server, and then maybe we'll write a paper saying, "This is the first data release of our digital sky survey. This is what we've done, here are the tests, and here is the URL where you can actually get the data."
>
> The group at that university is very, very averse to making anything public because their whole history has been that they have gobs and gobs of telescope time, and they take the data and leave it in their desk drawer for decades and they don't want anybody knowing about it.
>
> So the point is that in the presence of these data-sharing tools, a lot of moral suasion has come to the fore. Astronomers used to be big offenders. They would observe over a lifetime, and the data would be in the desk drawer and they would never share…I think that if you build an observatory and you are sure that you will never need any federal money, for any purpose—to build an instrument, operate your observatory, or get research grants to facilitate the work of the individual scientist—then fine, don't disseminate your data. That's a recipe for making the world mad at you, especially if you have one of the world's largest telescopes.
>
> Ten years ago, maybe 15, at the time there was one big telescope. It's a private facility, so there were a select few astronomers who could use it and those people held their data quite tightly and some of them still do.

Data preservation

In recent years, the methods for saving and storing astronomical data have changed significantly. The field has evolved from photographic plates to digital storage; for instance, data collected at an observatory tend to be written to CD. Migration to new technology formats is necessary, before data become unreadable and rendered obsolete. Overall, data management practices are largely idiosyncratic.

> Basically all my data are on spinning disks, and…I have to admit that they're not terribly well-organized. There's no thought or professionalism put into it. We protect the data by having redundant copies of things on multiple spinning disks. And, we use DVDs. We always write DVDs of the raw data at the observatory, but normally we never have to look at those because it's so easy to transport all the data over the network at the end of a night of observing, so you never actually have to deal with these external media.

> The formats change, the programs change, the media change, but the information should persist. I think we are moving past the old conundrum of obsolete media, especially magnetic media. Somebody once said that digital information will last forever, or five years, whichever comes first. But now, spinning disks are cheaper than paper, and it's a matter of hooking an Internet cable from your old computer to your new computer, so it's much easier than having someone move tapes, which can become demagnetized. I think, in terms of the persistence of media, that problem is going to go away. And storage is becoming infinitely cheap. But then there is the whole different preservation issue of formats and standards.

> Raw data will be saved on discs or maybe they will be put on tapes, but they will normally not be exposed to the world. Besides the data in image form, catalogs from which you can derive some processed data are most useful…and in general we will save as much data as possible but it's difficult. A few decades ago, many photographic plates were taken. We hope to convert them into digital format, but there are so many of them and they're expensive to convert, so that has not happened yet. They are available somewhere, in dungeons, and in principle, accessible, but not available in practice.

Stakeholders in data sharing

Data archives in astrophysics are typically open access. Data associated with national facilities (such as the Hubble and Spitzer space telescopes) become publicly available after a twelve-month embargo period, which provides scholars a window to work on the data first. In contrast, some data are released sooner, such as those associated with the Lick observatory, which is owned and operated by the University of California.

> The sociology of our field is changing so that data are becoming public more quickly. Projects like the Large Synoptic Survey Telescope (LSST) and others are providing lots of data. I think there will be more of that in the future. The public institutions and the federal governments encourage that type of release.

> Data in astronomy are made public usually one or two years after they're taken. The national facilities, like the Hubble Space Telescope and the Spitzer Space Telescope, provide and fund archives that enable anybody in the world to download their data. These archives are now incredibly useful, because they integrate of all the observing that's been done by that facility over 10 years or more. That provides a huge data set for people to study. And you can even get money to analyze that data—you can write a proposal, not for observing time, but just for resources to analyze the archive.

> Public-access data archives, frequently international in scope, are becoming the bedrock of observational astronomy. Some examples, initiated by NASA, include all data from the Hubble Space Telescope, Chandra X-Ray Observatory, etc., which become public 12 months after they are taken. The data are stored in a public archive…The Hubble Space Telescope's archive was the first big archive in astronomy that showed how it could be done. I don't think they're wonderfully organized, but nevertheless, it's a huge step forward. After one year all data are public…So now people are used to using the archive, and even if you don't get the money, it's sort of in our blood already. And they're doing the same kind of thing with all the new NASA space observatories. It's a completely public archive and access does not depend on funding…I think that all of our telescope data ought to be archived publicly, with a grace period of maybe a year…The Sloan Digital Sky Survey was a private consortium funded by the Sloan Foundation, initially, and they've also gotten some government money. And so they have a two-level archive. They have an archive that's private and then every once in a while they do a big data release where they are happy that everything is in good enough shape that someone from the outside like me can come in and not use it incorrectly…Increasingly astronomers are participating in very large surveys for which the data are eventually released in public archives.
>
> I'm using the Sloan data archives and the big public database. They have made their data products publicly available, not the raw data but processed data, and many scientists are doing first-class science just by downloading their data sets, and I'm one of them…There's still a high premium on being there first and you won't be first if you're not physically there first…and some data sets are truly public where everybody does get immediate access…quite a few projects are run that way these days. There's the Lick telescope itself—a gamma ray burst satellite. It transmits all the data to the whole world immediately as soon as it gets it. It truly comes as fast as you are observing. Sloan is not quite that way. There is a year-long lag on their release. Some of the product being designed in the large LSST is supposed to be public immediately. In practice, however, I think there will be some kind of a lag.
>
> NASA satellites have got the one-year proprietary period. Scientists want to get a chance for a first crack on the data…that's the principle…For each of the space facilities that goes up, NASA sets up a very expensive and very well done archive with access, calibration, all that kind of stuff.
>
> The most heavily used of all the astronomy archives is probably the Space Telescope Science Institute at the Johns Hopkins University. They have a very elaborate archive and they dedicate millions of dollars to it every year.
>
> One project is developing a really fancy website for multi-wavelength participation, so it's one-stop shopping…There are instructions there that tell you what the data files look like. You press a button, and the data are all available in tabular form. If you want to download all the images—every picture ever taken—you can get it. Every spectrum is fully reduced. You can do whatever you want with it and it's public.

The reuse of data sets is widespread practice in astrophysics, though dependent on corresponding developments in software. Programming is often done by graduate students.

> There's a lot of sharing. Everyone freely shares software, with no guarantees, of course. So the software tools are becoming very useful.

Data curation

Astrophysics has a fairly long-term perspective on data collection and curation; telescopes are expensive to build and astronomical events may take place only once or may extend over several decades. Data are decentralized and distributed across numerous archives, described by one scholar as an "archive archipelago." The International Virtual Observatory Alliance (IVOA), funded partly by the NSF, is an effort to coordinate astrophysical archival data. As a virtual large-scale collaborative partnership, the IVOA involves a number of member organizations drawn from various countries around the world. While it is perceived as a potentially useful resource, its success is questionable since funding is said to be "piecemeal." Although the IVOA is addressing data interoperability through the development of consistent and common standards for both data description and analysis, data interoperability remains a challenge.

> The Virtual Observatory is an example of this new kind of scientific, virtual organization. Virtual organizations are discipline based, like astronomy, or biology, or earthquakes, etc., and they provide a research framework for science with massive and complex data sets, measurements, or theories. And they're internally distributed. In the case of astronomy, you have data centers for each NASA mission, for each observatory, for each major sky survey. And so we have what I call an archive archipelago. So you go to one place to get this piece of data or you go to another place to get that piece…It can't be centralized because data should be where the experts are, where the producers are, and so the archipelago grows exponentially. What can be done, and what was done, is to connect these different archives. And so that middle-ware or connective tissue was what the Virtual Observatory was all about. And they have done fairly well with it. They've established a data grid.
>
> There's a whole mechanism now called the Virtual Observatory. It's funded partly by the NSF and by other agencies, and it's supposed to be a big repository of astronomical data. Google is getting involved. They're starting to archive very top-level astronomical observations.
>
> I think the National Virtual Observatory could be enormously important. It would be great to be able to go to any point of the sky and see, at a given moment, who's observed it, and how you get the catalogs…My feeling as an outside observer is that the project is stalled, or it's slow in being realized. But I'm not an expert.
>
> In principle, you should be able to bring together these diverse data sets in a way that actually allows you to make use of them together in a useful way. The idea is to have theoretical models or calculations alongside data so that, in principle, if you're interested in some particular set of objects in the sky, you can gather the data on them from all these different sources, but then also simultaneously look at what theoretical models would predict as well, and you can compare these different threads and look for inconsistencies. If that could be made to work, it should be incredibly powerful.
>
> On the global scene, there's been talk for years now of a National Virtual Observatory that would incorporate all the different data from different observatories into one single interface with ways to cross correlate data. And I don't know why that's taken so long to get someplace…it's been a little piecemeal…The project involves a combination of astronomers with computer scientists, so they really get concerned about standards, and they can argue over a four-day meeting about how to spell keywords. I think it's going to get there but it hasn't quite yet. It would be nice if in fact we just had some nationally organized, well funded facility that took care of all of this.

> Especially in the Virtual Observatory context, a lot of effort was spent trying to devise standards of communication, metadata, and it's working fine.
>
> The astronomical community worldwide is aiming for a future where the archived data from many different places are linked through some common language, so that you can, for example, search for an object and find out where that piece of data is, and access that data from wherever it is located in the world.
>
> The International Virtual Observatory is the archive to end all archives. The idea is for computer scientists to come up with a way for all the archives to talk to each other, on one website. You type in some keywords and get a list of everything on earth that's ever been done on that subject…we have a National Virtual Observatory that's part of the International Virtual Observatory. They have a website that's up and running but I have never used it. At conferences when I've talked with people who are working on the National Virtual Observatory, they talk to me in computer science language. And my response is confusion, since I'm not a computer scientist. The idea is that eventually astronomers and astrophysicists will use it. But right now the computer scientists are trying to figure how to make it work.

Ap3.5 New Technologies for Sharing

Email largely sustains informal networks. In addition, listserv use is widespread, changing scholarly communication patterns, particularly among younger scholars. While there is limited reading of blogs and uptake of social networking tools for sharing information, both are perceived as generational. They are not generally used by scholars for early sharing of work.

Listservs

Scholars stay abreast of the field by following subfield-specific listservs and alerts in the form of electronic telegrams, circulars, and e-newsletters. These belong to various scholarly venues including scholarly societies, such as the American Astronomical Society, journals, and the arXiv. Specifically, electronic telegrams or circulars notify scholars "instantly" by email of interesting events taking place. These include, though are not exclusive to: the astronomer's telegram, IAU circulars, gamma ray burst notices, and virtual observatory event messages. The astronomer's telegram, in particular, is a self-regulated forum in which scholars can post announcements and share ideas that are not written up as papers.

> For example, gamma ray burst satellites detect gamma ray bursts. Stuff goes to the ground control station. Within literally seconds, an email is generated and gets exploded to subscribers. Some of those are actually formatted for humans to look at, saying "swift satellite found such-and-such." Others are written in XML and they're intended to be consumed, not by humans, but by robotic telescopes that receive an email from satellite via the ground control station, intended to interrupt their program, and instruct them to go take a picture. And then the telescopes can send their own email. So there is this real-time communication story that is never on paper. It's all electronic, which involves four players: human producers, human consumers, robotic producers, and robotic consumers. And they all communicate with each other.
>
> We use the astronomer's telegram a lot, actually…this is something that I read very regularly. It comes by email to my mailbox and I make sure I read that.

> Most people on the astronomer's telegram are people who do high-energy astrophysics. So it's organized by the sort of people studying supernovas, novas, X-ray binary, cosmic gamma ray bursts, and so on and so forth…all those people will be registered on the astronomer's telegram by now…There's one other service, which is specifically for cosmic gamma ray bursts…and, again, that's similar but it's specifically just for people doing cosmic gamma ray bursts.
>
> The astronomer's telegram is extremely important to me…It started about seven or eight years ago as a competitor to the IAU circulars telegrams, which have existed for 100 years when they used actual telegrams…It's something that has been used for rapid communication of things that are popping off in the sky. You discover a new asteroid, a supernova goes off, an X-ray binary goes into transient outburst, whatever it is, you would publish a telegram. So now you have a new result, you go to the astronomer's telegram…You don't pay anything…You just go to the webpage, you just write it, you submit it, you click "go." If it's something that's so time-urgent that you want people to put their telescopes onto your new object within hours, you click the box that says, "instant email," and it sends it immediately to all the subscribers. There's another use for it…if you've discovered something that's kind of neat but isn't worth the paper, sometimes you'll just put it on the astronomer's telegram as soon as you've discovered it. It's supposed to be timely, but it's not always timely what people put on there…But what is remarkable is that the quality has been very high. The only screening is when you register. The editor-in-chief checks to make sure you're a real astrophysicist, but, from that point on, it's entirely self-policed as to what you put up there. And, to me, the quality of it has been extremely high. People haven't been abusing it grossly…The population of people who use it has been growing…my community, in particular, has moved over to the astronomer's telegram.

Unlike other disciplines we have examined, scholars in astrophysics use listservs as a mechanism for communication, and they have replaced traditional patterns of keeping up to date, particularly among pre-tenure scholars.

> A listserv has changed the way most of the younger generation receives and vets papers. It is through the listserv. Nobody gets papers in a journal and nobody goes to the library. That's a given. I don't even know that many people who go to the website of the journal when they release their new papers. It really is primarily from the listserv. Astro-ph does send out its own email to those who want it. I'm a member of very few listservs. I get the astro-ph one, and then just a few ones local to our department. I guess there's an AAS one for announcements for the American astronomical community.

The arXiv preprint server also serves as a platform for dissemination of different kinds of information not intended for journal publication. This can range from announcements of database releases to newsletters and tutorials.

> Astro-ph serves a broader purpose. You can publish things where the intention was never to put it in the journal. So you can announce, for example, the release of a database to the whole astronomy community without having to go through a regular journal process, or some other announcement.
>
> We've used it occasionally for essentially announcing data releases…telling people that we have put up a bunch of publicly available data on some website and giving a brief description of it. The first time we did this, we actually contacted whoever was administrating the arXiv and asked if this was acceptable content and they actually said, "Yeah, this is one of the reasons we set this up in the first place—to allow this kind of communication."

> There are newsletters. There are email exploders where we're all kept up to speed. I can give you a good example. Right now we're all writing Hubble proposals and there's a document that tells you how to apply for time and it contains all kinds of information about the efficiency of the Hubble space telescope. That was produced last October. It has mistakes in it so the entire community gets email updates, not entire documents, but just saying, "We've subsequently found that this has changed or we've got an improved version of this." And the webpages are constantly being updated with addendums and so on. So, they're living documents.
>
> There are some articles that get published only on the arXiv that are like tutorials, for instance, which are unlikely to go into an actual journal…because scholars have accumulated some knowledge, which they would like to get to others but it's not something new worth publishing.

Blogs

Few scholars consult blogs to stay abreast of recent developments in the field and many consider them a time drain. For those astrophysicists who read blogs, they can serve as a filtering mechanism, much like a sophisticated subject listserv.

> I don't have time. I would look at other things before I'd look at that. I don't have time.
>
> No. I don't read blogs. I'm actually quite vigilant about trying to avoid things that I feel would be wasting my time, because if I weren't, then I would get nothing done at all.
>
> No, I'm not looking at blogs…I don't have time for this.
>
> I don't have time for reading blogs.
>
> I'm not familiar with blogs.
>
> I don't find blogs very useful myself, but project-based wikis are a much better structure for that kind of thing. To me, blogs are a chattering thing. But wikis are okay.
>
> When something comes up in the news, the first thing I do is go check the blog of this particular scholar, who's very smart. I have absolute confidence in this scientist's assessment of new results. And sometimes this author will say, "This is silly for these reasons," or sometimes, "This is important." That's an absolutely new way to sort through the quality of papers that come up…I know a lot of people refer to this scholar's view of things…everybody reads it…S/he'll write a piece and pretty soon everybody in the field will have their views and it's very interesting and handy to read. There are some real heavyweights who weigh in with opinions…It takes a lot of time to maintain a blog…This author updates it often, and thoughtfully; it's very well written.
>
> The blog is a new kind of reviewer.
>
> So a blogger, who is particularly interested in what is on arXiv, would comment in his or her blog. Blogs are certainly more common than 10 years ago…I think it's maybe a young person's game, or at least limited to people who like to blog, but I don't think it's become the default means of communication.
>
> That medium hasn't really grabbed onto me. I do read a political blog, so I can't even say it's a failing of the medium altogether. It's some kind of thing that I still enjoy, but for astronomy,

> no. Maybe it's too distilled at that point. It becomes like a press release. They're nice, but I'd prefer a more technical look at the paper myself, to get the results myself.

Among the astrophysicists that we interviewed, there was the perception that blogging activities are generational.

> I'm sure students are reading blogs. They tend to look at them more than we do.

> I think that the specific reluctance to use the Internet is a generational thing. Among the people who have blogs and are using them in energetic ways, it's certainly the younger crowd that is leading the way. That is true. Nevertheless, I think that the general feeling—that the serious people sit at their desks and write equations at their blackboards and they don't bother talking to the outside world—is not going away. That's not generational.

> To an extent, I read blogs. I think the main information does come from the more standard ways, but yes, blogs are interesting. There's one I look at every now and then, not every day.

Writing blogs

Astrophysicists generally consider blogs outside the realm of scholarly production and there is a certain degree of academic stigma and frivolity associated with writing blogs. One scholar, who actively maintained a blog, could envision it as a venue for sharing undeveloped research ideas.

> I'm now in a position where my job is only doing research. Blogging is purely a spare time activity, which is fine…My institution doesn't mind it, but I think that mostly they just don't care one way or the other. It's neither a plus nor a minus…If you have an idea and you put it out there on a blog without getting a paper out of it, someone else will take it and write it up. One of the reasons why we did not choose to use our blog mostly as a technical tool to talk among researchers, is that at some point you have enough communication between people. And I think that the arXiv works really, really well with that. You write a paper that is at the same level as a scholarly paper and everyone sees it the next morning. And the blog is very, very informal in the way that we've done it…Within physics or mathematics, there's a huge downside to that. Namely, that you have an idea and you put it out there without getting a paper out of it, then someone else will take it and write it up. We have a system right now where you get credit for the papers that you write, the official scholarly papers…Nothing I write on my blog ever appears on my C.V. as a scholarly contribution. Right now we have this threshold that until you write something that's worthy of being published as a paper, it's not a contribution. I'm not saying it's a bad fact—it may be perfectly reasonable—but because of that fact, it's harder to have a forum for discussing things that you think are interesting ideas that are not quite publishable as a paper. I don't quite know how that would work. Either I have an idea that's not very interesting and "Who cares?," or I have a good idea, in which case I'm going to write a paper about it. So I think that's the current system. Maybe in other fields it works differently. If you were in economics or political science, you might think about, "How does this electoral college feature interact with this campaign feature?" Maybe it's an interesting thing to say, but not quite something you want to do your research on. So there's more room for that in-between kind of research.

Social networking/Web 2.0

There is little indication that astrophysicists use social networking tools for sharing at this time, though some scholars envision a future in which these venues might provide such opportunities.

> There are new, different things that people are experimenting with that will change and make these cyber environments compatible with research. A lot of that has to do with Web 2.0 technologies and the semantic Web that's coming. It's to be decided. It's a marketplace of ideas. We'll see what works and what doesn't. Right now, we're essentially reacting to commercial or silly things. For example, one discussion I keep having with people is about Facebook and LinkedIn, or YouTube. So Facebook was essentially created by undergraduate students to find dates and LinkedIn is intended for business people to get business contacts. So scientists go on those and try to establish their own groups. And you know what? It's just not working…because it's not made for that. We're just using this stuff because it's there. What about virtual reality? There are people now experimenting—having lectures in Second Life—which is probably just a baby version of what's coming.
>
> One thing that has been discussed is something like Facebook for astronomy, and the typical name being used for that is "Spacebook." Unfortunately, that term has already been taken by two other groups…So, that is one thing that many people seem to find interesting…in the future, something like Facebook is going to be very important.

There is the perception that the younger generation may use social networking technologies for sharing information. The European Space Agency uses YouTube to reach a younger audience and prospective Ph.D. candidates utilize MySpace. Similar to history, the astrophysics job rumor mill is accessed by scholars to find job-related information online.

> I'm thinking about having a presence in Second Life. It would be the first observatory. And it looks to me like we can take a bunch of the stuff on our website…the history of the observatory, the modern instrumentation, all our press releases, somehow it looks like there's a way to get all of that stuff easily into a Second Life location…We just have to buy some land…it's not very expensive. I think for a thousand bucks we can have a pretty real presence.
>
> The European space agency has a young guy…and he talks to the younger generation about astronomy. I think it's YouTube. That is their communication forum.
>
> I think there's a fair amount on MySpace that goes on by kids younger than me…it's not my generation, but I think…I remember being told when students were deciding what department they were going to go to for a Ph.D., other students knew via the MySpace universe.
>
> The astrophysics job rumor mill is actually based at Berkeley now. The astronomy job rumor mill was started about 12 years ago, as a way of publishing rumors about jobs in astronomy—so faculty jobs, postdoctorate jobs, analyst jobs, whatever. And it's basically who was on short lists for jobs, who had been interviewed, which jobs had already been offered and accepted. It's not scholarly communication, that's a little outside the purview. It's community input. Right now it's a wiki in the Berkeley astronomy department…it's self-correcting and it's kind of interesting.

4. HOW DO YOU COLLABORATE WITH OTHER SCHOLARS? AT WHAT STAGE OF RESEARCH?

Collaboration takes many forms in astrophysics, many of which transcend disciplinary, institutional, and national boundaries.[49] Collaborations frequently center around costly national

[49] Birnholtz, Jeremy. 2008. When Authorship Isn't Enough: Lessons from CERN on the Implications of Formal and Informal Credit Attribution Mechanisms in Collaborative Research. *The Journal of Electronic Publishing* 11, no. 1. http://quod.lib.umich.edu/cgi/t/text/text-idx?c=jep;view=text;rgn=main;idno=3336451.0011.105

facilities and are often driven by funds awarded across multiple institutions. Some astrophysicists collaborate with technical experts involved in the construction and maintenance of a facility's hardware and software. Evaluating individual contributions in team-based research is a growing challenge for the field. The use of wiki-based technologies by scholars is prevalent, particularly for project coordination and management, and coauthorship of papers.

Ap4.1 The Nature of Collaboration

Collaboration in observational astrophysics is the norm, although its scale can vary. Traditionally, scholars have analyzed observations of individual targets over a few nights. Increasingly complex and ambitious research projects can, however, require observations over hundreds of nights by teams of scholars drawn from multiple institutions. The allocation of highly competitive and expensive telescope time for observation drives collaboration for some scholars. The emergence of survey astronomy has magnified the size of collaborations in the field, which are often motivated by data sharing and analysis requirements.[50]

> For thirty, forty years of modern astronomy, individuals have been going to a telescope for a couple nights. There are some projects you can't do that way. You need 400 nights on a facility dedicated to a single project. To put together that kind of a facility requires bringing in lots of people who have contributed from the beginning to the end.
>
> Telescope time, either in space or on the ground, is sufficiently hard to get that people are very motivated to collaborate with other people so they'll be more likely to get telescope time…In some cases the teams are so big that they're quite unwieldy…it can be anything from half-a-dozen people to 100 or 200 people. The Sloan Digital Sky survey is the archetype of billions of people…Before these big surveys came along, people were collaborating in small groups, frequently on multi-institutional projects. Then there were a few inspired people…I could probably name less than half-a-dozen individuals, who came up with the idea for these big surveys, and who stuck with it long after everybody else said, "Forget it, you're way over budget, you're way overscheduled, don't even think about it, you're doing a terrible job." And it turned out great. All of those negative things were true, but in the end the project turned out great. And it really changed the way people think about doing research on the early universe and the evolution of galaxies, and even things like looking at the halo of the Andromeda Galaxy, which is our nearest decent-sized galaxy…So that's relatively nearby, but it's all done in this big survey mode…So if you want to find out the shape of the universe, you look at a million or even a thousand galaxies and get good statistics on what these galaxies are doing. And anything that big is a collaboration between a bunch of people. Those surveys have made a real change in how people do extragalactic astrophysics, anything beyond our galaxy. They're encouraged by the various time allocation committees.
>
> We deal with experimental facilities, accelerators, for example. They're so expensive that you have to have teams of hundreds of people. And now, in astronomy, people get into these enormous surveys that can have a hundred members. It's like the accelerator physics mode of work. Because an accelerator costs $10 billion or Keck Telescopes cost $100 million apiece, and time goes for one dollar per second, whether the sky is clear or cloudy. You can't screw around. And so you need the political might to corner the resources. That means that you need to have big teams and so on. These things are sometimes inevitable in order to actually get the data flowing.

[50] The Sloan Digital Sky Survey (SDSS), for example, comprises a collaboration of about 150 scientists drawn from participating and non-participating institutions and external collaborators. The members of the SDSS coalesce around a 2.5-meter telescope at Apache Point Observatory in New Mexico.

> Certainly bigger and bigger collaborations seem to be the rule. Many people resist them, but I don't think you will be able to resist them because they're so powerful. The ones I know about are largely American with a few international members. So, for example, one collaboration I'm involved in…has some people in it from England and Canada, as well as the United States. But the bulk of our people are in the US. So there's still a barrier there. As much as anything, the time zones are a barrier.

Collaboration for theoretical astrophysicists is often one-on-one and internationally based, largely because their research has historically been more solitary in nature.

> I think there's collaboration but maybe only one-on-one rather than in big groups. It's hard to spin off the parts of a theory the same way that you would spin off parts of an instrument. There's a lot of international collaboration in theory, maybe even more than in observation. So people flit around the world to work together; somebody will go someplace for a week, Munich or somewhere, and somebody from Europe will come here for a week.

Inter- and multidisciplinary collaboration

As data collection and analysis become more large-scale and complex, research teams require technical expertise and skills, often provided by visualization experts, statisticians, and computer scientists who manipulate and process data. Since observations are made across the electromagnetic spectrum, astrophysicists can team up with colleagues working at other wavelengths, such as x-ray and gamma ray experts. Astrophysicists may also collaborate with scholars who specialize in astronomical instrumentation, including physicists and engineers.

> Our group does have a database expert, a computer science expert who works on neural networks and things like that, and then a couple of other people who function between astronomers and computer programmers…The survey I work on is a slightly bigger project. We handle much more data. But it is difficult when there are more people to coordinate things in a coherent manner.

> You call upon an expert in visualization. In the early days there were probably only one or two people who knew what they were doing in that area and had the wherewithal to make the tools, and either you had to call them up and beg them for help. There are experts in building this software and it's essential to doing research.

> I guess we don't have any people who are employed as experts in a particular area. We don't have a database expert. I guess we've all become experts in small areas as we've needed to, so within the collaboration, we all know who to go to with a particular problem, because they handled that before.

> It started out as a survey…that was the core of this bigger collaboration. We measured spectra with a Keck telescope…As we were part way through that, we focused on one region of the sky and proceeded to team with other people working at different wavelengths with x-ray satellites, gamma ray satellites, with ground-based radio telescopes, etc. So a team that started out with about twenty people has grown to more than 100 by the time we added all these other wavelengths.

> There are now so many services that are out there that once you find something interesting, you want to know, "How does it look in x-ray?" You can just go to your computer and get that data and then do more things. But then if you need an x-ray expert, that starts another collaboration, you start with someone, then add a third one, so it spreads just like that.

> In high energy physics, you can have up to 1000 physicists and engineers designing instruments and machines. With greater technology, broader expertise is required, which increases the number of people involved in collaborations. Space missions are huge collaborative endeavors.

Ap4.2 How Do Collaborations Arise and How Are They Sustained?

In astrophysics, collaborations are frequently developed through informal networks, ranging from departmental contacts to meeting like-minded scholars at conferences. Some scholars collaborate because they need certain data and because collaborative research gives them a competitive edge and is more time efficient.

> There might be a shared set of expertise. If I have an idea and I understand some aspect of it, but there's something else I don't, if I'm thinking about cosmology, which is my thing, but I want to relate it to quantum information theory, I'll go across and knock on my colleague's door, because s/he knows that stuff…Well, there are also other factors. One is it just might be more fun. You have friends, you know they're interested in this thing, so you say, 'Hey, do you want to work on this?' Or you might come up with the idea in the course of a conversation with somebody at a conference or under informal circumstances.

> Astrophysicists working together would be able to accomplish the task in two or three years. It would take ten years just by yourself. The field has totally changed in that time. So the pace has moved so fast that, if you do not collaborate, I think, you will not be competitive.

> Our facilities are not in our universities, so research suddenly becomes open for inter-university collaborations. A theorist in Princeton meets an observer in Chicago and they decide that this would be a good thing to work on together. That happens in conferences, it's not going to happen over email, it's primarily going to happen at conferences.

> I sent an email to someone in Australia to tell them I had an idea and they had some of the data that I was interested in using, and we struck up a collaboration that way. But it doesn't necessarily have to be international.

Collaboration between senior scholars and their younger counterparts, including postdoctoral researchers and graduate students, is common in astrophysics and can contribute to department collegiality. Collaboration among senior faculty within an astrophysics/astronomy department, however, is rarer because faculty members are busy running their own research groups, labs, or centers.

> One of the things that we deal with here—that isn't as true at other institutions—in astrophysics at least, is that everyone is expected to have a sort of self-sustaining and independent program where it's actually almost discouraged from collaborating with faculty colleagues. Everyone works with younger people, like post-docs and graduate students. I think with that comes with quite a bit of stress, particularly for younger faculty who don't have a group…Departmental collaboration can contribute to the collegiality and feel of a department. I think once you get down one level, it's good among the post-docs and graduate students…It's just that everyone is so busy running their show that there isn't any time left to collaborate.

Funding

Funding often drives collaboration in astrophysics. Grants are frequently awarded across multiple institutions, as evidenced in the case of the Sloan Digital Sky Survey (SDSS). Grant proposal writing in astrophysics is highly nuanced as scholars tailor their collaborations to secure funding and to negotiate the 'politics of international collaboration.' An element of competition and collaboration between countries and continents is prevalent.

> Money is a big question. Sloan would not have gone to a single institution. They needed a combination of institutions, including private ones that were wealthy enough to bring in a few millions apiece to put together a package that is big enough. For our case, we have collaborations because individually, I can't get sixty or fifty collaborators in two or three years. So I collaborate with other institutions…I think NASA has really changed some of that. In the last fifteen to twenty years, the type of projects that they've supported, and each of their efforts, are huge teams of people. They gave the Nobel Prize to two scholars out of a big, big team.

> For the Gemini Observatory, you often need your international partners to make sure that your project is really accepted. So the politics definitely dictate collaborations. So when you write proposals you take into consideration, for example, the Hubble Space Telescope. If it's going to be a US project, you're going to ask for hundreds of orbits. Over half the members are Europeans and in evaluating the proposal they won't look on it as kindly as the ones of their colleagues in their own institutions from their countries.

> There are obviously funding streams that have very different facilities…there's a north-south hemisphere divide almost between the United States and most of its observatories…if I want to observe something that's south, there's only a couple of US-based ones, and if they want to observe something in the north there's only a couple. There was nothing European-based. So there's an interest to come together across the hemispheres, if nothing else. And in the end people are doing similar science on both continents. We compete and we collaborate.

Ap4.3 Judging Multiple Authorship

Multiple authorship is not new in astrophysics, but an increase in the size of collaborations has resulted in more scholars attributed in the final research paper. Typically, the key contributor is listed as first author. Credit is assigned to those engaged with intellectual heavy lifting and to 'builders,' who are associated with data produced by a facility (which can include telescope instrumentation, optics, technical infrastructure, spectrography, software archiving, and data reduction.)[51] Multiple authorship is a particular concern for younger scholars because it dilutes their individual contribution.

> There's usually a whole group of people associated with the instrument. So all of a sudden if you propose to collect some data for a project, all of the collaborators become coauthors. But there are pros and cons with that as well. Sometimes it dilutes your own contribution if there are 20 or 30 collaborators on your paper.

[51] For instance, under author inclusion, the SDSS Scientific and Technical Publication Policy states that, "At the very least, any scientific paper will include in its author list any individual who has contributed to the scientific analyses presented, along with all builders who have requested authorship." Authorship is based on a "two-group" system. The analysis group consists of scholars who contributed to specific analyses outlined in a scientific paper (including research described in the paper and the writing of the paper). The second group consists of all other authors on the paper and assignment of these names is alphabetical.

> There's just this proliferation of involvement and, therefore, entitlement to results. I may want to publish a specific data point and I can't do it because it's a specialized piece of data that involves a team of 40 people and you don't necessarily want all those people on your paper. I personally try to shy away from big projects; I've been involved in one in my entire life, and it's not that I regret it, but it was a painful way to do science. So I'm not necessarily in a position to comment. Anything done in a group takes longer, it's more expensive, but the result is probably a bit better because you have many more eyes with different areas of expertise on a problem.
>
> There's a lot of politics that goes into the ordering of author names and we are still in the process of working that out because these huge collaborations are a fairly recent thing with in the field. When we were a smaller team, we sat down and we wrote down policies about collaboration and publication…our database is so rich that you could probably write 400 papers with it so there's plenty of stuff to go around. So the way this has worked is that somebody gets an idea for a paper and writes what we call a paper proposal, which has a title, an abstract, known authors, possible authors, but the authorship list is still open within the collaboration, and a list of data that is going to be used…And so we approve these proposals, and once they're approved they're filed away and that's your protected turf. The order of authors is not specified in that first paper proposal. There are two groups of authors—there are people who actually did the work on that particular thing, with the leader of the paper called the first author being first in the list. In astronomy, the custom is that the most important person goes first…And then people appear in order of their importance. And we leave it up to the first authors to decide with very little argument over what the ordering of people should be. Then because we're part of a huge survey, and somebody's measured red shifts, which went into this particular project, even though they didn't do anything more than that, so we've been in a mode where we're very generous and we have long author lists and that part is alphabetical…We're entering a new mode where the author lists are going to get shorter and be confined to people who actually did something important on the particular project. We're in transition.
>
> So usually you have a little battle or rather you have a discussion between one and four contributors. And at some point you can look in the list, and if there are thirty authors, all of a sudden it becomes alphabetical and that's where you know those people all made some contribution but it wasn't the major one.
>
> I find working in a collaboration of six quite easy…it's usually clear who should be the first author on a paper because there's almost always one person who did 90 percent of the work, and then our approach is that everybody else has the option to be a coauthor, if they want. That ordering is sort of negotiable.

Evaluating multiple authorship

Since citation counts are often skewed in favor of a "baseline team" or "builders," tenure and promotion committees often rely on other indicators, including external letters of reference, to inform their decisions on multiple authorship publications. In addition, a scholar coming up for review may need to specify personal contribution to a given paper.

> Our efforts now are becoming increasingly large scale, where we have the thirty-meter telescope, we have the big project called Sloan, and there are others that are very large. They're much more team oriented, and I believe they've grown by large factors in the last twenty years. In the old days we used to publish by ourselves. Now, there are teams of 3, 50, 100 people. And so you get publications now with, say, 100 people and they're understood to always be on every paper so they produce 100 papers. There are people who have done no

> writing and they get 5,000 citations now because they're part of the Sloan baseline team. How do we judge their contribution? How are we going to judge citations is this way? In our university here, for example, we're supposed to write our specific role for each publication. So evaluating total citations, one could ask us, "How many projects have you led? Can you verify that you were the main originator of the ideas? Are you the person who came up with the discovery?" I think some of these questions will have to come into play. Yet we have to find that kernel of the citation that's relevant to what we would judge.
>
> The problem that I face is how to deal with a multiple author paper. It can have 20 authors so how do I apportion credit? I would ask for every faculty member coming up for review to write a self-evaluation and a description of each of their papers and their known contributions. At some level, what they say is about all you have to go on, unless you actually go out and investigate. If it's a promotion then you get outside letters and you can use that. Otherwise, you go on what they say. But generally I found that was enough to build on for something like that. But it still doesn't get to the real heart of the matter of what's central to the university. What is the real scholarly level of this person? At what level are they a scholar advancing the field? And in multiple author cases you often don't really know. And there's nothing much you can do about that.

Intergenerational coauthorship

Intergenerational coauthorship can give younger scholars a leg up in their pre-tenure years. Some senior scholars assign graduate students first authorship on a paper or coauthor with their graduate students to provide them with much-needed writing experience.

> More often the case is that the coauthors are graduate students, and often the faculty members will put their graduate student first, just so that the student's name gets out there and they feel they can get a job.
>
> If I have a good idea, even if I could write it up myself, it might be more useful for me to hand it to a graduate student and have them play with it, so many of these collaborative papers are an advisor and a graduate student.

Ap4.4 Mechanisms for Collaboration

Many astrophysicists have adopted new technologies for scholarly communication and project management. Collaborative research, in particular, harnesses multiple technologies in the research process because scholars need to be in touch with colleagues located around the world.

Data analysis and discussion

Although sophisticated communication technologies can facilitate collaboration—some international collaborators may never meet in person—they do not replace face-to-face interaction for some scholars. Meeting fellow collaborators at ground-based telescopes provides a more intimate and creative exchange than afforded by other means. That said, use of communication technology is widespread. In particular, telephone, email, Internet telephony, instant messaging, webcams, video-conferencing, and wikis are most commonly used.

> Astronomy is really nice because the teams are still generally up to ten people, often four or five. And so, we can all keep in touch with one another, even across the Atlantic, by telephone. We have teleconferences, we have video conferences, and the observatory is often

the focal point. We meet at the telescope….People like to travel to the telescope because it gets them out of the office. It's like moving into your laboratory. You have your administrative office, but then you have the lab where all the students are and that's where everything's happening, it's where the social interaction is. Our lab is the telescope, and so when I go observing, I regard it as research. It's like a mini sabbatical. I'm going for a week or four days or five days, and I get out of the office and I deliberately try not to take teaching work with me. People will fly in and meet there, and that's where we really communicate in the spirit of research. So the observatory is the focal point for a lot of activity. Now for some people, there is of course the capability to operate the telescope remotely, and some people do this, but I think it's quite unpopular because you don't get this feeling of getting out of the administrative duties. Of course the younger people don't feel this quite so much as the senior people…There are two reasons why even lousy weather is still a productive trip. One is you're physically with your collaborators, and so, if there's no observing then you can get on with something else, like writing that paper that you found difficult to do when you were all in different places.

Well, technology certainly makes it easier. So one of the things I've noticed is in the past I might have collaborated with a faculty member, and now they say, "Well, do you mind if my student sits in on the iChat?" And then we see each other face to face and there's a little bit of ice broken. There's a human relations aspect to all of this, too. It's easier to start sharing hypotheses and ill-formed ideas if you've actually seen the person and chatted with them for a while about the weather. When you're trying to actually collaborate, there's a lot done by email, there's a lot done by video teleconference, which is getting more common because of iChat and iSight and Skype. They all have video now…So we used to collaborate by mailing things back and forth and talking on the phone. Now, we collaborate by posting things on personal websites or twikis and wikis, and getting on iChat, iSight. If it's in a group it's more likely to be a video cam. That's becoming more and more common. So that's sort of in the fluid stage of research, when you still don't quite know what you're doing and you're trying to get your ducks lined up.

I don't use wikis. I know other people who have set up wikis for their research groups and I've thought about that. But again, there's this cost benefit analysis. There are only two or three people working on a paper. I think it would be different if I had a large experimental collaboration, then it would make all the sense in the world to share common information. But basically we're dealing with ideas that are pretty abstract and we can just talk about them back and forth. And we do have group meetings where we talk about what we're doing, but I haven't seen an obvious need for that yet.

Telecoms…It's real time discussion of various issues. A conversation, and it's often about the strategy, how to do something, wrapping up a paper, and comments and discussion of issues. So I think it's not really replaceable by other means. It's certainly better than having everybody in some common electronic chat room or something. It's discussion, so I think it's reasonably effective.

We use iChat a lot now, and I'd like to do it even more. I'm just in the process of upgrading the number of pixels I have. We're going to put up a big screen…If you're going to have a meeting with your collaborator, it turns out better than email, better than phone calls, and now often we use the built-in cameras on our laptops.

We have videoconferences once a week with the whole engineering and sciences team. So this is going very well and it's the first time we've actually done this. We do videoconferencing and the whole team meets face-to-face once a month. Altogether, it's about 20 people, I would say. Mostly engineers and a few other faculty involved, but it's mostly engineers.

> It's now reasonable to have full-on collaborations with people you've never met face-to-face, and may never meet face-to-face, simply through Internet interaction. So it ranges from something as simple as email to chatting tech type programs between Mac software and Skype software that people do for both immediate communication as well as file transfers.

Although virtual gathering places may be beneficial to the field, especially as a means of bringing a project team together, collaborative efforts can be hampered by everyday practicalities, such as low bandwidth.

> I envision in the future we will have more of these distributed institutes and centers without walls…Really we need wall sized TVs showing common areas in all the places, to create an electronic virtual gathering place; that would be wonderful. People have tried to do this but can't. Maybe it's bandwidth? Sound turns out to be a worse problem than pictures. I'd like to see us make progress on that. We need really effective multi-node coordination communication so that people don't have to travel so much.

> I don't like videoconferencing. If you only have a couple of people, a telephone is much better. I'm not too impressed with videoconferencing technology, because in most of the systems, the bandwidth is too small, and so people can't talk over each other. You end up spending a lot of time thinking someone else is about to say something or talking over and just eliminating each other through destructive interference. So I don't find that works very well.

Project coordination and organization

Wiki-based technologies, including wikis and twikis, were noted as particularly useful for project coordination and organization, enabling scholars to hold discussions, and share and manage information (such as documents, tools, software, data, and results). Team collaborators are more likely to respond to questions posted on a wiki rather than those sent by email because the public nature of a wiki elicits feedback and messages do not get lost in an email inbox. Concern over security is noted, even though access to a wiki is password protected.

> We have a wiki going that is mostly internal. The purpose is to stay coordinated, and also to let people know what tools are available, because, with 100 people we're writing software all the time and somebody might have written a tool that you could use. It's just a sharable set of instructions for using tools and data.

> We have a center here, there's one at another institution and there's one out at Waimea at Keck headquarters. Those guys do all their communication through a wiki they set up here. So as new results come in they get posted on it. When questions come up they get posted on the wiki. Everybody can read them and respond, and it's proved to be amazingly effective at keeping those collaborations close. And it's clearly the way things are going to work in the future. I think it's because people spend so much time in front of their computers now. Communication flows very freely, and you don't get this business where you send an email and there's no response and you forget about it in two days. I think that is because it's public. So if we need someone to answer this question, it's there for anybody who feels compelled to answer it. It's really helped our research.

> I work with a collaboration of five or six people spread around the world. We actually use a wiki mostly for managing software development. So the particular bit of software that we work on in this collaboration, we have a wiki, which is really a list of tasks to be done and ideas, what jobs different people are supposed to be doing. We've been doing that for a little over two years, maybe three years now. It's incredibly useful for keeping track of what everybody's

> doing, because before we would send each other emails but then information would just get lost.
>
> We have a wiki for our group. It's a place where group members can list the latest topics that require attention, and then depending on whether you have time, or whether it relates to your particular field, you can tackle those challenges.

A wiki can serve as a preservation mechanism since drafts of scientific papers and research processes are archived and can be retrieved with relative ease.

> The way we're using wikis is very fluid…it's a format where you edit webpages very, very simply, so you can go in and add your own page…And you could just put down musings, you can upload files that somebody can easily download, and you can do it in literally 30 seconds. It's very, very fast. So while we used to be able to do this using FTP sites and webpages, this is much less hassle. So, in principle, this was all available before, but it's much more efficient now…A wiki also is archival in a different sense. The whole history of whatever you're working on is there, all the drafts and something that somebody said last February are still there. So since research involves a lot of backtracking, and side tracking, you can pick it up and…Whereas I used to do research using a notebook, and by the time I would pick it up…an idea would be four notebooks back and I couldn't find it anyway…I think if we didn't have a wiki, the project wouldn't have been organized the way it has been.
>
> I'd say that many large groups and projects now have wikis where they put all of their information…it's preserving all of the information…my post-doctorate will do some test and say, "Here I have done this and that, and it's on this page and look at those plots and here is the manual, how you do this particular part of the project and so on." So all of that stuff can and should be made in digital form. Then you have to decide which stuff is for my group only and which stuff the whole world can see. And then you don't know what's actually important and suppose that some group's work someday is great, fantastic research. Nobel prize. Scientific revolution. Then historians would want to know, "How exactly did they do this?" And there is no equivalent of Einstein letters or Milliken's logbook.

Age

Intergenerational models can serve as building blocks for technology innovation in astrophysics as technically proficient younger scholars assist their senior counterparts. Graduate students often set up wikis for their research groups.

> I'm older than these guys and have never used a wiki, though our engineering group here and at other places uses it extensively.
>
> People are using wikis quite a bit. I haven't started, although I want to. So when a student starts a project they might start a wiki based on that, and then log what they're doing as they go and put in figures. And they can point collaborators to the website and within a wiki format that person can ask a question or two, as opposed to email communication.
>
> A wiki is more like a chat room, right. I'm not following that trend because…frankly, I'm cruising along at a very high level. This is…what grad students use, and I'm not doing that.
>
> The way I've learned these things is largely from my graduate students, with the exception of the twiki…they've grown up with computer programming to an extent that we didn't. So I think I was probably in the first generation of scientists that did computer programming at all…I'm not as fluent in some of the nitty-gritty stuff as the students are.

Coauthoring papers

Astrophysicists author and edit research articles by passing documents back and forth among themselves using email and FTP. While wikis are predominantly used for project management, a few scholars use wiki-based technologies and CBS software for coauthorship of scientific papers, particularly when documents are too large to send as attachments.

> We collaborate using email to transfer files. Or, everyone knows how to set up FTP sites and all that kind of thing, too. So if the files are too big to email, you know how to deal with that. We've also started using wikis.

> I've written papers with people I've never met just by emailing back and forth. I've also worked with people whom I have known from something else but, in academia, we move apart but we still talk. We end up writing papers together through email, so it's very easy to do.

> We usually have a telecom, so we have a telephone call, and we usually agree to a structure for the paper, and then we agree who's writing each section. Then we set their lines and then usually the student collates the paper if he or she's the first author. That's all by email. We don't use a wiki…We are terribly old fashioned.

> I do a lot of paper building or writing in collaboration using a four-year-old software tool called CBS, which people use to build software, mainly, but then I build papers that way. It's an archiving system that allows you to have different people to work on the paper at the same time and kind of manage that. But we have a big firewall here and it's tough for me to share that with my collaborators as a result.

5. WHAT DO YOU NEED TO CONDUCT YOUR RESEARCH?

The research process in astrophysics is data-intensive. For observational astrophysicists, primary research data are generated and collected from optical, infrared, gamma-ray, and X-ray telescopes. Observations are made from orbiting observatories, such as the Hubble Space Telescope (HST), or from ground-based telescopes at locations worldwide. Although traditionally, scholars apply to telescope allocation committees for telescope time, increased access to archival data is changing the research process and "democratizing" the field. Theoretical astrophysicists produce data from computational analysis of observational data sets.[52] As new technologies enable larger and more complex means of data collection and distribution, astrophysicists require better tools for storing and processing data, as well as extensive technical support and training.

Ap5.1 What Do Scholars Do in Their Research? How Is What They Do Changing or Not?

Data collection

Conventionally, scholars collect data by applying for telescope time and specifying what they want to observe. More recently, publicly accessible data archives—many initiated by NASA—have

[52] Research Information Network. 2008. *To Share or not to Share: Publication and Quality Assurance of Research Data Outputs*. Report commissioned by the Research Information Network. http://www.rin.ac.uk/our-work/data-management-and-curation/share-or-not-share-research-data-outputs

become the 'bedrock' of observational astronomy. Some scholars rely on extant data such as sky surveys, which involve large-scale data collection across wide areas of the sky.

Standard versus remote observing

Traditionally, the research process in astrophysics involves the collection of data by an individual researcher through telescope time allocated by the observatory. While a handful of universities own and operate observatories, such as the Lick observatory on Mount Hamilton, astrophysicists from institutions without access to their own telescope can submit proposals for observation time on NASA's space-borne observatories and other telescopes. New data capturing technologies enable remote observing, where astrophysicists provide the facility in question with their observation specifications and data are subsequently transferred, via the Internet, to their home institution. Although remote observing cuts down on research cost and time, and is attractive to scholars who experience high altitude sickness[53], low bandwidth can hamper such efforts, particularly between the US mainland and the Mauna Kea observatories on the Island of Hawaii. Some scholars note that a physical trip to the observatory remains an important part of the research process.

> The availability of space resources…means that anybody can apply for telescope time…I think certainly many more institutions are very active participants in the field…anybody from an institution that doesn't own big glass can apply for time at the National Observatory, which has two major telescopes and a lot of really good minor ones. And then also there are all these spacecraft that anybody can apply for time on. So, that seems like a *de facto* leveling of the field.

> I only do remote observing when I'm unable to travel…I use it quite rarely. And it actually makes a big difference to go out there in person, not so much in terms of what you get out of the telescope, but just because that's the way that you find out all the things that are happening at the observatory and what the new changes are, etc.…You can now do remote observing at the Keck observatory. I was just doing it the other night, sitting there working with someone out in Hawaii and they have this VNC viewer where you can see the exact console that they're using to operate things. And, in fact, you get your own cursor and you can make things happen on the console that override or supplement whatever is happening on the other end. That's certainly useful.

> As far as the observing goes, often being on location gives you a much clearer understanding of whether it's hopeless or whether it's worth persevering compared to when you observe remotely. Generally, I would say 80 percent of astronomers want to go to the telescope as they feel that they have more influence if they are physically there.

Public access to data archives

Widespread access to online astronomical data is changing the research process in the field. For some scholars, downloading data is preferable to waiting for telescope access because it is more cost effective and, "the online data detail and quality is likely to rival that generated by the

[53] For more information, see: Cohen, Judy, Patrick Shopbell, and Larry Bergman. 1998. Remote Observing with the Keck Telescope Using the ACTS Satellite. http://www.astro.caltech.edu/~pls/papers/acts-report/node2.html.

typical telescopes" (Szalay and Gray, 2000).[54] Increased access to data enables the lone researcher (or small teams) to make discoveries and write research papers without physical use of telescopes. As such, the field is evolving from the "ownership of data and resources" to the "ownership of expertise and creativity." Scholars may run into problems, however, if they lack a full understanding of the data in question. "Plucking" data off the Web is simply no substitute for understanding the research process in its entirety, such as knowing the origin of the data stream.

> You can either sit at your desk the way I do, informally, and just go hunting around the archive, which doesn't get me any money, or you can make a proposal to the Space Telescope Science Institute to do a larger project with archival data, and they'll send you the data and the money. These options have been very productive.
>
> There's been at least one superb result on a pulsar that wasn't even a solar emission. It went off near the sun and this junior scholar just pounced on the data, wrote one email asking the head researcher a very simple question, and then analyzed the data and found some incredible star quake oscillations on the neutron star in the data from this mission. It was a very nice result that probably made this scholar's career. So it can happen, even when the instrument is a messy one. Someone can step in and do good work. They could also step in and do terrible work and mistake instrumental effects for real physics, so practically speaking it's always best to team up with someone who knows what they're doing…The data go straight to an archive, and the only edge that the instrument team has is that they're very adept at the data analysis. The team is supposed to make a good faith effort to also post their best data analysis software, as well as the raw data. So it's a different paradigm. It still turns out, in this particular case, that the instrument is so complicated, and has so many instrumental effects, that people in general would do well to consult a member of the instrument team before they start analysis.
>
> One thing that is maybe more true of astronomy than many other fields is that young people, and students in particular, can make a huge impact, essentially all by themselves. You can go to a telescope or do some calculations. And students in astrophysics are capable of doing top-tier science from the start, which is just not true in biology or chemistry or a lot of other fields where it's a big team effort and there's a pyramid with someone driving everything at the top and the people at the bottom doing the tinkering. And so there's a bit of a big head culture that gets established very early…so junior people *think* that they can do great things, and they certainly have the potential, but it causes problems in some areas…Downloading data from a catalog is not as good as understanding the data stream from the start to the catalog. So what you see is people just plucking information off webpages or out of catalogs and publishing it without a true understanding of the errors or the systematics.
>
> In general, public data sets are the growing wave of the future. We're in a time where…a large number of scientists on the planet is taking advantage of the data flow…It's kind of a free for all at the moment, in terms of becoming creative and finding new ways of doing astronomy…I'm sure there are going to be people misusing the data, usually not intentionally, but making bad conclusions out of data…It's a by-product of the way that things are shaping up…You need to have a knowledge of astronomy to take full advantage of the data, and that doesn't necessarily require a large team but it does require some expertise or teaching along the way.

[54] Szalay, Alexander and Gray, Jim. 2000. Designing and Mining Multi-Terabyte Astronomy Archives: The Sloan Digital Sky Survey. See: http://research.microsoft.com/en-us/um/people/gray/papers/ms_tr_99_30_sloan_digital_sky_survey.pdf

> A discovery can be made by a team of two hundred people or it can be made by one person, or two or three people working together. And if you put all of the data and tools up on the Web in an open way—although somebody may have paid a hundred-million dollars for some experiment and there are two thousand people involved—in the end, some smart person in Bangalore can make the discovery and write a paper without help. This is a very interesting and strange situation. The focus is changing from the ownership of resources and data to the ownership of expertise and creativity, which is, of course, priceless. I don't think the scientific community has *quite* gotten that message.

Whole-sky surveys

The advent of survey astronomy has revolutionized the field. These projects involve whole-sky surveys covering multiple wavelengths, such as the Sloan Digital Sky Survey (SDSS) and the Two Micron All Sky Survey (2MASS). Large-scale and complex data collection efforts—requiring 'real-time' automated processing of the data stream—have been transformative for the field, enabling scholars to rapidly harvest and mine large volumes of data to better understand the universe.

> In the area of imaging, technology has really changed or enabled a whole range of science in the last ten years. We're just dealing with pictures of the sky, nothing more complicated than that. And with modern telescopes, you can take a tremendous number of pictures of the sky. Having the computing resources to process that data, look for changes in the sky, and count objects and cross-correlate their colors is a huge advantage. We now have the computer resources to do that on large data sets that were unfathomable ten years ago. You would previously have to rely on humans to count the objects themselves or do things that would have taken hours of time, but these tasks are now achievable with modern software. There are whole new experiments being devised that you just couldn't imagine doing observationally without the advances of computer speed and data storage.
>
> It's going to be crazy in the next few years when the next generation of really big observatories comes online, because they will take snapshot images, at several gigabytes per image, and with each image at only a 10 second exposure. And they will do this throughout the night. So we will have millions of megabytes of data constantly streaming in. There's going to have to be some kind of archival system. All of the data needs to be processed immediately because you have to make decisions, based on the observations, whether you want to continue the observation or move on…so it's definitely changing the field.
>
> There's a project called the Large Synoptic Survey Telescope, at a telescope in Chile, which will scan the sky and generate 20 or so terabytes of data every night. That is a lot of data by any account. All of that will be somehow stored and saved…Now, in these 20 terabytes of data, they expect to see…somewhere on the order of 10 to the 5th power of things…go bang in the night, per night. And from what I can estimate from our experiences, we may also see between a million and 10 million asteroids, most of which will be uncatalogued. All of that has to be communicated, sorted for follow-up, and reacted to right away. And that means that there are no humans in the loop. It all has to be done automatically. The data volume is getting serious…And so it's a very different story. The mode of operation is different. Traditionally, you obtain some measurements, you analyze the measurements and say, "Oh, gosh, this is interesting. I need some more data." And then you write a proposal to get some more data. A year later, you get more data. So it's a cyclical process…This is typically how astronomy works…But now everybody's got exponential data growth. In astronomy, we have the number of bits doubling every year-and-a-half, like Moore's Law. And what this means is

> that, in the next year-and-a-half, we'll generate as much data as in all of the previous history of astronomy…and everybody's in that position.
>
> I write computer programs to basically mine through large amounts of data, from…a robotic telescope that takes snapshot images. Every 10 seconds it takes a snapshot and then moves to a different galaxy and takes another snapshot. And we find supernovae by comparing an archival image to the new image, and you subtract the two images because it's all digital, and if anything is left over, any bright point, any new pixel, it's probably a supernova…For us, you would traditionally go to the observatory and look through the telescope, but that doesn't happen as much anymore. It all goes straight to the computer, because it's all taken with a really big digital camera, so you don't even look through the eyepiece anymore. You just give it the coordinates and it zooms in on it.
>
> There's a whole new area of astrophysics called time domain astrophysics. So there are a couple of telescopes being built on the ground, which will take pictures of the entire sky once every few days with great depth and sensitivity. And they're going to find things varying all over the place, and we'll want to know what they are. So if there's a big splash, or we see something dramatic, we're going to need to cut across all these different modalities to find out what it was. You're going to need to find someplace that looked at that place in the sky before the thing blew up or whatever happened, and then people to follow it as it's dying down, if it's dying down slowly enough. And then you're going to ask, "Has anybody ever seen anything like this before someplace else, in any wavelength, ranging from gamma rays to millimeter waves?" And that's the kind of thing that the National Virtual Observatory ought to be able to do…And then the other set of things they'll do, in addition to individual dramatic spectacular things, is find things that are just varying day to day or month to month or year to year…I think that's going to demand being able to reach into all the existing data sets in ways that we haven't done before…to go in and make time specific queries and cross-correlations among different wavelength bands.
>
> There's a lot of data out there and people have more ideas and the science builds upon itself. I could have a whole career where I should just stop everything I'm doing and turn off all the telescopes and go sit and work on the ideas I already have. But science moves at such a pace that, again, there's a cost-benefit analysis of, "Okay, I have this old data, which is really interesting, but I have access to new information that's even better."

Visualization and simulations

Theoretical astrophysicists produce data on a scale that rivals the generation of observational data. In particular, specialized visualization and modeling software is used to produce simulations of the universe. Increasingly, informatics-driven research is blurring the boundary between the observational and theoretical arms of the field. Some scholars rely on visualization technologies to make sense of the large amount of data produced.

> People who rely on advancements in visualization tend to be more theoretically oriented; they're doing models on computers, and they're visualizing their models, as opposed to those of us who take data. They're a synthesis of imaging and spectra that requires new visualization tools. I don't have much data dealing with that technology.
>
> One of the biggest developments is in simulations. When we observe the universe, we don't change it ourselves, we're not experimenting with it, we're really just observing it passively, which is a big problem in astronomy…So people have now created simulations of the universe that allow us to compare a whole family of realizations of the universe with the data that we see, or if you like, with the one universe that we have. And I think the boundary between the

people who simulate the universe and the people who observe the universe is blurring. It used to be that we would meet at conferences and the observers would say, "Well, here are my data," and the simulators just felt triumphant if they could come anywhere near reality. And the two sides would jeer at each other and not get on very well. But now we realize that the tools of modeling the universe are an integral part of understanding our data to the extent that the simulators can account for the characteristics of the observatory and the telescope. These tools have taken a while; it's taken about 15 years for the observational astronomers to grow accustomed to the idea of working with theoretical simulators. But even the old diehards are now doing it. So this has been a gradual transformation in the subject.

A thousand-fold increase in data…is not just data from the sky, but it's also data from the theorists. The theorists are creating huge simulations that are just as intensive as the observations…there is a huge data flow and…we need to be timely. Our advances in technology are happening so fast that we can't even imagine what the science will be five years from now. We have some idea, but I would say it's very difficult to say in detail even ten years downstream. So for us, the technological rapidity and the handling of huge amounts of data, the ability to reach across the world, in the public as well as private domain, with security, observing all these things, characterize our field.

New technologies for data analysis

As observational data grow in volume, astrophysicists rely on statistical methods, such as principle component analysis, to find patterns in large data sets. Some scholars advocate the use of more complex algorithms for advanced statistical analysis in the field.

A technique that's very useful with large statistical data sets finds patterns in the data that you wouldn't be able to spot by yourself. The data sets are getting so big that you often can't plot them out. In the old days, if you didn't know what you were looking for, you'd think, "Well, here's a unique set of data and I know there's some trend here, but I don't know what it is," and you could plot everything against everything until you saw some trend. Now there are clever codes, which allow you to take a huge set of data and filter it directly, and it will tell you the most significant trend or component in the data that allows you to shortcut the process if you don't know what you're looking for. This is called principle component analysis, where you just throw the whole thing in a box and out comes a whole set of parameters that tells you the most significant correlations in your data. When this idea was first presented to astronomers, people thought it was terrible, "We should approach our data with a rational viewpoint and some hypotheses." But it's amazing how people are now growing accustomed to statistical tools in looking at big data sets.

We need to be able to apply statistical techniques to large data sets. In my field we find many variables and transients, and individually we tend to know what they are. But…statistically we would like to be able to predict using just a small number of observations. That is not possible, so personally I would like to better combine statistics with astronomy…A study a few years back found that about 50% of all astrophysics publications use some sort of statistical tool, and 60% of those techniques are older than the first World War. There are so many advances in statistics that we should use.

Computer-aided design

Computer-aided design (CAD) enables scholars to test instruments virtually, which is considered a boon for engineers working on astronomical instrumentation.

> The 3D CAD programs are so much better than they were ten years ago that I find it almost mind-boggling what the engineers can do with these programs to avoid making costly mistakes because…in a big mechanical system you might not notice that a bolt went a 16th of an inch too far. And you can check all that before it ever gets built. The way it used to be done is you would design something and then you'd build it to see if it worked. And now you can basically tell if it's going to work before you ever touch a piece of metal. That's certainly been a big thing.

Search and discovery of secondary literature

Journal articles are typically accessed through online bibliographical databases. Scholars rely heavily on the Astrophysics Data System (ADS), a NASA-funded bibliographical database, and the arXiv preprint server, though the former is preferable for accessing *final* archival publications. Using ADS, scholars can download PDFs and data, search by keyword, and retrieve citation information. Citation metrics in both ADS and arXiv can inform selection of frequently cited papers. Although there is limited use of Google Scholar, astrophysicists may rely on search engines for literature searches outside of their immediate field of expertise. Because of these online resources, there has been a consequent decline in individual journal subscriptions.

> We have the astronomical data service…and they have put everything in physics and astronomy online, and they keep adding to it over time. So supposing you were interested in what I have published, there's an interactive webpage, where you type in my name, you can limit the dates or you can look at all dates, and all my papers will come up. You can sort them according to your preference, backwards in time, forwards in time…It's a marvelous tool. We're totally spoiled…I can download a PDF of the paper; I can look up all the citations to that paper. I can get a version that has great figures, to snare a figure for a talk I want to give. And data sets are tabulated there, so more people are not spending the money to publish long tables. They'll publish the first 10 lines to show how the table format works and then the rest of the table is available electronically. You can download huge tables that way and it's very efficient.

> ADS is essentially *the* electronic library of astronomy, supplemented with the arXiv preprint server for all physical sciences, which is now expanding to other fields. I essentially start 99% of my literature searches with these two resources. I find that I very rarely go to electronic journals' sites. I would go there largely to get a better formatted version of the paper that I have discovered on one of these two sites, to get them nicely printed, as opposed to LaTeXed. Every six months or so, I go to an electronic journal site—and there are only two, three, four in our field that really matter—to see if there is something that I missed.

> If I'm trying to find some reference, I pretty much always go through ADS just because it'll take you to the actual, final published version. That way you don't run into the problem where you're not sure if you've got the latest version of something or if they didn't update it…and, of course, it goes the whole way back to the beginning of time, essentially.

> People are not so interested in papers in detail, but they look for papers that are repeatedly cited, in other words, papers that have matured over time to become important and influence present papers. I always look for papers that reappear or are cited often. That alerts me to important papers that have appeared in the past. Some people never look at papers that are never cited. Of course, that's dangerous too.

> Because the physics community worked that system out pretty early, I think that we have not paid attention to things like Google Scholar that work for all of academia. But now, in my

> research, I've become more interested in areas that are slightly outside what I'm used to doing, and Google Scholar turns out to be very useful for looking at wider ranging sources…ArXiv works very well, in part because it works very closely with something called SPIRES at Stanford [a high-energy physics literature database], which has been around even longer than the arXiv and has been keeping track of what papers are cited. So, for better or worse, I can go online right now and tell you every paper that's cited each paper I've ever written. It's a tremendously useful scholarly tool because if I read someone else's paper and I think it's interesting, and I'm going to use it in a paper that I write, I need to know who else has found that paper interesting, what else have they said, and what are the chances that they said the same thing I'm trying to say?

Annual reviews

Traditionally, scholars moving into new research areas rely on annual reviews or review papers to bring them up to speed. These could be replaced by online-only review journals, such as Living Reviews, which enable scholars to contribute and update articles electronically.

> There's something called *Living Reviews*. Review articles are excellent ideas for young researchers or anybody really. If you're moving into a new field, how do you find a state-of-the-art article that summarizes everything that's been achieved? Now, up until recently we've written these articles called annual reviews, and there's a book called *Annual Reviews of Astronomy and Astrophysics*, produced in California. You get an article on some topic in astronomy, but it's out-of-date within two years…and this is really a chore. But now to write an article on the Web that's constantly updated…it's not too difficult to imagine this could become like Wikipedia. At the moment there's still a person who is charged to update it. But it's only a small step from that to an editable Wikipedia version.
>
> The publications of the Astronomical Society of the Pacific invite review papers on a subject from an authority. They might invite one from somebody on the discovery of planets, and then they will send that out to be refereed. Even though it's an invited review paper, they feel their journal's integrity is at stake.

The role of the library

Although astronomy/physics libraries are widespread, the role of the library is declining in the field. Libraries tend to hold conference proceedings, annual review volumes, and monographs.

> There was a big argument when we moved into a new building about whether we were going to have a library or not. And I thought it was probably a waste of space if no one's going to use it…It's just a whole bunch of books that no one looks at…I think the whole concept of a library has changed, at least in this field. I know there are still fields where they haven't quite caught up in terms of electronic publication.
>
> People do not visit the library much anymore. We have a library, but I rarely set foot in it.
>
> Astronomy libraries, which are large reading rooms embedded within astronomy departments, are focusing more on keeping up to date with proceedings volumes, annual reviews volumes, and monographs, with the presumption that the main archival journals will be accessed electronically.

Ap5.2 What Do Scholars Need? How Are These Needs Being Met or Not?

As astrophysicists become increasingly sophisticated in their data generation and analysis, the need for better technologies for streamlining the data collection process has become more urgent. Scholars look to their institutions to provide technical support and training in the use of new tools and technologies.

Bandwidth

There is demand for an infrastructure to support remote sensing and archival research among the scholars we interviewed. In particular, scholars complained about low bandwidth, which can hamper data-intensive research. Many scholars complained that their institutions do not have high-speed Internet, which is required to access, download, or manipulate large amounts of data remotely.

> It would be good to have a higher bandwidth link to any big telescope for remote observing. I always go to Hawaii to observe at Keck, because there's a time delay at the remote observing room here. Their spectrograph has the world's largest spectroscopic detector; every picture is 100MB. To get that from Hawaii to my home institution takes 20-30 seconds. I don't want to wait for that. You have to feel more in touch.

> There's a lot of discussion going on at this campus about high bandwidth…I'd say it's being driven more by simulation, because simulations are producing more data than actual observations. We only have one universe but we could simulate a million of them…and the simulations are just churning out data. We have a mini supercomputer on campus and they can't get data from there into their offices. Once they've got it in their offices, they can't analyze it because it's so copious; they don't have the sophisticated visualization hardware that we now need. So it's on our list to raise resources for. We're thinking about starting an astrophysics visualization center, with a combination of software, hardware, and people. But the first step is to have a high-speed channel. We have to upgrade the wiring in these buildings to get at least one gigabyte onto the office desktop. So that's more money.

> Our institution is in a special position of not having high-speed Internet, the next generation technology. If there's some way we can get it, that is what we need in astronomy and I think probably in other disciplines too.

> The thing to keep in mind is that our volume of data will increase enormously, if not by factors of a hundred, probably a thousand in less than ten years. Therefore, if this university does not have high-speed Internet…we will be out of the running for quick access to large amounts of data. It is important to keep that basic communication channel. Then we can use whatever technologies are developed commercially or otherwise. There is remote observing, but we would like to be able to pipe the data from whatever observatory to our home institution, to work on.

> What we can't do is get huge data sets back and forth. So we can look at the guider, we can point the telescope. It's a little harder to evaluate because we don't have the pipes to get the data through all the instruments. So that's the state of things, and that's the way the future is going to look.

The scale of data is becoming so large that some scholars conduct their computational analyses at the site of the data set, instead of downloading the data locally.

> I work in a large collaboration, which does very large simulations of structure in the universe, and generates *huge* data sets, tens of terabytes of data, so it's just not practical for everybody who wants to use them to drag a copy across to their machine. So we have switched to a system where you take your analysis software and move it to where the data are and do it all remotely. It's all in Munich at the moment, so…I have access to the computer and I just log into that, and then run my analysis on their machines. So practically, it makes very little difference. I still sit at my computer in my office and do the work, but having that infrastructure allows you to connect in this way.

Technical support and training in the use of new tools/technologies

Scholars rely on their institutions to provide technical support, particularly for developing and maintaining data archives, which are often made available through project websites. Technically proficient individuals, which can include graduate students, postdoctoral researchers, and librarians, often provide this support.

> Data management is no longer something that a computer savvy faculty member can do simply. The average faculty member can't make their data easily available. It requires some professional software and specialized equipment. The data sets are getting big enough that you need to spend some real resources on it, which is a change from the past.
>
> When you get Hubble time, you're offered enough money that you can hire a grad student to actually reduce your data, which is good. It's made the research process much more productive.
>
> I'm hiring somebody next year whose full-time job will be to help organize the data sets we have and make them it easily accessible. We have the luxury of hiring people to do that here because we serve a lot of people.
>
> The amount of data, and just the organization of it, is either something we're not very good at or don't want to do. We have it on our hard drive, we use it on a daily basis, but we aren't able to conveniently get it to the community, and having a professional working on this…would be a huge advantage.
>
> We have a very, very good but extremely overworked system administrator for the computing here. I am told that our new librarian is willing to help with those kinds of things…managing data archives and things like that. So there's a lot of expertise in these areas, but if you don't have money to pay for it, it's hard to make use of it.
>
> At our research institution, the information technology was in such a mess that they completely redid it…One of the guys who was on the team to revamp the whole thing was an ex-system manager for the physicists…It's interesting. This is all one human being's idea…if they hadn't found him and put him on the team, it never would have happened. They just needed somebody to see it was an issue.
>
> Our biggest problem is getting webpages designed and written. Maybe that hasn't been fully absorbed into the culture yet. It's extra overhead to manage this new publication medium, and our manpower allocations are so far not fully successful in riding both horses. I would like technical support, perhaps somebody to design a webpage for me. I could write the content and they would make it look reasonable…Every unit here in astronomy solves this problem in a different way and to a different degree of success….Our webpage actually is slick, and that's because we got a grad student who happened to love this…that's very hit or miss. Without that person we would have not solved the problem.

> Developing a website is left up to the individual. I would say on a scale of one to ten, I'm a number three; there are quite a few people who are not very tech-savvy at all and worse than me…It's a headache…I could probably find somebody here whom I could pay to develop a website, pay a couple hundred dollars to just set it up, but I have no time…If I look at my own career, the old days of being able to do the calculations of the brightness of a star just using a hand calculator are gone. The instruments that we use now are extremely complicated. We need to process data rapidly and to deal with new technology. We now need graduate students who are incredibly talented at dealing with the complexities of computer systems and data sets that are often spread over many different databases and need to be brought together…How do we keep up? The answer is we need students and postdoctorates. As we get older, it gets harder and harder to keep track of all the complexities involved in technology.

Astrophysicists receive limited training in computational technology. While there exists the perception that astrophysicists, and in particular young scholars, are "innovative" in their use of new technologies, they frequently simply inherit tools and techniques from their more established counterparts and the world at large.

> The problem with the technology is that almost all these tools that are available to us have so many different options and modes, there's no really efficient way to learn how to use them. Most of them never get used because no one knows how to use them. I've learned everything just by needing to do something and having someone down the hall show me how it's done.
>
> I don't think that younger scholars are more innovative. I don't know why that's not the case. To some degree, I've seen in the field that we basically pass down the techniques of the trade, and students get handed a tool whether you want to or not. And then there's the opportunity to innovate from there, but you're already at a point where there is an accepted way of doing things that restricts your options to begin with. I don't see the younger generation doing things in such a radically different way than the previous.
>
> We do not innovate. We just use what the world gives us. It would be nice if we could innovate in some way…I find myself frustrated that the academic community, by and large, is not really leading the charge…The way most academics use these new tools and technologies is no more sophisticated than what their secretaries do: there is an off-the-shelf product and we use it because it's there.

6. TO WHAT DEGREE DO YOU OR YOUR COLLEAGUES ENGAGE WITH THE PUBLIC? HOW? WHY OR WHY NOT?

Astrophysics as a field enjoys widespread public interest and has broad public participation: professional societies enroll a substantial volume of amateur members, the Smithsonian's National Air and Space Museum continues to have a significant influx of visitors every year,[55] and members of the public frequent observatory visitor programs. Scholars engage with the public in multiple ways, including in schools and community programs, and in a variety of media outlets. Citizen scientists are playing a growing role in the field by helping scholars to process and analyze large amounts of data in crowdsourcing initiatives like SETI@home and Galaxy Zoo.

[55] See: Friedlander, Amy. 2008. "The Triple Helix: Cyberinfrastructure, Scholarly Communication, and Trust." *The Journal of Electronic Publishing* 11, no. 1. http://quod.lib.umich.edu/cgi/t/text/text-idx?c=jep;view=text;rgn=main;idno=3336451.0011.109

Ap6.1 Why Do You Engage with the Public?

As in biology, many scholars in astrophysics feel a sense of obligation to give something back to the public, especially since public agencies are the primary funding sources in the field. Funding bodies, such as the NSF, increasingly require public engagement as a condition for rewards.

> I'm a fairly senior person, and I've been giving public talks since day one. I think many astronomers feel an obligation. I'm paid by the taxpayers and we ought to give something back. Communication with public audiences is my attempt to share some of this interesting knowledge. We provide inspiration and entertainment, and it doesn't do any good if it doesn't reach its destination.

> Initially, we paid no attention to public outreach. Then we paid lip service to it and now you have to take it very seriously. You need a real plan and you need to report on those activities as well. It has become part of the proposal and part of your reporting structure, so you can't ignore that anymore.

> We need to communicate to the public. There's a lot more pressure by the NSF and the federal government for us to be out there, doing outreach and education.

> Many postdoctorate and graduate fellowships stipulate public outreach as a specific component that you have to address through public engagement.

> The NSF and NIH tried to include a K-12 component to grant applications, but I don't think it's working terribly well. It worked well right after Sputnik was launched. At that time, I went out to high schools and we did summer institutes for teachers. It was a lively period. Public engagement is most valuable when it creates a sense of professional community with a much broader range than just the professional university and college scientific community.

Writing and lecturing for a public audience can also "fire up" a scholar, especially since the process requires them to take a step back from the intricacies of research.

> I give public lectures, if the opportunity arises. I actually enjoy it. I usually find that giving a lecture gets me more interested in what I'm doing, just because in your daily research you can get into a state where you're worrying about your own problems in detail, often about simple mechanical things. So public engagement forces you to step back and look at the big picture and then communicate it in an interesting way. And that usually is a very therapeutic thing to do. And so I like to do it. Although perhaps I don't actively seek out opportunities to do that as much as I could or should.

Why not?

Even if scholars are enthusiastic about their outreach responsibilities, some feel restricted by a lack of time and resources. Public interest in astrophysics depends on subfield; "pretty" images are said to resonate with the public more than overly "technical" work, because there is a greater grasp and appreciation of pictures of the sky.

> We have open days at the observatory. Outreach is time consuming and the resources we get to help us do it are lacking and very competitive. So I'm trying to get other resources to help improve my outreach.

> I used to do more public engagement when I was a postdoc but it's too much responsibility and I barely see my own kids. I'd rather see my kids than somebody else's Girl Scout troop.
>
> Some amateurs say, "I have a theory of the universe and I would like you to critique it." I don't take those questions seriously, but a lot of times interested people who saw some astronomical DVDs may have a reasonable question that I'll try to answer. So that takes some extra time.
>
> I engage with the public mainly through public lectures. My own science is mainly spectroscopy-based, which is tough to make very flashy and accessible to the public, not that I couldn't try harder. But I'm not taking pictures of the sky where you have immediate gratification, and make a general person say, "That is really cool."

The contested nature of the "public intellectual"

While young scholars are advised to steer clear of excessive public service—such as writing a blog—it is encouraged among scholars who can "make a splash" through a new research discovery.

> The campus increasingly wants their people to be prominent. Everybody is scrambling for a spot on the front page, including astronomers. When we have a good story, we try to put it out there.
>
> People in the social sciences and humanities have taken to using the Internet in a much more active, energetic way partially because, I'm guessing, what they do relates more directly to the things people on the street are interested in…But for a physicist, it's just not respectable to do that. Stephen Hawking gets a tremendous amount of grief for writing popular books, and he's one of the leading physicists of the last 30 years. You can be a really good, productive physicist without ever leaving your office or talking with anyone other than your colleagues while you can't be a very good political scientist or economist without doing that. So talking to a wider audience is perceived as unserious and with suspicion. Even as people will blatantly tell you otherwise, saying that public outreach is very important, secretly, you're considered less serious if you spend time doing that.
>
> There are NSF awards for young faculty called NSF Career Awards where I find that there's a distressing expectation now for us to be all things to all people. You're supposed to be doing heroic, world-changing research and running some huge enterprise for public outreach at the same time. I think it's important for people doing the research to take opportunities to communicate to the public when they arise, but really both responsibilities are full-time jobs. I think that the people with the right skills to do each job well are not necessarily the same people, and they don't have the same training. So it seems unfair to expect, particularly for young people trying to establish themselves in their research program, to be doing planetarium nights and setting up outreach programs where none existed.

Ap6.2 How Do Scholars Engage with the Public?

Public engagement can take a variety of forms, including school and community outreach, observatory and university-based public lectures (some of which are made available to the public in DVD form), observatory visitor programs, websites, and blogs. There is also the online "ask an astronomer" service, maintained by graduate student volunteers at Cornell University, which enables members of the public to ask astronomy-related questions based on personal hobbies and as a supplement to K-12 teaching. In addition, some societies (such as the Astronomical

Society of the Pacific) have a large amateur member population alongside its professional constituency.

> For the past couple of years, I've given a public lecture at our observatory in the summer.
>
> We have a summer visitor program where an astronomer gives a talk each night, and then the observatory is open to the public to look through the telescope and to hear a science lecture…the Keck Observatory is doing even more of this all the time. They have general public lectures and then "invitation only" events. You have to be really rich or a major donor to get one of those.
>
> I have a blog that I use most obviously for outreach to the general public. We don't post a lot of equations or complicated jargon. We're trying to talk to a wider audience…We're not getting paid for this, we're not hired by a magazine, we're not doing a service, it's what we want to do. And, so we get thousands of readers every day, which is more people than I would ever get in giving a talk.
>
> The graduate students support the "ask an astronomer" Internet service, so you could ask a question and some grad student will then read it and pass it onto the appropriate person or they'll answer it themselves…And I think we need to do more public outreach. The other way we do public engagement is when we get calls, from say, the Rotary Club. And I either do those or I ask a colleague to do those public talks. We've gotten pretty good with those requests. We're now at about 100% participation in any request we get, and we get about three a month…I actually try to lean on faculty, rather than graduate students, to show up at events, but different events require different people.
>
> The Astronomical Society of the Pacific was created by the Lick Observatory in the 19th century as a way of inviting wealthy armchair astronomers to events and soliciting them for funds. It survives as a professional society to this day.

Astronomers are fairly strategic in disclosing their research results to the public. Press releases are issued by press offices, often with input from the scholar in question. Press conferences held at society meetings can also act as a source of information for journalists and the public. Also, science writers act as "mediators" between scholars and the public by fostering public understanding of the field.

> There was an American Astronomical Society meeting where the authors presenting a paper held a press conference associated with the meeting. Apparently they had all these planets saved up that they presented at once, so they made a big splash.
>
> If you have a really good research result that you think is interesting, you issue a press release and you may also organize yourself into a larger cluster of scholars so that you can release a larger body of results in a more major concentrated way, which will get a lot of attention. So you try to create these packets of critical mass.
>
> We have a press office, where someone specializes in the sciences…and it's up to us to say, "We have a press release with AAS, or we have a *Nature* article, etc." And he's very good at responding to those things.
>
> Serious public outreach requires a dedicated staff position in the department. We have a public relations person at our Observatory, but they're just swamped. It's amazing how, if you just do a little work in that direction, the response completely overwhelms you…I worry that if

> I started to spend all my time getting the public to help me look for distant galaxies, I would just be *completely* inundated with emails and phone calls, and with people wanting to come and talk to me. So if we were to do that seriously, and it sounds like a great idea, we would need a lot more manpower here, with non-faculty people running it.

Citizen science

Astrophysics has a large citizen-scientist component and various scholar-driven campaigns aimed at soliciting help from the public. Examples include SETI@home and Galaxy Zoo, which enable individuals to contribute their home computing power to help sift through the data involved in the process of galaxy classification. These initiatives are hosted and run by individual universities or by multiple institutions.

> It could be very lucrative and helpful to get the public involved, and it would raise the field's visibility…The only example that I can think of is Chris Lintott at Oxford, who's running a galaxy classification project. He has got a huge amount of attention from the BBC. The idea was that there are all these galaxies that need categorizing. There's a webpage where you can learn how to help, and he's had something like 20 times more inquiries than he imagined. It was just over the top.

> Another issue is classification of galaxies. Galaxies come in various sizes and shapes, and in the old days we used to look at them by eye, classify them, and see, for example, how they're distributed. A round galaxy is more common in certain areas of sky than spiral galaxies. We now, through Hubble, have observed millions of galaxies with different sizes and shapes, and so the process of classifying galaxies has become standardized. In fact, the public is now doing it. There's a webpage that's a little bit like the search for extraterrestrial intelligence. Your idle computer analyzes signals that are coming from radio telescopes, to look for signatures of life in the universe. And lots of people have signed up for this. If you have a PC, you get a software package and you can dial up and use the data. People are now doing this for galaxy classification, too.

> There's also the VSNET (Variable Star Network), which is a project between amateur astronomers and professionals. Because of the sheer volume of asteroid-related activities, professionals cannot do all the work. So amateur astronomers are very interested in following up on leads. There are other communities like VSNET where the public can do a lot of work.

Computer programs, such as Google Sky and Microsoft's WorldWide Telescope (WWT), further feed the public's interest in astronomy by turning home computers into a simulated telescope capable of exploring the virtual universe. Data and time for these projects are donated from a variety of sources. The withdrawal of funding is a concern for some, particularly if these types of programs provide training or spark interest in future generations of astrophysicists.

> Google Sky uses some of our data and Microsoft is going to release their own competitor, called WorldWide Telescope. Google Sky has different layers, so some data come from the Sloan Digital Sky Survey, and also from others, and then they also have smaller areas, which come from specific smaller surveys and larger telescopes. And Microsoft is doing the same thing. And you can add your own data. Google Sky has what they call a "mash up" where new view events are immediately seen there on Google Sky. So astronomers who are following up on events, even through Google Sky, can find out the new sources.

> Google has a project…where they keep attaching new data sets to the library, which they think of as layers. For instance, here's the sewage system, here's the ethnic makeup of that

point, etc. That way of thinking about things fits well with the celestial sphere, because you could think of various ways of observing a piece of sky as being layers. So they have an automatic way of accessing, browsing, and keeping track of observations. This is what virtual observatories are supposed to do, so I'm not sure who's going to win or how things are going forward.

I saw a huge display of Google Sky at the American Astronomical Society meeting. I've seen students playing with it, and it seems great that a company that has funds is actually doing this, rather than trying to scrape together federal funding to do it. But then, that makes one concerned about relying on a for-profit company to do this kind of thing; it seems, ultimately, like a bad idea, because they can change their minds at any time and withdraw funding.

SELECT RELEVANT LITERATURE AND LINKS

This is not meant to be an exhaustive bibliography; as a courtesy, we are providing some of the literature—scientific and popular—that we have collected over the last few years. Please see the main Relevant Literature section and various footnotes for additional citations.

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CHAPTER 4: BIOLOGY CASE STUDY

CONTENTS

INTRODUCTION AND OVERVIEW OF THE FIELD

As many say, we are in the "era of biology," which is reflected in the field's dynamism, commercial potential, and the rapid expansion of new sub-disciplinary branches. Biology, broadly defined, is the scientific study of life and living organisms. The biological or life sciences can be subdivided into a number of specialized subfields, often distinguished by the level of organization addressed, from ecosystems, to the whole organism, to the cellular and molecular. The field can be clustered into two primary academic divisions: the "bench" sciences, which encompass molecular and cell biology (MCB, e.g., genomics, neurobiology, microbiology, developmental biology, biochemistry, immunology, and biotechnology), and the "field" sciences, comprising organismal biology (OB, e.g., marine biology, ecology, zoology, and evolutionary biology).[56] In addition, the expanding field of computational biology/bioinformatics utilizes techniques borrowed from informatics, artificial intelligence, applied mathematics, computer science, statistics, chemistry, and biochemistry. Bioengineering is a relatively new field as biologists increasingly collaborate with engineers, chemists, and computer scientists to explore existing life forms and to create new ones. Departmental organization is idiosyncratic to individual universities, and those with medical schools offer a particularly large range of subspecialties. In addition to faculty members, non-tenure track scholars in the field work as research scientists, support staff, or directors of research facilities. MCB follows the laboratory model, with a single faculty principal investigator who oversees graduate students and postdoctoral scholars.

Peer-reviewed journal articles are the principal means of archival publication in biology. Molecular and cell biologists are particularly attracted to a small handful of prestigious journals for their high impact factors[57] and speed to publication—including *Science, Nature*, and *Cell*—despite, or because of, their low acceptance rates and consequent high selectivity. Experiments in many areas of MCB can be conducted rapidly, which, in combination with the highly competitive nature of the field, can preclude the widespread sharing of work-in-progress. Rapid review for publication is paramount in MCB, contributing to the continual incremental growth of knowledge and the need to get new discoveries into the public scholarly domain quickly. The trend toward the "smallest publishable unit" has been met with some resistance by some scholars and facilitates a virtual race to formal publication. (Speed to publication remains subfield dependent, however; in neurobiology and the field sciences, speed does not appear to be as crucial as in genomics, for example, where scientists depend heavily on hyperlinked literature and their associated data.) Papers, in the form of preprints, are often posted online by journals once articles have been accepted for publication. The electronic publication of supplementary and visual data enables scholars to reuse, re-manipulate, and verify research.

In biology, medicine, and other life sciences, the academic community faces a "serials crisis," in which a handful of commercial publishers are perceived as monopolizing scientific knowledge. University libraries, often with decreasing budgets, are struggling to cope with rising journal subscription rates. Many are forced to cancel journal subscriptions, resulting in diminished access to articles for faculty members. The "serials crisis" has prompted a number of responses from the field. Most notable is a move toward open access (OA) journal publication—exemplified by the array of journals published by BioMed Central and the Public Library of Science—and self-archiving to digital repositories like PubMed Central. Some funding agencies, such as the

[56] See Quinn and Kim (2007: 3) for a useful map of the discipline.
[57] The impact factor is used widely for assessing the stature of journal outlets in biology. Some suggest it is overused heavily (Monastersky 2005a).

National Institutes of Health (NIH) and the Wellcome Trust, stipulate open access dissemination of research results (at variable periods following publication) as a condition of awards. Author-pays fees are common for OA journals and are generally covered by grants.

MCB is comparatively very well funded by national agencies and industry research grants, often in the multi-million dollar range. The top funding bodies in the US include the NIH, the National Science Foundation (NSF), and the Howard Hughes Medical Institute (HHMI). In the UK, the top funding body is the Wellcome Trust. Securing extramural funding, particularly single-investigator grants, is essential for a scholar's career. Such large-scale funding is less common in the field sciences.

There is an abundance of digital data types in biology; in molecular and cell biology, a reliance on centralized and hyperlinked electronic literature and large databases is prevalent, specifically PubMed. The National Library of Medicine (NLM) has worked with other organizations to bring together databases of protein structures, DNA sequences, human genetic diseases, pharmacological tools, and other resources—all interlinked to PubMed and journal abstracts (though not always full-text papers). In MCB, data and other materials are typically distributed in three ways: as supplementary material to a journal article, deposited in a subfield-specific or federal repository (often mandated by funding bodies), or shared *ad hoc* by the researcher (which may be dependent on the size or culture of the research area; cell lines are often distributed this way). GenBank and other data repositories play an important role in harvesting and storing genetic, protein, and other sequence data for reuse. Some have suggested a role for Wikipedia-like platforms for the correction of data.[58] Work in bioinformatics and genomics may increasingly rely on the computational branches of the discipline to create software facilitating the mining, collection, analysis, and publication of data. The use of imaging technologies for analyzing and visualizing data is becoming increasingly important and many scholars publish visual material, including complex charts and figures, still and moving images, animations, and three-dimensional images.

While conferences are an important means to keep up to date in the field and to make contacts for collaboration, other sharing mechanisms (e.g., working papers, preprints, public blogs, and wikis) do not appear to be embraced by scholars at the most competitive institutions. Some publishers are experimenting with Web 2.0 and social computing models as mechanisms to publish early results and solicit online public review, though uptake appears to be predictably limited. Email, informal networks, and face-to-face interaction remain invaluable for sharing ideas in-progress and managing collaborations. Although biology is already a social, team-based enterprise, there is a push by some scholars and funding agencies to encourage a move toward very large and complex multidisciplinary collaborations targeted at "grand challenge questions." These projects enlist multiple experts across diverse disciplines and thus can present significant challenges to the advancement system, which tends to reward individual scholarly contributions within more or less familiar disciplinary boundaries.

Scholars engage with the public through formal talks and seminars, community outreach, visiting schools, and public forums that include op-ed pieces and media interviews. Such activities are considered natural by many given that the bulk of biological research funding comes from taxpayer supported agencies. Some funding bodies, such as the NSF and the Wellcome Trust, require a public outreach component as a condition of their grants. Publishers are experimenting with new ways to engage lay audiences, including the heavy use of

[58] Huss *et al.* (2008), Pennisi (2008).

multimedia and "light" genres such as video and podcasts. The "public," according to our interviewees, includes the usual suspects—school children and the community—as well as biotechnology and pharmaceutical companies, and government agencies.

In sum, the publication system in biology is almost exclusively journal based and dominated by a few highly selective journals, although there is a proliferation of journals of varying quality to accommodate new and existing subfields. Competition is fierce and speed to publication is critical. Working papers and other forms of early public sharing in MCB are eschewed, although non-prestige outlets that publish long-form articles (with room to expound on methods and to present data) and more prosaic material, such as protocols, may find a niche. Until the academic reward structure is sufficiently nuanced to judge multiple authorship, "grand challenge" questions will continue to collide with tenure and promotion requirements and have the potential to impede collaboration across institutions. In response to exorbitant subscription charges by commercial publishers, open access experiments have emerged. Some institutions have set up funds to pay for publication charges, and new journals have been established both by scholarly societies and commercial publishers with well-known and prestigious imprimaturs. Large repositories play a crucial role in ensuring the preservation of and access to data, though the field still lacks a sufficiently robust technical and institutional framework to support widespread data sharing practices. Issues of data preparation, accurate curation, storage, preservation, and the migration of changing data forms, remain outstanding challenges facing the field.

1. REQUIREMENTS FOR TENURE AND PROMOTION: WHAT ARE THE QUALITIES OF A SUCCESSFUL SCHOLAR?

In biology, successful scholarship is marked by high-impact publication and procurement of extramural funding, but the unwritten rules of judging scholarship can be flexible. Quality is most important during evaluation at the departmental level, but final review committees often rely on multiple layers of assessment, including imprimatur and impact factor, both of which must be reinforced with external letters. Grant reviewers also tend to gauge applicants based on impact factors. These pressures do not wane at later career stages.

New and emerging forms of scholarship are not valued much in their own right, but supplemental articles describing a novel tool or resource may be considered in review. The work of developing software or data resources can be perceived as less valuable "tool development" rather than scholarship. Teaching and service are also expected activities for advancement, though they will not stand alone without a strong record of high-impact publication.

B1.1 A Suite of Achievements Anchored by High-Impact Publication

Several administrators at the departmental level noted the fluidity of judging good scholarship. Although a strong and sustained research trajectory is deemed critical at top research institutions, there is some flexibility at this level of review. Department chairs and deans holistically scrutinize each case, focusing on the quality of publication—measured by impact and originality—rather than quantity.

> You have to be a good scientist. You have to discover something or understand something that nobody did before. You have to do credible, original research. Depending on the level of institution where you're trying to get tenure, that has to be a bigger or smaller deal…My belief

is that if a young person has two strikingly original publications that are believed to be such by the reviewers, that's enough. Twenty unoriginal publications might not be enough…It's not about where it's published. Now, you maybe could fool some people into thinking that something is strikingly original just because it's published in *Nature* or *Cell*, but that's actually very hard to do. So strikingly original, published wherever. The point is it has to be believed.

We judge a record of productivity by an evaluation of the effect that the research has made in the field. And so, at the departmental level now, nobody counts papers…Tenure would not require publication in one of the "newspaper journals." So, the scholarly contribution to the field, how much it has impacted change or qualitatively changed our views of thinking about things, are the most important criteria.

So if you don't show a sufficient degree of publication and haven't found something—it doesn't have to be earth-shattering—but ground-breaking, path-finding, novel…those kinds of terms are applied to what we like to see a young person achieve as they're coming up for tenure…We'd like to see an acceleration in the trajectory for publications. Maybe it started with a lag, but then it's increasing so that maybe by the time somebody comes up for tenure there have been four or five research articles, six or seven would be terrific, and of course the better the forum in which these things appear, the better…Looking back at my own tenure, I think we've raised the bar some. We certainly have. Our expectations include both the impact of what the young person will find and what kind of science they do, so it's really a quality thing as well as the quantity. It's hard to put objective kinds of numbers or degrees to it…If the two papers were in *Cell* and *Nature* and they were really something exciting that nobody had ever done before, two might be enough. If the two papers are in a second-tier journal, in the pedestrian characterization of some enzyme, then it's not enough. But devising a whole new method that took five years to devise but now everybody's going to use it … that's a very interesting leap of creativity and you can't say that one paper wasn't enough. So it's a subtle mix of a lot of subjective criteria…judging the quality of what they've done, the novelty, the impact it'll have on the rest of the field, is it a flash in the pan, is it a one-hit wonder, is this an idiot savant, that you don't really trust this person, but they just happened to hit the target? All those things factor in—it's really hard.

It's clearly a mixture of both quantity and quality; that someone who has only one really, really fantastic paper is probably not going to be viewed too positively. The concern is that they got lucky once. The people who tend to get the most serious consideration tend to be those where there's some story they have that's really fascinating, which is borne out in a few of their papers, but they've done other things as well.

I think on this campus we're pushing hard to move away from just the body count of papers and really looking at the papers and their quality. I would like to see that generalized, saying, "Give us your five best papers," so it doesn't benefit anybody to publish 50.

Fundamentally, everyone is judged at the end of the day by his or her publications.

Now that I'm on the other side of tenure, I would say that one of the most important things that everybody knows is that the quality of the publications are more important than the number of publications, although you also have to have a certain number and it really depends on your division and department and what people count as a significant finding. And in some cases, maybe a single high-profile publication is what really puts you over the bar and you might need two of those. It varies among departments.

Additional factors may come into play when granting tenure or promotion, such as departmental fit.

> There are even cases where, despite all the objective indicators that there are out there—number of papers, where they're published, etc.—part of the decision too is, "How good is the fit? Is this person a team player? Do they seem to enjoy being an academic or do they seem like a fish out of water having never talked to anybody?"…So there's a little bit of a sixth sense about whether, 40 years from now, you're going to like to have them around as a sounding board and a friend, or whether you can't stand them and you want to get rid of them. Despite the fact that we try not to do *ad hominem* things … it's in everybody's mind.

Although not as important as sustained high-impact publication in the primary literature, writing review articles can establish a scholar as an expert in specialized areas.

> I think that the primary literature is more important than writing reviews but, if you get invited to write a review for a prestigious journal that seeks out the top people in the field, I'm sure it's quite a *coup.*

> Most of the *Annual Reviews,* for example, the *Annual Review of Biochemistry* or the *Annual Review of Cell and Developmental Biology*, have the highest impact factors of any journals in their fields. So if you publish in those sorts of things, people get to know who you are and what you do.

In addition to a strong publication record, junior scholars are also expected to establish and maintain a lab. Teaching and service play a secondary role for advancement.

> What's usually required for tenure…is to complete a piece of research that may result in three or four publications that are widely accepted as being of great significance. The "great" part is adjustable, sometimes it's just the significance, but it has to be a completed piece of high-quality research. That's in the research area. Then, you have to establish yourself as a teacher, and in the last few years, largely at the urging of our faculty senate, we've been paying a lot more attention to teaching…And then the third arm with the tenure and promotion is the service. And there, the biological sciences people are really excused from service and from some teaching in the first year because the very first piece of business is for them to set up a lab, and that's extremely time-consuming…Those are the three things that matter.

Multiple layers of assessment: considerations of imprimatur and impact factor

Perhaps in contrast to closer scrutiny of the holistic case made by one's departmental colleagues, some scholars suggested that tenure and promotion committees may privilege publications in journals with a high impact factor[59] over more substantive work in less select venues. This echoes our findings among biostatisticians during the planning grant phase of this study.

> Coming above the bar in terms of the quality of your published research and the journal needs to be a high-impact journal, so it has to be a *Cell*, *Science,* or *Nature* paper, and you've got to have at least one of those…It's a horrible thing in a way that you're not really recognized as excellent until you have a publication in an excellent journal…It's really the name associated with it that means a lot, especially to the tenure and promotion committee. They only know the impact factor of the journal; they can't really judge the science. So you have to really aim for one of those.

> Particularly in biology, because it is so competitive, where somebody publishes really makes a difference in terms of getting a job, a grant, tenure, attracting good graduate students and

[59] The impact factor is a quantitative measure of citations associated with a specific journal.

> postdocs. So they look at it through the variables that are most important to them, and if they're going to get the most respect from their colleagues by publishing in *Cell*, well then, they're probably going to continue to publish in *Cell*.
>
> The fact of the matter is that what really counts, certainly in molecular and cell biology, is whether you have a paper in *Nature* or *Science*. If it's in those journals, that assures your next promotion, basically, or if it's in *Journal of Neuroscience* or *Cell* or one of the high-profile journals…When I write tenure and promotion cases, I have some faculty who continue to do what I used to do and just publish one or two papers a year. I have to point out to the tenure and promotion committee that that's a legitimate way of approaching science…because there's a tendency to count the number of publications and to look for *Cell* and *Science* and *Nature*, and to downplay these other publications, which can actually be the result of substantive amounts of work.
>
> People like the idea of being in *Science* or *Nature* because the administrators are impressed with *Science* and *Nature*. There's no scientific reason for it at all…I don't publish there unless I have something like the double helix, or they ask me to write a perspective on education, so, sure, I'll do that, because it's a news magazine and is read by a lot of people. The name recognition of the journal is based on a model that nobody follows.
>
> One just has to defer in a way to the experts in tenure and promotion committees who know the culture. On tenure and promotion committees there's a group that, hopefully, is properly represented by good people with good judgment who have good standing in their field.
>
> There are the so-called high-profile, high-impact journals, and then there are the respected, society, peer-reviewed journals of the field. There are only a couple in every field. And when I was on the tenure and promotion committee, papers that appeared in those I counted as valuable as papers that appeared in the high-profile ones, because the difference between leading journals of the field and the high-profile ones is somebody's taste, informed or uninformed…We all know journals in our field where you stick something in if you've got to get a publication for a student and you just hope nobody reads it. Those are easy to see and that's at the bottom. But then there's this mid range where you scratch your head. I would say at my institution that is maybe 15 percent of the publications that you see. But…you can tell a paper pretty easily that has some substance from that which doesn't, so it's not an insurmountable problem.
>
> You need the peer-reviewed article in the recognizable publication for your department or field. So it could be the top journal over in this other field, but people in your department won't recognize its value.

Reliance by final review boards on bibliometric data may have perpetuated faculty publication in journals with the most stature, yet scholars readily admit that their best work does not always appear in the most selective journals. Scholars also mentioned that reviewers do scrutinize each case carefully and can exercise some flexibility.

> There's still the heavy reliance on the peer-reviewed journal, and we as librarians have tried to make some attempts on campus to broaden that a little bit, and gotten tenure and promotion committees to agree that open access journals are acceptable, because those are peer-reviewed. But going out beyond that scope is still very difficult, at least in the health sciences, because that's the way promotion and tenure is based, and so that's what the faculty need to continue to publish in. So the peer-reviewed journal is still the ultimate, and the handful of named peer-reviewed journals are even more important, *Nature* and *Science*

> and those kinds of publications, even though faculty will admit that their best publication wasn't in one of those top journals. But that's what the committees look at.

> I haven't done anything specifically for tenure and promotion, and the things I have done are things that I think will be productive in sharing the science we've done and, to some extent, also helpful for people in my group…I figured if I do good science, it will happen. And my sense has been, and so far this has been borne out, is that actually the tenure and promotion committee is pretty good at being able to work with different disciplines and their different approaches and being pretty sophisticated in dealing with how different groups do things differently and appreciating the achievement independent of any particular model. I know a lot of people often raise these types of concerns.

Advancement committee members with different academic backgrounds may look for more substantive work than what is showcased in the most select journals, which can cause tension.

> On the other hand, it's not always clear that the people on the tenure and promotion committee appreciate the pressure to publish short articles in top-tier journals…somebody on the advancement committee once said about one of the candidates put up for tenure, "Well, all they have are these short little articles in *Science* and *Nature*, where's the 50-page article in the *Proceedings of the Royal Society*?" Of course, different academic cultures have different standards and thresholds…but if somebody had two or three papers in *Science* and *Nature* each, that's terrific because these are among the most difficult journals to publish in, they're interdisciplinary and they accept papers from all the fields of science. To get your little story in there is kind of an achievement. I was shocked that there were even people on the advancement committee so naïve that they wouldn't know that.

Young scholars are acutely aware that publication in flagship journals receives the most credit from review boards.

> What they're looking for is, coming from a top-ranked program and publications. I'd say three would be the minimum you could have going into application for a tenure-track position, but usually a typical number is probably more like six or seven, maybe even in the double digits…Some of those can be in more specialized journals, but if you're going to get a tenure-track position at a good program, you should have a major publication in *Science*, *Nature*, *Cell*, PLoS, or *PNAS*, one of the top journals, in addition to your other publications in lesser journals…I failed to mention that the Ph.D. work alone is not sufficient for a tenure-track position in the biosciences. A postdoctoral fellowship is a necessary step to qualification. You absolutely need to do two to five more years of research, doing the same kinds of projects, at hopefully a faster pace, and producing more data in order to be considered for such a position.

> I think that the students generally know that if they pull something off in a higher-profile journal that it will reach more readers and that will be taken as an indicator of the quality of the work. For the postdocs, especially, that is something very important for their careers. So I don't worry so much about my own promotion and tenure because I'm here.

The need for change?

Several biologists made disparaging remarks about the top "newspaper" publications, *Science* and *Nature*, and have called for change. The imprimatur of such publications, however, still greatly influences decisions by advancement committees, and scholarly practice is unlikely to change until tenure and promotion requirements are altered.

> At this point, we're in flux. It's not clear how to change those incentives. To get a publication in *Science* is a very valuable coin to get grants and to get rewarded in your field at your institution…the university is basically saying, "We want to be providing those incentives. You bring us one of those shiny *Science* coins, we'll give you a pay raise." Meanwhile, the library is saying, "You're killing us." So it's a bit odd. The university is actually the player that's setting up the incentives, because they're cashing in that coin for you, but it's also the main consumer, as in the university library. So the universities have the power to say, "We don't mind. We will judge your work separately. We will find some way of doing peer review that's independent of whether it's appeared in *Science* or not. And we'll therefore change the incentives for the faculty." And, at the same time, that would free them up to say, "We don't want *Science* and we'll save $40,000 per year for that one publication." So it's a very interesting phenomenon.
>
> We are being held hostage by our own inflexible ways…The publishers have a wonderful business model to milk us. We give them the research for free, the content for free, we review for free. I serve on the editorial boards for free, and they just sit back and watch the coins come in. And the problems, of course, are advancement systems and hiring decisions, where the metric of success is measured by impact factor and number of publications in certain journals…The things that we should change most are: the metric for success and the way the content is evaluated for the impact the paper makes as a contribution.
>
> The more difficult thing is modifying or adding to the credit and the assessment systems within science. They are very well established and difficult to change in order to make sure online-only publications get recognized. And there's a bit of a chicken-and-egg. While they're still very minority activities, there is less of an incentive for anyone to try to measure them and give credit. But I've spoken with very receptive senior people at places like NIH and Wellcome, who completely buy into the concept of Web-based publication. So, I think it's possible to give it a really good try. But we're not going to convince anyone right away. It's going to be a long, slow process.

Visibility in the field

Visibility in the field is closely coupled with other promotion criteria. External letters are solicited from outside experts and provide another layer of assessment to inform committees. External reviewers rely on reputation, a record of high-impact publications, and conference appearances to judge a scholar's work.

> I think advancement and making a name are very tightly coupled…The tenure process requires that we send out letters to outside institutions. It's a funny business there, too, because these people might not know the person from Adam. We're the ones who see them every day, listen to the questions they may ask of our visiting seminar speakers, know whether they're in their office beavering away or in Acapulco on the beach, whether they've got their grants or they've got a live lab. We have intimate knowledge of the way the person operates, so we should rely on our own judgment. Yet the university demands that we get these outside letters and get judgments from people who might not know the person at all. So you can see why this ties into…reputation in the field and who gets noticed. It is vitally important that somebody publish. The only way that somebody from the outside world can know this candidate is from the file we send, and if they haven't ever seen a paper by this person until we send the file, then they have no opinion until they read the file. Or they meet the person at an international meeting or conference.
>
> The tenure committee gets input from outside reviewers, people in the field who are anonymous for the candidate but known to the committees, who are evaluating a faculty

> member based on their knowledge of the assistant professor's publication record in the high-impact journals, whatever they are.

Conference attendance and invited appearances

Scholars can also increase their visibility in the field by speaking at conferences, invited lectures, seminars, or summer courses. Conferences, in particular, are a means for scholars to network and make their work known.

> I think that published journal papers probably matter more than conferences. But I think that in terms of having recognition in the field, conferences are extremely important. I would even think that presenting new work at a conference helps you get into a higher-end journal because people are excited about it. So I think that conferences actually have a pretty big role.
>
> It basically reflects the standing in the field, if you're a sought-out speaker, say, in the seminars.
>
> Some visibility within your field is also very, very important, because tenure and promotion committees get letters from outside people and really the big question is, "Is the person a leader in the field or are they going to be a leader in the field? How do they compare with other people in the field?" So the more visibility you have, the better. So the letter writers judge your visibility based on your attendance at meetings…It actually helps a case a whole lot to be an instructor at a *Woods Hole seasonal course*…that provides a lot of visibility…People are there who see you give lectures and associate you with that course, which is a very famous course. And then it's also really important to attend meetings and give talks, and to go visit when you're invited to give a seminar…It's actually really good, not just pre-tenure for getting recognition as a scientist, but also post-tenure for setting up collaborations.

To avoid distraction, scholars need to be selective in how they make a name for themselves. Pre-tenure scholars, in particular, may be inclined to take advantage of every opportunity for exposure, which can be too demanding.

> Going off to meetings and giving seminars, lectureships…It's like sex. When you're young you'll go anywhere, do it with anybody, at any place, for any reason, at any time. When you get to be my age you have to learn how to be much more selective about it…Early on in my career, these were the only opportunities I had to make an impact beyond my little circle here, and so every conference and meeting that I could possibly squeeze into my schedule, every trip, whether it was Mississippi State, Normal College, or MIT, I went and gave a seminar. And that probably does help with your visibility…But at my institution, you're teaching both semesters and it's hard to be on the "chicken à la king"–meeting-conference circuit because we've got other commitments and duties.

The role of external job offers

Two professors at one public university pointed out that external job offers are crucial for salary increases and other perks.

> I got a lot of good offers, Howard Hughes positions, a job with a top research institution. So the administration said, "What can we do to make you happy?" And believe me, I'm just as happy I didn't leave for that university or any other place; all the other offers for Howard Hughes dollars were only money and sometimes money can't buy happiness.

> Well, there's an element of politics that's really annoying at my institution: you're valued as much as you're worth to somebody else, especially in terms of salary and perks like an endowed chair position that would give you maybe $50,000 a year for your research. So in order to get the highest salary and the perks like that, you have to get a job offer from some place that is deemed as good as or better than my institution. So, to actually be judged for your grants and your salary on what you do, what you publish, what your C.V. is like, that would be awesome. Grants really should be based on, "Has this person done well before, but then they forgot to dot their 'i' in this word and so we're going to ding them?" I don't know; it's just a very messed-up system in some ways. That's one thing that would be great to change, especially for promotions at my university. And they say, "We can't give you more salary because then it's not equitable with your peers," but we're all underpaid. They know that their salaries are under market, but if they change one then they have to change more, and so they really have to wait until you have an offer with a written salary and say, "Well, we can't match that but we can give you a raise."

The importance of extramural funding

Tenure and promotion committees also expect scholars to secure significant independent funding. Funding expectations can vary by area of specialization; in the bench sciences, in particular, there is a premium placed on grant-funded research.

> Basically what is required in our program—and I know other programs and places are the same—is publication and funding. The more publications in more prominent journals, the better; and the more funding, the better.

> Certainly on the biomedical side and medical schools, in particular, the promotion committees are looking for RO1 grants. This NIH-independent investigator award is something that I would like to have seen broadened or changed. It is still the standard in which promotion committees for tenure look to see if you have this particular brand of independent grant.

Similar to the advancement process, grant review committees tend to rely on high-stature publication as an indicator of a scholar's success. As a result, pre-tenure scholars tend to "play it safe" and often do not stray beyond expectations. A number of the senior scholars we interviewed expressed concern that funding tends to be awarded for research projects that are less creative and less speculative in scope.

> I haven't done anything specifically for tenure and promotion…to the extent I do think about anything, I maybe think about what would be necessary in order to get a grant, but that really doesn't have a direct impact on how I choose to publish.

> The other thing that's affecting promotion and tenure now is the ability to get grant funding…Take the study sections of NIH. The thing that was disturbing over a period of time was the extent to which it became more and more conservative. The grants were being awarded to people who actually had done half the work already…Somebody who came in with a really creative idea, but it was more speculative, they would not get funding. And now that's gone to an extreme.

> I'm an old guy and maybe I'm biased on this…but the young guys just feel so much pressure to stay funded and not take risks, and they get their heads bitten off if they propose to do something that's not obviously going to work. The process is just teaching them the wrong lesson. In fact, I think it's often the more established people who feel like they've got the security to take risks or the ability to find the resources that let them take the risks. And I

> don't mean to say the young guys couldn't be as innovative or more so. It's just the structure of the organization that they aren't. Probably they could be, would be my guess.

Biologists repeatedly mentioned that advancement and funding requirements place excessive strains upon a scholar's well-being and ability to do longitudinal scholarship.

> Everything comes from grants. I had a very generous startup package that got me going, and the university was very good at providing resources…The one distinction is that my salary is not 100 percent from grants, which is probably the more common system in the States…My summer salary comes from grants, and my year salary is guaranteed for the academic year from the institution…My guess is that the majority of faculty research is funded out of grants for the faculty salary as well. So the other extreme is what I actually saw overseas…Some scholars never wrote grants, they never did anything except think. So it was a very different environment, whereas I get very, very little time to think. All my time is spent trying to publish things or trying to raise funds or trying to manage the group and not thinking…I think that competition has benefits and it has drawbacks. The advantage is that it does tend, to some extent, to promote renewal. It does tend to make sure that people don't pursue things that are useless. But it makes it hard to do things that are very long term. It makes it extremely difficult to go into new fields, and so in that sense I think it promotes stasis. The system as it exists now, you can't get a grant until you've already done major work in that field. You can't get that first grant to do that major work in the field without either having start-up funding or illegally subverting funds from one grant for some other purpose, or having some other outside source of funding to do it. And the fact that so much effort goes into a grant process where so few are funded, that's an enormous amount of wasted energy…When you could be sitting, thinking, writing, and being able to think about how to do things that are adventurous and would really drive things forward as opposed to, "How do I stay afloat?"
>
> This plays on what every postdoc went through at some point in their postdoctoral training, where they're thinking, "I finally feel like I know how to do science and now they are making me compete for jobs, fight for lab space, write grants, plan courses, adjudicate fights with lab members, hold office hours to talk about yesterday's quiz, and worry about tenure." So, the field takes these people at what is arguably close to the peak of their creativity, and certainly close to the peak of their energy, and derails them. And everybody fantasizes. "Let's sneak off and go rent a building on Mount Tam and do our science."

B1.2 Evaluating Other Scholarly Genres

New, online-only journals

Although the array of Public Library of Science (PLoS) journals is viewed as a credible publication outlet, biologists had different opinions about its ranking compared to other journals. For some scholars, PLoS journals still weigh in under established publications in terms of stature.[60] Yet, until tenure and promotion committees and/or funding bodies actively state that it is acceptable to publish in these venues, scholars will continue to resist.

> I think there are a lot of vested interests in supporting the status quo, one of them being the system of tenure and promotion, which still relies on recognizing and appointing individuals whose work has passed muster at a high level in the peer-review process. Having an

[60] PLoS ceased providing printed versions of their journal articles in 2006. See: http://www.plos.org/about/faq.html

> individual who published everything on the open Web and could point to half a million downloads in a month—that still doesn't cut a lot of ice as far as tenure committees are concerned.
>
> So I think there still is some truth to the exclusivity and selectivity of certain journals. More merit, more credit, more luster is attributed to an article that appears in those fora and those publications, than in online things.

Some high-level administrators supported the idea of online-only journals.

> Now, I think PLoS is regarded as a legitimate place to put papers…although there's no comparison to *Cell*…none. If you have a paper in *Cell* or a paper in the *Journal of Neuroscience* or in *Science* or in *Nature* or *Neuron*, or one of those very high-profile broad-impact journals, that's really like the stamp, "This is great stuff." I actually don't agree with that.
>
> In my faculty, I don't see a phobia against online-only publication at all, because we have the dialogue and the chair is approachable to have these discussions with everybody…especially with junior faculty…I think junior faculty are very adventurous. In my eyes, you get an extra brownie point if you do the right thing.
>
> Yes, absolutely I avoid publishing in Elsevier journals. And I try to convince everybody in my lab to do so.

Some scholars actively discourage graduate students from publishing in commercially owned journals. Yet these early-stage scholars, reluctant to take career risks, may ignore such advice.

> Everyone in my lab would know that there's not a real hard-and-fast rule against publishing in Elsevier journals, but everybody knows my stance on it…There are young people who feel they have to publish in those journals to survive and I'm not in the right position to argue with them since I'm not at that point in my career anymore…There are some people in my lab making noise right now about sending a paper to *Cell Metabolism* and I just let them talk about it…I hope it goes to PLoS.
>
> I'm a big believer in open access. I think that's the direction that I would like to see things move…I would encourage young scholars to publish in PLoS.
>
> Faculty going up for review are going to be very conservative. You want to get your promotion and you're not going to take a chance in putting something into the packet that people are going to say, "What is this?" So I think that that's probably what is holding some of it back. But the people like Michael Eisen, Peter Walter, and Keith Yamamoto, who are well-respected scientists, they have their degrees and do provide good models for the junior scientists and faculty who are coming on board, and certainly those that work in their labs.

According to some scholars, strong peer review is essential irrespective of the type of publication outlet. Tenure and promotion committees may consider peer review in open access journals comparable with peer review in traditional outlets.

> So when we went to the promotion committee on campus they said, as long as it's a peer-reviewed publication, they would support that just as they would any other publication. So I don't think that in the health sciences there's any negative impact on whether it's open access or not.

> So I hope that biology will push this open access thing in a way that doesn't equate to lack of review. It's very important.

The resistance to disseminating in Elsevier publications has been met with mixed results in tenure and promotion decisions though some scholars indicated that having an Elsevier-free publication record is not detrimental to a graduate student's chance of securing a top postdoctoral position.

> I signed the Public Library of Science pledge and I tell my students that if they want to publish in *Cell,* I won't hold it against them, but I won't be a co-author with them. And so far, none of them has challenged me on that…and every single one of them has gotten their first choice of postdocs. Every single postdoctoral researcher I've ever had has gotten a job at major research universities. So, nobody has been hurt by not having a paper in *Cell, Molecular Cell*—the Elsevier premier stuff.

> In his case for tenure review, one assistant professor pointed out the "personal sacrifice" that he had made by publishing in online-only journals.

Tools and resource development

For scholars engaged in database creation, data management activities, visualization techniques, and other tool or resource production, official credit is earned generally through a published journal article discussing the data or resource. Assessment is dependent on "how high-profile the article is that contains the data."

> If you build a big database that's boring, then it's not going to get you very far. If you build a big database that's creative and actually has something that affects people, that will have a sizeable impact. One scholar in my field is still best known to the community at large for…building a database called SCOP. That became the standard for protein structure analysis and it remains essentially the standard for protein structure analysis…Just pulling a lot of data together, and not doing very much with it, won't do very much for you. But in terms of getting credit for that outside of the community of people who use it, it's especially the paper that you write about it, and then who cites it and how much impact that paper has.

> One paper of mine, which is most cited, ironically, is actually a visualization technique, which is not one I developed. It was developed by someone else. But I basically built a website that had that visualization technique easily accessible. And I had had this running for about a decade and then was basically asked by a journal…to publish it, to increase their impact factor because they thought it would be cited heavily. And we ended up changing a lot and taking it somewhere else but that kind of spurred us to do this and it has been cited very heavily.

Though creating and maintaining Web-based resources may be appreciated by the academic community at large, such activities can be time consuming and often do not count toward tenure and promotion.

> A lot of faculty members maintain really good Web-based resources, for example, very methodical and scientific protocols and resources that the community relies on. These guys have spent hours of their own effort and they're giving it back to the community. But how do you cite that? How do you thank them for that? These protocols changed the way the science is done in a given lab. I've seen faculty who actually have a genuine commitment toward a community that they don't know…they just want to share…There's no accurate measure of that. Even in microscopy, where I've seen a lot of people take a very new method of staining

> something, observing something, or even tweaking the optics of a confocal microscope that's come out…What does that end up as? A thank-you note in some publication. And to me that's not exactly fair.

Scholars who develop valuable resources are still required to publish articles in high-impact journals to receive credit. Such requirements can be tedious for scholars who already dedicate significant amounts of time to self-explanatory products, such as software or shared and annotated data resources (i.e., strains or vectors). At least one biologist we interviewed called for an alternative, user-based metric to measure a product's value.

> We have had multiple discussions in my lab about these vectors that this postdoctoral researcher generated. We talked about it and when we have visitors come and talk to us, we tell them about these vectors, and they say, "Oh, that's great, can I have it?" Here we have a postdoctoral researcher who spent maybe six months of his or her life generating these lines, and they can help advance some areas within the field, and I'm going to give them out. I have no choice, because we've talked about them. Do I sit down and spend whatever amount of time is required to write a paper to describe these damn vectors, when all I have to do is just put a PDF on the Web and everyone would understand what it is all about? Or just send them to a stock center and have the stock center distribute them? But, realistically, we have to write a paper; otherwise it's not going to be acknowledged ultimately.

> In the current model, if you have a strain collection that is really useful, you have to write a paper about it…The person who made that resource should not be required to go through all the effort of writing a manuscript and getting it peer reviewed and published, to get credit for the resource that people are using. The evidence that it's a useful resource is that people are using it, not that people read the paper that describes the resource. So it's a very indirect way of getting credit for something that has a much easier metric.

Scholarly contributions, such as Web-based resources, may not be perceived as "scientific findings," but rather as "tool development." Consequently, such activities are ascribed secondary status.

> I don't see a significant effort in establishing alternative means to evaluate nontraditional contributions to the field. You would expect, either at the level of journals or at the level of institutions, and particularly the funding institutions, that there should be some move in that direction, and I don't see that. When you sit on a grant panel, you're still looking at the publication list and if there is any other contribution, they don't count it very positively…Web resources, contribution of a significant number of strains, mutant populations that have moved a whole field…those are not considered a scientific finding…It's tool development.

Tenure and promotion expectations, particularly traditional peer review, can be the biggest obstacles for publishers attempting to experiment with open systems (including early sharing of data sets, software, protocols, or other materials).

> *Nature Proceedings* is definitely not a mainstream activity by any stretch of the imagination. The other thing, though, that *Nature* is trying to achieve there…it that this is a way of you actually gaining priority over the idea, albeit at a pre-peer-reviewed level. And if other people do stuff off the back of that work and they do publish, then they ought to cite you. Now, of course, whether they do or not is a kind of whole social thing about whether people want to cite you and whether journal editors and publishers require or allow them to cite that kind of material. But in principle *Nature* is interested in breaking out of the bind, which is that people really only get explicit credit for stuff that they publish in peer-reviewed journals. There are

> other ways that they can contribute…and if they're sharing at an earlier stage…and the same would go for sharing data sets or sharing software they might have developed, or whatever. You don't get credit for that stuff either. How can we incorporate this into the credit structure of science, which is very heavily based on citations and can we make this stuff archive-able and citable in order than they can, in principle, get credit for that? But we're touching on this issue now, which is, you can set these things up. The technical challenges are trivial compared to the social and political challenges and incentive-type challenges around it.

Research museum curators

Faculty holding dual appointments as curators of research museums, or otherwise maintaining collections, may not get credit for their work.

> Some faculty hold dual appointments as half-time curators of research museums, for which there is a lack of credit by tenure and promotion committees since maintaining collections "does not lead to research advances."

B1.3 Teaching and Service

Although teaching, university service, and engagement with the academic community are required for faculty to gain tenure and promotion, scholars repeatedly mentioned that sustained publication and the ability to secure funding take precedence in top-tier research universities. As one senior professor at a public university described it, "Tenure is a three-legged stool: service, teaching, and research, and the latter leg of the stool is much thicker and stronger than the other two." This rule-of-thumb is particularly emphasized for younger, pre-tenure scholars. Faculty are acutely aware that they should not spend excess time on teaching and service. According to one:

> Because of the nature of the science here, the fiercely competitive arenas that our faculty work in, they are among the least likely people to do work in terms of writing books or reviewing proposals or things of that sort. They are extremely clear-minded about where their energy should focus and that's on being highly competitive in some of the most ferocious areas of current research.

University service can range from serving one's campus to contributing to the field at large. Serving on grant review panels may also be considered professional service and can increase one's scholarly network.

> The university pays attention to your contributions to the academic community, scholarly life of the department, and the campus at large: Have you done an adequate amount of service? Have you been a hermit or have you engaged yourself in the community? But that's pretty minor.
>
> If you serve on grant review panels, most junior faculty are not asked to do so, but sometimes you are, and again, it's a way to meet people and make an impression on them.

Time commitments for service can be difficult for young scholars already juggling a full load, as noted by an associate professor at a public university:

> Someone asked me if I could be on a USDA panel, and I basically said no because I do a lot of service and I've been warned by everyone in my department, my department head, and my division head, not to do it. And so I basically begged off.

No credit is issued for the activity of peer reviewing others' work. One scholar suggested that there could be a formal, specific mechanism for this activity, which might garner additional professional recognition for thoughtful reviews.

> When it comes to actually formally measuring people's output, they get credit formally for publishing papers, particularly for publishing papers in good journals. And they don't get credit, in any formal sense, for posting comments or for doing other things that might be around papers or leading up to the publication of papers.

> If you've reviewed 20 papers and you have very good, thoughtful, deep reviews, and some of the papers turned out to be important and were published with some of the changes that you offered, that could be part of a faculty member's dossier that s/he offers for professional recognition. The problem with all this volunteer labor is that we can't even cash out some professional credit for it. People do put on curriculum vitae, "review regularly for *Science*, *Nature*, other high-prestige journals." It's hard to take that very seriously because you don't really know. On the other hand, if in a promotion portfolio there were six or seven or 20 very thoughtful reviews of papers that eventually did get published and were clearly important, that might reflect pretty favorably on the candidate.

Textbooks and teaching

Textbook writing and other forms of written public engagement constitute part of the teaching component of a tenure package. Pre-tenure scholars are often discouraged from engaging in such activities to any great degree before tenure is earned.

> The other thing we're doing is writing and authoring a textbook…So it's the kind of reading that should be easy to read and motivating…It's such a time thing—I would not advise anybody who doesn't have tenure to write a textbook…I'm sure it would add to the argument for promotion, but it would not carry the day. I see it as equivalent to teaching.

Furthermore, teaching carries less weight as part of a tenure dossier compared to publishing.

> The tenure and promotion committee pay a certain degree of attention to the quality of your instructional skills and talents, the degree to which you've engaged in teaching: Did you go the extra mile and teach freshmen or devise a whole new course? Did you deliver a very, very large lecture course well? But really, this being a premier research institution, it's that way for a reason. I'd say the bulk of the weight, despite all the lip service paid to teaching, is on research.

> I still have issues with the way in which teaching is assessed, because it's not peer reviewed. We rely almost entirely on student evaluations and those are all over the map. And I think that's a very weak area. I would love to see peer evaluations of teaching, although I don't know how you convince your colleagues to come and spend time while you're teaching. Nobody wants to do that.

Monographs do not feature heavily in advancement cases in the biological sciences.

> Sometimes when you do write a book in the sciences it's really not given as much credit, if you will, by peers, as writing peer-reviewed journal articles that appear in *Nature* or *Science* or some sort of top-ranked journal. So there is a lot of difference, not only between disciplines but within disciplines. So they tend to fall out toward more peer-reviewed journal kind of articles versus the books.

B1.4 The Pressures of Academic Life

Academic life can take a toll on scholars. As one senior professor in the plant sciences noted, the current values in biology are "time, money, and publications." This recalls our findings in astrophysics, in which strong publication records are best achieved during the postdoctoral period.

> The postdoctoral researcher period is the best time in many respects, and the longer you can stretch that out the better, because you're really free of all kinds of pressures and you underestimate the difficulty of those things, how much they're going to take away from your creativity, although there are some people who are just so good at multitasking, keeping a lot of things like that going.

Some institutions provide young scholars with lighter teaching loads and funding for labs and graduate students throughout their first few years.

> For the first three years, junior faculty can take two students a year, they can have as many as six in the lab at no cost to them, which is a huge advantage…The students have a say in who they go to, so it doesn't always work out well for faculty. But they can get up to six after three years. So, in addition, we're able to recruit really high-quality people here. These are the people who routinely get one of the fellowships that are out there. That gets them up and running, and then they get an NIH award or not.

One senior scholar (also an editor and director) pointed out that electronic access to publication and technology in general has expanded the demands on scholars, particularly the time cost of doing basic work.

> Technology has made me one of the most highly paid, under-talented secretaries on campus…That's exactly right. I have to do a lot more than I've ever had to do before, badly. We used to have a graphics department that made figures for us. We used to have secretaries. Well, now we have tendonitis and carpal tunnel syndrome because we sit here all the time doing this crap. No, it's made me a really, incredibly overpaid, under-talented secretary.

A senior professor suggested that it could be difficult for female faculty who take maternity leave to sustain and accelerate their research trajectory.

> I think women have it harder. Until I had a child of my own, I didn't really appreciate that. I could tell myself intellectually, "Oh yes, maternity, they should be able to stop the tenure clock," but somewhere deep inside I said, "This is just an excuse for not doing the same amount that a man would do." But until I had my own family I didn't really appreciate and I couldn't even comprehend. Then once you see what pregnancy is all about and what a mother has to provide that a father can't during the early time of development of the child, you say, "Absolutely, give them two years! Why is it only one year!?"

2. CHALLENGES AND OPPORTUNITIES FOR DISSEMINATING RESEARCH: WHAT ARE YOUR CRITERIA FOR CHOOSING A MEDIUM?

The biologists with whom we spoke publish in the most prominent journals, with the highest impact factors, specific to the audience they want to reach. The explosive growth of knowledge in the biological sciences has resulted in an imperative to produce publications as quickly as possible. There has also been an unwelcome move to produce scholarship in the "smallest publishable unit" so as to be reviewed and published rapidly by top-tier journals. Consequently, important material such as methods and supporting evidence can be sacrificed. Additional publication types such as monographs, textbooks, handbooks, and lab manuals occur in relatively smaller numbers, and can contribute to the development of research in some subfields.

Peer review functions as a robust filter of the most relevant scientific literature. There are abundant criticisms of peer review, however. Editors are sometimes described as "too powerful" and/or "uninformed." Professional editors, as opposed to active scientists, performing reviews came under particular criticism. Faculty are overwhelmed with requests to be reviewers, which can lead to a general decline in editorial quality. Frustration with existing editorial systems have led to experiments with open online peer review and other filtering mechanisms, including post-publication peer review (characterized by *PLoS ONE*), and open peer review (as evidenced in the temporary *Nature* peer review experiment). The Faculty of 1000 Biology rating index is yet another mechanism for filtering and evaluating scientific literature. Early public sharing of work is not the norm in biology, so the success of experiments such as *Nature Precedings* (modeled to some extent on the arXiv preprint server in physics) is to be determined.

The need to publish large amounts of data, use complex visualizations, and present cogent methods has resulted in established journals experimenting with different models of print and electronic publication. Many archival journals and their electronic surrogates have or are acquiring the ability to publish complex, high-quality graphics and video, animations, and data sets (either in online versions of the article or in online supplementary material). Providing such supplementary material permits the reuse, re-manipulation, and verification of data and methods by other researchers.

The serials crisis is a major concern among scholars and institutions involved in biology, medicine, and other sciences. The monopoly of scientific knowledge held by publishers has led to university libraries struggling to afford skyrocketing journal costs. There have been a variety of responses to the serials crisis, including open access publication models in a variety of flavors, as well as new journals and author-pays models. The economic sustainability of open access publishing models is still unknown.

The biological sciences commonly use a short-hand dividing the field into two subdisciplines encompassing the "bench" sciences and the "field" sciences.[61] While work in the former tends to be "rooted in the laboratory bench setting," the latter is "traditionally rooted in field research" (Ithaka 2007, p.8). It is worth noting that bioengineering may represent a third division. Our study focuses primarily, although not exclusively, on the bench sciences and encompasses molecular and cell biology (MCB), including the following subfields: genomics, neurobiology, microbiology, cell and developmental biology, biochemistry and molecular biology, and

[61] See for example Quinn, Meredith, and Jennifer Kim. 2007. *Scholarly Communications in the Biosciences Discipline: A Report Commissioned by JSTOR*. Ithaka Strategic Services, March 26, p.3. http://www.ithaka.org/publications/pdfs/JSTOR%20BioSci%20Study%20Report%20Public%20final1031.pdf

immunology. We also interviewed scholars specializing in the field sciences and integrative biology (including: plant biology, biodiversity, marine biology, ecology, zoology, and evolutionary biology), and in the expanding field of computational biology and bioinformatics.

According to one scholar, "different subspecialties in biology have very different rules of publication." That is, publication practices can differ both between and across the bench and field sciences, in terms of where scholars choose to publish and the requisite speed of that publication. High-impact publication is *de rigueur* in MCB, and scholars at research institutions tend to favor publishing in flagship science journals.

> Every subfield has the knocking order of *Science*, *Nature*, and *Cell* first, then journals such as the *Journal of Cell Biology*, then specialized journals within the subfield.

In contrast, in integrative biology, publication practices vary and scholars tend to publish in more diverse outlets.

> Let me just say that in integrative biology it's different. Integrated biology is called integrative but it's not integrated really; it has a bunch of different small areas in it, and they all have their own specialized journals and people tend to publish more in those. There are some broader impact journals that are used, but not to the same extent as in MCB. So that's a slightly different kind of enterprise than MCB.

In molecular and cell biology, generally, the fast pace of the field and the premium placed on incremental scholarship means that rapid reviewing for journal articles is often considered paramount. In evolutionary biology and ecology, and even to some extent neurobiology, and some other subfields, exceptional speed is not as crucial.

> There are a number of subdisciplines within biology, and there are over 5,000 journals here. There's a great variability in terms of speed, so, for example, the major journals, *Science*, *Nature*, *Cell*, *PNAS*, we'll say Public Library of Science, they get their articles in and out quite rapidly, but there are other areas where things can be fairly slow, like some of the evolutionary biology journals.

B2.1 Criteria for Choosing a Publication Outlet: Prestige, Peer Review, Audience, Speed

There appear to be no hard and fast rules for selecting a publication organ, with some exceptions. Choices often involve a fine-tuning of perceived audience, prestige, and reach. In particular, scholars are careful to balance a journal's stature, as measured by the impact factor, with the need for wide readership. Previously we noted that pre-tenure scholars favor publishing in the high-impact journals primarily because these venues are privileged by final review tenure boards. While impact factors are regularly in flux, scholars also recognize that they do serve as a useful mechanism to indicate the most prestigious journals in the field.

> *Science* and *Nature*: These are where the young scientists most want to publish.

> It's all pretty clear, it's evolving all the time, which are the favorite journals, and which are considered to be the top ones, the impact factors are shifting and that seems to be more important. I was editor-in-chief of a major scholarly journal in my subfield for about four and a half years…so I've been immersed in all the authors' angst about, "but I have to publish in this journal!"…I'm at the point of my career where none of that matters anymore.

> In biology, you really try to get your article as high up on the prestige list as possible. Impact factor is a big deal.
>
> I think it's impact factor as an indicator but, within each field, we all know what the most high-impact journals are, so we all know where we're supposed to be publishing, in effect. Maybe we don't know what the impact factor is on a regular basis. I don't know if we really care to know that, but at least we know what the highest-ranking journals are.

The editors of a journal can play a key role in establishing and maintaining the prestige of their journal.

> Essentially, the more of a reputation that the journal has for selectivity, the more attractive it is to authors. A prime example of this was the rapid development of *Cell*, done by Ben Lewin, the founder. He expended much energy getting high-profile authors at the start, and made it clear from the start that it would be an exclusive journal with very high selectivity.
>
> When choosing where to publish, appropriateness of audience is also important to biologists. According to one professor and chair turned editor, "Most people who publish…just consider which journals they read and where they think that the article would get the broadest readership."
>
> I think that probably everybody would look how to disseminate the work to be the most widely read. So if it's an important piece of work they would want to put it in a journal like *PLoS Biology,* or *Nature,* or *Science,* where it becomes broadly acknowledged and read.
>
> I try to publish where the work will reach the largest number of people who I think would be interested or for whom it would be valuable know about it. And so typically we try to publish in a journal that will be widely read, because people use the name of the journal as an indicator of its significance, and so a paper in a better-recognized journal…people would be more likely, then, to read the paper or more likely to think that it will be an interesting paper to look at. We also have a preference toward open access journals because that means more people are more likely to see the article.
>
> I think most biologists would say, "I pick the most appropriate medium at the highest prestige level within that appropriate sector." I've published in *Science,* but I think my better papers actually were published in a more specialized journal because they were longer and could go into more exploration and so forth, and so I just thought they were better papers.

Considerations about the quality and length of contribution also factor into the decision-making process for scholars, although they play a secondary role.

> My criteria for publication venue are *ad hoc*…If I think it's really important and I want a lot of people to see it, I try to send it to *Science*, not that *Science* is free of all of the other nonsense—it isn't—but it's America's version of a high-profile, high-impact thing. And then I work my way down to whether it's a really nice, thorough study that needs to be out there, in which case I'll publish it in a respected peer-reviewed journal of the field, and not have people try to say this should be published or not published because it's not sexy enough—because that's not important in those journals. And if I feel that it's not going to get in *Science*, it's either too long to fit their page limits, but I think it's really kind of "gee whiz," I'll go through the nonsense of putting up with something like *Genes and Development,* journals like that, and then suffer the slings and arrows of inadequate peer review.

Limitations of relying on the imprimatur and impact factor

Relying on impact factors as a measure of a journal's stature is not without its limitations; similar to concerns scholars expressed that final review committees may rely a little too heavily on the mark of the imprimatur to inform tenure and promotion decisions, there is some apprehension that grant review boards, such as NIH, may be adopting a similar strategy.[62]

> There are various drivers for why someone is publishing in a particular journal and what they will do in terms of sharing their data. The number one driver is to be able to maintain our funding. That's a universal driver. So I would say that there should be some sort of an effort on the part of the major funding agencies to come up with a more open and uniform evaluation of research progress. The second driver, which is a driver for a lot of people, is more of a personal issue; that is, do I want my paper in *Nature*? I'm willing to hold onto the data until I publish it in *Nature*? But institutions are ultimately defining the criteria, and number one is funding agencies.
>
> Impact factors have become important within the field, although not so much at my institution. I have heard that scholars at the Max Planck Institutes in Germany are exceedingly concerned about impact factors, with the feeling that they will govern future funding.

Prior to submission to a funding body, in some cases grant applications are vetted internally, which perpetuates reliance on bibliometric data.

> Most agencies now, certainly the big federal agencies but also private foundations, when they send out an RFP they say, "We will only accept X number from any institution." So before anything goes off, we have to do an internal review…We use panels of faculty to look at all of the proposals that come in and then nominate the best. I must sit in on 30 or 40 of these a year. I'm a fly on the wall. And I can tell you if it comes down to hard-core, and a lot of them are hard-core because all these people are good, somebody opens up their C.V. and says, "Well, X has three articles in *PNAS*, an article in *Science*, and this guy or gal doesn't." And that's a deciding thing.

As one non-tenure-track faculty member pointed out, there are many confounding problems with relying solely on impact factor, such as the fact that technical papers are cited more often than other kinds of publications. In addition, there are recognized journals with low impact factors.

> There are well-regarded journals with a low impact factor, like *Chromosoma*. I do look at that journal from time to time, and a lot of it is really lousy stuff, but it also has a flavor to it that is different and interesting sometimes. So people pay attention to those journals, too, but I think it's usually because something in the title or one of the authors that they know jumps out and grabs their attention.

It may be that relying on impact factors is prevalent outside of the US higher education system.

> Impact factors are still around. There are certainly places outside of the United States that actually give point scores for certain journals, and you have to have a certain number of points to get promoted. I'm very aware of that from postdoctoral colleagues I've had in the laboratory who push hard to publish in particular journals and give me the exact reason why;

[62] The NIH is currently enhancing their peer review system. See: *NIH 2007-2008 Peer Review Self-Study*. 2008. National Institutes of Health, February 29. http://enhancing-peer-review.nih.gov/

> the *Cell* paper is ten points…To me impact factors are not important. I pay no attention to them when I'm in a promotion committee. So I would like to see that all go away.

As directed searching behavior comes to replace general browsing behavior, and articles can be located no matter where they are published, some biologists believe that impact factor will lose its importance. But, as one is quick to point out, somehow it has not.

> Publications are judged by people digging in…I pay no attention to impact factors when I'm in a promotion committee, so I would like to see that all go away. And I think that the seeds of making that go away should be there if you can make open access really grow into reality…Even now if I look at the students in my laboratory, they do their reading of the literature by automated computer searches in topic areas, and everything comes up that's published. And so, in principle, it doesn't matter where you publish…Of course, it still does, though.

Speed to publication as a driver in choice of publication

Given the importance of establishing precedent and the fast pace of research in some of the bench sciences (in particular, genomics and biochemistry), the conventional means of publication and communication have not changed, but they have accelerated. A premium is placed on speedy publication because, without it, scholars will not receive credit for their research.

> Because of the way that knowledge moves forward in academia, not publishing a piece of work becomes the same as not doing it…In the business world it's like not patenting something—it can't move forward because nobody can gain from it, and business depends on gain. In the same way in academia, a knowledge base depends on being able to build on something that is put out into the community in a way that it can be reproduced, and right now that standard is publication.

Yet a number of scholars fear being scooped rather than credited for their accomplishments in this ultra-competitive environment.

> In areas like genomics, some areas of biochemistry…everything's traveling at a tremendous pace, and so people guard their data very carefully until it's ready to go. We had a case not so long ago where somebody came to campus from another institution and talked about something that was not published, but was in the process of getting to publication, and somebody here picked it up and worked on it and published ahead of him…That kind of thing happens and I think people are very guarded about it in those areas of the discipline. In neurobiology, things happen at a slower pace and they involve technologies that are more restrictive, and people tend to be a little freer with information…I often, and I know colleagues who have often, talked about things publicly well before they're published, well before they've even been submitted…And I think everybody recognizes that if you don't talk about things until they're finished, it actually slows down the whole field, and I think that's one of the things that's always contributed, at least in neurobiology, to a certain freer attitude…I don't want to sound disparaging, but in cell biology, for example, basically there is a series of standard things you do…everybody has access to the same techniques, largely. In neurobiology you have to master the extreme difficult techniques that you have to apply to cells that are living…They take months to learn…so many people don't do that. They will approach the same questions without doing the…experiment. So, if you talk to them about your results, it helps them and their results help you…It's less, "Who's a competitor in the field?" You basically know who your competitors are.

> The priority in publishing a finding is credited, too. If you're the 15th person to publish something, who cares? Don't get me wrong: A very, very, very important aspect of scientific progress is reproduction, validation, corroboration, demonstration that the finding is reproducible. But, on the other hand, we should be giving the credit to the first person who did it for actually showing it. So while there's a certain amount of "me too–ism," and that's very valuable for solidifying what we think we know, the person who does something first gets the credit, especially if they publish it first…You can have all the brilliant ideas you want but unless you publish them they're of no use whatsoever.

Several biologists described the drivers of publication based on observation of their faculty colleagues, and the importance placed on speed is second to none.

> I think that there are a number of things that I would point to…In experimental biology now, there's a reward system beyond the purely academic, which is the commercial exploitation in terms of corporate relationships or the creation of patents. And also, because there is such an explosion of life science everywhere, there are many more jobs…and many more opportunities to get them. There's also a culture of very competitive funding within experimental biology, so that the Wellcome Trust or the Howard Hughes Medical Institute have positions that they offer on a highly competitive basis to people who are distinguishably the best. So being the best means being the first to publish in prominent places. And that's a major driver for most of the competitive scientists that I know. Another distinguishing feature—and this is something that began with the advent of recombinant DNA technology—is that experiments actually, once they work, can be done very, very quickly. So once you have an idea of what experiment to do, you can throw a lot of resources and a lot of manpower at a question, and get an answer to that question very quickly, in many aspects of molecular biology or molecular genetics. And so that tends to drive the pace of publication and it also tends to be the case that you tell people about your work too early at your peril, because you may be giving them the opportunity to go away and do the same experiment or even a better experiment.

Rapid review

Rapid reviewing has become standard in the field, with editorial decisions expected within two to three weeks for the top-impact journals. *Science* and *Nature*, in particular, have a fast turnaround time. A relatively new journal, *Cell* (an Elsevier journal), is only 30 years old, yet has achieved pre-eminent stature. The initial editor of *Cell* gained this stature by stressing rapid review and, in order to compete with *Cell*, other journals have followed suit.

> Most journals tell their referees, "We'd like your comments back in two or three weeks." And you're lucky if you can squeeze the third most tardy referee after a month and a half. You never know whether they're holding it up because they're working on a similar thing or they're just overburdened and overworked and underappreciated and underpaid…Sometimes it takes me a week to find three people willing to referee the paper, so that's already a week. I'd say most people get a decision in a month or less. They certainly don't get it in a week or two, whereas *Science* and *Nature* start beating you over the head if you don't.

Once a paper is accepted, the final version is generally made available online as a preprint (typically six to eight weeks after submission in the top impact journals, and three to six months after submission in more specialized outlets), although the official publication date tends to correspond to when a paper is published in final archival form.

> Preprint papers are posted online by journals once they have cleared the review process and have been accepted. Typical times from submission to posting are three to six months.

> Journals are increasingly posting work online immediately. And so the day a paper gets accepted it'll go up on the Web in the form of a preprint. And we all know that you read the paper, it may not be the same as final publication, but here's the paper in the accepted form. And then whether the journal will actually give you credit for publication on that date…a lot of journals will wait until it's finalized and it can go up in a journal format, and then that's the publication date, so that varies right now. So the important thing is that even in the preprint form some journals [*JBC, PNAS,* etc.] are making these things available.

> The dissemination process works pretty well…The actual getting stuff in the published form is slow. People are slow to write. I'm behind on writing papers. And then reviewing of the publication is slow. Publication after review has gotten to be pretty good…In a lot of journals you can depend on the paper coming out within six or eight weeks, which is really good. But, the review process can go on forever. It's ridiculous.

Work published in the *Annual Reviews* may take longer.

> *Annual Reviews* is not particularly good on the speedy side…But, start to finish, probably from the time the final manuscript is received, after the peer review—so the post–peer review changes, the pre–copy edit changes—to the formal publication, is about seven, eight, nine months…Probably nine months, which strikes me as not fast. But then, they only publish once a year in each of their areas.

One now-senior scholar complained that he and his colleagues' most highly cited paper was turned down repeatedly for publication because reviewers refused to believe that it was valid.

> If it's a straightforward and uninteresting work, then a paper could be published in…a few months, two to three months. For something that is more challenging, it can take a very long time. A paper that got rejected three times over the course of a year and a half before it finally got published is now the most cited paper in the field, because the first three times the reviewers just didn't believe it could be true. And then it got accepted and…it became the dogma in the field so everybody cites it…It took about a year and a half, two years…That was a long time, probably because we weren't able to do anything else because we were so busy rewriting it for these different journals, trying to address referees' comments…It was ultimately published and it was in large part because we had a supportive editor. Otherwise, it probably wouldn't have made it.

Quantum of output: The smallest publishable unit

Biology is witnessing an increasing imperative to produce the "smallest publishable unit" among journals. The scholars we interviewed reflected on the interwoven nature of tenure and promotion criteria, the pre-eminence of *Science* and *Nature*, and the need to get publications out as quickly as possible in an increasingly competitive arena. The result is the decline of longer, more thoughtful articles, which is unpopular with some scholars.

> The fact is that we no longer, almost never, publish long, extended papers. It doesn't happen for a number of reasons…so if you're thinking about molecular biology or genetics or molecular biology or stem cells or something like that…there may have been a time in the 19th century in which biologists—Darwin—sat on an idea for 30 years, or even two years. Right now people sit on ideas for exactly as long as it takes to get a credible amount of publishable evidence for them, and then the ideas are let go.

> The need to get a paper in *Science* or *Nature* for tenure and promotion is going to change the way people do science because in *Science* or *Nature,* generally you get to publish a two-page letter, that's the usual thing. And so people tend to think of their science in terms of publications in those journals, short little advances. And very few people do what I used to do, which is spend two years working something out, and then publish a couple of papers of 30 or 40 pages that outline an entire study.
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> In science, I think what's happening is people are moving away from the longer papers because there's a much greater return on the shorter ones if you can get them into the journals. It's very difficult.
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> Publication depends on the paper and the reviewers and the journal. So *Current Biology* is famous for being really fast. That's one of the major competitors now for the *Journal of Cell Biology*. So the journals try to be as fast as possible and *JCB* introduced this report format so that the turnaround time should be faster and scholars can publish a smaller body of work that's a significant advance, but it doesn't have to be a complete story. So I think journals are competing for that pool of shorter papers.

B2.2 Perceptions of the Publishing Environment

Peer review

As in other fields, peer review serves several essential functions in biology: It is perceived as a filter of the burgeoning scientific literature, it saves scholars time by narrowing what they have to read and foregrounding material that has been vetted by a known entity, and it helps to ensure the quality and reliability of what gets published and promoted as scientific findings. Even amid gripes about peer review, the scholars we interviewed still consider it the best available system.

> I think that the major reason for peer review—and this is an absolute cliché—is that it provides that filter that allows people to eliminate a certain amount of skepticism about what it is that they're going to read when they pick up a journal…Whether the journal takes five percent of what it's offered or 10 percent or 20 percent, there's an awful lot of other stuff that they don't have to read because the editors of those journals weeded it out for them. So that's one of the reasons why peer review is robust, because it does a lot of work for people who don't have a lot of time.
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> The whole point of peer review is so that any piece of crap doesn't appear on a computer screen any place it wants to. If that were the way, I could just have a website of my own and everything we do I'll just publish there…That's a very dangerous trend for science. *Science* has to be scrutinized by peer review, and then either it passes muster or it doesn't…It's like having people saying they saw flying saucers…*PLoS ONE* is a similar thing where you can just put any kind of dreck you want on there…I think the whole idea of peer review has stood us in very good stead and I don't see the reason to deep-six it now.
>
> For all the complaining that everyone does about reviewing, we really do depend on the quality control that comes with that important step to help us decide what to pay attention to. People decide to read a whole journal or not, depending on their impressions of the quality of the main oversight that goes into these papers. Most of the literature is ignored…So if the reviewer went away, the question would be how do you slog through all this stuff and know what to pay attention to? Is there a way to look for what you're looking for?

> These bits of hopefully significant information have been vetted by a peer…Publication is almost like getting a stamp of some level saying that this is something that's not completely out there and wrong.

The greater the stature of a journal, the more stringent its peer review. Some journals may drop in the prestige ranks because of a perceived slippage of peer-review standards.

> So the highest standard of peer review is what's supposed to distinguish the papers published in these top journals. You can have a fantastic story and publish it in a middle-grade journal, and it would be reviewed—maybe not as fantastically.

> *PNAS* continues to look for ways to ramp up the regular efforts for review. *PNAS* started as a place for academy members to publish things without review. It was like they had no peers. Over the years they've gotten better and better in terms of actually looking at how that process works and its consequence, especially because of when Nick Cozzarelli was the editor. His leadership meant the journal has gotten tremendously better in the last decade and a half.

Editorial quality

"Too powerful" and/or "uninformed" editors

The scholars we interviewed made a number of comments about "too powerful" and/or "uninformed" editors arbitrating who does and does not get published in some of the most select journals. The best reviews, according to some scholars, are the result of qualified and active scientists doing the reviewing.

> I don't submit to *Nature* because there's no parental oversight at *Nature*, just a bunch of failed scientists who couldn't cut it who are now trying to decide what paper should be published and what shouldn't. No parental guidance there…I loathe…No, that's too mild. I hated, detested, just resented everything about the *Cell* journals, which are the premier journals in molecular and cell biology, because I think it is a blight on our field that we let a fellow who didn't get tenure as an assistant professor become the final arbiter of what is important about our field in terms of getting published…half the editors are below average…I refuse to let *Cell* be a primary journal for me because I know there's a lot of crap that's published there, though I'm not going to ignore a paper that comes to my attention that's published there because I let others be the filter.

> *Nature* has all these failed scientists of their own that consider themselves smarter than the average bear and they sit around making judgment calls about your work. It's very annoying because they're not even practicing scientists anymore, but they are the ones opening and closing the gates of whether or not you get to air your stuff in a prominent forum…These fashionista rags that are run by salaried professionals—who cares whether they know you or not…So the good journals I'm talking about are the ones that are run by scientific societies or operated on a volunteer basis by other faculty or other scientists.

> The reviews for these potato chip journals, *Science* and *Nature,* are much more cursory than the reviews for what I'm pleased to call journals of record.

> I've published a lot in Public Library of Science, *General Cell Biology, Molecular Biology of the Cell,* so these are all journals that take a scholarly approach, that have an academic input into decision-making about a paper, so they are not just handled by professional editors.

> I think that the PLoS family has been unusually rapid in climbing this trajectory of being a high-status place to publish, in some part, but by doing things that I don't really buy into. One of the principles of other scholar-run journals in cell biology is that every paper would be reviewed by working scientists, as opposed to a professional editorial staff. I'm a big proponent of that. And so I know that *PLoS Biology* is kind of going in this *Cell, Nature, Science* model of using an editorial staff to do a first-cut vetting of papers of whether they're going to send them out for professional review or not, and I really disagree with that. But in a way, that is its own statement, that they've [PLoS] reached this upper echelon very quickly, and people are willing to put up with that kind of treatment of having someone much younger than you saying, "We're not going to send your paper out for review. It's not good enough."
>
> The editorial board of PLoS pays a lot of attention to who is treated well. If the reviewer says something is wrong with the paper, and you only have professional editors in the office, they don't know how to judge it, so PLOS has an academic editor involved in the process, who can actually argue and say, "Well, they're off because this and that." And then a decision can be made after a rational discussion.

Some of the same faculty (many of them editors) suggest that *Science* and *Nature* privilege the "sex appeal" of a paper over its scholarly quality. Overall, many of the biologists we interviewed perceive a largely random component in the selection process and in the criteria editors use to determine what constitutes a "scientific advance."

> *Cell*, the photographic representation was top of the line…but it was fundamentally a peer-informed, not a peer-reviewed journal. If it was hot enough, the data didn't have to be strong to get it published. And it became a cliché that it was published in *Cell,* but that doesn't necessarily mean it's wrong.
>
> Right now we're sending our paper to a journal and that journal makes a decision, "Is this good enough for us or not?" Let's say it passes peer review…then it's still the journal's decision whether this work is important enough in their judgment to warrant publication. If the journal wants to be the best journal out there, they often decline it on the grounds that this is not a significant enough advance or what have you…There's a large random component in that decision. I think it would be a much more natural model to put the paper out there and have the different journals bid for them, if they wanted to select it for their concept…then publish basically a reader's guide.
>
> With *Nature* and *Science*, in particular, you will often find the professionals saying, "I really don't understand how this got through the peer review system because it is clearly flawed in this way or that way." The editors at *Nature* or *Science* have decided that they're going to take this for one reason or another, and then, of course, there's usually lots of dark speculation as to what the reason is. It could be that the paper has come from a particular star in the field. It could be that the journal wants to publish anything in that particularly hot area of science, but what is absolutely clear is that there are issues that go into the selection of papers at these top-tier magazines that are beyond simple considerations of what the referees say in the peer review process.
>
> You send a paper into *Science,* most of them get sent back without review because it doesn't have a sufficient, catchy, medical-relatedness—a novelty…But it's a subtle thing…you have a board of arbiters of taste, so once somebody on their editorial committee sort of says, "Yeah, this sounds like something we might want," they send it to people who are on their advisory board, and then they make the decision, "Yeah, this should go up for review, or no, I see why you sent this, but, nah, forget it." Once it goes up for review, even if the referees love it, then it goes to their taste committee…If it's a slow *Science* news week, your paper gets in. If it

> happens to be a busy week, they only have so much space, they limit the number of articles in *Science* to X amount, and even ones where the referee says this is fantastic science, they sit around at an editorial meeting and argue with each other over what gets in and what doesn't, and your thing can go down in flames, even though it originally passed the arbiters…so that's what I mean about hard to get a paper in *Science.*

An overburdened peer review system

Some of the scholars we interviewed (junior and senior) commented that peer review may be declining in other ways as well. Many senior scholars become overloaded by the number of requests to review work (including being asked to review the same paper that was moving down the journal "food chain" after serial rejections) and are more likely to duck their reviewing responsibilities. Yet it is precisely this group of scholars that is best positioned to conduct peer review, as opposed to their younger counterparts. Several described this situation as a "cultural problem" or a "collaborative sickness" across entire fields of biology. As one dean noted, "We all feel that when we're reviewers the journal seems to call us every five minutes, whereas when we send a paper in it's as if…it falls into a black hole."

> The problem, really, is us. We are the enemy when it comes to the failures of peer review of papers and grants. It isn't the journals, per se, it's a collaborative sickness…Those of us who get more senior get burdened with so many other things that we're more and more likely to duck reviewing a paper for a junior colleague…So it's this weird thing where the people that have the experience and the judgment are disincentivized…because we've got all this other stuff to deal with.

The onus on rapid review can add further stress to an already overburdened peer review system. Yet with rapid review comes increased pressure on reviewers, a phenomenon multiplied for smaller fields. For scholar-run journals, editors spend an enormous amount of time ensuring that submissions get processed rapidly to stay competitive in the journal market. It was noted that published manuscripts may not be reviewed properly because of the mass increase in the amount of data, labs, and publication.

> Peer review is breaking down, frankly…There are so many publications now, there are so many labs that are generating so much data, and they're putting together these papers that are not really well done. In some cases there are significant scientific problems with them, and they're not being reviewed properly by individuals in the field. And they're getting published in traditional journals…Maybe there is a cultural problem that people are not as conscientious or they're not willing to contribute to their fields.

Finding reviewers

Another challenge to the peer review process is locating qualified experts to review work in small or nascent fields. Finding an unbiased reviewer can be problematic, since a critical mass of potential reviewers able to give unvarnished opinions may not yet exist.

> In these areas that are overlaps or extensions of the present field into newer areas—for example, computational biology—there are not enough experts to review the manuscripts. And so what we are getting is lousy manuscripts published in some of the journals because there's sometimes only one reviewer…And this reviewer is in your lab, or is your enemy!

> One of the recent papers I worked on, the journal asked us to give them the names of four more people, because they felt that the group they had could not evaluate this. It was very hard for us to find this—it was very specific—four people who were not connected with us to review it. So we tried to find one lab and then each lab that they found, those guys said, "We can't do this," so for about a month and a half we were just trying to find out who would honestly and genuinely review without a conflict of interest.

Some editors described their various *ad hoc* practices to find reviewers. And while senior scholars are often overburdened by the number of requests they receive to review work, some thought that younger scholars are better positioned to review papers since they may be closer to the subject matter in some cases.

> A good editor doesn't send senior people papers to review. You send them to people who are in the trenches, who are doing this kind of work…I might send it to a peer of mine and say, "Would you have a quick look at this and tell me if this is really as important as it claims?" I expect my friend to read it over quickly; don't expect him to figure out where all the warts are on the data. He's probably incompetent to do that at this point.

One scholar we spoke with consults PubMed a few times a day, both to look for potential reviewers in the area, as well as to evaluate the significance of a manuscript.

> PubMed…I use it a lot. I would say a few times a day, probably, when I'm assigning reviewers, and I'm thinking, "Who has worked on this recently that I know, and I know is good?," or, "What is really known on this topic?" if I'm trying to figure out if it's really a big enough advance. So for my editorial work I definitely use PubMed a lot, and then also if I'm just looking at, interested in a topic…I really don't have a lot of time to read the literature, so one great thing that I do is I'm the senior editor at a journal, and so a lot of manuscripts cross my desk that are related to my field and I find reviewers. And I don't often actually read the manuscripts myself really closely, but it's been great training to try to figure out, "What is the significance of this piece of work versus this?" and "Is this really significant? Is this really suitable? What is the advance, exactly?"—that kind of thing.

Reviewers tend to be conscripted by editors following submission and publication of their own article.

> If you review papers, some senior person asks for your opinion about something, you do a good job evaluating the paper and they see that you were critical, fair. We all get papers from other journals to evaluate, so you get known as a reliable referee by…other journals, the ones where you publish…Once you start publishing in certain journals they start sending you papers.

Alternative filtering mechanisms/peer review

Changing traditional peer review: A new metric of quality?

New filtering mechanisms might replace reliance on the imprimatur as an indicator of the quality of work, and some called for measuring the merit of research through its use and citation by other scholars, and not through publication in a high-impact journal.

> If we could find a way of adding measures of merit, ill-defined, that we find to papers that come up from those PubMed searches, so that you don't have to substitute the imprimatur of

> the journal for the quality of the paper, I think we could break the tyranny of these high-priced journals completely. And I don't know what that would be, but it seems like technology should be able to do that. I mean, the number of people who, say, go from an abstract to a full PDF of the paper is a measure of merit. It's not perfect, but…And so when you pull up this list of citations, if you could see a thousand downloads of this one had happened and two of that one, that tells me which paper I'm going to look at first. And I think that's what a journal is, the whole shebang about it, it really is a measure of merit. If it's in *Nature,* if it's in *Cell,* if it's in *Science,* there's the presumption of significance and impact, and execution…I'd like to see more measures of merit about the presumptive quality or impact of journal articles that are user-based and not editor-based. If there's a paper in no matter what journal that a lot of people in that field are looking at, I want to know that.

> Could the whole [publication] concept go away? Could it all become one repository?… Publication is very expensive because of the high rejection rate; every paper that gets handled costs a lot of money…I think that's the *PLoS ONE* concept…everything that is new will be published, still peer-reviewed, high-quality papers. Then the idea is that the important papers will be recognized and will float up on the scale of things. Faculty of 1000 may pick them out or your search may bring them up, you cite them a lot, and then they become blessed as being important papers by people using them and referring back to them. And then you wouldn't really need that personalized, "What is the sex appeal today?" decision-making that currently the journal editors do. So I agree, if one had a format that worked effectively, many of the specialty journals would just fade out. We wouldn't need them. I've only mentioned one or two or three or four different journals we publish in. You don't need 500 journals out there.

One editor and scholar noted that the single-blind peer review process may be undermined since knowing someone's history of achievements is an important part of the evaluation of a piece of research.

> There continue to be ideas that get floated about whether we should change the way that we review, blind the reviewer to knowing who the authors are, because of the tilt that can be generated. I don't subscribe to those things…my own opinion is that it's actually important to know who the author is, and then that becomes a part of the evaluation, just as it is and should be for grant applications—knowing what somebody's history is and how successful they've been with putting forth new ideas and doing things is important. But I acknowledge that you run the risk of this sort of "old boy" network that people worry about.

Nature's open peer-review experiment

Nature briefly experimented (from June to December 2006) with an open online peer review trial. The journal posted article submissions online to solicit public review alongside the traditional peer review process. The experiment met with mixed reviews and was ceased.

> A faculty member observed: *Nature* is certainly now in the process of rolling out post-publication comments…that will be their way of trying out whether it makes any difference pre- versus post-publication. One argument was that maybe people would be more willing to comment before publication because then they can actually try to exert influence over the editorial decision. They can actually have some input for that. On the other hand, the incentive to actually read the paper, given that it hasn't been through peer review yet, might be reduced. So it will be an interesting way of testing that.

Similar to the *PLoS ONE* model (which depends on post-publication peer review as described below), recruiting scholars to comment on an article can be a challenge.

> The *Nature* open peer review experiment has been abandoned, apparently…they would have to be volunteer peer reviewers, although there was one opportunity that they offered—I think perhaps those were not anonymous reviews—so that a person could do a very thoughtful review.
>
> I think it didn't work very well, and I don't know why. I think maybe some contributors might have decided that it would be better to try *Nature* when fully ready than to send in something preliminary. Some might have thought that it might prejudice their chances of getting published elsewhere. I know it was an interesting experiment. I'm a little surprised that they didn't get taken up on it more.
>
> The model was, when authors submitted their papers, if those papers were accepted for peer review—about a third of the papers that come into *Nature* are accepted for peer review—authors were asked whether they would like a copy of their paper on a public Web server, whereby comments could come from anyone who chooses to comment, at the same time as sending it to selected anonymous reviewers in the normal process. So it was happening in parallel and it was at the discretion of the author. The take-up was 5 percent…about half of the papers didn't get any comments at all. Some of the papers got a good comment stream, in terms of the numbers of comments. But in no instance did a comment affect an ultimate editorial decision…it doesn't necessarily mean that that approach doesn't work. It just means that at that time that particular implementation didn't add any value beyond anonymous peer review in terms of the editorial decision.

PLoS ONE and post-publication peer review

The type of peer review conducted in *PLoS ONE* differs from traditional peer review in that the former has an online platform for post-publication peer review conducted by the readership. This follows an initial review carried out by the editorial staff. Readers can rate the quality of a paper on a scale of one to five and post comments to articles.

> Everything *PLoS ONE* publishes has actually already been peer reviewed, albeit minimally, if I could put it that way. So they've got a slightly different approach, which is they're posting stuff post–peer review, but doing a very light form of peer review, light form of selection, and encouraging post-publication comments.
>
> PLoS has now instituted what is essentially an arXiv for MCB, *PLoS ONE,* the idea being to get pre-postings that will be reviewed through actual use. I'm wary of that approach, noting that *Nature's* experiment of a similar nature did not last long.
>
> There's *PLoS ONE* where you put such resources, where they're not publication grade but the community can comment.
>
> I think organizations like PLoS, at least in the health sciences, are certainly working to push that window and push the boxes. It's kind of an evolutionary process to look at new ways to communicate. They have a new publication…called *PLoS ONE* that is where there's some minimal peer review done before the article is put up, but then the idea is that there would be commentary by the community that would then continue to expand the concepts within that article. And so I think that's an interesting idea…One of their concerns is that they haven't really received many comments…I think *PLoS ONE* is going to be an interesting process to watch and to see if they are able to kind of push that window of the peer-reviewed journal and make some changes in it…Anybody can comment. You may have to register to comment, so they at least know who the comments are coming from. But I don't think once you've

> registered…there's no limit on what you can comment on. So you can comment on a molecular biology journal, even if you don't know anything about it. That was not the intent, clearly.

Publishing research that is correct, but lacks appeal, is another problem faced by *PLoS ONE* and similar open commenting systems.

> Editors have not been quite sure how low that standard is. What if everything is methodologically correct, it's just supremely boring, so that no one will ever find it interesting—is that good enough to publish or not?

Post-publication peer review relies on volunteer reviewers in the field. As with traditional peer review, this can be an obstacle. Some have suggested that younger scholars might be more willing to engage in online public commenting but, since official credit is not attributed to this kind of activity, scholars may remain reticent. In addition, since comments are not anonymous, some scholars may be leery of vetting one's colleagues in such a public forum.

> *PLoS ONE,* my understanding is…they're struggling a bit to get comments going. They have got it going, but it's been kind of hard work on their part…I think there are fairly obvious explanations for scientists' reticence in that regard, because if you're going to make any kind of significant comment about a paper, particularly if you're going to be critical about it, you're putting your neck on the line in a very public way, and potentially upsetting the authors and possibly other people who are associated with the work…for relatively little tangible benefit.
>
> *PLoS ONE* is moderately revolutionary…in that…what they're trying to do is to break the idea of the journal title as an indicator of the quality of the work…It may work in the long run. I'm skeptical of that in the short run…because people are used to evaluating a paper based on where it's published, and so it will take a long time for people to be accustomed to doing anything different than that.
>
> Things like *PLoS ONE* might eventually engage more younger people. I think that that's where comments are going to come from. They're not going to come from people like me or more senior than me, in most cases, is my expectation. But it remains to be seen whether that will happen, and whether that happens will depend in large part on whether there will be some way that they are recognized in a way that advances their career for doing it. And so that's what they have been trying to think of how to do within PLoS, how to actually make it so people who make valuable contributions are able to be recognized in a way that helps them with their career.
>
> That *PLoS ONE* is relying on people providing commentary, I think, is a highly desirable thing. The problem is how do you actually motivate people to provide that commentary and get the right people to provide that commentary?…My sense is they had gotten a relatively large number of papers, and actually I know they've gotten more than they anticipated.

One publisher argued, in response to the interviewer's suggestion, that scholars at less competitive institutions may be more inclined to make use of post-publication peer review experiments or open access repositories to share their work.

> It wouldn't surprise me if people from relatively lesser-known research institutions were making more use of post-publication peer review, in the sense that the people at really good institutions, really good labs, probably have a slightly less hard time getting stuff published quickly in good journals and it's a higher stakes game for them in terms of their reputation.

> They're already at the top of the tree, so to speak, whereas other people have less to lose and also have a harder job getting attention and getting published.

Faculty of 1000 Biology

The online rating index Faculty of 1000 Biology enlists a thousand prominent faculty members to highlight and review important new papers that they have encountered.[63] (One chair reported that young faculty tout their F1000 ratings when they come up for tenure.)

> An interesting innovation is the Faculty of 1000. The 1,000 faculty involved in this recommend important new papers that they have encountered and write a few lines about each. There is then a mechanism for turning those ratings into overall ratings. One can subscribe to weekly lists of papers that are flagged by this mechanism.
>
> Papers in different journals suddenly get picked up in the *News and Views* as a pointer in some other journal, or they get cross-referenced, and the Faculty of 1000 writes a little sentence on it and gives it a high priority rating…and you selectively start reading what other people rate highly. In a way the journals do some pre-digestion because they do some grouping of things that appeal to a certain target group of biologists.

Overall, responses in relation to the importance of Faculty of 1000 are mixed. For some scholars, they are simply too busy to be involved in rating papers, nor do they use it for their own research purposes.

> I'm a member of Faculty of 1000, and I jokingly say that soon they are going to be "Faculty of 999" because I'm so bad about submitting the reviews…I never use F1000 for my own research purposes. I would like to know what other scientists in the field are reading, what papers caught their eye, but don't really need to know what they think …And I don't find that there really are critiques in there, because…everybody knows you have to submit one of these or you get a phone call from London. I just want to know what's getting attention…As soon as you ask somebody to critique it, it's too much time.
>
> I haven't participated…I was invited to that. I declined. I was too busy.

There is also the concern, voiced by a couple of the scholars we interviewed, that Faculty of 1000 may be abused as a system.

> I think it's a very nice experiment of how to come up with a separate metric…There's the occasional abuse in the system, when [those in charge] get lobbied or…there may be cliques and networks of people writing for each other, which is just hard to avoid, because it's completely unavoidable—whoever wants to write can write in if they're part of this group.
>
> I actually don't use Faculty of 1000. I don't know if people do. My university is really connected, and so how much people want to depend on somebody calling attention to a given paper or given area, as opposed to things that are just being generated, I don't know. There's certainly faculty at my institution that are in that cohort, that are feeding papers out…but I'm not involved in it, and I don't use it.

[63] In addition, articles that have been highly rated but have not been published in a highly select journal are flagged and appear in the Hidden Jewels page: http://www.f1000biology.com/top10/jewels/

One scholar complained about paying for a Faculty of 1000 subscription, and the fact that it is not user-friendly.

> It's an interesting experiment but, frankly, you have to pay for it. And that's stupid. That's another way of getting faculty to make money for somebody else. I'm tired of that. And it's kind of a kluge and it's not seamless. It's annoying to deal with. So it wasn't technically very well done.

The utility of preprint repositories

According to one biologist, it will be important to explore platforms where scholars can stake a claim on an idea, albeit in preprint or half-baked form, and be cited properly. (This echoes what scholars have mentioned about posting on the arXiv in astrophysics since papers are date stamped.) For example, similar to the arXiv in physics, *Nature Precedings* enables scholars to disseminate online pre-publication and preliminary research results (and other materials) and solicit informal peer review via an open online review system.

> Observations that maybe aren't as complete—or maybe you don't have as much enticing background behind them that make them really exciting to a lot of researchers—but are nonetheless important discoveries, need to be shared.

Some form of peer review, however, is necessary to cope with the abundance of literature in the biological sciences, something that would be exacerbated under a preprint system (even if it coexisted alongside archival publication).

> I don't see an open system that substitutes for the reviewed literature. I would like to see experiments done with an open system. But, if I just try to think about how I myself would decide what to look at…it comes down to a matter of time. I would probably sacrifice missing something that's buried in the big heap and instead hope that I pick it up in another way or wait until it goes through the peer review process. But other people have different amounts of time than I do and would probably greatly value it.

> Essentially anybody can throw anything onto the Web that they want and then it's caveat emptor. There were some of the very early advocates of open access who believed that it was the responsibility and should be the professional competence of any academic to read critically whatever they found on the Web, and that therefore the whole system should change and that everything should go up on the Web and then be selected after it had been made public. And I can see the beginnings of that happening. This is sort of more akin to the physicist preprint culture than we've had in biology. It's a very, very big problem in biology because there's just such a gigantic volume of material that would go out onto the open Web to be selected from, but I still think that it's certainly possible to do it that way.

> I think journals will cease publishing on paper and that the Web will become the mode of communication. And then the question is will we continue to do it solely by the traditional means of refereeing and reviewing everything or will we begin to move more toward what we see in physics and some other fields where there are pipelines that provide a basket into which you can throw any piece of information, and then there continue to be reviewed pots, as well, so you have both pots…It's outside of tradition, and I think that most investigators would say, "No, we don't want to do that. We're buried already in what we have." Biology is very dynamic right now. It's really moving quickly. There are a lot of things that are very poorly understood. And so whether we're ready to be able to use that model effectively, I'm a little bit less certain.

> I think it would be great if things were…open [Web 2.0 tools, *Nature Precedings*, arXiv]. I think that the need for a rigorously reviewed archival record would still be there…But once things start it starts well, so I guess the question would be if there's a way to establish this that people would feel comfortable enough with and feel that there's real value added to make it really work. The other side of the coin is that with these blog-type vehicles, people feel that there's no quality control.
>
> In biology the business of volume comes through, because an arXiv equivalent for biomedical sciences would have ten hundred times more deposits every day. I can't scroll through all that many and would I even want to? So it'd be something like a maybe better-organized version of Faculty of 1000 or del.icio.us for scientists, or something like that…This is where semantic technologies can help filter the paper stream…and make annotations available to others…It's going to be a real issue, because everybody's got exponential data growth and it's exponential. So we absolutely need some sort of enabling technologies or behavioral methodologies to help us distill or rank or at least annotate all of that.
>
> Physics and computer science are really leading the way with new models…they've got these working papers and technical reports and preprint servers, and stuff goes out there in a whole variety of ways, but biologists and life science scholars are more traditionalists in a way that stuff really has to come out in a peer-reviewed journal, not necessarily in print, but it has to be a peer-reviewed journal for it to count…Now, that's not to say that peer review always works. We just had that thing with the Korean stem cell stuff, where obviously peer review didn't work. But it still obviously is very important.
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> *Nature Precedings*, I think "good for them." They own the technology to be able to generate those work spaces for people who want to use things in that way, and they're putting things up there and seeing what happens, and no doubt they're learning, at least from the negative effects if not from the positive effects. But I still think that these are small developments that are interesting to a very small minority of people. Whether they will become larger is just not clear to me.
>
> Then there is *Nature Precedings*, and it's only been up a couple of months…I don't even know if they've actually put up any articles on *Precedings* yet. They may have, I just haven't looked at it. So I think those are the kinds of things that we need to take a look at and try to get some experience about what works and what doesn't work…I think it's going to be pretty slow.

B2.3 Capabilities and Affordances of Electronic Journals

Tensions around quantum of output

Methodology

Some scholars blame word limit constraints that are typical of the premier journals for the decreasing quality in publication content—in particular, the dangerously inadequate description of experiments leading to the "irreproducibility of scientific knowledge." As a result, the ability to be free of unreasonable word limit constraints (which often means excluding descriptions of methodology and supporting evidence) is a criterion some biologists cited as attractive.

> What's changed a lot since I started was that I was instructed—it became the credo of how I conducted my science—that the whole idea of the article was not just to communicate what you did or found out, but it was to put in a sufficient amount of experimental detail so that anybody else skilled in the art could actually reproduce what I did from what I said, and if it

didn't meet those criteria, if I left something out, the concentration of a buffer or some component of the time of incubation, that was considered a no-no. And among the most prominent journals, like the *Journal of Biological Chemistry,* after the introduction, the next section is experimental procedures, because that's critical to how you interpret what you've got as an outcome. And it was *Cell* that stuck the materials and methods at the end of the paper. So you read the introduction, then you went right into results, then a discussion, and so the methods were an afterthought…And that was the beginning of the end as far as I'm concerned, because what happens in most papers now is there are such space limitations in terms of number. Some journals…have 50,000 characters including spaces and punctuation. *Cell:* 55,000 characters including punctuation and spaces. Some journals, it's 50,000 characters, fine. But still, to say something and provide a lot of detail about what you did in 50,000 characters, including spaces and punctuation, is impossible, so people stick a lot of that stuff in supplemental material and when you actually read a paper you don't actually read the supplementary material with the methods. And if you're in the field, then you go get it, you print it out, and that's a pain because it's a PDF.

I had a paper that was accepted in one prestigious journal with two other competitors that were also accepted in the same journal. They were going to publish all three of them together. They demanded that we shrink the paper to the point that I wouldn't have been able to tell as a member of my field if I did the experiments correctly or not. I couldn't include controls and this or that. I said, "Screw it. My reputation is too important." So I yanked the paper and I've never dealt with them since. I published it in a competitor's journal instead, which has its problems as well.

There's not even room for description. You read the *Science* or *Nature* versions now, they're so abbreviated that experiments are described in one sentence, and then it's on to the next sentence. And I have dealt with senior graduate students who have been reading papers for four or five years, and in their field they're not understanding the papers, if it's the *Science* or *Nature* abbreviated version.

There was a time when *Science* and *Nature* were pretty much restricted to big-news articles that were very short, like the double helix. There was never any pretext of providing all the data. The data were going to be provided at some other time, and they were in a sort of conundrum between real news, science news magazines, and scholarly journals…*Cell* had always been weak on methods, the methods were at the end in fine print, and what happened was that the so-called journal of record…began to approach asyndetically the news article. And the data got left out. That's why the community started *Molecular Biology of the Cell,* because…it was emphasized over and over again that they were in business to show all the data, not just a selected subset of the data…And so the idea that you have the major results of the field written up as little potato chip articles with the underlying data never really ever having seeing the light of day…is in fact a bad thing for our field.

Some journals have responded by posting methodology and protocols online, in complement to the print article. Some faculty may even write methods papers in *Nature Protocols* to compensate.

We also write methods papers…and I've had people say, "Oh, we used your *Nature Protocols* paper and it worked, and it was good," and I always think, "Wow, that's amazing," because you never think you can actually convey a complex procedure really by writing it down, but I think they were good.

I pay a lot of attention to having enough room to actually develop the story, so to write it not as a postcard, but write it as a paper where you can actually introduce the material so that

> students can pick it up and use it for journal clubs, and read it and not…have to read between the lines.

But one professor, also an editor, disagrees:

> I find that you can usually condense the longer paper into a report without really losing that much, so there are masters of the minimal publishable unit out there. We try to get a complete story, but sometimes that complete story still constitutes a report…I don't really worry about it too much.

According to one scholar, preprints used to be a popular form of dissemination in biology. Their larger unit of publication facilitated the writing up of a full methodology section.

> Preprints were big at one time, but they went completely out of use once the practice had become that the methods in the papers were so sketchy that you couldn't tell what had been done. And that is in general true of 90 percent of the elite literature. I defy anybody to repeat an experiment that they see reported in *Science*. It can't be done…The preprints were really popular because you learned method from them.

Data

Some scholars, but not all, put the most important subset of their data in the paper, but then look for journals with robust websites in order to deposit the rest of the data in supplementary information for reuse and re-manipulation by other researchers. The ability to have enough information (e.g., software code, back-end data, etc.) in the journal or supplementary material to enable reproducibility is important to many faculty, particularly those from biostatistics, bioinformatics, and computational biology. This may favor open access publication among these communities.

> PLoS wants you to put that software out in an open way. I respect that, because a lot of the papers that I read in other journals, where they cite the software or they'll guard it, it's not reproducible. It's almost painful when I can read it but I cannot use it. Then why I am reading it?

> The founders of PLoS Computational Biology thought that the bioinformatics community would be more open to open access because they would appreciate the value of having material available so people could work with it.

One senior scholar described how to recover the data from supplementary materials and re-analyze it as part of peer review of a manuscript.

> I review such a paper, I do that, I recover the data from the supplementary materials, and I put it in the program of my choice and take a look to see whether there is at least a simulacrum of similarity in what I see and what they claim. Now, for example, in a recent paper I rejected, on the ground that they said they had N replicates, I went to look at the replicates and some of the replicates didn't look like the other replicate. So I said at the very least there's some doubt about how many replicates are replicates…anyway, it got rejected.

One faculty editor explained that his/her journal transferred to an entirely electronic publication format for the purpose of accommodating increasing amounts of digital data. Integrating data

with an online research article is seen as a boon to the field by some (although it necessitates reading online).

> We got into electronic publishing, ironically, largely because there are some data that were so voluminous that you couldn't print them.

Although data may be available in an online supplementary format, the reader will more often than not prefer to read a hard copy, which raises the question of the usefulness of online access to data.

> Mostly, I think that supplementary information is a red herring; it's data that really should have been in papers. The publisher is under such pressure to shrink the size of the paper that they say, "Well, you can have that figure but you can't have it printed. You can only have it on a website." And this is a very bad thing right now because, typically, you print out a paper to read it. Well, you print out a PDF. Not many people read papers online live, and so you get to a point where…by and large, you don't go look at it. So that's really corrupting the way that we read papers because some journal editor's idea about what was important enough to put in the paper is what's dictating what's in the paper, and it should be the reader's interpretation that says to the reader what's interesting and what's not.

Another editor noted that the journal *Cell* has followed in the footsteps of *Science* and *Nature* by shortening its article length. Not only are methods missing from shorter publications, but there is also an absence of data, something that has caused some controversy in the field and has led to the launching of competitor journals. One prestigious journal editor we interviewed is toying with the idea of restricting print articles to page-long summaries, and providing full, unrestricted versions online. This would allow publishers to publish a broader scope of papers while maintaining the same standards and selectivity, and reduce the cost of publication (though revenue is generated from advertisements in print publications). It may be that, increasingly, print and online journal articles are diverging in what they have to offer.

> I think online and print are increasingly becoming two different things. That is, when [journals] first went online, it basically consisted of taking the print version and putting its pages online. Gradually they could use more supplementary materials online and direct people to that. And it soon became clear that although it wouldn't save much editorial time, that papers were a lot cheaper to produce online than in print…So why not give more space to papers published online? Why not evolve the print versions of those same papers to a somewhat shorter format with more extensive explanations for those readers? Eventually, maybe the print version will become more like *Scientific American* at the end of 10 years, maybe…it has a lot of news, it has commentary, it has short one-page summaries of a number of papers that readers can jump to online if they want to read the whole megillah, but otherwise they probably learn about what the message is. But what's terrifying is that the revenue from the print volume, because of print advertising, is much, much larger than what journals could get through advertising online, and until that stops being the case, publishers can't go quite as far as they might like to go in that kind of experiment.
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> *PNAS* has a length restriction, which is constraining to authors. [The editor] recently created Feature Articles, for which the length restriction is relaxed, there is no member privilege, and there is very high selectivity. Another trend over recent years has been for there to be much more "supplementary material." With an electronic version of the paper, one "clicks" to be taken to that material. The editor has taken the step of doing away with the length restriction for the online version, so as to reduce the need for clicks. The editor would now like to make a

> further move, whereby articles in the print version would be restricted to one page, backed up by an online full version, available to subscribers immediately and fully open access after 6 months. Having one-page print papers would enable [the journal] to reach more broadly for papers across all of science, while still maintaining the same standards and selectivity. One step toward this may be to include the one-page paper with a full electronic backup paper as an option to authors…Early movies were simply film versions of stage shows. Look at what has happened to movies over the years.

The journal article, as the publication of record in biology, has been criticized as an outdated mode of communication.

> I've heard a number of talks about "what's the future of the journal? Is the journal itself really going to stay as it is or are we really talking about the articles?" The journal is just a container, an artificial container, that was used 200 years ago because that was an easy way to get the information distributed. But with electronic information do you need the journal?

Visualization: media, animation, video, and 3D

Scholars who work with visual images and sophisticated graphics have traditionally chosen high-quality print publications. As publishing moves online, graphics and video material can be published in an electronic version of the article, or in online supplementary material to reduce publication costs.

> Some papers require video material or large electronic databases, which I think pretty much all journals now handle pretty well…but it used to be a problem. Quality of print, sometimes for microscopy or quality of putting the figures high enough as original, matters. "

> Almost all journals now allow online supplemental material so you can have 14 QuickTime movies; you have to shove them into supplemental material, but you can publish them there.

> Color photos are commonly useful in biology, especially structural biology. They are no problem for online versions of journals, but can create large costs for print publication. Journals that are black-and-white only maintain websites for color photos.

Whether the need for supplementary visual and multimedia data will be the death knell for print remains in question, despite that digital publication proves superior in meeting some scholars' needs. The biologists we interviewed have different opinions, which may reflect the different roles media plays in a scholar's research or experiment.

> I know that now within some subjects, for example, radiology, you can actually view videos of the heart, or the dye going through the heart, within the article itself…The faculty that really depend a lot on imaging have been strongly supportive of electronic journals because the quality of the image is so much higher. If you go from digital to digital, you don't have that degradation that you do when you go to the paper and then back to the digital. So it really provides much higher-quality images…Imaging is just so much a part of what goes on here, anything that can support the use of images is really highly valuable.

> Increasingly, in print we do a much better job of presenting visual images and qualitative data than we did 10 years ago, I think. We've got better artists. More thought goes into what kinds of representations are present. Some authors do some terrific things that can be presented as supplementary online material. They're streaming video or making interesting films…Carlos Bustamante is doing a lovely piece of work on how viral DNA is packaged by being reeled in by

a little molecular motor and stuffed into this capsid. It involves a loading process that involves energy expenditure, overcoming increasingly high pressure with great changes. And so it's a beautiful analysis and it was a terrific illustrative movie. That's another way print readers can become accustomed to online because you can do that online, but you can't do it in print…It's not terribly more costly.

Journals are two-dimensional—you have to work with them, and you have to show different views, whereas if you have something on the Web you could show a video that would give you, I think, a clearer picture of a three-dimensional structure.

There's certainly a lot of pressure to publish an image that illustrates, for example, how a potential drug molecule might interact with a protein or an enzyme, because, as they say, a picture's worth a thousand words. It really does give immediate credibility to something, you can see how it's interacting, where the overlay is. In terms of the science, however, the science is really in the calculations that go along with that, and then there are a lot of calculations…forces between parts of the molecule that stabilize the one thing relative to the other, that I think is as important or more so than the image. So I'm not sure if that's going to change the way people publish their stuff. I think at the moment it's published in a two-dimensional flat journal with pages that give reference to a website. Or I know some journals are providing CDs that you can take with the publication.

If they publish in *Science* how much room is there for an image? They have one image. Then maybe they'll have supplementary data with three more images, though there were 10,000 views to get the result. It's a problem.

Multimedia textbooks

Two scholars producing textbooks spoke to their desire to take advantage of online capabilities to make their textbooks interactive and multimedia.

I hope that accessibility will steadily increase. We've gone through a phase where the media has become much more intermixed. It's now easy to have a movie and a paper linked, so a lot more will become electronic. Paper is on its way out. Technologically, what I am hoping for eventually are devices that are less clunky than the current laptops, electronic books…something that is light…We've toyed with it in the textbook arena, actually, with the publisher, and it just hasn't caught on, there's no market out there for people actually using these things.

I'm involved in putting together a new textbook. And what I'm trying to convince the publisher is that a lot of what I want to talk about has animal behavior in it. Animal behavior is incredibly beautiful and graphic and interesting, and once you see it, it sticks with you, whereas a photograph and a description just don't have that strength. Now, we have a vast amount of video available today on animal behavior. It's mostly in the form of one- and two-hour documentaries, in which things have been carefully selected and embedded…And to see it, students or faculty need to buy the whole thing and show the whole thing. But, of course, what you want to do is you want to explain something and show a little clip of 10 to 30 seconds' worth of video. I do that in class all the time now. It's a very powerful tool. What I want the textbook to have…some of the images can be put into a CD that's attached to textbooks—that's a hot topic these days, everybody has a CD with a textbook—but what I want is also to have a Web link, so that each photo or diagram or graph that is in the book will have a little Web link, and when you buy the book you buy a certain amount of access to this Web link. You can link in, type in a code, and you'll see the animation, you'll see the video, or something like that. So that basically the text now becomes an access point where you've got

> material to study, background material, and you can click on it and see the details. So it becomes a much more interactive kind of education.

B2.4 Non-Article Publication Types

Monographs

Monographs may play a not-negligible role in the development of research in some subfields.[64] Although not a primary publication outlet in the biological sciences, monographs can function as a vessel to bring together the core reference material in a subfield. For instance, Cold Spring Harbor Press has published a number of literature reviews in monograph form.

> The editor-in-chief of Cold Spring Harbor Press began a series of monographs that became, through the '70s and the '80s, the core literature at an advanced research level of molecular biology. Many of those monographs had their origins in meetings that took place at the laboratory. The nature of those monographs has been retained quite consciously because they essentially represent the core reference material for a particular field, and what is in there is judged to be true and to be reliable. The people who have contributed those chapters are judged to be key figures in any given field. Usually those books were assembled by people who were known to be thoughtful leaders in that particular area.

The editorial interaction in creating books and soliciting chapters from various scientists may be an opportunity to bring a research community together, or pass the torch to a younger generation of researchers. On the other hand, there is the criticism that books may represent only one editor's view of the field.

Handbooks and lab manuals

Handbooks and "lab manuals" by publishers like Cold Spring Harbor Press have been particularly important for conveying protocols and notes for experiments, equipment-based techniques, and practical advice for lab management.

> In 1972, the very first lab manual in experimental biology was published at Cold Spring Harbor, *Experiments in Genetics*, by Jeffrey Miller. Then, in 1982, the first edition of *Molecular Cloning*, which was a lab manual, was published from Cold Spring Harbor, and it was not much different from a set of photocopied notes handed out at a course that was run by the authors…Tom Maniatis and his colleagues…It sold 65,000 copies, which was a colossal number in those days, but was evidence of the fact that the community was hungry for the details of how to do experiments that involved cutting and pasting DNA.

> I would say the most recent form that [CSHL Press] has invented is a series of handbooks, and particularly handbooks oriented toward the craft of being a research scientist…One is called *At the Bench*, which is an instructional guide for people who arrive in a laboratory environment who work for the first time. There are some very, very simple, practical techniques in their equipment-based techniques, but much of what's in the book is really about how to conduct yourself in this new and strange world as a novice. And that has been enormously successful, that's now sold 50,000 copies plus and continues. Then…*At the Helm*, which is a book of guidance for the newly appointed principal investigator and people who

[64] In the field sciences, books are "more likely to play a role, albeit a small one" according to Quinn, Meredith, and Jennifer Kim. 2007. *Scholarly Communications in the Biosciences Discipline: A Report Commissioned by JSTOR*. Ithaka Strategic Services, March 26, p.3.

> want to become principal investigators. It's about how do you motivate a group, how do you solve conflicts, how do you solve human problems that arise, amidst a group of individuals who are working together and yet competitively at the same time? Then…another book called *Lab Dynamics*, which takes things back to a slightly different and more intense level. I just want to make the point that Cold Spring Harbor has had a history of inventing new forms of scientific literature, or new forms of communication within science, about different topics and providing that information in different ways.

Accommodating multimedia materials with written protocols may be turning them into "software houses" rather than publishers, according to this scholar:

> I think video is slightly different…you can do some quite serious science with it, particularly in something like *Nature Protocols*, because for certain protocols you really want it to be able to go along with the written description…When it gets to things like interactive figures and querying tools, that's where it gets much more complicated…And inevitably you reach the problem that if you develop an application for dealing with one particular type of figure or one particular type of data set, it's very difficult to make that as generic as, say, a journal like *Nature*, which publishes across all the different disciplines… So *Nature* has something…on the structure of molecular biology, where you can see the 3D structures of proteins. So actually, in effect, it's an external link that shows the structure of the molecule…*Nature* has R&D-type work going on to develop its own offerings in that general area. But that's quite a leap. That's turning it more into a software development house than a publisher, which is kind of the path that we're on, but we're only a part of the way along that path.

B2.5 The Serials Crisis in Scholarly Publishing

The serials crisis is generally perceived as the loss of control over scientific scholarship. A rise in the cost of academic journals, which are increasingly owned by commercial publishers or society publishers following a commercial-based business model, in conjunction with a proliferation in the number of journals available, translates into high costs for university libraries. As a result, universities find themselves in the paradoxical position of effectively buying back scholarship they produce from the publishers.

> The faculty have really lost control over their work. There's the large increase in prices, and researchers don't hold copyright for their work, and it's owned by the publishers, so researchers write their papers, they give that work away to the journal publishers, and then the university has to buy it back, and unfortunately we really can't afford to buy it back, so we lost control over the intellectual output of our scholars, and we're making companies like Elsevier very rich in the process.

> Perhaps the largest change [to scholarly publication] is the consolidation of the publishers…so you basically have a few holding companies controlling the vast majority of the journals…and they are really just interested in how much money they can make. They're not particularly interested in how well or equitably scientific literature is disseminated.

Several biologists we interviewed said that they opt to publish in open access venues, including PLoS and BioMed Central (the latter is the UK-based for-profit open access scientific publisher). The phenomenon is documented below.

Open access journals

Open access journals are one of the main publication models or forms of experimentation emerging to address the serials crisis in the biological sciences.[65] The scholars we interviewed most heavily cited the open access journals launched by the nonprofit Public Library of Science (PLoS). Faculty uptake of open access varies considerably, especially by discipline and by age but, nonetheless, remains a small but growing percentage.

> I think faculty uptake of open access varies, and to some extent it varies by discipline, by the amount of competition…Our faculty have had a number of articles in PLoS Biology…so people are publishing through open access methods. It's still a fairly small percentage, but it hasn't been around for very long, either.

> According to one senior scientist, editor, and director, however, "More of my colleagues have signed the PLoS Pledge than had followed it."

> The PLoS Pledge is that I would not publish in or review for journals that did not respond to the Public Library of Science Initiative, which is to make the content freely available worldwide. And they specified a six-month window…but my feeling is if the journal lets the stuff out after a year, that's good enough…But many of these journals…the first thing you see is a cash register. You've got to come up with a credit card number to look at the paper…And that's crazy, because we paid for that stuff. We wrote the goddamned paper. We did the research, and they're controlling people's access to it…That's nuts.

One open access proponent was indignant about being asked to provide free reviewing services for Elsevier.

> I was invited to edit for a journal owned by Elsevier. I write back and ask them, "What are your plans for making the content available?" And they have no plans of doing so but they would pay me $600 for editing this issue, and if I want to convince the authors to pay an open access fee, then they would consider that on a case-by-case basis. And I just wrote back, "I can't help but feel insulted by your offer, the 16 reviews, $600. It takes me two hours to even just read each paper. That's not even twice the minimum wage for unskilled labor." And then they're asking me to go out fund-raising for them, to ask the authors who do this to also pay for it. It's ridiculous…I generally don't review for Elsevier journals. I have a letter now saying I charge $200 an hour and I don't work for their shareholders for free. It's basically what it boils down to, and at that moment they find some other sucker…I'm a strong proponent of open access…in the big picture, the current publishing model is only possible because we let ourselves be abused…Why do you spend three hours reviewing that paper for Elsevier to then sell it? They give very little back to the community. So that model isn't sustainable either if you analyze it by economic analysis, because it relies on volunteer contributions.

> There is a political consideration, and I consider it a part of my responsibility as a mentor to enunciate what I think is right or wrong about everything, not just publications, but how people act in the laboratory, how they treat their students, and so forth. Secondly, and it's connected, I really believe in the open access model and so I want to publish in places where it's automatically open access or I publish in *PNAS* and pay the extra $1,000 to make it really open access.

[65] Peter Suber refers to open access journals as gold open access. See: Suber, Peter. 2009. Open access policy options for funding agencies and universities. *SPARC Open Access Newsletter*, February 2. http://www.earlham.edu/~peters/fos/newsletter/02-02-09.htm

PLoS has been particularly transformational in biology publishing, according to some, who attributed PLoS's quick success (as well as their own decision to publish in PLoS) to a number of factors.

> PLoS Biology…has been well received, but I actually think that this is because of the quality of science that it has published. I don't think it's been well received simply because it's been published in an open access fashion. I think that scientists will already read high-quality material when they can get access to it, and one of the things that PLoS has done very successfully with the nine million dollars that it was given, is to create lots of awareness and lots of access and draw lots of attention to the material that it published.

> PLoS has had a significant impact, although it's still a relatively small impact but…it has raised awareness of open access publishing.

> What's interesting that's going on right now is this PLoS phenomenon. The Public Library of Science is a new journal series. There's *PLoS Biology*, *PLoS Computational Biology*, *PLoS Medicine*, *PLoS Pathogens*. And they're all open access so there are no fees to the libraries or the universities for access to the journals. And there's been this whole social movement behind that, which actually started at Berkeley. So the first impact factors are being calculated now. People flock to it because of the social good. So when you publish you pay a little bit, but then everybody has access to it for free. It's a new model for funding, and that's created a lot of buzz, and that's becoming very, very popular. And even journals that weren't doing that before are moving to this model. People are really into it.

> PLoS is my substitute for *Cell*, *PLoS Biology*. I already published one paper there. *PLoS Genetics* is my substitute for *Nature Genetics.*

> So I've been very active in PLoS…We've also published in BMC journals, BioMed Central.

> My preference is open access, so I don't happen to publish in PLoS but that's an accident of history, because I think of *Molecular Biology of the Cell* first. They know me, I know them, I know their rules, I know what passes, and also the subject matter is appropriate.

Setting up a new journal

Launching a new journal can be a challenge for both commercial and open access editors alike. A new journal can take time to become established. Name recognition and marketing certainly help, as seen with the spin-off journals from *Nature* and *Cell*. For instance, the former has a number of *Nature*-branded research and reviews journals that enjoy relative success among the academic community.

> It takes any new journal a while to catch on. Really, the only journals that take off running are what we call the *Nature* twigs. *Nature* started out with just one journal and now there are almost 70 different journals. You really generally have to have name recognition for a journal to take off immediately. So when *Cell* started making *Molecular Cell* and *Developmental Cell* and other things, they tended to take off because they already have a brand name.

Some faculty have launched competitive journals for several reasons; either as a response to the serial crisis and/or "uniformed" editors making arbitrary decisions over whose and what work gets accepted or rejected. In addition, some new journals have been set up as a solution to the constraints placed on word limit by some of the most select journals.

> We founded a journal in order to provide a venue for people who were not being served by the journals of the time, almost all of which were essentially run as commercial enterprises. We were probably one of the first serious experiments in open access and then of course the PLoS began, and that really set the lines very clearly about what should happen. But all of those things were driven by considerations that have nothing to do with communicating with our peers in the interim in biology, as far as I can make out.

PLoS Computational Biology, for instance, was created not because of a need for an open access journal in the field, but rather because of a vacuum (perceived by some, but not all in the field) in editorial quality.

> *PLoS Computational Biology,* one of their three community journals, was created not so much for the purpose of open access, although that was something that was a benefit, but because the field lacked a high-caliber journal that would be recognized as being a place where good science is published…What people were doing until then was they would take their best work and they'd send it to a journal that wasn't really quite appropriate…the problem was you'd normally be reviewed by people who didn't really know the details of your work. The editors would not have, typically, a significant appreciation for your work. It was much more of a card game to know whether you would get accepted and to know the quality, because they weren't really looking for a paper like yours, but if you happened to grab their attention, you might be lucky…It was easier to start this journal because there was a vacuum, but also it was highly contentious because the people who were involved in Bioinformatics didn't think there was the vacuum. I think everyone appreciated that the quality of that journal was mixed, but most of them thought that it was good enough.

For new journals, securing well-known authors, having a reputable editorial board, and emphasizing high selectivity is a must.

> In biology, there are relatively new open access journals that have a lot of people paying attention to them, and publishing in them is quite respectable, and…they've come along in the last decade. They basically publish good stuff from good people, in the first few editions at least, and that gets them on the radar.
>
> *PLoS Biology,* some of the titles are right up there, and some of it is because the top faculty are publishing there—Joe DeRisi, Peter Walter, Keith Yamamoto. And so that is sending the message to others throughout the country, as well as to their students, that this is an acceptable mode.
>
> *[PLoS Computational Biology]* is a new journal that has an editorial board, which I think is really the top people in the field; people submit papers, they get thoughtful, quality reviews; when someone sees a paper that's there, generally they can be pretty well assured that it's going to be a very solid, good paper. So it's really very much a traditional journal, except it will be a good, traditional journal with the spin that it's open access.

Repositories and self-archiving

Some universities aim to deliver open access to their faculty's work by providing no-cost access through institutional repositories.[66] There are concerns, however, with creating parallel universes

[66] Peter Suber refers to this as green open access. See Suber, Peter. 2009. Open access policy options for funding agencies and universities. *SPARC Open Access Newsletter*, February 2. http://www.earlham.edu/~peters/fos/newsletter/02-02-09.htm

of publication repositories, rather than simply pointing to a single version of the article in one place.

> So, in the Harvard open access move, the institution is retaining copyright over works produced by its scholars, and providing them free of charge through its repository. Harvard should instead simply provide links from all of the faculty's work to *Science* and the other full-text publications, and negotiate something that works that way. We shouldn't keep making parallel universes of publication repositories.
>
> So one of the questions is, if we continue to support our repository, we're asking faculty to deposit into PubMed Central and our repository, how do you coordinate these? And there's no cross-depository searching, and so it seems to me that there should be some kind of a federated system [that enables a single search]…But the sustainability of our repository is an issue that also has to be looked at. And what's the long-term vision…in terms of all of these other depositories that institutions have like Cornell and Columbia and you name it, and where that's headed.

Some funding agencies, such as the UK-based Wellcome Trust, stipulate open access dissemination of research results as a condition of funding. Similarly, as of 2008, all NIH-funded investigators must send their accepted, peer-reviewed manuscripts for deposit into PubMed Central, the NIH's archive, within a year following publication.[67]

> I think that that bridge has been crossed now because the open access movement has really been so successful. The information is out there, the publishers are jumping on board, so now there's a request to make any NIH-funded research available, and there's work through Congress to try to make it mandatory. So, it's happening.

Despite some institutional and funding mandates to support open access,[68] most faculty are, by and large, indifferent to self-archiving.

> There's just a very profound indifference to self-archiving among most scientists, and it's easy to forget that the open minority is trying to progress these things because it makes much more noise than the indifferent majority. Personally, I find that rather sad as a scientist myself, albeit one who happens to work in publishing, but that's the way it is. And I think part of our job is to help show people how these ways can help them do their research better. And if we succeed, then it will work, and if we don't then it won't.
>
> I notice that some of the top faculty are also contributing to the archive, but some of it is how easy can we make it for them to deposit. If it's just a few clicks, the faculty are happy to do it, they're very supportive, but they don't have time to figure out any of the details about how to deposit. And I think the other issue that they are concerned about is how many versions of their paper are going to be running around…So it's a big effort to get the information out to all the faculty about what they can do.

Other scholars suggest "making things open" as a response to the serials crisis, and highlight the role of leading bodies in driving forward new approaches. Leading bodies could comprise universities and funding bodies (including HHMI).

[67] For the NIH Public Access Policy, see: http://publicaccess.nih.gov/
[68] Faculty at Harvard allow the university to make their preprint research articles freely available online. See: Guess, Andy. 2008. Harvard Opts In to 'Opt Out' Plan. *Inside Higher Education*, February 13. http://www.insidehighered.com/news/2008/02/13/openaccess

> I think it would be fantastic if the university were able to promulgate a policy, something like, "Thou shalt not use research grants to pay page charges for papers published in journals that do not provide free access to all papers more than one year old." I think if the university got behind that, that would be really interesting…or if HHMI did something like that…but every significant journal you want to have a subscription to, they're not giving up anything. Now, I think if we did that, that would be enormously powerful, just enormously.
>
> For example, because Harvard is such a leader, if it makes changes, it can be a leader for the rest of the country…people pay attention to what it does. So, things that Harvard could do would be to, say, remove burdens from faculty for trying new models. They could say that faculty research needed to be in an open institutional archive, or to be open access for it to be considered for tenure. That would be a fairly far-out thing for them to do, but it would get people's attention, and it would really change stuff…So I think that there are things that can be done for incentives probably in all of the fields of science, but…there isn't one thing that's going to work in all disciplines because they just all have their own cultures and, to some extent, their own different set of rules about what's important to succeed.
>
> NIH or Congress should just declare eminent domain, and say that the information generated with taxpayers' money should be freely available. It cannot be held back or locked away in archives and be sold over and over again, because it holds up the speed of research, the speed of progress. Legislation could do that because they are the funders. Howard Hughes could drive it. We could say we're giving you extra brownie points in promotion systems, in hiring, for publishing in journals that are open access.
>
> If you want to shift a paradigm, it has to be in steps. It's never going to happen in one leap. For me the first step is making the paper completely open, anybody can do anything with it, it should not be held back.

Ownership of research

As one dean pointed out, "There is a reasonable fraction of the community that recognizes that print publication is an essential archival feature of molecular and cellular biology…but that it's slow, and it would be good to be able to get information out ahead of that." But faculty who attempt to post preprints or copies of their published articles on their personal websites may run into serious copyright infringement problems. One senior scientist and editor of an open access journal notes that "the old copyright model is in jeopardy, and it's obvious that history is on the side of Google."

> I have every one of my papers on my website, in complete violation of copyright, and nobody complains because I would make sure that it would end up on the front page of some paper if somebody ever insisted on me taking it down…Many journals now say it's perfectly fine. Nature does not ask you to sign over the copyright; neither does Science. So all journals are different. Most people who publish don't consider these things, they just consider which journals…would get the broadest readership. But the NIH has special deals, they do not allow the copyright to be signed over…and Elsevier just says fine. So there are two different categories. We could do that as a university, right? Why can't we just say that if you are a faculty member…you cannot sign over your copyright?
>
> I put a paper on my website, usually, or send it to people directly as a courtesy of coming attractions. Some journals forbid you from doing it; *Science*, for example, wants to have the opportunity of a news release. But generally once a paper is accepted, publication follows pretty fast…That has improved a lot.

Librarians encourage faculty to better manage their copyright (including, but not exclusive to, open access publication) and provide seminars on copyright to better inform them of their options.

> The main thing that I advise faculty is that they cannot assume that if they have published an article that they can put that article up on their website, that they need to check with the publisher to see if that publisher will give them that right. And in general, they need to be more proactive about managing their copyright. I am a proponent of open access journals that are under a creative commons license, where they have more control, but I think that many people are not aware of that and many people violate the law unknowingly. They put their articles on their website from publishers who don't offer that.

> The scholarly communications officers group does some classes, we participate with the School of Medicine on copyright workshops and author's rights is a big issue. And so there are a number of strategies that are underway…There was a workshop that our school had on copyright, and I was amazed at the number of people, number of faculty, that attended that. They were interested in: "how do I use the images?," "what can I do with my articles?," "what if I signed off all of my rights to the publisher?," "what happens then?," kind of thing. So it just depends. But I think, in general, we've gotten a pretty good response to seminars and sessions that we've held on the topic.

Cutting library costs and educating faculty

In the face of shrinking budgets, libraries have been responding to the serials crisis by cutting journal subscriptions and educating their faculty about journal pricing.

> Libraries have been responding to the serials crisis basically in two ways, maybe more. The main way that libraries have been responding is by canceling journals, cutting paper subscriptions, in some cases not obtaining electronic subscriptions, and canceling electronics subscriptions that we once had. The other really big way that libraries have been responding is by attempting to educate faculty and the administration as to what the issues are, and by supporting new models…I would say that faculty are aware that journals cost a lot of money; however, just recently when I've mentioned to faculty that we pay Elsevier over a million dollars a year…they sort of go, "Oh, I knew they were expensive but I didn't know they were that expensive." So I think that there's a lot more that we could do in that regard…Faculty don't know the cost of the journals, and I actually believe the library has done a bad job of getting that information out, but it's also hard to get it out because at this point we have a big contract and so sometimes it's hard for us to say exactly how much we pay for a particular journal…For example, Elsevier publishes about 1800 journals at this point. We don't get that many, but nevertheless it's well over 1,000, and so knowing exactly how much we pay…it's a very complicated formula…But nevertheless we should be doing something, because faculty really don't have any idea, and it's news to them to learn that Elsevier is one of the most profitable companies that's out there.

In addition, librarians provide information and support for alternative forms of publication.

> We have a scholarly communications group, and so we work very closely with staff…and try to figure out what we can do to support new methods of publication and ways to communicate with the faculty and students about how to support their efforts.

Two librarians complained that some faculty perceive the serials crisis merely as a "library issue:"

> All I can really do is let people know what the situation is. So for example, this year *Nature* started a number of new journals, and we didn't have access to those new journals for a while. Now the faculty wanted access to some of them, and I was getting lots of email from people about it, and *Nature* had some issues, because they didn't provide perpetual access, and then they also were raising our prices quite a bit. So it took a while before we had access, so basically at the time I sent the email out to the faculty, "Okay, many of you will be happy to know that we now have access to *Nature Methods* and *Nature Chemical Biology*," which were the two that they really wanted, but *Nature* put out seven or eight new journals this year. We did not subscribe to these others. *Nature* had increased their prices for one set of journals by 50 percent and another set by almost 70 percent. Anyway, I said, "The prices are going up this much. You should know in the future that we will not just automatically subscribe to any *Nature* journal because we have faculty working on editorial boards."…Our journal budget did not increase at all this year. So anyway, I can't send out a big long thing because faculty won't read it. The amount of time that any one of them can really afford to spend on thinking about "library issues," although I would say it's not a library issue but they perceive it that way, is fairly small…The faculty all know that librarians think that Elsevier is evil, even if they don't think Elsevier is evil because it owns *Cell Press* and they love *Cell Press*, and *Nature* has a pretty good reputation among many people and their journals…Nevertheless, we can't afford for them to continue to increase their prices. So anyway…I try to take something that's important to them and then give them a framework so that they understand.

> That's the great thing about biologists. When it used to be that we did journal cancellations title by title, before anything was available electronically, I'd give them a big spreadsheet. We knew all the uses, we knew the cost, we'd figure out the cost per use of the journal, and they would get that a journal that costs 35 dollars a use, even though they thought it was a great journal, we couldn't keep it. And so that part of it is nice because they can be very rational that way…And so I like to make things very rational discussions…because some people have very strong feelings about scholarly publishing.

Librarians as supporters of open access

Overall, the librarians that we spoke with are very much in favor of encouraging open access publication models.

> I think that open access is really important…If nothing else, it gives the publishers and some of the societies that are gouging money pause to consider their price increases because they have competition. And before open access really came along, for the last 20 years libraries and librarians, and a number of institutions, had been bemoaning the very extravagant price increases that we were seeing for journals, far outstripping inflation year after year after year, and nothing really changed…the only thing that has really given publishers any cause for concern, or the impetus to re-examine what they're doing, is the open access movement.

One librarian noted that faculty in molecular and cell biology, far more than the clinical sciences, are leading the trend toward open access publication—perhaps because of professional hazards in giving the public too much access to medical information.

> I think one of the changes that we've seen…is the whole open access movement, and particularly in the basic sciences. The clinical sciences have certainly lagged significantly, although they're trying to catch up, but the basic sciences have always been way far in advance in open access and very supportive of it. And as a matter of fact, a number of the faculty have been working very closely with PLoS certainly in its early days…and so the open access aspect of that I think is very important to them. I've been trying to think about

> whether that's just by the type of people they are that they're interested in it, or is it driven by the discipline that they work in? Is there something about molecular biology or cellular biology that really makes it important for them to have open access to the information? I don't have the answer to that…but certainly my observation in the faculty that I've worked with, they are the ones who are really leading this whole trend toward open access. So that's certainly a big issue. It's beginning to happen [in clinical medicine], but there was a lot of concern five or six years ago, that you just couldn't do it in clinical medicine, that this would give the public access to all the health information.

One librarian acknowledged that Elsevier remains a vital source for many faculty in molecular and cell biology.

> Elsevier is certainly much more important for the basic sciences, molecular and cellular biology, I would think. I haven't done the analysis; I haven't looked at the titles. But the one that a colleague got all exercised about was *Cell*, and that certainly is a very high-ranked journal. What the other content looks like, I don't know. And the other confounding factor is a lot of the publications switch; the publishers sell publications to somebody else, or there are mergers.

Variation in economic models for open access publishing

For some scholars, the wealth of funding in biology makes the field particularly conducive to open access publication, enabling some authors to write it off on their grant. Howard Hughes grants, in particular, pay related fees for scholars to publish in any open access outlet or model. If an author cannot pay the deposit fee, at least in PLoS, the fee is excused with no questions asked.

> There isn't any reason why open access shouldn't work particularly well in molecular biology and in other areas of biology…just because it tends to be…better funded than some other areas of biology. Most of the open access publishers do offer people the ability to opt out of paying if they just don't have any research money to do it.

> Author-pays fees are on a sliding scale…$2,000 is what they ask for, but this campus has a discount, so it's $1,600. If you can't pay it, you can say, "I can't pay it." No questions asked, and the editors don't get to know about that. So the people who decide whether or not it gets published don't get to know. This is huge in biology; these PLoS journals have just taken off. They went from nonexistent in 2003…and now they're high impact journals, and they're mentioned in the same breath as *Science*, *Cell, Nature,* and *PNAS*. The social good has really appealed to people…You take grant money. The labs that are publishing in top-notch journals have yearly budgets for which $2,000 is not a significant amount of money… well, significant, but it doesn't deter them.

> I don't actually like to call it author-pays, I like to say that the organization that supports the research pays, so it's more like funder-pays. I think calling it author-pays gives it sort of a misnomer, because really the idea is that whatever grant originally supported the research should also pay for publication.

> One of the things that we decided was that we were going to only publish in *PLoS Computational Biology*. It costs me more money. The impact factor is still not where it should be, but the fact that you can get everything right away…And the board was composed of brilliant scientists who I have respect for…Since I do work with other people, when it's

> completely driven by me I make that choice. And you can write the $2500 in your grant, it's not a big deal as far as cost goes.

According to an economist we spoke with, paying a publication fee to publish in a PLoS journal is not a deterrent given the value-added of publishing in a high-impact open access outlet.

> I looked at the PLoS citation rates and they're phenomenal. If I were a biologist I would be delighted to publish in there. They have some of the top journals in the specific field, and given the value from a career point of view, from a salary point of view, it would be well worth paying the fee, even several thousands of dollars' worth of it, because the differential in citation rates is quite phenomenal, it's remarkable. Just look at the ranking of the journal on impact factor…I used the ISI tool and looked at biology. There must be 50 or 60 journals there, and in some specific fields they're the top journal by quite a bit.

Some faculty have argued, however, that high publication fees are a deterrent to faculty publishing in open access venues, especially those scholars working in developing countries.

> I'm a little bit biased about this whole idea that you bill the scientist who submits the paper rather than billing the person who wants to read the paper. Well, you're still billing somebody, and are you actually restricting the level of publication, rather than the level of the reading of the paper? I don't know. I think their business model doesn't actually work.
>
> The other aspect of open access is to the extent that the author has to pay $1,000 or $1,500 at Public Library of Science. For a lot of authors I'm sure that's discouraging. That would discourage me. I don't have grants to pay that.
>
> Researchers would rather spend the $2,500 on other things.

Scholars and publishers alike have complained that PLoS is heavily subsidized and is simply not sustainable as a publication model. One economist we interviewed suggested that other open access journals charge a much lower publication fee yet manage to break even financially.

> PLoS has had the ambition to be a very exclusive journal from the start, but how well they are doing at that is questionable. PLoS is essentially without a business model. They have high overhead because they picked a very expensive location (San Francisco) and expensive people.
>
> PLoS is heavily subsidized by the Moore Foundation, and is simply not sustainable. Again, it seems unethical to offer utopist hopes for an economically unsustainable model.
>
> I know the PLoS organization is losing a very large amount of money at this point…I think there are two ways that they could go to become sustainable. One is clearly to continue to get charitable grants from organizations that wish to support the journal and the principle of open access. Another approach that they could take is to sustain the organization in other ways…including having journals that work on a much more sustainable financial basis, by simply having much less cost associated with them. I believe they are hovering on the brink of being able to claim that things like *PLoS Genetics* and *PLoS Computational Biology,* which don't have the very heavy editorial costs that *PLoS Biology* and *PLoS Medicine* have, are on the verge of being self-sustainable.

The impact of open access on scholarly societies

It was suggested that pressure to make articles published in society-run journals openly available is resulting in a decline in journal-generated revenue and a decrease in independent subscriptions. As a result, many societies are feeling the income pinch.

> Some of my friends in professional societies are the most organized opponents of open access…because the journals for those societies are big moneymakers…And I think it's a conflict of interest. I think that they should figure out a way to run their societies without depending on income from their journals, but it will take time.
>
> Open access publication affects the professional societies, where all of their activities are really run off what they make on the journal. It's not run off of membership fees, which are miniscule.
>
> Society journals really have come a long way and they're doing a good job. One of the issues that they're struggling with is, of course, they are losing some subscribers because they've done this thing with putting papers online after a year…One of the issues that they're going to be having to decide is whether or not there are two tiers of publishing in that journal, or a hybrid model where only a subset of the papers are actually in the paper journal and the other subset are electronic papers, because somehow you've got to keep paying the bills. And the membership can't have it both ways—have everything instantly available electronically and not subscribe.
>
> *Science* has the following interesting history. It went online in 1998. The subscription rate as a print journal then was around $160. And it was made available without charge to individual users but with a charge to whole institutions like Cal, Stanford, Harvard, NIH. There are about 1,400 institutions that have site licenses that allow anybody, faculty, graduate students, whatever, to get anything. So some people, wise people, have said, "Why should I subscribe to the print version of *Science* and be a member of the AAAS? I can get it all here." So it lost some subscriptions. I guess it went from about 160 to 130, and then stabilized. And this year those 1,400 site-licensed institutions equal almost 30 million downloads of *Science* articles—so outreach is much larger online. And so if the interest is to bring *Science* to the largest possible number of people, that's where it's going to do it. Right now, the institution pays. Institutions are put in brackets according to FTEs [Full Time Equivalents] but there's a utility feature put in it. So within a given slice of institutions in terms of FTEs there are heavy users, medium users, and light users.

B2.6 Who Pays? Sustainability of Publishing Models

Sustainable business models for open access publication

Several scholars we interviewed with administrative positions (including librarians) hypothesized about sustainable business models for open access publication.

> Two things should happen: One, the funding agencies should regard paying for part of the cost of publication just like paying for part of the experiment. And two, educational institutions…should acknowledge that…we will pay these outside groups in order to have the publication infrastructure to use and in order to move the knowledge base up and outside of the university…So they outsource that one piece, which is publication, and they pay for it. And if they can do that, then I think there's a business model. Otherwise it won't work.

> A number of libraries have done some really back-of-the-envelope calculations looking at, if we had to support the publications from our institution, and compared that with subscriptions. And those of us who are at the top would be paying a heck of a lot more than we're paying now to support the publications that our campus uses or that our faculty deposit articles into. And so there are going to be a lot of issues in how that new model is going to emerge…that we can't just solve in the library world. Right now, there are faculty who are very willing and have the grants to pay for open access, but I know there are others who probably do not. And we still want to be able to sustain the peer-reviewed journal, and so it's a question of how that's going to develop. There certainly are costs to the library and staff time to participate in this process. I think it's time well worth spending…Then I think about where we were five years ago and where we are today, it's a huge difference…just in the whole open access movement, faculty awareness of what they have access to, the movement toward electronic publications, digital publications. Today, faculty want everything in one click. If they have to click three times, it's too much.

Additional scholars we have spoken with (including a publisher) acknowledge the widespread calls for open access publication in biology, but are quick to point out their weak financial sustainability.

> There are myriad interesting things being done by scientists on the Web with grant support and many people are very, very eager to avoid there being a commercial tariff attached to that in any way at all. They want completely open access and they don't want anybody to have to pay for anything. And with a lot of these projects, if there is no sustaining grant support then they won't survive. I'm very interested in what's being termed now "freeconomics"—the business models in which things are given away for some financial benefit of another kind. Maybe science is heading very much in that sort of direction, but we don't have a very clear picture of that at this point, but it's certainly something we're interested in.

One publisher defended author fees as analogous to the traditional model of knowledge transfer in scientific research, wherein commercial interests develop publicly funded research outcomes to benefit society at large, and recover some of this value-added work by selling it back to the public.

> Now that the NIH has approved putting grant money toward author fees in open access publication, taxpayers are paying for the free and open dissemination of knowledge. But, in the traditional model of academic publication, information users are responsible for paying for what they use. So, why should all taxpayers pay for information, instead of simply its users? This could be an unethical practice. In the traditional model of knowledge transfer in scientific research, commercial interests take and develop publicly funded research outcomes, with the results then benefiting society at large. In other words, the commercial sector is allowed to recover some of its value-added work building on scholarly research (by selling it back to the public). Why are journals being criticized for doing the same thing?

Different cost/fee structures

Some of our sample drew a strong distinction between the "real" open access publishers, like PLoS, and journals and publishers that make articles open access for additional fees, like *PNAS* or Elsevier. One librarian refers to this as an "open access, traditional, subscription-based model hybrid."

> There are certainly obstacles to faculty publishing in open access venues. One obstacle is the fact that people do have to pay, but NIH and Howard Hughes allow people to use their grant

> money for that purpose, but that's certainly an obstacle. And then there are some traditional journals that have open access options, where the journal already has stature, and so in that case, for example, you can publish in *PNAS* with an open access model. You can publish in *Nucleic Acids Research* in an open access model, so then you're not taking a chance on what people think about this new journal. It already has an established reputation. And there are even some other commercial publishers, like Springer, that are offering that option, although they do tend to be a little expensive. So, the two obstacles are one, that you have to pay; and two, the unknown perceived importance for these newer journals that are coming out and how well it will be respected.
>
> Usually we do pay page charges. But it's miniscule, so it costs us, I would say, maybe $200,000 to do the research for each article we write, so paying another $2,000, $3,000 for page charges, it's really small…It's worked into the budget. And then Howard Hughes pays us extra if we want to go to an open access journal.

One scholar claimed that the Howard Hughes Medical Institute "copped out" by paying Elsevier for instant open access for all of their researchers' work, when other respectable journals do the same for free.

> Elsevier has been the most resistant to these open access trends. Elsevier recently got the prestigious Howard Hughes Medical Institute (HHMI) to agree to pay Elsevier a substantial sum of money to allow papers by HHMI investigators in Elsevier journals (that includes *Cell*) to be available open access from the start. I and others believe that HHMI copped out by making that deal.
>
> I thought it was sad to see that compromise [with Howard Hughes paying Elsevier for its fellows' research to be open access], because there are many other publishers, like the *Journal of Cell Biology,* that provide the same services already, that don't get extra pay for that. So, now to pay Elsevier extra sums of money I think is bad for the whole system, because it drives the price up of everything. So Howard Hughes was in a fantastic position and they could have just said change your ways, they could have effected change. It's a missed opportunity.
>
> You know that Hughes is paying Elsevier. I don't know what the number is…I believe it's per paper, that anytime somebody publishes in Elsevier, for that paper, they've got to pay a certain amount of money to open it up…I was pissed off about it…I don't want to give Elsevier the money for anything.

Likewise, access can also be variable with some articles immediately available while others undergo an embargo period before placement on open access. Scholars had mixed responses to movements by publishers to provide free access to their publications in developing countries. Those in favor note that the journals are not losing anything, since those countries would not be able to afford subscriptions anyway.

> The concept of subscription-based publication followed by placement of electronic versions in open access after six months or a year has started to come into use in the MCB world. The journal I edited…analyzed the number of hits versus time for its electronic versions and found that the number of hits dropped off sharply with time. This led them to adopt a 6-month embargo period before placement on open access. *PNAS* have now done the same, and supplement their policy of a six-month proprietary period by allowing open access from the start for the developing world. (China has just been removed from their developing-world list.) Additionally, *PNAS* authors may pay to have their paper be available open access, online, from

> the start. Many do so. *Nature* is somewhat more conservative. They allow the author to upload a PDF after six months, but they find that only a few do so. I believe that *Science* allows open access (not clear by which of the two methods) after a full year.
>
> *PNAS* makes everything immediately available in developing countries. And I think that should continue. There's no money in those countries, so the journals aren't losing anything, and so they should just make it available.
>
> There are initiatives that the commercial publishers are participating in to provide free access to health information for developing countries. And, frankly, it probably has little economic value to Elsevier anyway; those countries are not going to buy their publications, so they can make them freely available.

As one scholar pointed out, however, access may not be available to many of the poorer countries where science is actually taking place, making the initiative somewhat redundant.

> Basically the publishers got together to say for the poorest countries in the world we make access free. If you actually go there and look over the list, Chile is not on it, Argentina is not on it, Brazil is not on it. So all the countries where science is actually done, they are just too rich. It's only the countries where there is basically no science happening. It's like giving the homeless free coupons for an oil change at a Mercedes dealer.

3. HOW DO YOU SHARE YOUR WORK WITH OTHER SCHOLARS AND KEEP UP TO DATE IN A FIELD?

In the biological sciences, individual personality and subfield-specific cultures largely determine the level of sharing between scholars. Some subfields tend toward the sharing of work and data at an early stage of inquiry, particularly in cases where labs share complementary research questions. Informal networks, often sustained by email, enable scholars to elicit feedback, stake a claim, and keep up to date. In contrast, some fast moving, intensely competitive subfields avoid early sharing of work and data, particularly when different lab groups are simultaneously working on common research questions and thus engage in a race to publication. The sharing of more polished work occurs through formal mechanisms, typically conferences, though some scholars remain reluctant to share non-published research under any circumstances. Biology does not have a preprint tradition. Established scholars place a premium on specialized meetings, over the annual society-run conferences. Data sharing by biologists is common practice post-publication, and funding bodies and journals often promote good data-sharing practices. New technologies, such as blogs, are not used for sharing in-progress work. We found no evidence that social networking tools are in widespread use for scholarly purposes and, although publishers are experimenting with Web 2.0 and social computing models, uptake appears to be limited among scholars at the most competitive institutions.

B3.1 The Importance of Informal Networks

Despite subfield differences in sharing practices, individual personality is a key determinant in a scholar's propensity to share. Scholars repeatedly attributed differences in sharing to the personality of a lab leader. In biology, there are different "tribes" or "cultures," even within subfields, that foster different degrees of sharing.

There are even more hyper-competitive tribes than others. The people who study gene regulation, for example, are completely different in their behavior, and in their attitudes toward each other, than people who study development biology of mammals, the latter being far more collaborative and less competitive than the former.

In my group, we tend to give talks about work as early as we can and we don't tend to be secretive about things. Different groups have different models. My experience has been that sharing has been productive but sometimes people scoop you on things that you were working on, but then they go back to the lab and build on things you did. So it still is valuable feedback.

I'm not saying that it's pervasive in the biological sciences, but individuals certainly can have a concern that their ideas will be stolen. Again, you get people falling into groups; you get the people who say, "I'm going to talk about what I'm doing, and let the chips fall where they may," and you've got the others who say, "I'm not telling anybody anything until it's published. I'm not saying a word. People will steal my ideas."

If it's published we share it. If it's not published, we don't share it. If it's a buddy, he's a friend and he knows I have something, I send it. But somebody that I don't know from Adam, I say, "Look, you're welcome to anything about which I've published. That's the ethics and the etiquette of science. The whole reason to publish is so you have access and if it's out there, I'm more than happy to send it to you freely." If it's a company we charge them. But any researcher at a university or research institute, a non-profit, we just send it for free when they ask. They may pay the FedEx bill or something.

I don't spend a lot of time trying to show other people how brilliant I am through email, phone conversations, or meetings, talking about unpublished data. I'd much rather put my effort into trying to get our papers out and telling our stories, and let the world assess it after the fact…At a meeting you can raise an important question, but if you don't publish it and three other people do, they get the credit and everyone forgets about you. So, you can be brilliant and forgotten, but what's the point?

There are two philosophies about that. There are investigators who never talk about anything until it's published or just about to be published, and other people who lay claim to things by talking about them. I'm in this second camp, sometimes to the chagrin of colleagues in my lab, but we've always just talked about things as we go.

Even among scientifically quite close disciplines, as in molecular biology versus bioinformatics, there are huge differences in culture, even though they're related in many ways…Molecular biology is probably the most proprietary of all fields. For some understandable reasons, they have commercial value. There is just generally more money in molecular biology research. The stakes are higher. There are typically more people investigating the same particular issues, so there's a higher degree of competition. This is not across the board but, certainly, it's quite common to talk to molecular biologists about preprints, and they say, "Why on earth would I put out an ad to my competitors that I've written a paper on this?"

My attitude is always to be as open as possible, as early as possible. I tell people what my ideas are, I find that I gain more than I lose. There are some risks; some people might be a bit unsavory and run off with your ideas. Normally it's not really much of a risk, especially if you know what you're doing, you have good ideas and a good lab. You're going to do well and if they need to steal your ideas they're in trouble in the first place.

Richard Freeman, a senior Harvard labor economist who looked at high-prestige labs in molecular and cell biology, described the economy as a tournament with high incentives for

> finishing first and so forth…He found that they sacrificed and exploited everything to produce results: family time, graduate students, postdoctoral researchers, etc. As a result, their salaries are much higher than in the physical sciences. But, this atmosphere also resulted in very little sharing…And I think that the intensity of competition and a somewhat heightened sense of striving to be first with important discoveries, I think a lot of biologists feel that it's their time, that molecular biology and genomics have opened up whole new important fields, that there are many more distinctions to be won, and so there's a lot of competition.
>
> Since my job is to work with people from cancer biology to ecology, across the board, life scientists—I prefer to call them life scientists rather than biologists—sharing varies greatly. And I would say as a community I find the plant sciences—which again, you can break down by cell or physiology or whatever—they are pretty good about sharing…I see the plant community being a lot more open.
>
> I regard geologists who do evolutionary biology, that's a kind of life science, and ecologists to be among the most openly communicative. It's not that they're not competitive. It's that they're the most communicative. In fact, they're much nicer to one another, by and large, than the molecular biologists. They've done fieldwork and they drink one another's bad coffee.
>
> I guess because we don't really have direct competitors we know are doing the same things that we are, we tend to try to do different things and have a different kind of emphasis…other labs use the same experimental system as we do, but generally those labs are fairly creative and really not trying to do what others are doing. So it's good…And this topic of cell division, you can gain interesting information by studying amphibians, by studying yeast, by studying all these different systems, and it's all publishable and interesting within the field, but because you get different variations and different organisms, everybody's excited about it. The competition hasn't been a huge issue with me, because we feel like we can do different things.
>
> In biology, competition between labs is often pretty ferocious. There are many situations where you have competitors working on, if not the same problem, a very similar problem, which, if it gets published, will take the wind out of the sails of your work. And there's no way for sharing, or really even knowing what people are doing, besides snooping around conferences and seeing what people talk about or present…And there's a lot of that pre-publication lack of information accessibility, and secretiveness that is very detrimental. Having said that, it's also very motivational. So I definitely find myself working harder thinking, "Oh, my God, somebody could be working on this and I better get back in the lab, finish it up real quick, write it up, and get it out." And it's definitely motivated me, my collaborators, and my professor to do things faster. So maybe it's a double-edged sword.

Widespread early sharing is prevalent among the *C. elegans* academic network, which is underpinned by a strong and sustained sense of community and collaboration.

> The *C. elegans* worm community is highly interactive and very conscious of itself as a research community. If you talk to individual investigators, there's a very strong sense of who the eldest of the tribe are, who worked with those elders, what they're doing now, whose lab is doing particularly significant work, and whose individual scientific antecedents were. Obviously there's competition, as there is in any scientific field, but there's also an enormous amount of collaboration and community-based activity.
>
> If you look at *Arabidopsis* or *Maize*, those two areas have a long tradition of sharing, especially *Maize*, going back 50, 75 years…a colleague went to the *Maize* meeting and he said, "It's like the *Drosophila* meetings used to be 25 years ago. Everybody's got all these ideas, they're all open, they're sharing everything, and it's not competitive in the same way." And so

> I think it depends a lot on the area…I think this is probably an important reason why NSF chose plant biology for the cyber infrastructure initiative…the plant community gets along pretty well, it's pretty well integrated, and there is a lot of openness.
>
> And of course there are lots of people in fields that are much more closed. Retrovirology, for example, where the tradition of sharing never took.
>
> Scholars who do not share include anybody who has any connection whatsoever to any kind of clinical trial…it was always a question of, what are you going to do with our protein that we've made that's a potential drug, because if somebody does something inappropriate with it, and a bunch of animals die, that has to be disclosed to the FDA. So there's a legitimate problem.

Some scholars call upon their informal network of peers for advice or a point in the right direction.

> One has a certain set of friends that you develop over time. I have friends at Duke, Cornell, MIT, and all around the country. Oftentimes you'll call them up and ask for advice or information or a plasmid or a strain or an antibody to help your work. A lot of people, though, play their cards really close to their vest.
>
> After I gave a lecture last Wednesday, a nice guy came up to me and said, "I'm really surprised that you didn't mention this fact." And I said, "Well, I wasn't shocked at that because there's a lot of that going around, but I really need to find more about it." I went home and I thought about it and finally I said, "Oh, I know who can answer that question." So I emailed him and I said, "How can I give a better answer, because I need to include it in this lecture when it gets written up as a book?" He sent me back the exact source right away, nice email. So in that sense, it makes scholarship easy.
>
> There's no really systematic way for avoiding overlap with someone else's project…I guess there's a sense of what different people tend to work on, and if you think he might be working in the same area as someone else you might physically ask them, "I'm planning to do x. Are you going to do the same thing?" But generally people just do what they want. You try to do your research in the literature to find out whether someone else has done the same thing you're doing before you start it, but if no one else has published it yet then people often just go ahead and do it.

The dynamics of lab-based research are conducive to sharing and keeping up to date. Frequent informal meetings with colleagues are the norm, as is intergenerational collaboration with current or former students.

> They have group lab meetings, where all their students will come into the same room and they'll exchange ideas. They actually work together and they publish together. They have program project grants together sometimes…I'm thinking particularly of a group of people who all were recruited within two or three years of each other and they occupy adjacent labs. The lab doors are open, students come and go all the time. It's like one giant lab. And it's been very successful. I think it's a great model…The whole idea of the central areas—with coffee and computers and the library—is to get people from different labs to talk to each other…When you exchange ideas, great things happen, that's for sure, and if you don't exchange ideas, you become kind of narrow.
>
> I communicate with my group, my collaborators, and the literature in a couple of different ways—working first in the small group with three or four graduate students, communicating with them frequently and collaborating with my other lab members on a weekly basis.

In contrast, some subfields, particularly the "bench" sciences, are driven by intense competition in a race for results, publication, and credit.

> People definitely get scooped…it's who had the publication data first, period…You will tend to get cited but it's definitely who was first…That's what I mean by scooped. I don't mean stealing ideas…scooped means you get beat out, not that they stole something…Even just this week…someone said that for the first time they heard someone talking about getting scooped by a research group in China and no one ever used to have to worry about China.

Establishing informal networks

Mentoring plays an important role in the socialization of graduate students and postdoctoral scholars; their sharing practices likely mirror those promoted by lab leaders. Some advisors expressed concern over their graduate students' research being scooped, though placement in a prestigious lab can nullify those concerns to some extent. Again, the degree to which graduate students are willing to share can be dependent on subfield.

> First, I should say that there are very strong individual differences. Extremely strong. And it's just another example of the impact of training. Jerks come from jerks, and nice people come from nice people…It varies with people. There are people who will only talk about stuff that's in press. I always talk about stuff we just did and sometimes put in the deniability clause that this result may go away because we've only done this experiment twice. I think people appreciate that. That's just part of my acculturation. I grew up with the notion that a way to get credit for something is to talk about it right away…and other people say you've got to hide it until it's in print. It's about whom you're trying to impress. I learned from my graduate advisor that if 97 percent of people don't think you're any good because your paper published third, but the 3 percent that think your paper was the best paper are the people that you respect and care about, then you did great…It's something that we try to pass along in the culture in our lab.
>
> There's a certain ego thing, too, which, if you tell me you are doing that and you've got the result, well, I know that I'm doing this and I've got this result and that's more important…I used to know a very prominent professor who had postdocs up and down the East Coast in various labs. They were feeding him information about what was going on. That was ridiculous. You would have graduate students jumping on these leads.
>
> I do worry about students. Sometimes they're struggling and not making progress, and if someone comes through from a big lab and they're working on exactly the same thing, they could pass a piece of information onto a postdoctoral researcher who could make that part of their paper…It's been an issue more recently, so I leave it to students and postdoctoral researchers to decide how open they want to be.
>
> Again, sharing of in-progress work by younger scholars depends on their backgrounds. I should start by saying they're more at risk, there's no doubt about it, and so I think they would naturally and understandably be more concerned about their pet experiments getting out than somebody who is more fully covered in this regard. But that being said, their access to information really, again, depends on their pedigree. And so if they come from the field that they're still working in, especially if they achieve something there or if they're from a laboratory that is big in this area, then their chances are much better. So there's a lot of good continuity there.

It is imperative that younger biologists build informal networks and keep up on other scholars' current research interests.

> Faculty tend to instruct students or postdocs nearing graduation that they had better get themselves fully into the "networking" of the field (conferences, hallway conversations, etc.). If they decide to pursue something that stems from a new publication, they should then be aware that the authors of that paper may well be many steps further down the road by now.

Although multiple sources are relied upon to keep up to date, close colleagues remain invaluable in flagging papers and information of interest. In an ideal model, graduate students keep their advisors up to date with the latest developments although, in reality, this is often a two-way process.

> I'm an exception. I don't like meetings, I don't like to travel, and I go rarely. So I read…PubMed, searches. I don't browse a lot. I hear people talk; people come to my university and give seminars. I read the paper. I do read the news and views in *Science* and *Nature*—they're good for that. I occasionally read a review. I have students who read and tell me about stuff, not often enough. I have to give exams to Ph.D. students and I talk to my colleagues. And if you're willing to read you can learn everything…I am sort of at a crossroads of science and people tell me stuff. I'm not typical.
>
> My graduate students bring papers to my attention that they want to talk about. It's really important for me to make sure that I respond to keep that cycle going, because if I don't, then they will stop bringing them to me. We have to keep the graduate students cultivated so that they know how to find interesting and important papers and not just papers whose title is relevant. And then, also, colleagues will often say, "Say, did you see that paper about so-and-so?" And word of mouth does pretty well.
>
> It goes both ways. My research group feeds me papers and I feed them as well…I'd rather it go in the other direction, but I still find things for them that they've not seen, often because I go to meetings and hear of things that are coming down the pipeline, or talk on the phone with somebody and learn about it that way.
>
> There is some measure of people looking to see how long your resume is and how many papers you have. My personal view is that, if a paper is really boring or only concerns three people, email it to those three people. The first thing about these papers, the bioinformatics are not worth very much; those are publishable, but I prefer not to be the one publishing those…Writing a paper takes time and effort—pursuing it through the whole process takes time and effort—it's just better to go on and do some interesting research rather than pursue that.

Time is a key impediment for keeping up to date; scholars report immense difficulties filtering large amounts of research in their areas of interest.

> I think in-progress communication activities depend upon who you are in the field, what stage you are at and what time, and the history of the field you're talking about…I am embarrassed to admit, though I believe it is widely true, that I and most of my colleagues do not get most of our primary information by perusing the most recent issues of the leading journals in our field. We don't do that. It's bad, and it's…true for 80 percent of us…And here's the bizarre thing. I know there are really important papers that are in my field that I don't see until embarrassingly long after they appear. And it wouldn't matter if I had, because my bandwidth for being able to read the number of papers that are out there is fractional compared to the

> stuff that really is interesting that I could read…It's almost like there is no particular premium on knowing all the important stuff, because you just don't have time to act on it…I don't think it should be this way and I don't see a solution to it. And it's a crazy paradox. We all believe there is not enough money to support all the good work in our field that needs to be done. And none of us reads most of the papers in our field. Now how can both of those be true?…It's a paradox that I have recognized and not come to grips with.

B3.2 Widening the Circle: Conferences and Meetings

Conferences are the formal mechanism by which more polished work is shared with the academic community. For most scholars, selective conference attendance and informal networking provide a time-effective way to keep abreast of recent research, often prompting a search on published findings of interest. Though they provide a forum to exchange ideas, elicit feedback, and garner access to resources or techniques, it is acknowledged that papers by graduate students can be "green" and scholars defer to published rather than conference papers for definitive information. Some scholars may face difficulties reconciling the relative "freeness" of sharing at conferences with concerns about having ideas purloined.

> For me, my knowledge of the newest things comes primarily from my attendance at significant meetings in my field. There's a trade-off between being up to date broadly and hearing too much of the same thing and having your vision narrowed. And so I find that for myself a reasonable compromise is no more than two meetings per year in my field or in each of my fields. And that's good enough to keep me in the sweet spot where I know about 80 percent of the stuff that's interesting that's happening, but I didn't hear about it to the point that I'm bored with it. And then I can look for the papers that come from those people in those fields shortly thereafter.

> A lot of it is just word of mouth, hearing other people talk. And to an increasing and somewhat discouraging degree, it's a lot of hearing about things at conferences as well. Many people don't have time to actually read anything anymore and so they go around to conferences and they hear about them instead. And then if there is one that's really relevant, then they go and dig up the paper afterwards.

> Conference attendance is important both for the talks, but even more so for the other informal interactions with scientists in the field. Because publication is slow, there's a lot of action before publication. Access to resources or techniques really come from conversations at a meeting. That sort of interaction really pays off. And it's important for meeting people that might want to come to your laboratory.

Conferences provide a forum for young scholars to establish a reputation and to start building informal networks. In some cases, advisors do "the rounds" with their graduate students and introduce them to key scholars in the field.

> I give talks at meetings, I send my students to give talks at meetings, posters at meetings, and we publish in conventional ways.

> I…call it standard mentoring, which is you go to conferences, you take your students and postdocs and you introduce them around.

Sharing work prior to publication at conferences

The real dilemma faced by scholars at conferences is how to share non-published research without giving anything away to competitors. Because of this, scholars tend to present papers nearing publication. At some conferences there is a premium on discussing the latest research findings, though scholars in particularly competitive subfields may be reluctant.

> Let's face it, these communities contain all your best collaborators and all your best competitors, too…There is a culture and an expectation that you will share certainly your results, and possibly your ideas, and your interpretation of those results with the community of people who are most interested in them, and you have to do that knowing that there in the room are most likely to be the people who are going to take best advantage of what you've just told them…Chemists for many, many years have been absolutely used to working at the interface of academia and commerce, and they knew to a nicety exactly how to both ask the questions designed to uncover commercially relevant information in an academic context, and also how to answer such questions without giving anything away. That's absolutely part of the game, and it was entered into with good spirits on both sides. And that has become the case in biology, too, and I've certainly been in the auditorium here where people have great fun, trying to get the speaker to say things that s/he doesn't want to say. That's just a fact of life. I think that these days most people do not communicate results at meetings that are not already either submitted or on the cusp of being so.
>
> It's not unusual for me to be able to talk with somebody on the phone or especially at meetings and learn quite a bit about what they're doing, and vice versa. The culture of biology meetings says that it's not so cool to talk about published work, and the people who talk about work that is unpublished—only because it's not Wednesday yet and the journal hasn't come out yet—even that's considered to be not so good. I just came from a meeting a couple of weeks ago, where the sanction was, "We want to hear unpublished new work, don't give us a review of what just came out last week in *Cell*," and I found that people adhered pretty strongly to that…So I think that, at least in the sector of molecular biology where I reside, there is a culture of getting stuff out ahead of time.
>
> Obviously there are issues about ideas or data that one might want to hold and not make public yet. If it's as big as the idea, I think you're just in trouble. If it's the data, it's a little easier to keep that private, but the idea will be a concern for people, definitely.

Conferences versus specialized meetings

Annual conferences, hosted by scholarly societies, are large in size and broad in scope compared to more selective conferences, such as the Gordon Research Conferences and Cold Spring Harbor Laboratory meetings. The latter are said to cover more specialized subject matter, provide an intimate environment more conducive to scholarly debate, and reinforce informal academic networks. Specialized meetings have been particularly powerful in developing new fields or forging collaborations between new disciplines.

> I've also been involved in a number of fields that are nascent and are busy trying to create government funding in those areas. One of those was structural genomics, which…didn't exist ten years ago. There were a handful of people coming from different directions, who all thought this would be a really good idea in the late '90s. The NIH has put something on the order of a half billion dollars into the area since that time. Conferences were very important to get things going, to present the ideas…we had one every month. This was before the field really existed, so there was nothing really to say other than what we thought it should be. And

so you heard the same eight people speak at every conference every month…But it was actually very important for developing the field that people began to learn what the field could and should be and it led to an understanding of what expectations were.

At Cold Spring Harbor in 1933, there was an invention of a form of communication [the symposium in quantitative biology] that was inspired by the need to capture the special nature of communication that took place intra-personally there and bring that to a wider audience…The big impulse behind the meeting remains the same, which is to take a topic of serious significance and bring together a large number of international people who approach that topic from a variety of different perspectives. Traditionally the very best investigators in the world, whatever the subject, have come together for five days, which is a long time by current standards. Up until three or four years ago, it was a week, and there were people who were prepared to come for a week and sit in an auditorium, morning, noon, and night. So these were very intense experiences, and the book was there for the important means of communicating what happened at that meeting.

I've been at meetings that have been designed deliberately to just bang people together and see what happens. So, for example, Virginia Tech about five years ago put together a meeting of GIS people with people in bioinformatics…One topic of conversation was whether some of the techniques of GIS could be applied to three-dimensional studies of the brain or studies of the layer sequences of the human genome.

I'll want to go to a Gordon conference that's organized by people that I have deep scholarly respect for. There was recently a meeting in my field that I didn't go to with some students, because I didn't think the organizers could tell important stuff from average stuff and so it wasn't worth my time. So there is a measure of merit that I use.

Actually, I enjoy the small meetings or seminar visits more than big meetings. But big meetings, there's a lot of networking going on…There's a big meeting, the American Society for Cell Biology. Now I'm at the age where I know so many people I can barely walk like 10 feet and I run into somebody else and it's, "Oh, you want to have a coffee," and so I have trouble actually attending the scientific session because there's so much to catch up on. And it's not all professional, it's also, "What have you been doing?" and "Where did you go on vacation?"…It's a social thing too.

The meetings I attend tend to be a Federation of American Societies for Experimental Biology meeting or conference. And those tend to be smallish meetings, meetings of 150 or so. And then I'll tend to go to something like the National this or that meeting. They tend to be larger meetings. And the smaller meetings are more valuable to me, although they cover a narrower scope than the larger meetings.

Conferences, of course, are critical. They're really important for staying ahead of developments. And there are a number of other conferences like the Gordon, which people tend to go to. And then there are the big gigantic society meetings, things like the Society of Neuroscience or the American Society for Cell Biology meeting, which are mostly graduate students talking about things that are far from being finished, usually. And there's a lot of exchange of ideas. I think they're extremely valuable in that respect.

I used to go, when I was younger, avidly to Gordon conferences, skiing meetings, and workshops on Crete and all the rest of this stuff. And two things occurred to me. One is, boy, these are a commercial enterprise. They're not actually science meetings, most of them, the Cold Spring Harbor excepted, Gordon Conferences maybe excepted. And I discovered that I heard all kinds of interesting stuff at these meetings, and I didn't really believe or act on it

until I read the paper and had seen the data. And I talked to my friends and I discovered that almost nobody took stuff seriously until they had seen a publication.

Conferences are the most important form of in-progress communication, especially Gordon research conferences and hallway conversations at other conferences. Conferences are how you get the alert as to the most recent things that are happening.

In-progress communication is pretty much the same as it always has been—society meetings, Gordon research conferences, and seminars.

Conference/meeting webcasts

One cyberinfrastructure project in the plant sciences is trying to promote open sharing among the community through conference webcasts and is being met with some expected reluctance from scholars. It may be that broadcasting specialized meetings undermines the notion of intimate exchange upon which they are built.

So first is, we ran into some reluctance from some of the speakers in this conference…My attitude is to tell them in advance what the rules to the game are and say, "This is all going to be public." So…if they don't like the rules of the conference, then they don't have to participate. But if they want to be in there with everybody then they've got to play the openness game. We try to be reasonable with that and if the community decides that we're being too open or not open enough, then those rules can change…There still needs to be discussion about that and where the boundaries are. I think we won't get wide open discussion if the whole thing was webcast to the world…people can participate in it by webcast, they don't have to be present.

I think anything that we put funds behind will be public, so if we support a grand challenge workshop, the idea, the proposal for that workshop, will be on the public site…So the idea is to be very transparent, so certainly anything that we're putting resources into will be public…so people will know what the grand challenge questions are and who's working on it and what's going on…We're very sensitive to the tenure/publication/information sharing issue…that people need to publish in the accepted outlets in order to get credit for it. And so we want information open on the website, but not at the expense of someone's career.

Conference proceedings

Conference proceedings are very important in bioinformatics (and the Cold Spring Harbor Symposium for Quantitative Biology played an important role in the development of that field), but proceedings are seldom cited or used to publish significant work in molecular and cell biology.

In bioinformatics, the conference proceedings are very, very important. But in most of genetics, there hardly are proceedings. There are abstracts, but the most famous of the proceedings historically, the Cold Spring Harbor, are almost never cited anymore. They're unavailable.

Certainly in the biological sciences journal articles are the main method of communication. There are a number of conference proceedings produced, but with the exception of one or two conference proceedings…no one would publish anything that was really important in a conference proceeding. Maybe the Cold Spring Harbor Symposium for Quantitative Biology, but in general any particularly important work comes out in a journal article.

B3.3 Open Sharing: Websites and Preprints

Biology does not have a preprint culture, which is largely attributable to the fast-moving publication process and intense competition among labs. Research that tends toward the social sciences may make more use of working papers. Of the academics we interviewed, maintaining a lab-based website with links to a selection of publications is fairly common, and faculty websites are important resources for scientists to find out what colleagues are up to. Some scholars may circulate papers as PDF files to colleagues as a courtesy, with email expediting this sharing.

> Preprints really aren't used at all. If there's someone who's doing very similar work we may send them a copy of the paper so we can try to coordinate the publication or let them know the details of what we've done. But that's a fairly rare case. And usually by the time that something is written up, then it's off to review and we figure, well, why not wait until there's the final one, which will be a few months later.
>
> I haven't put preprints on websites and stuff like that, just because it's one more thing to do. If it were part of my culture, I'd be happy to do that…It happens a little bit. My field is fairly competitive and people are less willing to do that, because you're already giving up some of your so-called trade secrets, and it only really counts when it's published. So there's this unspoken ethos that, "Well, why give your competitors the extra advantage before you actually get points for it?" So it's not like physics.
>
> When arXiv and the physicists started using preprint servers everybody said, "Biology should do that," and there are some out there, but people really don't use them very much. I really think it has to do with the kind of competitiveness that you see in biology with small labs competing against each other, so people really want to get that publication out.
>
> I'm familiar with the arXiv. There is no equivalent or anything similar to it in molecular biology.
>
> I send people PDFs of our papers if they want them. Preprints, not usually. We have to have them for promotion cases, sometimes. That's the only time I've ever really had preprints; the committee has to review your package and you want them to see your latest work. But in general the publication process isn't so long and you really don't want to share your data before it's published, so not much in terms of preprints.
>
> Technology has made it much easier to send papers out to my colleagues. So if you hit my website, my whole C.V. is there and each publication is a PDF. So when people ask for preprints, I just tell them to pull it off the website. But we've always sent out preprints of our papers to our colleagues, so I don't think that's changed a whole lot. It's just easier to do electronically, than putting something in the mail.
>
> IHPS, the Institute for Health Policy Solutions, does quite a bit of working papers. Those researchers and research areas that lean more toward the social sciences have some working papers, but not to the extent that you find in disciplines like economics and astrophysics.
>
> To find out what another group is doing, one can look at the website of the faculty member.
>
> The website is kept up to date with bibliographic information, which is not under my control. That would have been kept up more today if it were under my control.

B3.4 Data Sharing

In molecular and cell biology, data sharing is common practice and promoted by both funding and journal mandates. Although subfield-dependent, processed data and other information are typically shared post-publication. Exceptions include the model organism community who share data pre-publication.[69] There are three main models for data sharing: scholars publish data as supplementary material to a journal article, deposit in a subfield-specific or federal repository, or share personally in an *ad hoc* manner. Given incremental knowledge-building in the biological sciences, sharing data is essential for replication and verification purposes and to push scholarship forward. The premium placed on publishing and securing grants can undermine data sharing efforts in some cases.

Journal articles and supplementary data

The sharing of data is usually associated with article publication in the form of supplementary data. This can be in conjunction with repository data submission. Processed data are valued over a raw "data dump" since articles have undergone peer review. For some scholars, submitting a paper and accompanying data to *PLoS ONE* or another less competitive journal is a way to provide open access and accrue publication credit for low-grade data.

> These days a lot of stuff goes into supplemental data in journals, so we make a lot of use of that. I insist with my students that everything needed for someone to really follow up on this ends up in the supplemental data. I get a lot of complaints. It's a lot of work and they don't necessarily see the reason for it…They want to move on to their postdoctoral research position, to the next job, the next paper, and this and that…I think the culture of science is very focused on the publication and there isn't a strong culture for preserving the records. No one would know or care if I threw out notebooks from the last 25 years, but they might later.

> I strongly disagree with the data dump that hasn't undergone peer review. It's useless…I don't think anybody wants to go to somebody's website and look at their notebook dump. Let them organize it, put it together in a paper and submit it…Honestly, when I retire…I am going to do just that. I'll have an empty lab and I'll be sitting in an office with my computer. I'll write up the paper and I'll tell the editor of the journal, "This has to be archived, take it or leave it…If you feel it absolutely needs revisions or additional experiments, then don't publish the paper," and I'll send it further down the food chain until I find the journal that'll publish it.

> There are only a couple of publications that we've had that involved relatively large data sets…and in both cases the data were provided really as supplementary data and not really entered into any archive or public database. You'd have to have access to the journal in order to have access to the data. But if people contact us requesting data, who don't have access to these journals, we're happy to send it to them. I don't think there's a conflict with the journals about that because there's just free sharing of information, like you would send reagents. So, on our small-scale level of not doing too much large data set gathering, it works for us to just do it through the journals, for the most part.

[69] The draft human genome sequence data set was made available prior to publication. For more information on pre-publication data sharing, see, *Nature* 461, 168-170 (10 September 2009), http://www.nature.com/nature/journal/v461/n7261/full/461168a.html

> Once the data are published, they're in the hands of whomever we contract to make that material available publicly. So it goes as part of the paper into supplemental material and we submit it to a database for crystallography.
>
> The distribution of data is also through the journal, when you have supplementary material.
>
> We're writing a paper right now where this will be all embedded in there.
>
> Actually, we have a paper we're going to resubmit to *PLoS ONE*, which is their low-grade journal, which is not very competitive—it should be just publishable data. I like the fact that if our paper does get published there, it has maybe more visibility than it would have in BioMed Central…The PLoS name is good to have associated with whatever open access, low-grade data you have.

Journal mandates

Before accepting an article for publication, some journals stipulate that, where applicable, scholars deposit data in a repository. While the majority of researchers comply with these mandates, journal requirements do not necessarily ensure deposit of data by scholars and standards are inconsistent.

> If scholars are publishing a result in which the data are an essential part of the result, like genomics, they've got to deposit that in the journal. And if it's not like that, if it's materials or data that would be essential to somebody else to expand or build on the conclusions in the paper, they have to be able to supply that if it isn't publicly accessible in some other way.
>
> Where there are accepted repositories for certain types of data, like nucleotide sequences, protein structures, for example, we will require our authors to deposit the underlying data sets before we will accept their manuscript for publication, and we'll include the accession numbers in the manuscript. So our philosophy and our editorial policy is around making sure that data, wherever practically possible, are openly available to other researchers, because that's just good science.
>
> We're writing two papers right now and the journals and the funding agencies require that you deposit those data in the federal repository, and they're available to everyone, so that works pretty well.
>
> There are investigators who don't comply with these things, who don't make the data available, or don't make animals available or resources available when they should, and everyone complains about that, but it's a small minority. So in general we have what we need.
>
> My raw data go into specific databases in the subfield and then they go to NCBI or EMBL. Not everybody uses those and the journals require it, but very frequently when you go there you discover that what was deposited is not useful…I don't think the problem is standards, I think the problem is the will to do the right thing.

Journal-owned data repositories

As the academic community is faced with large amounts of data, serious thought is required to address data sharing, preservation, and curation issues. One way forward is that journals take responsibility for storing data, perhaps via publication-based data repositories. But, this requires

extensive logistical considerations and additional time and money on the publisher's part. In particular, imaging and visualization data pose unique problems for archiving.

> I think data preservation is hopeless…The best thing to happen would be if the journals would take responsibility for the data that underlie their publications, just as they used to do, by having a repository for them. And a part of the review process would be that the reviewer recovered the data and saw that they were in a useful form.

> We prefer to host at least a copy of the data on our website because at least then we can guarantee some level of future-proofing that it will be available. Where that's impractical for various reasons, we do link out to data sets elsewhere, but the half-life of those links tends to be quite short, a couple of years or something, so there's a real archiving persistence problem there…A scholar will stick it on a Web server and then they'll move on. There's no one there to make sure that it stays around.

> The question of supplementary data…is becoming more and more of an issue because there is simply more and more of it. Obviously that's good in certain respects because it allows people to really acquire the raw data that lie behind the summary tables and figures and then to do manipulations of those data themselves, and that is a beneficial tool for the community. But from a publishing perspective it means that they have to provide huge amounts of storage, ways of ensuring data integrity—just making sure those files are available…so one has a duty of curation that is much beyond that of simply keeping access going to a set of written documents. The question of visualization—that too we've been engaged with. There are times clearly when the images are the data and one can't escape that. As data become available at higher and higher resolutions from imaging technologies, then, again, there are issues of storage, integrity, and curation that one has to be aware of.

> There are all kinds of data that are produced and only a small amount of that gets into the published literature. And actually what happens to all of that supplemental data…is a really big problem in that faculty feel that they can't actually do peer review on an article if they don't have access to it, but we don't really have any national standards or, in many cases, good archives for that kind of data. So that's an issue—if the National Library of Medicine could do something…I believe that there need to be national or international archives where data and software are stored. I personally don't think it would work for a university to archive every faculty member's website or data, no one's ever going to find it again. It needs to be in a place where it's taken care of as a whole…I think this issue is just starting to be on people's radar. There was a letter in *Nature*…In some cases there are some journals that have supplementary data, but the question is, whom do you rely upon to archive that, even if they have it?

Subfield-specific and federal repositories

Good data sharing practices can be promoted by funding bodies, such as the NIH and the Wellcome Trust, which stipulate how data should be deposited and archived.. While there are the centralized databases, such as GenBank and others supported by the National Center for Biotechnology Information (NCBI), some scholars make a name for themselves by starting their own database in a particular subfield or specialization; these can be funded by grants or startup packages. They may also help establish and sustain academic communities.

> There's a standard community-wide protocol for what happens to sequence data. There's a lot in nuances and messiness, but in general it's pretty clear what you're supposed to do with your data. I think there isn't too much controversy there.

> The National Center for Bioinformatics has archived all sequence data ever made. And part of publishing new sequence data is that you do it in a way that is compatible with the way they've organized their databases. So when Craig Venter sails around the world and sequences gallons of seawater genomes, he puts it right up on the NCBI website, and I can search through that database with the online tools they have. And it's very user-friendly and very easy. So all of the biology field is, relatively, very up-to-date and computationally searchable and accessible.
>
> There are some areas like the protein database, which is an incredible thing in biology, where now, when people learn about the structure of a protein, they send it to the protein database, it gets stored there and everybody can have it and so forth, and so on…But as you start doing these things, you start finding, "Oh, my gosh, this depends upon the kindness of strangers to some extent."
>
> Molecular biology is hugely data-intensive…The Nucleic Acids Research publishes a database issue every year, and molecular biology databases, and this year there are a thousand molecular biology databases…and they're very, very specific to an individual's research. They're distributed—Let a Thousand Flowers Bloom….What happens is that the faculty member needs to organize this data for his or her research, and then they start to talk to others, who say, "Hey, that would be great if we had access." So they go from an individual database to one that is available to people throughout the world. So there's somewhat of a sharing culture, I think, within molecular biology. When you look at a thousand databases, and how that's grown so rapidly…there certainly are centralized databases that are provided from the National Library of Medicine that are available, but these are just individual databases…and then they get support from NIH, most likely, to support their research, which then also supports the database.
>
> The only guys who have done well in this, the guys who have had their eyes on the ball, are NCBI and PLoS, more NCBI than PLoS…the point is that what you want is you want all the data to be there.
>
> We started databases for our own data and that of others. And yeast is pretty well supplied in databases, but most fields are not. I believed that that is the future…for example, for human genetics, the situation where people would publish linkage data, typically in *Nature*, which were a fantasy, and no one ever checked it, you couldn't get the data because they were propriety or something.
>
> There are also smallish versions of cyberinfrastructure, where the community tries to come together, like the *C. elegans* or roundworm community, or vector biology. So for insect disease, that group has come together to try to pull data together. Those will tend to be focused around a database, pulling information together, so data and tools. But it does pull the community together.
>
> So you can find pockets of people withholding things in plant biology and you see that nationalistically sometimes where, say, Japan has put a lot of money into rice genome sequencing. They may or may not give it out. The corn growers have funded a bunch of stuff. Usually that ends up being totally open because there's more of a culture here of, if it's funded by NSF, then they really push for the openness that is going to benefit everybody.

As young fields become established, and access to online resources expands, sharing can be undermined in some cases, even among communities where early sharing is the norm.

> Nascent fields, as they emerge, fairly often have these community blackboards, and I remember the times when the Drosophila community had stuff flying around on faxes. *C. elegans* has a Worm Breeder's Gazette…on the Web, and you can basically throw in anything that you want and it's cross-referenced. You can look in a given topic area to see if somebody's done anything interesting. People put negative results as well as positive results, everything…And so these things seem to work well as the field is struggling to establish itself and people realize that nobody's got a breadth of expertise or tools. There's a great need to do that, as there is a certain amount of bonding that goes on in trying to get a field on its feet. But then once that happens, things get a little tougher, the quality of the information drops off, and people start to get a little more competitive.
>
> The most open community I've ever seen was the people who worked on *C. elegans.* This is in the pre-Web days. They would document and share their data and the new version of the database would come out every few months, and they would use it to design their experiments, which I thought was really beautiful. And as the World Wide Web came along, I started seeing walls getting built up. I think the pace of innovation hampered that collaboration, because we didn't have guarantees for the provenance of the data…I see the walls being built when they're afraid that the pace at which innovation can happen, that they're sharing it with someone who can take the ball and just run and hit the finish line much, much faster than they can.

Data curation and revision

Data curation or "biocuration," is the collection, organization, and annotation of biological data to make them available to scholars in reusable form. The heterogeneity of data and existing mechanisms for curation can result in some data inaccuracy; data annotation practices are not yet streamlined[70] and data sets are often idiosyncratic, particularly in the "field" sciences. In addition, some databases are "over-curated" with particular ways of searching that impede research. Errors may go unreported as providers of data may be unwilling to rectify mistakes identified by their users. Real-time quality assurance provided by an electronic community of contributors is not widespread and may be actively resisted.[71]

> The number of data types for which a universally accepted community repository exists is vanishingly small; actually nucleotide sequences and protein structures is about it. I suppose you could say gene expression and microarray data now, as well. But there really aren't that many data types, and there isn't an obvious place to put most data, so they are not made available for people. We do publish data sets alongside our papers as supplementary information, but it's pretty unsatisfactory in the way it works…there's nothing more structured than perhaps an Excel spreadsheet. Most of it is just PDF pages with extra figures…There are a whole bunch of challenges associated with publishing peer-reviewed data sets, not least of which is that some of those data sets can be very big…But also, making the data useful for people is more challenging than making a document useful for people. It has to be structured in a way that people can use; it has to have appropriate metadata along with it that allow the data to make sense; for example, the experimental conditions under which they were gathered. As I said, the data types that are out there are very heterogeneous. So it's something we think a lot about…I agree in principle that scientific output should be made available to people. And the people who do should get credit for it. But the practicalities of enabling it are more challenging than documents and so it's taking more time.

[70] For more information on data sharing, see: *Nature* 461, 145 (10 September 2009) http://www.nature.com/nature/journal/v461/n7261/full/461145a.html

[71] See, for instance, Pennisi, Elizabeth. 2008. DNA DATA: Proposal to "Wikify" GenBank Meets Stiff Resistance. *Science* 319, no. 5870 (March 21): 1598-1599. doi:10.1126/science.319.5870.1598.

> In the plant sciences, there are simply too many fields and types of data in the biggest databases and repositories, with an overall lack of standards to unify and translate between data types.

> People don't take data management very seriously. They leave it to some secretary or some graduate student who doesn't do it right and there's no quality control whatsoever…If everyone deposited tab-delineated tables, that would already be good…I think the community has to rebel. Those communities that don't get their act together will fall by the wayside.

> Some of the providers who give you the data are taking back what they call third-party annotations or adjustments, but it's not the most ideal approach to doing that because people do find errors in a lot of these things and they try to give it back, but a lot of the agencies are just in the process of being the data warehouse, so they don't care about your viewpoints and your scientific judgment on the quality of what is in there…They're only the distribution channel, like NCBI.

> The conversation in the lab is about who's going to write this report telling other people that there is a problem in the stock center for this particular set of lines. No one wants to do it.

Ad hoc practices by individual scholars

Scholars may receive formal or informal requests, often by email, to share materials, such as a particular strain, image, protocol, or organism. Some scholars openly share images, video, visualization techniques, software, and other tools for data analysis, often on laboratory or public websites. Scholars work on the assumption that they will be credited for sharing their data, which serves to reinforce existing academic networks. The process of uploading data can be time-consuming, acting as a deterrent for some.

> Disciplines are very, very variable in regard to sharing. The model organism communities, the phage communities, E. coli in general (although not absolutely completely), other bacteriology communities, the yeast worm communities, which are Drosophila communities that are directly descended from either the Drosophila community or the phage community…they all say, as a matter of ideology, that any published strain is available. Most don't limit themselves to published strains, they'll send anything. But they feel an absolute obligation if it's still alive and still kicking…As a consequence of this, most of the strains in yeast, for example, are still alive…And the Drosophila people—who can't freeze their strains—have been heroic in their efforts to keep everything alive. That stuff is all available…There are a few of the older people in genetics who are the standard sources for things of this kind, because the repositories are very limited…Some image sharing is done. The worm database and the fly database do in fact share a lot of images.

> We share the protocols as well. Normally what happens is, if somebody needs help they contact me…It's still not like we really expect this to help people develop a method that they haven't used before. They're probably going to have to get more information than what we provide…They'll say in the acknowledgments, "We thank this lab for antibodies or sharing their expertise or whatever." And that's totally fine. There are some professors or PIs that want to be an author if they've just given an antibody or something…it's crappy. But we definitely send people stuff a lot and we don't even really remember to check to see if they acknowledge us…That's just what we expect when we write to people…There are a few times that I've written emails and no one's ever written back, and we've had to come up with some other way of doing it, but I would say 75 percent of the time we need a reagent, we just email the people on the paper and we send them our FedEx number and they mail it to us…The system

works really well for people at good universities who go to meetings and have all this contact. I think it probably doesn't work as well for people who are at smaller schools and don't have the visibility. But they can still email me and ask me for stuff, and I'd be happy to send it. It works quite well.

I was considering donating some images to some imaging library, but it's a pain. If people are really interested they can contact you. I want to know who's interested in my data. Just by Googling you can find a lot of images and movies, just on people's websites…So the whole image database, especially if they're going to charge people for these images…it's not really going to help anybody that I know. If people want an image, I'm happy to send it to them.

People in my department run large databases and make the software available and they set up tutorials of how to run the software and how to build this machine or that machine, so a lot of that is done electronically.

Actually, there are two videos on the first page of the lab website that you can download, and I've had people email me saying, "Can I have that video?" and I said, "Well, you can just download it." So the videos that are there are downloadable. And the images, I'm sure, are, too. But, yeah, people would have to email me for specific other things they wanted to use.

Barriers to data sharing

Because of the premium placed on publication and grant awards in some highly competitive subfields, labs working on similar research questions fear being scooped, which may preclude sharing data. There are also stringent controls on the redistribution of some data because of privacy and confidentiality concerns and when prior approval is secured for an experiment.

In biology, what matters most is having enough results to get the next NIH grant. And the fact is that NIH, and I think this is very bad, basically doesn't give you a grant unless you've already done the work. And so that leads to tremendous secretiveness. You don't dare publish the results until you've got the NIH grant that you're using those results to get, then you can publish it.

Certainly, I've noticed it in biology, despite the fact that we talk about openness, there's a hell of a lot of holding back until the paper comes out, even to the point when you're submitting an NIH grant, and for any NIH grant you pretty much have to have proof of principle, which means data that shows that you're likely to get the results. It's a weird system, but that's what it is. People will hold back data, even though it would strengthen their proposal, because they're worried that somebody on the review panel at NIH, is going to see what they're doing and scoop them…And the other reason people do that is they think there's a patent.

Or you may not want to share for the next grant where you're using this as fodder.

The other reason people withhold data on grant applications is they think there's a patent.

It depends on who it is, actually, and what is it that they're going to use it for. I've told people that I can't share this data right now because it seems that we are both working on the same thing and I cannot have this kind of collaboration affect the progress of my postdoctoral researchers, graduate students, and myself, in this regard. That's just the reality of it. That could preclude us publishing and that would affect us getting the next grant.

The data itself, on its own, we could put in some public open access thing. But there's really no incentive to share that because what we need are the publications for the postdoctoral

> scholars to get jobs and for my career to advance so there's a strong motivation to share data through publishing it.
>
> This speaks again to the inappropriateness of publication as a means for you getting credit for the work or the data, because if publication was removed from that equation and you were going to get credit no matter what, you'd be probably much more likely to share the data.
>
> I also get data from the medical community, so the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) and others, where you usually have to go through a formal institutional review board, get approval for the experiment, and then apply to that agency to release the data set and things like that. But you cannot redistribute that because it's gone through the channels. But then there are others where you find data and there's no easy way to give it back…it's one-way traffic.

Large-scale collaborative projects may promote increased data sharing since their focus is not publication, *per se*. This is not to say that the directors cast a blind eye to publication and tenure and promotion issues.

> The publication comes out at the end of it, but the project is entirely about that middle zone…We're facilitating other people to get the data, to put the data together in new ways and discover new things. I'm not going to discover new things unless I have some time on the side to play with it.

Despite support for data sharing from some scholars in the biological sciences, in addition to funding and journal mandates promoting good practices, there remain obstacles: scholars continue to deposit data in inconsistent ways or may not deposit at all.

Data preservation

Deciding what to do with "useful" surplus data, which is not included as supplementary material accompanying an article publication, is a challenge for some scholars. These data include notebooks and "non-useful" digital data, which do not "see the light of day." For one scholar, the ability to replicate results undermines the need for data preservation since he/she produces new data regardless.

> The vast majority of bits generated in science are actually garbage. They aren't worth saving…But in fields like biology, they don't even know which are the useful bits. They all may be useful bits. Probably 99 percent of them are garbage, but they don't know which ones, and so then things get very murky…So how do you preserve that kind of stuff that's not worth it and not appropriate to publish in any traditional sense?
>
> There are two kinds of data. There's the notebook kind of data that never see the day of light, all the things you accumulate, and then there's the things that you can make sense of, and data sets that you can make sense of, which we try to publish.
>
> The fun thing about this kind of science is that, sure, you have that story that you pursue over many years, but you find something out and you publish it, and then you go do something else. It's not like everything I do depends on the data that I had before. It certainly depends on the experience and the knowledge and all that, but the data itself, I think if it's more than a year old I want to repeat the experiment anyway…What we can do we can generally repeat, so we don't have to have a great archiving system.

While data preservation and storage practices by individual scholars are highly idiosyncratic, this may be related in part to the many different data types produced in the lab. Frequently, graduate students take primary responsibility for data management in the lab. Across all biological subfields, data loss is exacerbated by migrating data to new storage formats. In fields like ecology, some data loss is inevitable.

> Data preservation is a very big deal…An increasing amount of information is being taken from what are fundamentally imaging methods and the images aren't preserved. A measurement might involve 1,000 images, each of which is about a megabyte in size, so that we're talking about a gigabyte of information for one number…Researchers are not keeping the images…They sit on your computer until you need more space…But storage is keeping up. Moore's Law is keeping up, and we keep buying bigger and bigger network appliances to preserve all this stuff.
>
> The current arrangements for data preservation are all exceedingly haphazard. We will lose an amazing amount of stuff, because now…everything is electronic. It's in scholars' email, it's in Word documents, it's in I don't know what forms, in terms of statistical data and sequenced data…And we have an unknown number of machines on this campus that can create data, capture data, etc., far faster than anyone can ever analyze it.
>
> I retain none of my primary data. When my students leave, they take all of their notebooks with them with my blessing, unless there happens to be a notebook that's critical to an ongoing project. I don't retain any primary data, because I don't have the capacity to. I wouldn't be able to walk in my office if I had every notebook from every graduate student who's ever worked in my lab here. So the university does not provide the archiving capability for doing that, and the data just disappear. And I'm living with some element of risk there because if I'm asked, in the case of a fraud investigation or whatever, I have to depend upon the goodwill of my students to maintain their notebooks.
>
> We try to back up our data…poorly. We have hard drives, and people are supposed to have it in at least two places, preferably three places. We have an automated backup system for the university for some things…just for my computer and maybe one other computer, because it costs money…We need more server space…Data management is more the graduate students' role, actually. If it's their experiments then I consider the data to really be theirs, and the better that they manage it the better for the lab because we don't want to lose it, but I don't really enforce any kind of organization…It's really a cottage industry where we're all working together, but people have their own projects. We try to have common databases for things like antibodies and plasmas and stuff…We're just basically disorganized.
>
> We find more and more that going back five years we can't find any data anymore, because the volume is so big and people have left…It used to be that everything was in a notebook, and that's no longer the case. Now, parts are here, there, depending on where the disk space is available…We have an internal server that collects our data and makes it available to everybody in the lab, but that is very loosely managed. People just put the stuff there and tell each other where to find it. So data management is done pretty haphazardly; every lab has their own system, and you burn it on CDs or you store it on zip drives. Five years later you figure out there is no computer anymore that takes a zip disk…We basically live on the edge and move forward, and I think anything we have produced that is of enough value that somebody else would gain from it has to go in the public domain via publication.
>
> The media for electronic stuff changes so rapidly. Nobody uses their Sony Betamax or their VCR players anymore at all, they stick their DVD…and now because Wal-Mart wants to sell Blu-ray it'll be Blu-ray instead of DVD. These things change and then they go out of fashion.

> That box, that accordion way up on the top of the shelf, the accordion box— it's filled with three-by-five floppy disks. I don't even have anything that can read a floppy disk anymore. Fortunately the papers are archived, but if I wanted to go to those original texts, I couldn't even find anything out there to read it anymore.

The majority of the biologists we interviewed called for institutional support for data preservation. For larger collaborative projects, one scholar suggested partnering with Google for long-term data storage, but raised concerns over security.

> Should we be creating offsite repositories some place? Maybe we should be thinking about that, I don't know. Central IT provides services, but who's going to scan the paper, though? I'm not going to do it…The institution is going to have to take the responsibility for making that facile at some point to do, because otherwise I'll do nothing but that stuff.

> I will tell you that I think that the campus support of individual faculty computing infrastructure is not good enough to support the demands that we place upon it now. It really isn't. Our department spends a lot of our discretionary income to hire people to preserve data that really should be coming out of the overhead as part of what you need to maintain faculty research…We're lucky, relatively speaking, that we do have research grants that give us money, and there's patents and stuff to come back to our department, so we can afford it. But there are other departments that don't have those resources, and they have just as big a need to deal with it as we do. So I'd like to see that. That would be very useful.

B3.5 New Technologies for Sharing

Although some scholars write blogs and use social networking tools for recreational purposes, they are seen as inappropriate outlets for more scholarly practices such as publishing.

Blogs

Reading blogs to stay abreast of recent developments in the field was not typical among the biologists we interviewed. Many consider them a time drain and "unvetted," with some exception for those written by renowned scholars.

> I don't think scholars read blogs…With a blog, unless you know the person who's responding, you don't know how seriously to take the information.

> They may be people reading blogs and some of them are writing blogs, but actually very few spend time on this…Some of it is because when people look at what's available in the blogging space or on some of these newer networks, it's not worth their time to spend combing through and looking for stuff. The quality of the content, the nature of the content, and the nature of the insights that are being delivered that way are not worth the time when these folks are tremendously pressured in terms of their time use. I think that's one thing. Another thing is that scientists want to know what thoughts leaders in their field are thinking and saying, and thought leaders have not moved into the blogosphere, to any great extent. There are isolated instances, Michael Eisen…and his blog, The Tree of Life, he's certainly very energetically posting on it, and I think that has given him prominence in a certain sector of the scientific community, particularly the one that revolves around open access because he's a very strong proponent of open access. He's used his blog to publicize his opinions and his reactions to certain events in publishing. But on the whole, the thought leaders in science are not using those means of communicating, so far.

> There are a couple people in my field who do have blogs. I don't routinely read them. Every now and then they will say something that gets a little more attention…There are some science writers who do have blogs. Again, I don't routinely read them but I think those are a little more interesting. Carl Zimmer…has one of the best known ones.
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> He actually wrote a blog about one of our pieces of work, which is how I first learned about his blog…A colleague of mine here was reading some other blog, which referenced this blog, which referenced my work and so he emailed me…If it hadn't been for that one colleague, I never would have known I was written about, actually.

Writing blogs

Likewise, blogs are not are widely utilized by scholars for sharing scholarship. Although young scholars may write blogs for leisure, the conventions of their field are adopted when they share their own work-in-progress.

> I don't know of any of the people in my group who have scientific blogs. Some of them have personal blogs that are more personal musings but they don't affect their scientific careers in a meaningful way. I think that they pretty much stay the traditional course.
>
> There are, to some extent, some blogs and more purely electronic and non-traditional ways of communicating. People may answer or ask each other questions about techniques, but it isn't really in any sort of formal scientific communication.
>
> Blogging has taken off in economics much more strongly than in most other disciplines, and that there are some very, very prominent economists who blog regularly and who comment on each other's blogs. As a result of that you get a dynamic where you can have a good conversation with people and you don't need to be geographically in time or in space close to one another. And that has clear kind of efficiencies associated with it. I don't have to be in the same department or I don't have to go to the same conference as these people to have that discussion. So I find it difficult to think where, in principle, that same dynamic wouldn't have benefits in science.

Social networking/Web 2.0

Although graduate students and younger scholars are much more "net savvy" than their established counterparts, and engage with YouTube, have personal websites, and use social networking tools, this tends to be largely (if not exclusively) for personal and leisure use, not scholarly practice. Publishers experimenting with social networking reader tools (commenting, etc.) are not seeing them taken up in large part by the readership. Some attribute this lack of uptake to conservatism, time, interest, and fear of having ideas stolen. Young scholars tend to adopt the conventional practices of their subfields and mentors, despite the perception that they will change the world.

> What disappoints me was a senior molecular biologist saying, "I would ban my students from using *Nature* Network because they could be saying all sorts of stuff about what we're thinking and working on that I don't really want anyone else to know," which is understandable and in a sense not surprising, but when you think about how science is supposed to work, at least in theory, it's disappointing.

I'm told they do among the younger people. I'm too old for that…I do notice that the very small amount of the face time with the computer is actually done looking at data. I don't know what they're doing. If it actually has something to do with science I'm encouraged, but I think the social networking sites are about social networking…I think that that is about as useful as going out and playing golf. And I'm an old guy.

I'm not seeing that much of it. I think there are a lot of new ideas that got started when I was a graduate student. Having a website for yourself was something that people thought was a waste of time and it ended up being important. Now people always go look at your website to see who you are.

Anecdotally you can see that…all these young people blog and they use Facebook and everything else, and they will feel much more comfortable within that kind of thing as they become professors. It's actually quite easy to find counter examples of young researchers who are very conservative and older researchers who are much more progressive.

Our journal blog is increasingly accessed. What's interesting is that nobody wants to rebut anything that the editor says in his blog, or add comments. In fact, off the top of my head, I can't think of any comments that have been added. Personal pages and things of that sort…they're used to a small extent, but they are clearly not things that at this point people feel it's worth investing their time in, or perhaps they just simply don't think that that functionality is how they use that kind of information…It's that…"we built it but they did not come" element.

The whole community networking space was extremely interesting because we always functioned as a community…Could this be translated into a virtual space? The early efforts—which have not been tremendously extensive or tremendously sophisticated—have not been encouraging…They just never got a level of enthusiasm from the community that such a thing would be worth it because the community just did not seem interested in using those kinds of tools for professional communication…This isn't because these folks don't know about Facebook and Bebo and things of that sort; they absolutely do and they use them. The graduate students and even some of the younger postdoctoral students, too. But they don't regard that form of communication as appropriate for academic or scientific or professional communication…I think what happens when these recruits join these professional communities, they tend to take on the behavior and the patterns of those who are already there. They're not really engaging with the Web 2.0 type of technologies themselves.

Those blog commenting conversations are already going on…but it's the informal stuff that happens mostly verbally in journal clubs and in labs and at conferences, and then there's the formal stuff that happens through the published literature at a much slower pace. And what you could do online, one of the implications of the Web, is that you can now have the informal debate in a way that is permanently archivable—some definition of permanent, anyway—and globally accessible, anyone in the world can read it. So it's got those characteristics, if you like, of the formal debate that's going on through the literature, as well as being immediate, off the top of your head, and all of those characteristics of the informal debate. And in some ways, I think people see that as kind of a risky mix, which is, I can have an idea or an immediate reaction to a paper that in the cold light of the following day I might think, "Oh, that was actually cheap and I've got it wrong," and somebody might point out that I've got it wrong. And if I say that in a journal club or I say that at a conference full of people the risks aren't very high, but if I put that online then it's there forever for people to see that I said something stupid, then there's a risk associated with that as well…Because it's out there, potentially permanently, and you don't know who is reading it. You feel a kind of great pressure to make sure that it's right, which is contradictory to the spirit of having a relatively informal and kind of interactive debate.

If you really want to hear and think about what the new methods of communication are, you need to start pretty young. Even the junior faculty are too old because the ones coming in now are the ones that are using the Facebooks and Second Life. They're the ones that are really going to be thinking about what's the best way to use a technology to move the science forward. I think it's going to take a while for this all to happen because, who's at the top of the pyramid are the faculty, and the faculty have been here and they've been brought up in one system. And so, to try to make that change may be a generational issue, unless something emerges that is so wonderful that everybody's going to move in that direction. But you've still got to get the peer review committees behind it.

I know that for *PLoS ONE*, they tried to get the blogger involved with some of the papers to get interest associated with them. I think the blogging phenomenon has been under way long enough, I don't foresee changes from the current level it's at.

4. HOW DO YOU COLLABORATE WITH OTHER SCHOLARS? AT WHAT STAGE OF RESEARCH?

The scale of collaboration in biology can vary from interactions among lab mates to complex multidisciplinary research activities centered on "grand challenge" questions requiring diverse expertise. The traditional academic reward system, which tends to focus on individual scholarly contributions, has been increasingly challenged by the complex assessment of contributions in multi-authored publications. While face-to-face interaction is staple practice in collaborative work, the use of email and wikis facilitate data exchange, analysis, and coauthorship.

B4.1 The Nature of Collaboration

Biology is changing in such a way that "one group of experts can't do everything." Consequently, some biologists collaborate when they need expertise beyond the capability of their own lab, including access to instruments, facilities, methodologies, materials, or skills. These diverse collaborations can be within biology, or can enlist the contributions of scholars from other fields.

Biology is being constantly revolutionized by an influx of people from other fields. I guess first chemists and physicists, and now it's computer scientists and mathematicians. And it's not your granddad's biology anymore. It's totally fascinating to me to watch the science evolve in front of our very eyes.

Does good science mean collaboration? I think more and more it does, because the fields are getting too diverse to have one group be able to do everything. So I think that's a trend that is happening.

Usually our collaborations are mostly intra-biology, but biology is very broad so we're more biochemistry and they're microbiology. So we tap their expertise in microbiology, but usually it's within biology.

The best collaborations for our group have been the ones where different parties bring in different technologies and we can merge them effectively…Combining cell biology and crystallography has just been absolutely wonderful. We probably have ten collaborators of that sort.

> I think the focus for us is on collaboration and diversity, because I feel as though one of the driving principles is that it is better not just to be a bunch of molecular/cellular people hanging out together to work on a problem. It's better to include some molecular/cellular people, and ecological people, and computer science people, and so it's this notion of collaboration and diversity.
>
> In general, collaborations occur because one group needs the expertise or technology of another. Or sometimes it's because somebody generated an idea while talking to another colleague and both of them find it interesting, and they both bring things to the party. Most collaborations are of the former kind. So for example, when we started our research, it was clear that we needed a lot of help in statistics and computer science that went beyond what we could generate ourselves. We found ourselves collaborating with computer scientists and statisticians, and when we needed clinical samples we found ourselves collaborating with people who had been laboriously collecting these samples for decades.
>
> Usually I collaborate when I do not have the expertise to take the next step that I think is critical and I don't know how to do it in my own lab…I'm not a crystallographer, I'm not an electron microscopist, I don't have an electron microscope, I don't have an x-ray machine and all the associated computer equipment in my lab. These people are experts in this and they can take our level of insight to the next level. But they couldn't do it without the material and the biological background we provide, and so it's a perfect marriage.

B4.2 How Do Collaborations Arise and How Are They Sustained?

Both large- and small-scale collaborations arise in many ways and are driven frequently by the informal networks forged at research meetings, seminars, and conferences or through departmental connections. Face-to-face interactions, underpinned by easy-to-use technologies, are essential to maintaining collaborations. As biology becomes larger-scale, often as a result of funding requirements, originating and sustaining collaborations can become more complex.

> Traditionally the way you find your collaborators is very random, you happen to bump into somebody in a meeting and liked their talk or something like that, but that's usually somebody you know is on the same page as you and has a very, very similar level of interest.
>
> I go on lots of seminar trips, and it's tiring, but it's actually really good, not just pre-tenure for getting recognition as a scientist, but also post-tenure for setting up collaborations…I'm maybe the extreme in terms of how much I collaborate because I really get excited when I talk to people and find common ground. I just got back from another university and I for sure have one collaboration, and could potentially have a couple of other ones just based on the fact that I gave two seminars there, met with many people, and got a lot of positive feedback. So it drives my research to some degree, whom I meet at meetings and also on these seminar trips. That's what I love about science. I still think this one-on-one thing is absolutely crucial. You can't put your lectures online. You really have to go there, physically shake hands with the people, find out about their research, give your talk, and then all kinds of things happen, but I'm kind of the extreme. I think other people are not quite so open to collaboration.
>
> I think the most bridging is probably done through a person-to-person contact. You meet somebody, you figure out what they are interested in, and then you see what part of that can be applied to your problems, and it comes with an immediate feeling of what the quality of information is. Then you go back to the literature and you figure it out.
>
> We've come to the conclusion that it's personal interaction and that we need to talk and give presentations at different schools, and really get the word out. Also, we need to encourage

> people we think would be successful at collaboration…So much of this to me seems like it still depends on communication and relationships.
>
> You make a discovery that's an incomplete discovery and you see that there is a reagent, a method, or some other connection that some other lab has that you do not, but that would be a valuable part of your greater study. Then, you call up the PI at the lab and say, "Here's what we've got. Are you interested in collaborating with us to produce a study?"
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> People tend to share information with people they respect because they want something that they know is going to be useful, and very often those are people on campus who are in the department. There's a lot of within-the-department collaboration going on in MCB.
>
> We contact others where we think that they have results that would be interesting to pursue jointly.
>
> I just submitted a grant yesterday for a collaboration…most of us had not ever worked together before, but we were invited to submit an application by a national funding agency on a particular topic, and so I thought, "Well, who are the best people in the world to create a team to do this?" I contacted each of them and they said, "Yeah, let's be part of this." We came up with a work plan of what we would do together, and we put in the application. So that's a collaboration in writing a grant, and it will be a collaboration in research *de novo*.
>
> Can the research move toward something that's beyond what any one group or subfield can tackle? That's the hope.

As collaborations become increasingly diverse, biological researchers creating shared resources, such as biobanks, may need to partner with a bioethicist or lawyer to explore the legal, ethical, and social implications of their work and ensure protection for human subjects.

> Bioethicists are never called in to be part of a paper that is purely and completely about lab results…If they're involved in a project with scientists, it's because those scientists have concluded that it would be good for them to have somebody with expertise on legal, ethical, and social issues…to help them deal with the problems they're going to have…The other big model for collaborative work has been where ethicists get together or people involved in legal, ethical, and social issues get together and say, "Ooh! This is a really interesting issue. Let's have a meeting. Let's have a working group. Let's write a paper." And then usually, but not always, usually they'll try to pull in scientists.

Personality

While the quotes above demonstrate that collaborations often arise from needing specific expertise, personality still plays an important role. Some scholars collaborate because they want to "try" something new and daring.

> None of these collaborations are working very well, but I have the attitude that if you don't try, it's never going to work. The kind of people I recruit to my lab are like-minded in that sense. They're willing to try things, even if it's a long shot. It's more time for the student, of course, but often they recognize how cool this would be if it worked, and so they're willing to take the chance…It really depends on the individual, how they engage with other scientists and say, "I want to do something different." This is really the way to do it, to combine forces and not just think in your own head all the time.

> Some people work individually, others collaborate between labs at other places. So I would say that some people don't collaborate, some people do, some people tried it and found it exceedingly difficult, painful, disastrous, etc., and either scale back—and are very careful about how they do it—or stop doing it.

Intra-lab collaborations

Laboratory collaborations, in molecular and cell biology for example, are intimate in size, often involving a principal investigator and a small number of graduate students and postdoctoral scholars. Lab members coalesce around specific research question(s), often with an explicit division of labor. Responsibilities for much of the day-to-day data collection, organization, and analysis fall to postdoctoral researchers and graduate students; they regularly assume the role of technical expert and may work with the PI on computational and visualization problems. Advisor-advisee relationships evolve frequently into long-term collaborative research.

> There's a lot of software to analyze quantitative biological data, and by and large the graduate students do it, show the PI what it looks like, and the PI says, "This color should be different."…Sometimes the PIs will do it themselves, but often it is the case that they dictate to the graduate student what changes they want made, rather than making it themselves, because there's a lot of new software that moves very quickly, and the graduate students are much more interested in learning it and handling it than the professors…It's just getting to the point where you need to have those computational skills as a graduate student to succeed, because even if you have wet lab data you're going to need to represent it in a quantitative way or analyze it in a quantitative way.

> Someone has to take things forward and young scholars are the only ones who can, so they do. They get into their research. And they can't even learn from their PIs because their PIs don't even know how to program…Maybe it's just that the technologies are different, and I don't know how to use the technology that they do. But also, I was in labs where they didn't know how to run gels and do the Southern blots and stuff like that, and we thought they were old-fashioned. So maybe it's not that different. Maybe it's the same generation after generation…but it's astounding how fast it's moved…I think that the really successful older scientists kept talking to the smart young scientists…They didn't feel like they have to be the sources of all knowledge…I think where a lot of people get stuck is that they're so used to the students looking to them for all the answers, they feel like they're supposed to have them. It's this minority of people, who absorb all this information from these younger people, who then put it all together and have wonderful new ideas.

> I've been fortunate, there's always been one or more people in my lab who are interested in computers and don't mind me assigning them the job, "You are the lab computer guru…Anything goes wrong with the computer, if there's anything we need for upgrading the computers, any connections we need to make, any security or software we have to install, any firewall we have to build, you're our go-to guy or gal," and I've been lucky to have people who have been willing to do that.

> I have two postdoc students; their primary training through graduate study was in computer science and they are applying that to biology. In my lab I try to get a diversity of people coming from all different directions.

Inter-lab collaborations

Once a collaboration is established between PIs in different labs, these can be sustained by assigning one student per lab to a research project and by individual researchers footing their own bills.

> Usually we have one person in my lab, one person in their lab, and they have some overlapping interests, and we bring them together and we do the matchmaking.

> We needed a facility to do an experiment, but we didn't have to collaborate with everybody at that facility. I actually formed a collaboration with not an entire lab, but a specific graduate student and a specific professor, even though the professor had 10 graduate students. We wrote a paper that was myself, the graduate student in the other lab, my professor, and his/her professor, and that was the total authorship. So we were able to form a more intimate collaboration, with a very specific goal and a very specific set of experiments in mind.

Large-scale, multidisciplinary collaborations

Society's "grand challenge" questions, such as climate change, disease prevention, food production, or sustainable fuels, demand that multiple disciplines converge around large topic-based questions because no one discipline has the expertise to tackle the problem. Increasingly, these collaborations require the involvement of experts in bioinformatics and computational biology, and numerous technical support staff. Compatibility among scholars' working styles is critical to the success of collaborative work, and navigating the organizational and cultural issues around sharing resources—as well as coordinating personnel and egos among different universities and labs—provides its own grand challenge.

> The future of biology depends on being able to open the doors in ways that have epidemiologists and crystallographers and engineers and physicists and mathematicians feeling like it's their field, because I think it will be. I think that we now have opportunities to ask and answer questions using tools that have been thought to be far outside of biology. If we don't find the way to invite those people in—not to say, come and be our hired hand to build a device for delivery of a drug, but instead to say, look at these questions and think about them from your perspective, because you will able to move in ways that we can't even imagine—if we don't do that, we're really abdicating an important responsibility. It's also the way that biology will be able to have the kind of influence it should have on the ways that we all live, and this goes way beyond health and agriculture. It's really a critical time to be developing these broad initiatives, developing vehicles that allow people from one field to understand enough language to be able to identify interesting problems that lie outside of their own little areas of expertise…There's no shortage of such questions out there. There are big models and small models across the board where we can try to get people welded together by challenging them to think about a problem they haven't thought about before, because maybe if they go out to lunch with their friends from other disciplines, they may have an idea…It's those big social issues like welfare and drug abuse. There are so many different approaches that you feel like you need to take in order to tackle them.

> My impression of the biology community was that it was bimodal—the bulk of biologists, people who actually grew up with DNA and whatnot, for them, computing was Excel. Then there was this new bump of bioinformatics, which was populated by a whole new set of people. And those two are not talking very well with each other. That new bump has grown a lot, and now the gap is filling up…It impresses me to no end how people my age or younger

> are just changing completely…So they are populating this whole new field with a whole new set of people who didn't have all the prejudices, who never cut up frogs, but, boy, they knew how to run computers…It's all totally inter/trans/meta/multidisciplinary. Partly in biology, there's money…Now, you have other important problems like global sustainability, energy, global climate change, that kind of stuff. Those are not physics or biology or methodology or geography problems. Those are *all* of that. Those are huge challenges that cut across all different disciplines. Do we train people for that? Of course not. We train biologists, physicists, chemists, and computer scientists. There are attempts on parts of funding agencies and, I would say, enlightened university administrations to try to break this up. But the inertia is huge, because somebody who is a senior scientist in whatever field said, "Hey, I finally got on top, and I know how to work the system, so why should I rock the boat here?"
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> What are the things that we need to be doing in terms of thinking about how we fund science right now? It's siloed into the NIH and NSF and DOE and USDA and DOD and NASA…if anything, the physicists and chemists and engineers are competing with the biologists. All the big money is in biology…As much as we complain, we've got it great. The physical sciences are struggling to just keep their noses above water. We need to think about the doing of science in a much more integrated way, and biology is a real anchor point for this. There are a lot of big questions there that can now be approached with these other principles that biologists just don't know about and in fact it extends to…epidemiology, it extends to population studies and anthropologic behavior and social behavior, there's just no doubt about that. The questions are there and available to be asked, and so I think the real challenge and excitement is going to be how we expand this endeavor vastly. As big as we think it is with cell and molecular biology and genetics, I think that we're just beginning to open it up.
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> It isn't just about molecular/cellular biology. Projects are just as much about ecology and evolution and organismic biology…everything from the level of the individual plant to the ecosystem and across plants and all biodiversity…and integrating all this information across these levels, across scales. That's one reason the geosciences are so interesting. For one thing, they have brought together a lot of different kinds of data and so they're a model for how to do it, how to share, how to build the credit into it and all that kind of stuff. But also the geological surveys collect transect data on the flora whenever they do their surveys…And also there's the B-2 or Biosphere 2 earth science program to study hydrology…They've got hydrologists and ecologists all working together…It's all about group efforts and sharing and not talking about just publications…just facilitating the community's research.

Overcoming disciplinary barriers

Although collaborations around large topic-based questions require the input of multiple scholars drawn from different disciplines, overcoming traditionally insular disciplinary cultures remains a challenge. One scholar noted that there are not many people "thinking that big," despite the perceived advantages that diversity brings to a research problem. Convincing scientists to opt in to large-scale collaboration requires developing synergy and shared languages between fields.

> Even fields within biology, like cell biology and developmental biology, there's still a big gap there…We don't understand why they just don't look at it our way, and they don't understand why we don't use genetics to make a list of genes, and this is inhibiting. It's like two different mindsets, even within the same field…So between really different disciplines, I think large-scale collaboration could make an impact, but I think it'll be more of an interesting curiosity than a new pillar of the field…It'll be a long time before such disparate fields really mesh. Pathogenesis has really become important in cell biology, but there are still a lot of virologists with whom I couldn't have a conversation. I don't really know what their key questions are…and what's known and what's not known.

> You also have to develop a deep understanding of that sub-discipline that is very different from yours. Or you have to develop it over the collaboration…You have to have more trust in the collaborator. There has to be a certain amount of shared language so you can understand each other, but then beyond that you need that breadth and you need to be able to trust the person you're collaborating with to bring that together.

> We're just putting together a proposal…It's been rigorous and difficult, but we've been able to pull together people from various universities and from industry, everyone from immunologists to microbiologists, and then engineers and chemists. It's the grand challenge approach, where you identify a big problem that people will acknowledge if pushed, that we really don't understand at all, and that when they begin to dig around they realize that no one group has the answer…So it's been really interesting to try to pull together these people who really don't speak the same language but they're interested in this general question, and it was very sobering that some of them came in feeling like they knew exactly what the answer was. So we had to spend a few meetings all disabusing ourselves of this thinking, and then realized that we don't know the answer, that no one sector could really even approach the question, and that we would have to find ways toward one another. We were just getting down to what the real governance structure of this collaboration will be…How do you put together programs that actually do foster these kinds of grand, interdisciplinary interactions?…I think that there are fundamental things that need to be done, and we need to acknowledge that there are language differences that make these sorts of interactions difficult, but that the rewards are really great at the other end. Maybe we can put together training programs that integrate across these spaces, or open opportunities—with associated rewards—that promote people from different disciplines getting together and proposing or doing work together. I think that institutions need to acknowledge that this is difficult for people to accomplish…and I think it's the responsibility of the institutions to find ways to do that.

> Even if these two people are in the same room together, they may not recognize that they could work together and solve this problem. So we want to go from those obvious collaborators with whom they have a lot in common, to actually bring together people who are very distinct and separate in their research interests, and hopefully try to facilitate that sort of matchmaking via technology…The big hope is that these cross-discipline collaborations that start out with a very specific goal will then generate tools that become more generic or more wide reaching.

Strong leadership is required if scholars are going to overcome disciplinary boundaries and engage in rich collaboration.

> It can't be a rudderless ship where everybody is grabbing the wheel or 50 people are trying to turn it at once. That won't work and it's not how NCBI has succeeded. It succeeded because Dave Lipman has taken the wheel. I keep hearing that there needs to be strong, sensitive leadership, and I hear that in all kinds of different ways. It's by, for, and of the community, but there needs to be some kind of visionary leadership looking long term, looking out for the community, and with a willingness to make decisions and say, "We're going here, we're going to do this," and if it doesn't work out, "That was a mistake." Take in all the complaints, all the comments, and go from there.

B4.3 Judging Multiple Authorship

Multiple authorship is not new in biology, but the expansion of the discipline has resulted in an increase in the number of coauthors in final research papers. Accepted practice in the field places key contributors as first and last authors, which can result in those sandwiched in between

getting "looked over" by tenure and promotion committees. Several scholars suggested looking to the physics or astronomy communities where multi-authorship is prevalent in order to inform evaluation practices, which currently attempt to assess the proportionate contribution to scholarship of each author. Publishing collaborative research can also be a challenge when coauthors are from disciplines with conflicting publishing practices.

> First authorship was awarded to the person whose idea the experiments were…who was driving the experiments and had the bigger picture of what was going on, and who had in the end contributed to more of the figures in the paper.

> Describing who did what doesn't change anything, unless you can change where people look for that information…When somebody sees lists of citations, unless you're first or last author, they discount it immediately…I've worked in genome centers, where it's all team-based and there's usually one big publication. When you have 200 authors it really is not worth arguing whether you're 46th or 51st. But that again just points to how unrealistic the publication model is at judging somebody's contribution when it's large science. This is a new problem to biology, but it's not a new problem to science; physics and astronomy have had these large teams forever, and they have different ways of giving to credit to people's contributions to a project. But in biology it's still in the 1950s.

> Multiple authorship is the way biology will be going, because many of the approaches now require an interdisciplinary look at things, and not any one author is completely familiar with every piece of a publication, yet the whole thing comes together as one unit…We need more emphasis on teamwork and proper recognition of contributions, of multiple authors to a story, which right now is a pretty ego-driven enterprise.

> The biological sciences are in this huge transition between what used to be a relatively small-scale, highly focused operation run out of a single lab, to something involving collaborations across disciplines. Actually facilitating that transition, making it work—because it has to take place, there's no alternative—is going to put some challenges in front of the university in terms of the way it assesses people's research and contributions.

> Collaboration is not something that's seen as important for tenure…and in fact can decidedly be problematic…because then is it really your own work? Are you able to work independently, really stand on your own, particularly if it's a junior/senior faculty collaboration?…Tenure and promotion is all about publication…In the biological sciences it's pair of hands first, group leader last…So when you're a graduate student or a postdoc, you need to be first, or second, with an explicit statement that it's arbitrary and that both contributed equally…But everyone really looks at first and last.

> Tenure and promotion is a major problem for interdisciplinary collaboration…every institution in American academia has handed the tenure and promotion system in biology over to NIH study sections. It's unbelievable—to take something that is so important and so precious as making decisions about who will be lifetime colleagues at an institution, and give it over to two or three essentially unknown people who may or may not be really true experts in this field and are rushed and busy with what they're doing, and say, "Does the person have an RO1 grant?" It's crazy, and so what that system does is it sends the unmistakable message to the scientist that what will make a difference for his or her existence is how well he or she performs as an individual. RO1 grants are individual and just beginning to open up to multiple PIs, but they're really individually focused. And so for all of the big talk that we all deliver about collaborative research and joint projects and big programs, the tenure committee has missed the memo. If somebody is collaborating on a bunch of things, those things don't count. That's a disastrous message to be going out.

> How do you evaluate people for promotion and tenure in this context of multiple collaborations? It's a really critical, important question…A year ago, or a little more, I was at a conference with some postdoctoral researchers and faculty, among others, and the usual thing came up where someone mentioned how they're being told when they're on the job circuit about the dangers in collaborating: "Don't do that or you won't get tenure." That's the worst advice that you could be given at this point in time. You can't listen to that because that's not where biology is going. And the people who give that advice are just simply wrong. It's a matter of properly evaluating and learning how to reward collaboration. This is done routinely on this campus in astronomy and optical sciences—this has been done for decades. Biology just has to learn how to do it.
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> The fact that biostatisticians and bioinformaticians have very different publishing practices than biologists is a really big problem. In fact, there is an institute that's trying to solve that problem by giving students an education in more than one discipline at a time…I think that one of the reasons that I've been as successful as I have been is because I'm comfortable with mathematics and computer science, and most biologists are not.

Cautions were offered, including anecdotes about authors who were concerned to find several names appear on a publication when in fact fewer scholars wrote it. Others noted surprise to find their names included on papers based on research they conducted at a much earlier stage of their careers.

> I was working in an institute and I had two papers to publish from work that I did there. And I was surprised to find seven authors on the paper because I only knew one other. I knew that nobody else had been involved…They had a kind of a paper club, where I put your name on my paper, you put my name on your paper, and that way we all benefit. That's the extreme example, and I think there are shades of gray in between there and having a single author. But that, I think, is the real challenge that we have to address.

Judging technical contributions

While technical support contributions may be integral to the success of a research project, they are often viewed as "support" rather than "scholarship." Specifying one's individual contribution to a paper may be a solution to evaluating technical input.

> I'm seeing a lot more as the computational groups are trying to collaborate with the groups that are actually generating the data, where the value of the effort that goes into *generating* the data is very quickly diminished. People just see the spreadsheet, they see the data points, and then they take that and run, and the attribution to the whole work that went into the website is diminished, not maliciously, but just ignored. Then the person who's doing the computational work can go publish in the journal and say, "Thank you for blah, blah, blah," or make the person a coauthor, but then that doesn't help tenure because now the data-generating scientist is in the middle of 15 or 30 authors as the person who provided that raw data. That's when I see people saying, "I'm brand-new in this field," or, "I'm working toward tenure; I don't want to just give you everything." I think that's a bad thing that the protection is not there.
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> This computer scientist made a tremendous contribution by writing a program that allowed us to analyze our data, and s/he's definitely an author on the paper. Unfortunately these people are not going to be primary authors on papers, probably, because they didn't make an intellectual contribution to the actual project, but rather to the tools for the project. It's a supporting role…But, in general, I don't think that's an issue. People in those positions

> generally aren't looking to find a tenure-track job…if they wanted to do independent research they'd be doing something else.
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> In terms of the publications, this is where I think the challenges are really developing, because when I started in this business it was quite reasonable for me to publish single-author papers or publish with a collaborator. It was very easy to say what we each did. But now when you're doing work that involves genomic analysis, and you've got people doing bioinformatics, people doing the cell culture, people doing cell epidemiology, people doing a lot of things, they're all participating, and there can be seven or eight authors on paper, or more. It depends on the nature of the work. Then you run into the issue of what people are really doing. It's very important to find a reliable way of determining what a person's role is in each publication. It's kind of demeaning to some people to have to do that. Everybody likes to feel that they contributed in a substantive way to whatever comes out. But the reality is that some people supply the primary intellectual focus, other people don't, and some people do more technical things, and it's kind of sidelined…It's nice and easy when you can say, "Well, this person supplied this technological approach," but when you have somebody who's doing bioinformatics, you may find that the key advance came out of the bioinformatic analysis of the genome and the rest of the work is all getting to that point. So there the sharing of the intellectual input is quite different and it's hard to disentangle…I think when you list publications in the future you're going to have to say, "I was the primary author, it's my lab, and I was the instigator," "I organized this and it was on my grant"…or, "I took care of this part." I don't see any way around that. We can't have five people claiming that they were the primary source of intellectual input. It's not fair.

Negotiating with coauthors

Until the tenure and promotion structure is sufficiently nuanced to judge multiple authorship, many scholars agree on authorship order early in the research trajectory. There is a tacit working of the system by some principal investigators who negotiate first- and last-author credit for inter-lab collaboration. Authorship order may also depend on the subfield or journal in which the paper is published, and which scholar has greater credibility within that subfield.

> I've been pretty fortunate. In one case, I actually contacted the other PI who was much more famous…and said, "Can I be last author on this publication?" because I was an assistant professor. He said, "Sure," because he's already made his career. But it could have gone either way…At one point I was tossing a coin in the lab about whose name actually went first on the paper, because they were all co–first authors. I think the key is to give people different enough projects in your lab so that they all have a body of work.
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> We wanted to use a novel technique…and we had no experience with it. This friend of mine and his/her graduate student were working on it…So I called him/her up and said, "Look, here's the deal. I'm more than happy to make you coauthors but you've got to construct these materials and do the test for us."…And they did it and it worked fine, so we included him/her and his/her graduate student who did all the work…But still, my graduate student was the first author, I was the submitting corresponding author, and the other people were sandwiched in the middle for lesser contributions.
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> I have a lot of collaborations with my neighbor…and we made a deal, which has worked well, which is…two postdocs joined our labs, jointly, and with one of them, I would be last author on his/her first paper, and with the other one, my neighbor would be last author on his/her first paper, and then we would trade for any subsequent papers. So we trade, and it goes by the actual researcher what their productivity is. If they're really good and they publish two excellent papers, then we each get one. We're both corresponding authors on all the papers.

> In a collaboration like this with someone I've worked with for a while, we just haphazardly switch senior authorship back and forth, so it has never been an issue.
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> With people on your own campus, it's a lot easier. You see those people every day, you chat about it, and they say, "Let's shake on it," and it becomes sort of a gentleman's and gentlewoman's agreement. It's a little trickier with people outside. Some people demand names on papers for providing indispensable reagents, even if they haven't actually configured any of the actual data in the paper. My criteria really over time has always been, if some of the figures in the paper, the data actually shown, come from work that you and your group have done, we will make you coauthors on the paper. You just provide us with an antibody or a plasmid, you may want to put strings on it, but I don't think that's a fair reason to put you on the paper. What we're presenting are experimental results that led us to some certain conclusion.
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> With one model of collaboration—needing something from another lab to complement an incomplete discovery—my practice is to try to think through what the paper is likely to say and agree upon the order of authorship, which is really the final frontier where people get hot under the collar before the first collaborative experiment is done, because if you can't reach agreement in the beginning, it isn't going to get any easier at the end. And so I'd like to start with the working assumption and then renegotiate, if necessary, as it goes on. The second model—collaboration in writing a grant—is much more difficult to think about how you're going to share and co-publish, because you have no idea what any of results are going to be and what each person's relative contribution is going to be. So…first of all, I pick whom I'm willing to work with, people who I don't think have a big ego problem or a big insecurity problem. If you can avoid those two, then it's generally not going to be a problem figuring out what you publish together, what each group publishes on its own, and we write the applications that have large enough amounts of financial resources that no matter what the details, everybody feels like they got a good deal out of it, everybody got treated fairly.

Some scholars raised challenging issues about collaborations between corporate and public institutions, and noted that relations with biotechnology firms were undervalued.

> With regard to who gets what credit, I think all that does is reflect on how antiquated the university model is of using publications as someone's worth. Outside of academia, publishing isn't the measure used to credit good research. They use other metrics: how useful is it, how does it change what we are capable of, what is enabled from that research? Those are the metrics that are used to say whether this has had an impact within a company or within a nontraditional academic environment.

B4.4 Mechanisms for Collaboration

Face-to-face interaction through regular meetings and phone calls continue to play a vital role for most collaborators in setting up and sustaining research. For larger projects, arranging these important physical meetings remains important but can be difficult due to conflicting work schedules and expense.

> When you talk about wanting to do collaborative research, it sounds great, and then you get down to the practicalities of what human subjects committee do you go through, working with campuses on different academic calendars, setting up the times for the meetings so you don't have 10 different trips, etc. It's really the nitty-gritty details that prove to be quite troublesome.

> If we collaborate in-house, I prefer to do it locally because it's so much fun to share the excitement and to sit down if problems arise, just walk to the other person, and say, "Look, we need to deal with this or that, and this or that person isn't doing their job."
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> We have collaborations all over the place…at every stage…including multiple ones here. And has that changed much because of the technology for moving knowledge around? I don't think for me it has changed very much. We've always done this.
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> It's phone calls for me. My closest collaborator, I talk to him/her on an either daily or an every-other-day basis. And it's just phone calls, we know each other so very well.
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> It depends on the life and the nature and the significance of the funding of the project. For example, I have been involved in a project…and typically they would try to arrange one face-to-face meeting a year. Scheduling is hell for any kind of meetings these days, and so I probably made it to two out of three over the span of nine years—no, probably fewer than that. In the years that project continued, I probably went to four face-to-face meetings, and everything else was either email or telephone conference calls.
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> One model is you have one meeting: it's a conference, it's a workshop, it's a symposium—it's billed as a writing meeting. You get together once and get a sense of everything, and then everybody goes back and the writing takes place, shared via email. I think that's a fairly common model of how I've interacted, but if the people are handy, if there's good physical proximity, there will be more face-to-face meetings throughout. I find—and I think most of my coauthors find—that but for the time and hassle of travel, face-to-face meetings are quite useful. But the time and hassle and expense are a major concern.

Coauthoring papers

Email and circulating drafts of a Word document using tracked changes facilitate the process of coauthorship, enabling the exchange of information and data more rapidly and easily.

> We send around PowerPoint slides, when documents and ideas and experiments are in progress, and talk about those. And then once it's ready to publish we…send around drafts in circles using tracked changes. I think I average about 28 versions per publication.
>
> I send papers as an email attachment and then I would mark the changes in Word using tracked changes, and then send it back to my collaborator. That's the way I edit papers for people in my lab too, so distance has no impact. Often it is good to sit down and talk about what the issues are, but it's not always really necessary.
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> I've read the paper and edited and we went back and forth. I think there were something like 14 versions.

Data analysis and discussion

Discussions about data tend to be done by circulating data files by email, desktop sharing, and uploading files to shared workspaces. While wikis enable the exchange of ideas and data on a consistent platform, scholars were generally not using them for coauthorship of text. In some cases, collaborations can be facilitated by technologies, such as instant messaging and Web meetings, though their use is not ubiquitous among the biologists we interviewed. One scholar wanted to use technologies found in the corporate world, such as Google's integrated video collaboration setup, but could not afford it.

The ability to exchange large files of data instantaneously, and to pass images back and forth, and talk about them in real time on the telephone, everybody looking at the same thing on their screen, that's valuable because it avoids a schlep from one place to another. Historically most collaborations have been local, and still are largely local. But for example, we had occasion this year to propose a collaboration to a group…a few hours' distance away. We have physically met only once but we've done a fair amount of work already. There are a lot of files and emails going back and forth. I would not say that this is any special technology, and I certainly wouldn't encourage Kleiner Perkins to fund a startup to make this easier, because in fact it's pretty *ad hoc*.

Down to the actual nuts and bolts of tools, some collaborations we've had—and this is five, six years ago, so a while ago—everything was email. But Web-based video conferencing was very, very patchy at the time, and with this project we're getting more and more sophisticated in that realm, maybe not sophisticated relative to the commercial world, but certainly for academic collaborations. We're hoping that the project will develop much more useful electronic tools…wikis, video conferencing.

We're collaborating with people all around the country on a larger project, and there is a wiki for the entire effort. We use the wiki to exchange information. That project's really just starting so we're not sure how much the wiki will do yet…It certainly is a tool; that is, in many ways it's basically like email, but the persistence of it is useful. That combination of persistence and ability is a valuable thing. I could put up a webpage but then if no one else can do anything with it, that limits what can happen. The fact that people can go back and forth and change things is useful, but people don't tend to go and just trawl through the Web and say, "Oh, what's new today?" And so normally there's an email saying, "I've done X and the details are at this site." So in many ways it's where you go for more information following up from an email message.

I'm aware of some labs where people use wikis to share information…I think it's an absolute minority at this point…Why is that better than what we're doing now? And they often think that it takes more time, it's more laborious, and it does not substitute adequately for whatever the alternative is, which is often going down the hall and asking somebody something…Obviously the benefit of these kinds of technologies is that it allows communities to build up over a wider geographical scale, but then you get into issues of, well, who are these people and can I trust them and is it worth my spending time in this space with people I don't know and with whom I don't have a collegial relationship.

I don't think wikis have any major impact at this point. I have a wiki, which is just within my lab, but that tends to be more anomalies or interesting news stories; I wouldn't say it drives the science. It's a more formalized way of memorializing some things that might be discussed at a group meeting.

In the biological sciences, to my knowledge, I've never heard of anyone using a wiki professionally.

I think the wiki is really on the edge for a lot of researchers, quite frankly.

I'm 55…email is high-tech enough for me. I use Wikipedia, but the idea of using a wiki would require me to learn more stuff and I don't have time to slow down and figure it out. So no, I've not been involved in anything regularly that is more high-tech than a conference call.

5. WHAT DO YOU NEED TO CONDUCT YOUR RESEARCH?

Raw and processed data in biology are abundant and take diverse forms, encompassing DNA, protein, and RNA sequence data; 3D structures of biomolecules; and visual material (including, but not limited to, still and moving images, animations, slides, and complex charts and figures). In order to better understand the function and structure of the cell, molecular and cell biologists compare lab-generated data with shared sequence data and hyperlinked literature in centralized online repositories. A burgeoning amount of available molecular biology data is allowing scholars to mine, reuse, analyze, and publish these materials. The use of imaging technologies for generating, capturing, and analyzing data is prevalent, and many scholars rely on visualization tools and technologies for analysis and to visually represent their work. The growing complexity of data collection and analysis presents its own set of challenges, leading to calls for extensive technical support and training in the use of new technologies.

B5.1 What Do Scholars Do in Their Research? How Is What They Do Changing or Not?

Molecular and cell biologists produce sequence data from various organism models in their labs. Sequences, in the form of text strings, are submitted to data repositories, such as the NCBI-produced GenBank or databases specific to an individual's research. Scholars in the "field" sciences collect data during fieldwork and lab-based work, and may also contribute to and use the facilities and resources of museums.

Data archives

Data repositories in molecular and cell biology play an important role in harvesting and storing genetic, protein, and other sequence data for reuse and analysis. Use of centralized digital archives containing full-text hyperlinked scientific literature and their associated data is widespread. In particular, scholars rely on PubMed Central, as well as other databases. Some scholars start with literature searches and then delve into the data or begin with an examination of the sequence data of interest and then follow up on particular linked references. Scholars also rely on BLAST searches (basic local alignment search tool), which enable comparison of new sequences produced in the lab with the broader sequence literature and databases.

> Well, of course, everybody uses GenBank. There's no question about that. We use one particular genome database and contribute to it a lot. There are a lot of subsidiary, more specialized databases that we use. I use the protein database a fair amount…and then there are lots of genetic interaction databases that we use.
>
> The resource I use most concerns my organism of study. Incyte had a database called Bioknowledge Library and now it's run by a company called Biobase, and so I use that an awful lot because it has human genome stuff, yeast, fungi, mouse…Proteome Knowledge Database…Of course you use GenBank because whenever you use any of the resources that have links, you tap in. But there are also online resources of other sorts, Swiss-Prot and National Library of Medicine have all sorts of things. It's not just GenBank, it's a whole raft of things. Protein genomes, structure determination things, there's a ton of stuff.
>
> Repositories have curators that mine the data from any paper that's published and install it in a repository…You go to a gene…and here are the papers on which this conclusion is based. Somebody has gone to the trouble of putting together a little website that talks about the

> localization of proteins, but it's based on published data, not on somebody's notebook. It's the same with fungal alignment. It aligns your protein against all these other sequences that were done by the MIT sequencing group, the Washington University in St. Louis sequencing group, etc., from this and this paper. You can click on it and you can go to the paper. It's great to have these resources, but they're based on hard data that have passed peer review and then have been collated for your convenience in this way. It's not junk. Everything's hyperlinked now in science, everything…If you're interested in a particular gene or process, you can look it up and get up to speed very rapidly without having to read all of the primary literature, and then when you find some citations, some bit of mined data that's pertinent to what you're doing, then you can delve into the references; they're all linked…I'd say I used PubMed every day, ten times a day, and a couple of other databases every day.
>
> Certainly the people who are doing genomics just have to have access to GenBank and do BLAST searches all the time…That's very important.

Data analysis and visualization of heterogeneous data

Scholars increasingly look to the computation branches of the discipline, such as bioinformatics and computational biology, to assist in the mining, collection, and analysis of large genomic data sets. As biologists seek to understand (and make inferences about) the function and structures of cells, they mine databanks by taking the sequence of a given protein or genome and aligning it with others to infer functional similarity. Since the full sequence data are available for simple organisms, scholars use these to try to understand the functions of similar proteins in more complex organisms. Although access to data is a boon, keeping abreast of sequence updates is a challenge.

> Well, these days, I was going to say we generate all our own data, but that's not really true anymore because we're always searching the sequence databases. We're heavily dependent on that now, and in fact, there are some informatics projects that we're doing, and some to be published, where we haven't generated any of the data, although I think that's a funny way to put it. In a sense, this sequence data that we're pulling from the databases, you might say we're informatically generating new data as new ways of putting things together, whether it's new open reading frames or new signals, new motifs, whatever it is, and I consider that data myself…I was trained in a different field to biology so I don't have the same problem as a lot of biologists who think that, if it wasn't generated in a wet lab, it's not data. Well, what's generated in the computer is data, as far as I'm concerned.
>
> There are databases being built, and so we use genomic databases. We depend on our informatics colleagues and computational biology colleagues to help us develop new ways to analyze and collect those data. So things are available out there, and other tools we're building ourselves. I had an informatics graduate student in my laboratory who was fantastic for us…building new software, writing code for programs to do things. It's increasingly important, access to databases, and then analysis programs that are pretty widely available…The stuff that we use either isn't proprietary or we can write things ourselves.
>
> So what comes out of this is…because the data mining is so easy, you're responsible for doing that, and for knowing what the results are at all times. So if you're working on a gene, you're in a presentation, someone could easily ask you, "Which organisms have the longest genes? What parts are conserved? What parts aren't? Is this typical of the main architecture?" Those are all questions you can easily answer with the NCBI database. But you have to know them, you have to have done it, you have to be responsible for it because it's so accessible. It's just a given that you have to know the answers…To be fair, the database changes. We just got a

> lot more sequences put in from a project we're working on…So the results you get by looking at this thing change, but you still are responsible for the basic principles of the system you're working in relative to this database…There are ethical ramifications for the ease of communication.

The ability to harvest exponentially growing sequence data is opening up new terrains for biology, enabling scholars to explore new and increasingly complex questions. Yet one challenge facing the field—and computational biology in particular—is how to harness and navigate this growing mass of information.

> Today a full genome sequence probably costs a few million dollars, and people estimate that in 10 years or so it'll be a thousand dollars to have a genome sequenced at some level of accuracy…Masses of new information are becoming available in large part because sequencing's getting cheaper and more pervasive, but how do we make use of this?…This is where technology is opening windows onto areas of biology that were not yet achievable…and they give you more biological data, and, in some sense, more than we have known how to readily deal with to date…So there are technical aspects, and yes, we do need better algorithms, we do need better databases to apply these types of questions—but really, the thing I think about more is, "What is the biology that we can uncover using these new technologies that we couldn't before?" And then, secondarily, "What do we do to actually achieve that?" That's where the technologies to address both the volume of data and the biology question come in…So I really see myself as a biologist using computational methods as opposed to a computer scientist.
>
> I think a big deal is this high-throughput next-generation sequencing…mass spectrometry for all kinds of purposes, for proteomics, for metabolomics. I think both of those are really the immediate frontier. The longer-term goal of being actually able to build a model of a complicated organism so you can understand why all its genes are expressed at a particular level, that's still a long way off, but that's really the goal.
>
> Metagenomics is trying to do gene analysis, but instead of an individual organism, it's of a community…Typically we don't get to completion on it, so you have all kinds of challenges, but it can tell you enormous amounts about the ecology and the community, the biology of what's in that environment…This is almost always bacteria and viruses…One project involved Craig Venter sailing around the globe collecting seawater as he went, and the analysis of the DNA from the seawater he collected…what types of organisms are in there? How diverse they are? How do we learn from them? And now labs are taking this in the medical direction, trying to use this to understand diseases in a really comprehensive way.
>
> One of the major challenges in the field is the analysis and display of volumes of information, in ways that are useful for biologists.

As data become more diverse and complex, scholars rely heavily on visualization and imaging technologies to collect and analyze large data sets. While the increased availability of comparative sequence data in searchable and "mineable" form is allowing biologists to go further in "inferring" the functions of particular structures they generate in their labs, new imaging technologies enable them to visualize what the functions of particular things are by imaging them in new ways. The building of three-dimensional objects through the process of "protein folding" produces visualizations of sequences, genomes, and other objects, which users can rotate or fly through virtually.

Three-dimensional imaging, for example, in structural biology—looking at the three-dimensional form of molecules, and how that three-dimensional form changes under certain circumstances, how drug molecules interact—that's really critical to the success of a lot of the structural biology that's being done on campus. And so that's become extremely sophisticated now. If you take a crystal up to the advanced light source, you get the structure in about 15 seconds after you've analyzed the crystal. This is mind-boggling how fast it comes out. It used to take people weeks to plot it all out.

So much of cell biology is driven by what you can actually observe, and if you can observe it dynamically, we just enter into a new world when we can see the details, we can make models, we can identify the activities, etc. Imaging is the ultimate tool to really advance the field.

Well, tools for visualization are like the red and green squares of an algorithm. Visualization—because we're not very good at numbers, we have to get patterns or pictures or something. I think that that's really the main frontier of this business. It is, after all, the computers finishing the calculating. How can you represent the data in such a way that humans can understand what they mean?

The image can play a very large role; the whole experiment can be an image.

A lot of our data are images…It's all lab generated.

These advanced imaging techniques are a tremendous driving force in cell biology right now. Super resolution microscopy approaches and chemical tools that can be used in biology as probes for different things. That technology seems to really be coming into its own now, in terms of how it's really crossing boundaries and becoming more accessible to biologists and researchers who have a lot of interaction with chemists.

Imaging is a very, very hot area. There are techniques being developed to look at the movement of single molecules in depth in a tissue while the tissue is alive and functioning. This is a tremendously exciting development. It goes beyond just the fMRI approach, which looks at the secondary signal from thousands of neurons. You can look at individual neurons in this new technology…There certainly are moves to whole animal imaging. This is something that is developing at a phenomenal rate. Paul Alivisatos' work on quantum dots hasn't really been fully developed yet, but when it does it's going to completely change the way you do biology.

Figuring how to display things and visualize data is something that my group spends a lot of time on. Usually it's not very exotic. It's about how you make a graph that will really represent the story we're trying to understand here. And figuring out what are the right parameters for the axes—what is the right thing to do? I pretty much send everyone in my lab to classes…They just think more clearly about how to present the thing they want the person to understand…often they're very simple things. Rather than having a bunch of lines in all different colors and different types…a simpleness in that a key in the corner reads…instead of spending hours going back…you can just color this one and so on, just writing the names of the lines right on them. There are a lot of simple, obvious things there, but those make a huge difference…When people see the wrong information, then their head has to do the calculation of changing to the right form…For the paper we recently published…my postdoc spent enormous amounts of time making the graphs. It was really tremendous amounts of time on the graph, going over every minute detail on how we make this presentation most effective…and they were really abusing all these different programs to do things they're not designed to do…And at the end they just look like graphs, and they don't look like anything special, but just unbelievable amounts of work went into producing them to be exactly right

> and so they would actually have the most information…There are some groups that do really good presentation work, and other groups don't.
>
> One of the things is I have begun to do is a series of studies that involves the necessity of showing something by animation. No way can one do that on paper. No, it's completely impossible. To have an online site on which you can read the paper and click on the figure and it becomes animated is a much more powerful tool. I think more and more that's going to be important in molecular biology. For example, if you need to visualize three-dimensional objects, these complicated molecules, biomolecules, or ultra-structures in cells, there's really no way you can see it otherwise…Being able to do it in a real three-dimensional rotation, for example, or a fly-through of some complicated structure, is really very useful.

B5.2 What Do Scholars Need? How Are Their Needs Being Met or Not?

Biologists depend on their institutions and large-scale cyberinfrastructure initiatives to provide access to digital resources and technical support.

Access to digital resources and secondary literature

The ability to access primary and secondary sources online has enabled time-efficient, broad, and serendipitous research for biologists. Scholars look to their institutions to provide access to new and comprehensive bibliographic resources. Selective digitization is a concern for some since work not available online may be overlooked. Scholars in the "field" sciences are more reliant on older literature, which has less likelihood of being digitized. Library use has dwindled in the face of increased online access to bibliographic material.

> Hands down, the biggest change I've seen is computers and electronic access to scholarly material. When I came here, when I had to write a grant, I would go into the biosciences stacks in the life sciences building and crawl up and down and pull out these dusty old volumes and lay them out with bookmarks on big tables and write index cards and then go back and type things up in my office…Now, I never have to leave this chair to get practically anything I need from a journal. It's truly mind boggling, and producing a paper with the current software is just so much easier. Making corrections, pulling references with EndNote or anything, creating bibliographies…now it's just push of a button. It's just so labor saving, it's like heaven. I'm old at this point…If somebody had ever said when I arrived at this university, "Do you think there'll be computers where you're able to get the sequences of genomes off of the computer…in your lifetime, any reference that you want from any journal published anywhere in the world, right on a computer screen," I would have said, "You're insane, it will never happen in that short a period of time." And it has, it all has.
>
> If it's not online it doesn't exist for me, and I think most scientists believe that. What's not online now of that is of any importance?…I now feel closer to the material, can get to the material faster than I ever could before. I can read more historical material much easier than I ever used to, because so much of it is digitized…I have far more serendipity in my life, certainly in electronic searches, than I ever had in the library. I feel like I read a far broader set of material on a topic with electronic searching.
>
> PubMed is really crucial…although it's flawed. I have a colleague who says some of his/her papers are not in there. Now I think everything pretty much goes in, but at one point when they were archiving and putting in old papers, they made a judgment call on some papers…I thought pretty much everything was in there, but it's not. In the '80s, for example, there are some papers that are MCB kind of papers, but it was decided they shouldn't be in there…so if

> it's not there you're pretty much screwed because it's going to be hard to find. There's no other database, really, that we're used to using.
>
> I think the most influential thing is PubMed, the ease with which we can figure out anything, and scan the literature. The positive thing is we can find out everything quickly, get any paper, without leaving this room. And the bad thing is it's reduced the amount of browsing people do, to look a little bit on the edges of their field, and pick up a journal and actually read something like this next door to their paper. People have become narrower. So, to locate these papers in other areas, I'm out there looking, my group members are looking. We each have our own little ways of searching.

Reliance on PubMed Central, Google Scholar, and ISI Web of Knowledge is widespread. Biologists employ various tools for keeping up to date, such as table of contents alerts and Google alerts. Scholars use various citation management programs, including EndNote, QUOSA, and LaTek.

> I use RSS for all the journals, about six of them…And then I have keywords that are set up in NCBI PubMed, because I don't want to go to each journal and deal with something that is only abstract-based. I have that, and they have something called My NCBI, where you put in certain words into any publication that comes out…I have pretty broad interests…And then I use Google Alerts with the same keywords, so that if people put up a PDF with such things in it, I may find something that normally I wouldn't. It's not perfect but those are the two ways that I pick up the articles that I'm going to read. I don't read any journal cover-to-cover because I don't have time. So, it's pretty much that I pick the articles, and all the journals send you periodically…a table of contents and I look through that. And I hate doing that, but I'm just being honest about how I do my discovery, *per se.*
>
> There is PubMed and then there are…professional societies that will do searches in your topic area. You can send in keywords and they'll send you every week the papers that have come out in that area. But Google Scholar works great. It's fantastic.
>
> In PubMed you can write a little script or they write scripts for you that remind you when something comes out with your keyword. I have a short list of keywords that I put into PubMed and I look for things, and I have a cut-off of one year and anything that happened in that year I go and see, and I do this periodically.
>
> One of the things that's probably most useful is that I do a bunch of searches on ISI (Web of Knowledge), where I basically look for papers that cite other papers of mine or others that I know to be of interest, basically a set of papers that I know is interesting, then those papers with the high frequencies are themselves interesting. That's probably the number one thing I do. I also have regular keyword searches against PubMed as well, looking for papers that are in the area.
>
> I'm much less technically knowledgeable with RSS feeds and things like that, but table of content alerts for me are a primary way of seeing what's going on in the journals, and listservs, and personal communication.
>
> So I keep track of what's going on through websites, discussion groups, personal communication with people who are perhaps reading the journals that I'm not…they're usually people I have a history with.
>
> I'm thinking broader than the department, but email, conferences, listservs in the department, professional societies use listservs some.

> Maybe I'm just too old, but a lot of these listservs and wikis and networks and things…It hasn't really caught on for me…I've always been very selective, and I think it's because everybody has a different kind of a brain, and my brain can't handle huge amounts of information…I can get really lost in the forest and then I can't see the forest for the trees. So long ago, I began to consciously back off…I'm more into the context, what's the big picture here.

Technical support

As noted in NSF's 2003 report, "Revolutionizing Science and Engineering Through Cyberinfrastructure," a shared cyberinfrastructure that empowers more people and more disciplines will be required to support multidisciplinary, data-driven scholarship.[72] As technology becomes more sophisticated and data increase in complexity and number, demands are growing for a shared technical infrastructure and computational support that can enable real-time data analysis and dissemination of results among distributed scholars. It is imperative that scholars communicate their technical needs to those charged with building tools.

> The only way that something useful can be built is if researchers in the community invest time and energy in telling us what they really need and what they really want, and that doesn't happen in a 15-minute conversation. That's going to involve some intimate interactions, which may require us to fund a student or a postdoctoral researcher to spend time there.

> I feel that these scientists have great ideas, but they're boxed in by where they are restricted by the technology, by what they think is available…We're hoping to liberate them by saying, "Think big, think different, and don't feel like any computation is too complex or there is no way to do this." I feel that very strongly when I interact with people, at least life scientists, one-on-one, they have such great ideas and visions but it's very hard for them to scale it up to something completely large and complex, and it's because they're looking for a collaborator or a partner, not just on the computational side, even in the biological sciences.

> A standardized set of procedures for data storage, management data, and resource storage management is needed, and that isn't available in other models. One of the big problems is that people can't compare their data, and this can certainly be instilled in large-scale collaborations.

Although the university may provide scholars with general research and programming support for their work, sustained endeavors are funded through faculty grants.

> The library had somewhat of an academic computing function on campus, and so there is a small server room. They supported some programming efforts, and a lot of these have kind of been startups until they figure out what they really need or they get enough money that they could hire a full-time programmer to maintain it. There is a staff, a systems administration staff, that does programming support, as a support for their research. It's funded through the scholar's grants or through a recharge if they have those kinds of funds.

[72] Atkins, Daniel *et al.* 2003. Revolutionizing Science and Engineering through Cyberinfrastructure: Report of the National Science Foundation Blue Ribbon Advisory Panel on Cyberinfrastructure. Washington, D.C.: National Science Foundation (NSF), January. http://www.nsf.gov/od/oci/reports/toc.jsp.

Training younger scholars

Several scholars noted that future generations of biologists will need computational skills, such as visualization, but that graduate students and postdoctoral researchers are not receiving the necessary training. For some senior scholars, tackling the "grand challenge" questions requires a complete overhaul in how scientists are trained—including changing K-12 education to start with physics and chemistry as the "pillars on which the principles of biology are built."

> We need to begin to teach biologists to be able to think in computational ways, because, again, as just a traditional biologist, I'm completely inept when it comes to that, and I know that even the next generation, and potentially the next generation after that who are coming up, are not really that well equipped, and they're not being taught the kind of things that we right now already need in our field. So I find myself sending my postdoctoral researchers to computational training things to learn how to do comparative genomics, for example.

> With the computational side of biology, user groups have been around for a while to help you get through a technical hurdle in your work…I think it would be helpful in biology to have more online forums to discuss technical issues, the day-to-day experiments that we try to troubleshoot. Less so for people in really a rich academic environment, where you have people around who can help you, but more so the people trying to work in a more isolated environment—it could definitely be more helpful to them.

6. TO WHAT DEGREE DO YOU OR YOUR COLLEAGUES ENGAGE WITH THE PUBLIC? HOW? WHY OR WHY NOT?

Biology as a field has an important public component. Public engagement promotes improved scientific literacy among both school-age children and the public at large. Biologists engage with the public through school and community outreach programs and through op-ed pieces and interviews in the popular press. Although public engagement can constitute part of a tenure package, young scholars are advised to participate in such activities after securing tenure. As in other disciplines, the field may be accommodating a growing role for the citizen scientist.

B6.1 Why Do You Engage with the Public?

Many biologists feel a sense of obligation to engage with the public since much of their research is publicly funded. Some scholars support open access to research findings as a mechanism of accountability to the taxpayers, who ultimately fund biological research through public agencies. Thus continued funding for the field depends, in part, on the public's level of appreciation and understanding of the scholarship undertaken by academic biologists.

> I engage with the public a lot. In my own philosophy, this is a major responsibility that scientists have. Biologists are incredibly handsomely supported by public funds. We complain about the NIH budget, but it's $29 billion. That's a lot of money. On that basis alone, I think we have a huge responsibility to communicate our work. And then given the ways that our actual research activities can impact quality of life issues and various ethical dilemmas, we have a responsibility to let people know what we're doing. In the end, society is going to make big decisions about very complicated things, and we can't just expect them to do the right thing if we're not informing them.

> A big problem is that, increasingly, people who are not involved in academia will hear about some disease they've been diagnosed with, and when they try to get access to our research on the Web they are confronted with a cash register asking for payment…Damn it, they paid for the research to be done, so why do they have to use their credit cards to get papers they can't read and are not very interesting anyway? That's just absurd. There's going to be a backlash against this system that will come back to bite us.
>
> If you are doing research at a publicly-funded university or you are doing research with federal dollars, the public should have access to what you publish, but at this point they really don't.
>
> I think at all levels we have to engage. We have an outreach obligation; that's part of my job. But I wouldn't consider it an obligation as much as a personal goal. You pay taxes and you own a very small piece of my time, so here, let's talk about it.
>
> I don't do much public engagement, and I don't think it would have much impact. But, I realize that to the extent that the outside world has an appreciation for or understands our work, they're more likely to be interested in supporting the field in the future. So I have made more of an effort to make the work accessible.

Why not? The contested nature of the "public intellectual"

While public engagement counts as part of the service component of a tenure package, it is not encouraged among pre-tenure scholars. For that reason, some scholars may draw back from excessive public engagement in order to be taken seriously as an academic and to avoid becoming "Carl Sagan-ized" Young scholars, however, may be driven to engage with the public because it provides them with an outlet to explore alternative careers to academia.

> There are open source things out in the public domain that people read and ask me questions about. I will answer them and I enjoy doing that as part of my job, but I don't know who those people are or what they do. And fortunately, the organization who pays my salary counts that towards my efforts in service for advancement. So service is not only within the university, but it's also what you do outside.
>
> My colleagues, particularly those who have active laboratories and numbers of graduate students, may engage with the public on the occasions when they do something scientifically surprising or revolutionary and the press comes to them, but otherwise not. They would never encourage their postdocs or students to do something like that. And it's so discouraging to be raising another generation of scientists that won't care much about the public's scientific literacy…I think the big change has to come from the academic institutions…What do you think would happen if the Association of American Universities transmitted to all its member institutions a query for their science departments to describe their specific mechanisms for public engagement? They wouldn't get a single response to that query.
>
> Younger scientists will do public engagement because they are often looking for a career alternative to research, like perhaps going into public policy—not exclusively, but often that's the motivator.

Scientific illiteracy

Scientific illiteracy can be a deterrent to public engagement for some scholars who are cautious about the misrepresentation of their research findings. Despite this, talking to the media can ensure an audience far greater than through academic publication alone.

> The scientific illiteracy of our country is frightening. When we hear that of all the First World countries, the U.S. has the highest percentage of its population that believes literally in the Bible, it's truly mind-boggling for an advanced civilization. It's like the Enlightenment never happened…Many of my students unfortunately are science majors, but there's always a handful that are sociology or psychology majors and are in it for interest. And there's a few every year who had strict religious upbringings, but they're asking questions and that's good.
>
> When I deal with reporters, my policy is I'll talk about somebody else's work, but not about my own. It is self-interest. Given the way reporters can take something out of context, talking about your own work is dangerous.
>
> I get called by reporters all the time. God only knows why. I was asked to comment as a geneticist about whether Angelina Jolie and Brad Pitt's baby was likely to be beautiful or not. I was proud of my response, which was, 'Based on my many years of experience in genetics and as a parent I am confident that both parents will judge the baby to be so.' And it was printed in various newspapers.

B6.2 How Do Scholars Engage with the Public?

Much public engagement in biology target scientific literacy among school children. Biologists engage with students, as well as the public at large, through education and community outreach programs, through government advisory boards, and through articles and interviews in the popular press.

School and community outreach

Some scholars work directly with school teachers and children (often at schools attended by their own children), give public lectures, and take part in symposia.

> I'm on various policy committees with public education components. We do things here in terms of outreach to the community or interaction with the public schools that try to increase scientific literacy and knowledge. I also give talks. I think both aspects are really critical.
>
> Broadly speaking, people in the biological sciences—although some universities do more than most in this regard—generally interact with teachers down to the elementary school level, through research experiences and curriculum development. As far as addressing the general public, you'll have speaker series. People will go out to classrooms, generally their own children's…Research experiences and curriculum development are only effective if you're really partnering with the teachers. Scientists cannot develop effective curricula…You'll throw an idea out, and the teachers will come back with something quite different, but related, that works in the classroom. If the scientist has very rigid ideas about what it should be, it doesn't work well.
>
> We have a partnership with the school district, so we have hundreds of volunteers every year who work with the teachers, who go into the K-12 classrooms in the public school system. That's a major outreach function.

> I try to engage with the public at every opportunity I can. I give talks at my child's school.
>
> I went to one venue and brought some slides to give a, supposedly, layman's level presentation, although it's really difficult to do, and I don't think that I'm as good at that as some scientists. The desire is there to try to connect more with the public, but there are not that many opportunities. We can volunteer in high schools, and some of my colleagues who have students in school get involved with that kind of thing, but I haven't done that. I think most of us would be willing to do more of that, but then there's also the limited amount of time you have during the day.
>
> I try to give public lectures, as often as I'm invited. I've done things with the public at children's science museums. On the campus, if you want to call that public service, I was involved recently in this colloquium on genetics and science. I also talk to a program for retired people who come back to campus. It's fun, and that's a really lively, intellectually-engaged audience.
>
> My public is mostly my peers and students…and my actual public, outside the academic environment, has been high school teachers.

Government agencies and industry

The "public," according to some biologists, can include biotechnology and pharmaceutical companies, and government agencies. Scholars may also serve on committees advising government agencies on state and federal science policy.

> The major engagement that the university is promoting at the moment is an interaction with various drug and biotech companies that do discovery research…They've been trying to set up agreements with a number of these companies so they can support research here, in the hope that something will bubble up from this cooperation. There are various ways in which they can participate…So if you consider those companies as being part of the public domain then that occurs. The rest of public engagement is generally people talking about their research, mainly in conferences and symposia.
>
> Outreach to government agencies and to state and federally elected policymakers is very important. High profile faculty will serve on certain boards that advise the government, for instance through the National Academy of Sciences or the National Research Council. But that's exceedingly rare and possibly not even existent at state levels. If any states are doing it, it might be California, New York, Massachusetts, maybe Minnesota or Florida. Examples of things that have been funded are programs for graduate students or post docs to do an internship with the state or federal government in some capacity. Those kinds of things exist, but there are probably greater numbers of students doing that than faculty or postdocs.

Media

Biologists engage with the media in a variety of ways; some scientists form advisory panels for media outlets, such as the *Lehrer News Hour* science unit, while others publish op-ed pieces. One Scholar noted that op-eds can also function as a way to move the field in a certain direction. University press offices and funding bodies are often the primary liaison between biologists and the media. For instance, the Howard Hughes Medical Institute arranges public engagement opportunities on behalf of its investigators. Some organizations educate scientists on speaking to both the press and the public.

> There is a small group of scientists that gives advice to the *Lehrer News Hour* science unit, and that is an important and thoughtful contribution that they can make to the public understanding of science.
>
> Writing an op-ed piece is very rare. Somebody might write op-ed pieces about the role of the university in neglected diseases, for example, which is something they care about. I thought about writing such a piece, but it seldom happens.
>
> When there's work that I think is high impact, which would be interesting to a broader audience, I let the people in the press office know about it so they can write a story that might be of interest. And very recently—I've never done anything like this before—I saw some press coverage of genome analyses that have been done, and that gave me some ideas of what was missing in the field and what should be done on a very broad scale. I wrote an op-ed piece and sent it around. No one has accepted it yet, the *New York Times* and the *L.A. Times* didn't want it, so it's not clear that it will ever be published. I also sent it to a lot of people in the field, for their feedback before I sent it to the newspapers.
>
> The Howard Hughes Institute…contracts generalists, science writers, who come and interview us now and then, and the Howard Hughes magazine and their website has research descriptions for the layperson. And personally I've given lectures to various organizations to just try and engage the general public. It doesn't necessarily need to connect to the research going on in my lab, because the main thing is that you stimulate an appreciation in your audience of what is going on, and what the prospects are and how it may relate to them. So stem cells have been a big issue; it's a wonderful thing to talk about.
>
> The old Leopold program, which is supported by the Packard Foundation…provides training for young scientists and teaches them how to talk to the press.

Certain research areas, such as genetics or reproductive technologies, are popular in the national press than others. These topics often resonate with individuals because of their social or ethical implications.

> The three biggest areas of ethical interest in recent years are genetics, stem cells, neuroscience, and the overlapping area of reproductive technologies. These are likely to have near term implications for how people live. People look at genetics and they say, "Our genes, our genomes, that really is our essence, who we are." With neuroscience, there is attraction added from the fact that our brains are overwhelmingly our most important organ: "my brain is me." So those fundamental aspects attract people, whether accurately perceived or not, to those areas. There are different degrees from field to field of foreseeable, important consequences for society. Topics such as the forensic use of DNA to catch criminals, the use of brain scans to predict who's going to get Alzheimer's disease, or the use of leftover frozen embryos from in vitro fertilization for stem cell research, all have an innate sexiness. But I'll give you a counter example. An awful lot of work being done in immunology has real potential for health implications, but apart from the fact that maybe fewer people will get sick and die—and that will change the long-term age distribution of society—I don't know that anybody sees serious social changes coming about with advances in immunology. Immunology is exciting to immunologists, but it isn't exciting particularly to the outside world. Even though it's a science that's moving very fast, and that may have significant medical implications, it doesn't have social implications, and it doesn't have the lay sexiness that genetics, neuroscience, stem cells, and assisted reproduction all have.
>
> Some biologists, especially those who work with stem cells, disease, and human genetics, prefer to publish in *The New York Times,* even over publishing in *Nature*. These are people

> who are really in it for public acclaim, and they talk to the press all the time. I'm not so popular, but I have on occasion talked to the press. They are usually interested in ethics, or in anything but the science. I tend not to talk to them for very long.

Publishers and their role in promoting public understanding of science

Science publishers are experimenting with new ways to reach wider audiences. These can include using new media, such as podcasts, and scholars writing descriptive abstracts for a broader audience.

> The basic idea is now everybody is a layman. You could feel like a layman if you talk to an astrophysicist or a molecular geneticist about their work. Part of this is because the papers in journals are so hard to read, even for people in adjacent disciplines. *Science* is starting an experiment where all research articles will have an extended abstract by the author that is edited intensively for approachability and clarity. So that will be a test of whether some kinds of science can be more accessible to people who aren't prepared to drill deep.

> *Nature* does a lot of audio now, and a lot of podcasts…news, summary, or commentary-type content. *Nature* does interviews with authors that are four or five minutes long. It's a good way to give people a scan of what's in the journal and to get a different experience in learning about the science than reading the paper, but it's inevitably more superficial…The podcast…took off really quickly. Within a month it had 20-30,000 listeners, and is now around 40-50,000. It's free, admittedly, but when you consider that the print circulation of *Nature* is about 60,000, the volume is right up there…And, actually, one of the reasons for the rapid growth is that the podcast has a broader reach outside professional scientists, whereas Nature Network doesn't.

The citizen scientist

According to some biologists, the citizen science component of the life sciences could be expanded following the model of astronomy. The Encyclopedia of Life is one project combining the efforts of citizen scientists with the expertise of professional scientists for mutual benefit.

> It's like how NASA is sitting on a mountain of data. Historically, you've got people with their telescopes in their backyards, and they're discovering comets. Now they're going on their computers and discovering all kinds of other things because there's all this data that nobody has time to look at. Well, it's the same thing with biology. We have all this data that nobody has time to look at, and all these tools produced by the cutting-edge systems biologists, and if we bring it all together in the right way, there's no reason why the public can't as a hobby on Saturday night…discover pathways, networks, etc. It's been good for astronomy, so if you could get enough people interested in that, why can't it be good for biology too?

> Amateurs have long been involved in collecting species samples. Naturalists, birders…and there's a citizen science element to the Encyclopedia of Life…There are amateurs and experts involved in it, and it will be authoritative…It's housed at the Smithsonian, although there are different institutions involved. But there's a core group…that is involved in its administration…and they'll have these pockets working on the project around the world.

SELECT RELEVANT LITERATURE AND LINKS

This is not meant to be an exhaustive bibliography; as a courtesy, we are providing some of the literature—scientific and popular—that we have collected over the last few years. Please see the main Relevant Literature section and various footnotes for additional citations.

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CHAPTER 5: ECONOMICS CASE STUDY

CONTENTS

INTRODUCTION AND OVERVIEW OF THE FIELD

Economics is the study of the production, distribution, and consumption of goods and services. Though generally a homogeneous discipline, the field's major division is between empirical and theoretical practice. There are a variety of subfields in both areas, many of which overlap with other disciplines, such as business (e.g., finance, marketing), political science (e.g., political or international economics) and psychology (e.g., neuroeconomics or behavioral economics), to name a few. Despite numerous subfields, economics is a high-paradigm field in which scholars generally share a core base of knowledge and epistemological practices.

In economics, peer-reviewed articles are predominantly final, archival publications evaluated as part of institutional review. There is a relatively small number of high-impact, prestigious journals with extremely low acceptance rates that are generally society run.[73] Submission fees, which are common, have risen in the past two decades. Time to publication is unusually lengthy in most subfields (two to four years on average, and sometimes longer). As in the sciences, economics is experiencing a brand proliferation in journals, driven in part by commercial publishers.[74] While there have been experiments with varying forms and degrees of open access journal publication (e.g., *Theoretical Economics*, bepress), new genres of publication have not made major inroads to date.

Most journal content is available in digital form, and a variety of citation indices track the prestige and impact of journal outlets and articles. For example, Journal Citation Reports (JCR), published annually by Thompson ISI, lists journal impact factors. (These types of metrics, however, are taken with a grain of salt by many tenure and promotion committees.) Many online resources providing access to papers in economics, including Google Scholar, Research Papers in Economics (RePEc), and Social Science Research Network (SSRN), have tools for tracking download and citation counts. Listservs and similar email subscription services notify readers about papers of interest.

Due to long lag times between article submission and publication, speed to print is a major concern for economists. The sharing of work-in-progress is widespread (with the exception of a few subfields with "low-hanging fruit," such as neuroeconomics), and is an important way for scholars to stake a claim on research topics, disseminate drafts, and solicit feedback prior to formal journal submission. Conferences and informal networks (sustained by email) play a dynamic and important role in sharing early research drafts and ideas. Well-polished working papers are frequently posted online in paper repositories, such as SSRN and the National Bureau of Economic Research (NBER), or on personal websites. The sharing of preprints is less common. Formal journal submission and peer review can overlap with the circulation of working papers, and the resulting published journal article (the version-of-record) may be significantly revised. Consequently, individual scholars have various strategies for managing the different public versions of a given paper.

Economists use data derived from a variety of sources, including government, non-profit, and corporate entities. Some scholars also generate their own data sets. Publishing or disseminating some form of back-end data has become more common in the past decade, and a number of journals and funding bodies are beginning to mandate such release (though data sharing practices are governed by individual personality, data sensitivity, and proprietary

[73] Dawson and Rascoff (2006).
[74] The American Economics Association also introduced four new online-only journals in early 2009, but their success has yet to be measured.

concerns). The growing subfields of behavioral and experimental economics are opening new directions for data collection and research; for example, X-Lab (Experimental Social Science Laboratory), part of the Institute of Business and Economic Research (IBER), offers real and virtual laboratory facilities to support research into methods based on experimental design. There is little use of visual data beyond graphs and charts, although some scholars are working with geospatial tools and fMRI scans. Collaboration among small numbers of scholars (i.e., two to three individuals) is common and growing, and can occur both within and across fields. Graduate students and pre-tenure scholars often serve as data collectors or analysts in partnership with more established scholars. The mechanisms of collaboration remain largely traditional—email networks and face-to-face communication—and pre-existing personal relationships underwrite many collaborative endeavors.

Public engagement depends on a scholar's area of specialization and career stage. Interdisciplinary economists who work in public policy or business may be more likely to publish popular press books or have a media presence through newspaper editorials or radio and television interviews. During the recent financial crises, for instance, academic economists were daily fixtures on national and international news. (Journalists may also mine working-paper series to inform news articles.) Generally, however, these activities are considered to be outside the realm of standard scholarship and discouraged for pre-tenure scholars. Although there are some well-known economics blogs, there is little evidence of widespread blogging as a scholarly pursuit among economists.

In sum, economics is a high-paradigm field that almost exclusively depends on journals for final publication. There is a robust working paper culture, which functions as a form of early research dissemination and informal peer review. The primary concern in the discipline centers around the long lag time of the publication system, and scholars expressed hope that activities like paying referees and reusing peer reviews (for rejected papers submitted to other journals) could mitigate the problem. There is some concern about the high costs of commercial publications and the need for more journal outlets (either electronic or open access), but the main society journals are generally seen as serving the needs of the field, and commercial journals are perceived as disproportionately overpriced.[75] There is no significant need for new publication genres to accommodate complex media, although more comprehensive guidelines on publishing software code or experimental data types may become pressing in the future. Economists are eager to exploit the growth of digital and Internet data for research purposes. The subsequent need to generate additional training or technical support in harvesting and integrating diverse data forms could become more pressing.

1. REQUIREMENTS FOR TENURE AND PROMOTION: WHAT ARE THE QUALITIES OF A SUCCESSFUL SCHOLAR?

At research universities, the advancement process in economics places the greatest emphasis on a scholar's record of publication in the most prestigious journals.[76] Book-length scholarship is rare. Considerations for tenure and promotion, such as the quantity of articles or prestige of outlet, can vary by institution, though sustained publication in peer-reviewed journals remains

[75] Bergstrom and Bergstrom (2001).
[76] See, for example: Dawson, Michael, and Matthew Rascoff. 2006. *Scholarly Communications in the Economics Discipline*. Ithaka Strategic Services, June 12. http://www.ithaka.org/publications/pdfs/JSTOR%20Econ%20Study%20Report%20Public%20final1031.pdf

common practice. There is some variation in publishing practices in new or emerging subfields. Scholarship is judged on multiple criteria, including close departmental review of the entire tenure dossier, impact factor and imprimatur of publications, and external letters.

E1.1 A Suite of Achievements Anchored by High-Impact Publication

Scholars in economics are primarily judged by their publication record. At the most competitive research universities, economists are expected to publish high-impact articles in top-flight peer-reviewed journals.

> It's the *American Economic Review*, *Econometrica*, the *Journal of Political Economy*, and the *Quarterly Journal of Economics*, that's the normal list…Basically those are the most prominent of Western economics. And they stand head and shoulders above the rest of the journals, in the following sense…Pretty much everybody in the economics profession subscribes to them. And then everything else is one-fourth the size or less…The other journals have one-fourth the number of subscribers, so the effectiveness is, at the top schools—the top 25 universities—you have to break into those top journals…And while it's not impossible to get tenure without that, it's very hard.

Much like the other disciplines we examined, the criteria for advancement in economics can sometimes be opaque and idiosyncratic. Earning tenure was described as more difficult in economics than in other disciplines, though there was general agreement that the advancement system works well.

> Economics is one of the toughest fields to get tenure in. I am on the promotion and tenure committee for our entire university here, and like most economics departments, tenure rates are far below the norm…Just to put it in context, most people at the top 30 North American departments will not get tenure. I would say, averaging across those departments, maybe the rate is—this is not based on anything scientific, but it's just my perception—10 percent, 15 percent…So what do you need to do? I think of it as you need to do two things. First of all, you need to generate a C.V. with enough lines in enough journals, hopefully a couple of them generally regarded as one of the top four or five journals within the field. And second, the people in your field, in their tenure letters, have to believe you merit tenure, so you both need publications and you need the top people in your field to believe your research has made a contribution…I've read tenure letters from lots of different fields, and my colleagues on those committees tell me that economists are one of the most critical fields. A lot of these tenure letters are fluff, as far as I'm concerned, having read them, in many fields because people are never negative about anything. Economists will be negative. So that's a very high bar and most people do not exceed that bar, most people need to extend their tenure clock by finding a second term as an assistant professor or they will, in many cases, leave academia. So getting tenure is very tough in my field.

> There are no fixed requirements. Here, the requirement is supposed to be that you're among the top people in your field in the world, and that you've demonstrated that by your publications…It's vague…Though, even still now, I'm not spending much time considering it, but I'm sure most of my colleagues do. And it certainly is the case that it makes a big difference what journals you publish in, in terms of merit reviews, and other things here. And it also makes a difference when you look for outside offers and you're trying to get your salary bumped up…It does make a huge difference. And it's not as if once you get tenure, it makes no difference where you publish.

> The typical top 20 person needs to get published in a journal that is well-defined in his field—within industrial organization, if you're an empirical person you need to get published in *Rand.* It would be great if you get published in *Econometrica.* A few at one of the top four journals as well, which are *AER (The American Economic Review), Quarterly Journal of Economics, Journal of Political Economy,* and *Econometrica*. And then one or two of the field journals, like the *Rand* journal. If you can get published in those outlets in sufficient number then you've got a reasonable shot. But because of the lag nature of this, it's a challenge. People with the best departments teach less and they have lots of resources and lots of colleagues, and they expect that you'd publish five, six papers in such journals to have a shot.
>
> So, for economics, it's research, research, research. My personal view is that, other than maybe the top 10 departments, it's pretty much like selling a hit CD. You need a number one song. You need a couple others in the top 20 and then you need filler…Okay, so that's a warped view of tenure, and I think that's true for most departments…I guess I'm leaving out the bottom 80 and lower. It's a whole different ball game at small liberal-arts teaching places. So I'm talking about research universities. But you need something that changes the way people think and has lots of citations, and some of the stuff that's solid and specialists probably like it, and then a bunch of other things that show you that you have some original ideas.
>
> I have to publish and I have to publish papers that people know. So, our official tenure requirement is: excellence in research, competence in teaching.
>
> My sense is for tenure…over six years, I need four, or probably six, publications and four that are above relatively high thresholds…That was the signal I got early on: roughly one publication a year, and two-thirds of them should be really good.
>
> In terms of promotion, you still want to get your name in the top journals. Very few people care about the promotion…maybe you care a little bit, but unlike tenure, where it's "up or out" (i.e., if you don't get tenure, you get fired).

Institutional variation in tenure and promotion requirements

Idiosyncrasies within individual departments and institutions can affect both the advancement process and tenure requirements. Although all economics departments are likely to require sustained peer-reviewed publication, the quantity or quality of publication may vary by institution, and differences may be minimal among similarly ranked institutions or departments.

> Certainly it depends on the institution, so the higher the salaries and the stronger the research reputation of an institution, the higher the expectations. At top places, some people are expected to produce publications in general interest journals, the top journals as well as field journals…The top universities have a longer tenure clock, and behaviors, habits, and orientations pretty well fit, the behavior doesn't change radically, some change with age, and so on.
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> It varies a lot with the quality of the institution, but all of the top hundred institutions require you to have published in peer-reviewed journals. As the expectations of "how much" rise, the better the school. So, if you work in a top 10 school, the expectations are going to be substantially higher than at number 25. But all of them expect publications in peer-reviewed journals, and at least in the top 20 or 30, probably even in the top 40 schools, they want to see you publish at least one paper, and maybe several papers, in one of a really small set of journals. And I mean by a small set, it's four, or maybe five, total, and you have to get a paper in one of those journals if you're going to get tenure.

> Every place has a different structure. This institution has this very formalistic structure with central review, but most universities would have review at the department level. And practices differ a lot. At my former institution, we had a fairly well-defined structure where we counted citations and article publications, and tried to document pretty clearly what people were doing…and then ranked people pretty much by their publication record and by their visibility of citation, teaching, service, the usual things. But the judgment was really made almost entirely at the department level without the central university having much say. They would have some final approval one way or another, but it wasn't nearly as strong as at other places. So I think that the standard practices are not so different across economics departments. They want to see ongoing publication. Obviously, they want to see publication in top journals. There's pretty widespread agreement about what those top journals are.
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> Having gone through the tenure process, I think it's very idiosyncratic, first of all. It really depends on the department, but that's going to be true for all tenure and promotion processes. It depends a lot on the institution and what their expectations are.
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> Now, if you're going to get tenure at any of the top 20 schools, you're going to have a couple of papers in the *American Economic Review, The Quarterly Journal of Economics*, *The Review of Economics and Statistics, Econometrica*. There are a handful of other journals: *Journal of Economic Theory, Journal of Money, Credit and Banking*, depending on your subfield. And you're going to have a few other papers in the leading field journals in whatever your subfield might be. And those are going to be print published papers, no question about it, but they will have gotten their start, if you will, as working papers.

There may be some flexibility in publication outlets at less competitive institutions, although one scholar observed difficulties judging tenure at less competitive institutions.

> The further you go down in the pecking order…If you look at some of my colleagues at less competitive institutions, you'll see publications in a lot of journals that I haven't mentioned.
>
> I think in the top schools, where people naturally tend to get a fair amount of visibility, it's not so hard to talk to your colleagues in this field or that field and say, "Oh, well, what's…how's so-and-so doing?" Look at the journals…People have a pretty good idea of what the journal prestige ranking looks like, so they can do these sorts of things. They can make these sorts of evaluations. When you get down the list, down out of the top 20 or top 30 departments, then it gets much, much more difficult because the people have to struggle a lot for visibility. They're not necessarily invited to the prestigious conferences. They don't have the university name to put on their papers. There, it becomes much more problematic in terms of how do you evaluate these people, because you've got a much smaller sample and it's also a much noisier sample. That's where I think the real problem lies outside the top of 20 or 30 schools.

As in other disciplines, such as biology, a good fit within the department is crucial.

> The bottom line here is that tenure is very much a function of how the department is structured and their strengths. So if you're in a department where there is a good appreciation for what you're doing, then you can probably get tenure doing what is expected of that kind of person…If you're in a department where they appreciate what you're doing, but you don't as easily fit into the department, the expectations are that you're going to look like other people who are already there, you probably have to do something that increases the number of publications. People who don't do that will end up not getting tenure and going somewhere where they're appreciated. I know people who are in departments where they expect numbers, and if you're only getting two or three publications, albeit in good journals, then you go somewhere else where two or three is expected. So it's a matching problem, with respect

> to your field of expertise. And given the long publication lead times, economics on the average is going to look different than biology or chemistry. But then within economics departments and across economics departments, you're going to see different patterns of advancement.

Some scholars are strategic in their bid to earn tenure and be promoted.

> The first university I was at was, let's say, a number 20 econ department. They wanted to move up to be a number 10 econ department, and they had to hire people to do that. They don't want to hire a lot of old fogies who aren't research-active anymore, so places that are trying to build will be more aggressive in giving tenure. And if another institution makes someone a full professor in order to get them to move, that's a way to play the game.

Additionally, the required quantity of published work often depends on the specific subfield (macro vs. micro and subfields within, whether empirical/applied or theory) or whether a scholar has a joint appointment.

Applied economists spend more time collecting original data and consequently may publish articles less frequently. On the other hand, theorists and other economists who rely on existing data sets tend to publish more often.

> If you haven't published four or five pieces in what we consider the very top journals, you really don't have a chance of getting tenure. And that's not a guarantee, that's almost a minimal requirement.

> So, putting aside the idiosyncratic stuff, the typical economist, depending on the quality of the department—it's hard to generalize because each of the subfields within economics differ in terms of what is expected…There are people that get tenure at excellent institutions with one or two publications…People…who are doing the so-called high-tech industrial organization, you're not going to see them publishing 20 papers after five, six years in the profession. You're just not. You're going to see them in the single digits. Whereas other fields, like labor economics or something that's less technical, or even theoretical areas, they are more able to write lots of papers depending on whether they're non-technical, empirical papers or theory-type people. The former group, the non-technical labor types, they don't focus on theory as much, though they'll try to look at trends and correlations and they can take a database and write 20 different papers. Sometimes they collect their own data, but they tend to have these already-existing databases or they're applied theoreticians and…you don't have to collect data, which takes time. They tend to have more publications, and so the expectations of the number of publications are presumably different for them.

> If I were in the econ department, then my marketing publications would count for zero…And in many marketing departments, most of my econ publications would count for zero…But what's funny is that economics journals have thousands of submissions every year and publish a handful, whereas the top marketing publications publish dozens of publications a year, but marketing departments still weight the marketing journals at a higher level than the economics journals.

Emerging subfields generally have the same expectations for tenure and promotion.

> I think experimental economics has become more and more acceptable, to use this methodology…but the rules are basically the same. You need to be able to get your research published at highly visible outlets, and that…while experimental is kind of considered a niche, it still is being accepted at the major journals, so if you could get into the top journals, you would get your promotion.

Judging quality of scholarship: multiple levels of assessment

Imprimatur and citation counts matter, but because of a high degree of consensus in the field, scholars can generally judge the quality of the work for themselves. A combination of these assessments informs a final tenure and promotion decisions.

The role of review committees

Similar to the biological sciences, economists serving on review committees claim to closely evaluate work themselves and may make exceptions regarding the publication status or venue. This close review occurs, in part, because there is sufficient understanding within this high-paradigm discipline.

> Tenure and promotion committees put more emphasis on the quality of the individual work rather than the quality of the journal, or on the quality of the editors of the journal rather than the venerability of the journal.

> There's one difference in economics compared to the rest of social sciences, and I don't know if this is the causal factor, but economics is much more close to sciences or to mathematics. They believe there's a right answer to things and they can all agree: "This is good work."…That's their view, that they're a science. And so they're *sui generis* in lots of ways. For example, basically, there's a national, almost ranked ordering of all the new Ph.D.'s coming out from around the country. There's agreement that "This is the top candidate" or "These are top five candidates."…When you have consensus, you can move a lot more easily on these things.

> When we are considering people for tenure or major promotions, we read the work very carefully ourselves. And, in economics, there's enough agreement about the paradigm that actually most of us can read other people's work reasonably well and have a view about it. I don't think that's true in every field. But nevertheless, we do put a lot of weight on where the final papers are published. I can think of some clear exceptions where we've said, "This piece is really good. It hasn't been yet accepted in the *AER,* but we don't care because we know it's really good."

> There is a correlation between the rank of the journal and the perceived impact, but it's not one and the same…I know of people, for example, who have multiple papers in the so-called top general-interest journals, and they would not be ranked as highly as some people with only field journal papers. In general there's a correlation, but the top people in the field, they make up their own minds. They do not make it up based upon just purely the rank of the journal.

One scholar offered a differing opinion about the ease of judging across subfields.

> There's a lot of specialization. So, if you do labor economics, you might find it hard to read work in public economics. When you do public economics, you might find it hard to read industrial organization and finance. And there aren't so many people that are really generalists across all these areas, so there's always a certain amount of reliance on experts to make these judgments.

Citation indices and impact factor

At research institutions, work that is cited frequently is paramount and, by all accounts, impact factors are closely watched in economics. While bibliometric data can inform the decision-making process for advancement in economics, it is acknowledged that these data are not without their problems, including being out of sync with the tenure clock. It often takes years to accurately gauge the importance of scholarly work using citation indices. A variety of sources said that the use of Google Scholar for tracking citations and their quality is becoming more commonplace.

> Ultimately citations are what are really important. It's unfortunate that that's true…It's very hard to break the barriers.

> There'll be some things that get a lot of citations because they're wrong, and they're sort of everybody's favorite straw man. And there are some gimmicky things that will generate quite a lot of citations, which doesn't indicate the quality of the intellect driving the train. And we're really looking for intellect.

> I think citation indices are great 10 years out. I actually do think you can tell, based on citations, often whether a 1995 paper was important, but it's very hard to tell whether a new paper matters…The other thing about citation indices is often…sometimes you have a paper that's great, that's great because it proves something, it's sort of the last word on the subject, because it does it better than everyone else. That paper's not going to get any cites, at least in other academic papers…It says "this is the best we can do." If you think about if you do a randomized controlled experiment, a field experiment in a wide range, then we know whether such-and-such a treatment works or not, and you don't need to do another experiment, so then you're not going to get that citation…It might be a very influential paper.

> I have used Google Scholar informally myself to evaluate scholarship quantitatively…I did a little analysis of *Theoretical Economics* when it was coming out. I wanted something that was more forward-looking than the impact factor, because it's several years' delay. So Google Scholar is something you can go in and you can count citations…but I don't view that as any more or less sensible than the other methods…There is certainly a lag, but it's not the built-in lag that the impact factor has.

On the other hand, specialized knowledge can minimize general impact on the discipline as a whole, resulting in few, if any citations, beyond self-citing.

> Research productivity is really, really skewed. There's a long tail of people who will write papers that will be relevant in some very narrow sense, but that don't have much impact. If you looked at the distributions of cites, the median paper has no cites other than self-cites.

Pre-tenure scholars

It is essential for pre-tenure scholars to get a head start on the publication process due to long lag times.

> Economic peer review takes forever…From 1980 to the present…the papers that are published, the time to get them published has doubled, and this has really created a crisis because we're on a six-year clock, right, the American Association of University Professors wants a six-year clock, and so we're on a six-year tenure clock. That is, you come in, we have to evaluate you in six years and make a decision—those are just the rules. Pretty much every university works this way. So the average time to publication is four years. That means that basically we're

> going to evaluate you on your output of your first two years because that's the only stuff that's actually going to be accepted by the time we have to make a decision.
>
> When I started out…I probably made a wrong decision. I had a very good paper. Someone at a second-tier, but a good, journal said to me, "I love your paper. I'll publish it in three months if you give it to me." And I said, "Fine." I should have sent it to the top journal in the field, in hindsight, because that probably would have made a difference then. As it turned out, it didn't stop my career.
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> And, of course, you hit the ground running hopefully coming out of graduate school with a set of papers from your thesis that are ready to go into this process…The best people—the very best people—already have maybe one publication in these really good journals.

Visibility in the field

Though a scholar's reputation is ultimately determined by the impact of publication record, non-peer-reviewed activities such as attending and presenting at conferences, sharing working papers, developing websites or blogs, and data curation can also be valuable ways of making a name for oneself. Review committees rely heavily on external letters of reference as arbiters of quality. These subjective measures combined with objective measures, such as impact factor and citation indices discussed above, help to provide a relatively comprehensive view of a scholar's work.

> What we care about is the opinion of leading scholars. It's the letters of reference, and we seek those letters from the best people we can get to write them, and they are looking in detail at the quality of the ideas, and their sense of their importance, and their role, and that's the gold standard. And we look at impact factors as a rough statistical indicator, as a way of forecasting what the letters of reference will say, and they're not, the statistics certainly aren't perfect…The impact factor has no formal role in evaluating scholarship.
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> For excellence in research, your number of publications is a big part of it, but also *how good* your publications are. How is quality measured? Well, it's measured in two ways. One is how many citations you have, which is a relatively hard number to get really high, given that it's such a short tenure clock and you have not much time to do it. And the other direction is to have your letter writers, your externals, know your research and like it. The only way to do that is to present it in front of them and have them know you…And that is part of signaling excellence in research.
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> During the tenure process, I think people read these letters very, very carefully to see what the evaluation is of top scholars, not just can you crank out papers with enough lines on the C.V.
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> People are just very, very critical in my field, and if you aren't being original, I think the letters would state that…One thing I like about the letter writing process is that people at the very top places, they like originality and a little bit of courage, and sometimes the journals don't always reward that…And the other way tenure and promotion happens…suppose I wanted to hire a labor economist…I would call up somebody who is generally regarded as one of the very top people in labor, and I would call up several of those folks and ask "Who are the top four or five young people who do not have tenure yet within labor?" And that will not be one-to-one with just lines on the C.V. weighed by journal quality. I get those types of phone calls pretty often and I want to see my field have good research in it, and being boring,

unoriginal, playing the game too hard, I don't view those as characteristics of a good researcher.

Working papers

Sharing well-developed in-progress scholarship may enable scholars to lay claim to ideas, generate feedback, and build reputation in their areas of expertise. Though not directly considered part of the tenure review process, working papers may be utilized by department chairs to determine a scholar's research and pending publication status, especially given the long lag times typical of the field.

> Well, in most fields in economics, I would say that if you'd look at the non-traditional publishing venues, like NBER, they have conferences, they have workshops, they have the working paper series, and all the young economists want to get their papers in that series, because then they'll get recognition from their peers, the publications will be widely available, and I would say the papers should eventually be published in peer-reviewed journals. But, in some sense, it's even more important than in most fields to get into that venue because the working papers get out within a few months of being written, whereas published materials get out a year or two later. We have very long, ridiculously, in my opinion, overly long publishing delays. For most young people now…there's a huge value to getting your work out early. If you've got a publication delay of one year or, in some cases, two years, and you've got a time to tenure of six years, then getting papers read immediately is far, far better than having them in peer-reviewed journals. I think a lot of people build their reputation on the working paper articles, and then eventually they'll publish. That's this final seal of approval, but even before that getting things out in informal circuits is really important.
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> SSRN is really effective. It's a great mechanism. And it's not a substitution for publication when it comes to things like tenure, because it's not reviewed in any way. But it is a really good method of scholarly communication…I don't have to wait until my article comes out for people to know that I've worked on something and made a contribution. It's out there in the market.
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> This is kind of significant: I don't recall a tenure case, either internally when I was department chair or on various departmental committees, that did not include significant amounts of unpublished but circulated work.
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> The effect of a given publication on your career, if you're older, is, of course, smaller, simply in the numbers. It's one over N instead of one over 5. And if you basically want to get it out there and go on to the next thing, you publish it someplace perfectly okay and you go on to the next thing, and you put it up on your website. If you're a junior faculty member, and you're still trying to get established, if you publish something in a conference line or put it up on a website, or publish it at a second-tier journal, it's not doing the heavy lifting for you that you want it to do if you think it's good. So I think that one advises one's junior colleagues rather differently and they behave rather differently than people who are already established. And I've known very senior, very distinguished people who've essentially stopped publishing in refereed journals because…it takes a long time to get published in a refereed journal. You don't need to, so you put it some place where you can be done and go on to the next project and spend less energy worrying about publication and worrying about keeping the thing secret and all of the things that you might have to do.
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> For me, the actual publication of the work is still important because it helps build up your credentials, but it's not that vital. For someone younger, it's crucial.

Conferences

Giving papers and attending conferences does indirectly affect tenure decisions by potentially increasing a scholar's visibility and reputation in the field. For pre-tenure scholars, in particular, making a name in this way may be reflected in the external letters of reference that review committees rely upon.

> There are going to be letters of reference from outsiders, who comment on a young faculty member's work, and the judgments in those letters are of critical importance in promotion decisions. And some of those will be people who are suggested by the faculty member, but others are chosen by the department. So a person who establishes a reputation by going to lots of conferences and interacting with lots of people is more likely to be attuned to what's going on in their narrow subfield, and to come to the attention of scholars who are likely to be writing letters about them, and so conference participation is quite important.

> Conferences…I found, at least personally, going through that process, to be very important. People know who you are and what you're known for, so that when you go up for tenure, and people are asked to write letters about you, they know you. I needed to do that to establish myself. I've now kind of taken off and gone off in many different fields, but conferences play a big role in people seeing you…They're not going to read all these papers, so if they can see you and they see what you're doing, then they have an image of this person when they have to write a letter for you…Conferences very much add to your visibility. If you're not involved with that, you are at a disadvantage.

The importance of extramural funding

Although securing grants is not crucial for gaining tenure in economics, this activity is largely subfield-dependent and may be more important in those specialized areas that rely on large data sets or surveys.

E1.2 Evaluating Other Scholarly Genres

Economists are sometimes perceived as more innovative in publication behavior than scholars in many other social science disciplines because of their reliance on working papers. Economists are experimenting to some degree with online-only journals, curation and publication of electronic data sets, and blogs. Uptake of non-traditional archival publication outlets, however, may still be hampered by the larger academic culture in which more established scholars expect junior scholars to go through the same rigorous advancement process they did.

> I would say the advancement process enormously hinders publishing in newer outlets, and probably more than is justified. There's a reason that we look to publications and venerable venues, but I think it's overemphasized.

New, online-only journals

Some scholars noted that new online-only journals do not hold the same value as their print-based counterparts for two reasons: that they're online and that they are new and have not yet established prestige. One administrator we interviewed suggested that the historical reliance on journal imprimatur by reviewers, who often do not have the time to measure the quality of work in other ways, may be too much of a crutch. Although journal venue is an important way to

judge the value of the publication, one senior scholar noted that it is important for evaluators to still make a careful independent judgment of the quality of the work within.

> It's clear to everyone that new publication venues don't hold the same value. The question is whether they should. And I guess no one I know thinks that they should hold the same value, but there are people who argue that we're too slanted toward guessing that an article is good because it's in a venerable publication and not paying much attention to whether the article is, in fact, good. But, certainly, there is some information value from the place it was published, and so it would be foolish to completely ignore that, and unrealistic. But I would say that I, and many others, think that we are too concerned about that without actually paying attention to what the article says and whether it has merit.
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> Everyone has a fear that if they publish in a newer outlet, whether it's a new form or not, that it won't be as recognized or won't be as read. Those are two different things—being recognized and being read. You can publish an article in *Econometrica,* which is the most prestigious journal in economics. And I published several, and there's no guarantee that anyone will read it, but it will be well recognized, which is an important thing to have done.
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> New assistant professors by and large are not sending papers to *Theoretical Economics* [a new journal], but most of the established people are actually sending papers there first…One of my junior colleagues did, in fact, send a paper to *Theoretical Economics,* which was published there, and that was fine because s/he was actually pretty comfortable having enough papers to get tenure. But mostly you can't do that…We might be perfectly able to evaluate the paper itself, but then it's going to go out to outside reviews, and the outside reviewers, who write letters about the promotion, may or may not know how good this journal is. We have no way of knowing whether all the outside reviewers are going to realize that this relatively young journal is quite high quality. Then, in addition, once that happens, it then goes to the dean, and the dean says, "I've never heard of this journal. I'm not going to count it." That's completely out of our control. So I always advise somebody who is not yet tenured to go for the safe choice.
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> I think now, in many fields, people still have an assumption that if it's only published electronically, then it's not first-rate, and that anything that's truly first-rate can find a conventional publication channel and should.
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> I think online publications can be evaluated the same way anything else is. There's nothing magical about being on paper, but you've got to figure out whether the journal is good…You need categories, so that somebody has vouched for the quality of a given paper.
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> One of the challenges for new publication outlets is that in the start-up phase, they're just going to be hungry for content. And so you worry that a start-up fledgling entity is going to basically publish anything they can get their hands on, as opposed to having an effective screen or quality control mechanism. And that's a big barrier to entry, it seems to me.
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> There might be a cause to either encourage the creation of online journals or discourage the creation of online journals, but I don't think that's any reason to alter the reward structure for people who are trying to be academics. I think you've got to figure out the same thing we've always tried to figure out—which is "How good is the stuff they've done? How good is the stuff they're going to do in the future?—and on that basis, make decisions.

Pushing the envelope

Junior scholars are often encouraged to meet traditional expectations before pursuing activities that are generally considered to be outside the realm of core research. As a result, pushing the envelope in economics publishing is constrained by reluctance to publish in newer publication outlets among junior scholars who fear jeopardizing their tenure chances.

> The impact of any new form of communication is severely limited by the fact that lots of people are scared to publish in the new form, because they think they won't be respected or won't get tenure, or a variety of things like that. And, also, they're limited by the fact that starting anything new is very…very hard and time-consuming. So I don't think that open access journals have come close to changing the world…they haven't revolutionized the world. It would be too much expect that, in three years, any world would be revolutionized.

> People are concerned that these alternatives may not be credited by the scholarly community as having as much value as things that are published in traditional form. I think that some of the faculty here are worried, for example, about the reaction of the central personnel process to electronic publications, even though some of the electronic publications are peer reviewed in a fashion that's every bit as strong, and often stronger, than is the case in traditional publications. So I think that there's some resistance to that.

It was suggested that easing slowly into newer modes of publication might be the most palatable option both for nervous pre-tenure scholars and their senior counterparts reviewing cases.

> It's very hard to say that we should be more supportive of new forms of communication. I think we should be somewhat supportive. No, let's say it another way around. It's easy to say that. I think it's much harder to actually do it, because the people who are making the judgments are people who've been through the process. They've published their papers in the traditional journals, and now along comes this upstart and they kind of sidestep some of this stuff. Well, it's going to be hard to get them to recognize the value of these things, which is why I suggest the mixed strategy, because then you could say, "Well, so and so, who's coming up for tenure, he did the same thing you did, got over those hurdles, and he did these other things too." So then that'll be much more palatable, I think…It's not going to be an abrupt change. It's going to be a slow process.

> Establishing the ability to produce high quality replicable reviewed scholarship in a field is exactly what young people ought to be doing. So I would expect that the system will continue to want them to have done that. These marvelous additions that the Web 2.0 world permits of making work more accessible, more comment-able upon, etc., might contribute to that, might be part of that, but they're never going to substitute for it. The one place where you might get some action is: you put stuff out on your blog, you allow people to comment on it, you create a working paper, and you learn something about your field that way. That's fun and that's cool and that might be good, and it's not inconsistent with producing the kind of scholarship that you need to establish yourself in a career. But it seems unlikely to me that it's ever going to replace the production of new replicable results, which in the sciences and social sciences is essential.

Data curation, data sets

In economics, generating one's own data is an important task for scholars in some subfields, but the scholars we interviewed had little to say about whether or not data was a valued aspect of the advancement process (beyond anchoring analytical publication in standard outlets).

> Oh yes, definitely. Personally generated data are an important part of your portfolio. That's my job as an experimentalist to do that.

Blogs

Blogging activities would not advance a tenure case and might detract from it, particularly for untenured scholars. On the other hand, such activities could be beneficial to more established scholars. One high-level administrator suggested that a change in perspective may be on the horizon.

> Blogging is not considered for promotion. Getting ahead in the field really depends on core research and core publication, and blogging is probably distracting. So my advice would be: This is something that you shouldn't do until you're (a) tenured, and (b) over 40 or something. On the other hand, take Brad DeLong. Brad's got this blog and is very interested in policy, and he's a very bright guy. He's still a terrific scholar and I admire personally what Brad does. But I don't think he was doing that when he was 30. I don't know for sure, but I'm pretty sure he wasn't. So it may be related to age.
>
> A blog might be something you want to do. It might help you with your work, it might get ideas out there that other people respond to, but I think that having a successful blog would count for next to nothing in a tenure case. Whereas having a successful blog at the level of Brad DeLong or Juan Cole at Michigan (who blogs on Iraq and security issues and in the Middle East) is part of a record that makes you a distinguished university professor, but there's this sort of age-appropriateness to that.

E1.3 Teaching and Service

While teaching is an activity expected for advancement, it is not imperative that faculty at research institutions excel in this area. Writing a textbook only benefits scholars trying to distinguish themselves in teaching, but producing a textbook can work against a scholar in the tenure and promotion process at top research universities.

> The most important thing that young scholars can do is learn their field and demonstrate their ability to make contributions to it. Still, you now have to produce at least a competent teaching record. And I tend to think that young faculty will teach better in areas that relate to their work and are interesting to them. So I probably wouldn't tell young scholars to stay away from thinking about pedagogy as much as others might.
>
> A colleague of mine was working on a textbook and came up for review. They said that s/he shouldn't spend so much time on outside activities, including the textbook writing. They said they wouldn't hold it against him/her, but that this scholar should not do it…Actually, my promotion went through very easily based on other work, but no one had read my textbook…I guess that's about right. I think it's a good book, but the fact that I wrote a good textbook isn't what should get me tenured at a competitive research university. I would say that it ought to count a little bit…it ought to be seen as a plus because teaching does matter and it's really part of the pedagogy…I was a little irritated that they didn't say, "Hey, he actually knows how to communicate well enough to write a good book." But I wasn't surprised. If I were at a second-tier school, it would be very different there. It would be counted.
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> To get excellence in teaching, you basically have to write a textbook that's widely used, so it's not possible, as a junior person, to do that…I know one person at our school who's done that and who is truly an excellent teacher…S/he had influence beyond just the school itself, which

> is the point. So, most of us go off on the research side. Now, in a business school, competence in teaching is probably a higher threshold than in a lot of other departments in the university. So you still have to be a decent teacher. You don't have to be an excellent teacher, you don't have to win teaching awards. But you can't be an embarrassment to put up in front of the class.

As in other disciplines, service is an expected part of the tenure and promotion triad, though the economists we interviewed did not discuss this topic to any great extent.

2. CHALLENGES AND OPPORTUNITIES FOR DISSEMINATING RESEARCH: WHAT ARE YOUR CRITERIA FOR CHOOSING A MEDIUM?

Economists take several criteria into consideration when choosing where to publish; robust peer review, prestige of outlet, and audience are all highly valued. The field is characterized by an exceedingly long lag time to final publication in the premier journals. Therefore, not surprisingly, speed to publication is a primary concern for many. Informal publication mechanisms to share working papers, either through repositories or on personal websites, have emerged as a key means to disseminate well-developed research results in a timely manner. Though economics as a whole relies on a small set of (mostly society-based) prestigious and relatively affordable journals for dissemination, a fair number of journals are produced by commercial publishers and are considered to be exorbitantly priced. This has resulted in some experimentation with various models of electronic dissemination and open access or quasi-open-access outlets. The success of some of these early efforts has met with mixed reviews, which is not surprising given conservative and highly competitive tenure and promotion practices as well as the difficulty of launching new journals.

E2.1 Criteria for Choosing a Publication Outlet: Prestige, Peer Review, Audience, Speed

Publication in highly selective archival journals is essential for economists at the most competitive institutions. These journals signify both prestige and reach, and typically maintain the most stringent peer review processes. As in most other disciplines, stature and selectivity are the crucial criteria for selecting a publication outlet in economics, particularly for pre-tenure scholars.

> One of the things that's happened in the economics profession, and I understand this to be pretty unusual among other disciplines: we're dominated by this really small set of journals that then have a huge influence…So that's something that makes our profession much harder because there are these journals that wield a much larger influence than anything else.

> I suppose it's important to publish lots of articles in the top journals, probably irrespective of what they say and whether they're any good, or whether they're read. It's mainly publishing in the top journals.

> The journals are sort of a certification process at some level, imperfect as they may be, so the placement of a paper can be a signal to some old guys who are outside of the field who aren't as up to speed on issues of quality. So think of it this way: suppose you were beyond your research prime, you're a full professor, you need to make a decision about whom to tenure. You're terribly busy, you don't have time to read everything in every journal, so you need to make a decision based upon the best cues that you can, and this includes listening carefully to

> the letters, as well as looking at the journal quality…So, the ultimate placement in journals…seems to be more of a certification thing. By the time it's there, people have known about it for quite some time.

A small set of disciplinary journals with particularly low acceptance rates cover the entire field, and are generally published by scholarly societies. The second tier of journals is often run by commercial presses such as Elsevier. There are also top journals in each specialized subfield, which are also desirable publication outlets and, when combined with publishing in broad-spectrum journals, can be a good strategy for disseminating a body of work.

> The top general interest journals, the *American Economic Journal*, Journal of *Political Economy*, *International Economic Review*, it goes down from there. There are publications that rank journals. Field journals…would be *Journal of Labor Economics*.

> In economics, the society journals are the single most prestigious. So those are the *AER, Econometrica*, *Journal for Political Economy*. The next tier down of prestigious journals is largely owned by Elsevier and by a few others.

> So the leading journal in my field is the *Journal of Economic Theory.* This, if I can't get a paper in *Econometrica,* this is number two. It is the leading field journal in my area, and I publish more papers there than in any other journal.

> Well, the first stage is journal outlet, right? In marketing, there are somewhere between three and five journals that would count. It depends on whom you talk to. As long as you have one of the top ones, you probably have room for one in the fourth one. So, within marketing, there's that. And then in economics, from the point of view of the marketing department, there are probably another eight journals that would count.

While prestige holds the most weight, the long delay for final publication may encourage economists to publish in a variety of venues to reach their target audience. Finding the right fit is important, especially for junior scholars who depend on prestige and the timeliness of a publication. As one scholar summarized, "You want to balance your chances for publication, for getting accepted and getting the work out, and the prestige of the journal." The established scholars we interviewed recommended strategies for navigating the existing publication process.

> What I advise my students to do is to pursue a mixed strategy, to…aim for some of the traditional high-quality, highly-recognized print journals like the *American Economic Review* and *Quarterly Journal of Economics*, and *Rand*, and the *Journal of Political Economics,* and so on. So that would be the first thing is to make sure you have some papers there. But then, also, I think it's fine to submit papers to some non-traditional journals, partly because they've become often much more accessible. If you have a non-traditional journal that's not very accessible, then I wouldn't really recommend it. But there is a bit of a trade-off between getting through these long, drawn-out, and slow-moving processes for the top journals, so if you put all your eggs in that basket, well, you may or may not succeed, but it's still worth a shot for some of your eggs, if you want to put some of your other eggs into the new forms of communication. So that's what I would recommend people do.

> It's very much a matter of judgment about the quality of the work produced by my students, so it's a matter of finding a match. If you try to aim too high, you get delays that are costly. Aim too low and you're discounting your work, so it's a matter of finding the right match.

> The publication process is slow, especially economics…One paper, which was relatively quick for that journal, from submission to acceptance, was still over two years. In the marketing world, it's usually faster in the sense that turnaround is about three months where economics are going to be six months to six to twelve months…But, even then, the marketing paper, from submission to acceptance, was actually four and a half years. It went through several rounds. So time to acceptance matters, but, really, what I look for is the right outlet for that paper in terms of potential impact. If I think a paper is going to get into the *American Economic Review,* I don't really care if it takes an extra year. Yes, exactly, you're going to have a bigger and more prestigious audience. If I think a paper is particularly suited to an international economics crowd, I'm not going to try to send it to a management journal because it's faster…The journals are generally specialized enough that that means there are one or two journals to send it to anyway.
>
> I look at the editorial board. If you have somebody who is knowledgeable about your field, who actually wants published papers, who isn't slow in turning around manuscripts, I may be more likely to send a paper there. And I try to match the paper to the journals in terms of their rankings. Your first journal, you may just shoot a little high, you may get rejected, but sometimes you get lucky, too. So I look a lot at editorial boards from the webpage…There's a managing editor who will give it to an editor. That editor will ask an associate editor to be a referee, and I try to go backward and duck through that process…Acceptance rates at our journals are around nine percent at the very top ones. It's like trying to get into Harvard…and it's going to cost you a bunch of time. So, I try to ask myself, who will be editing that paper and who will be reviewing that paper at this journal. From the statement of who the editorial board is, I can assess that. In fact, sometimes I will tweak my papers so it will go from one editor to another…After I learned how to do this a little bit better, I learned how to play the game, your papers have a much better experience at the journal.

Publishing in new and emerging fields

Publishing in journals located in other disciplines can be problematic for scholars with research interests spanning fields. One scholar saw online publication outlets (or publishing in the general-interest science journals such as *Science* and *Nature*) as a way to bridge this gap.

> I don't know how to judge these other places, how they'd be receptive to a different way of thinking. I just thought about going to a sociology journal, but I don't know the customs, the traditions, of that field, in order to speak their language, which is kind of depressing. But likewise I'm not sure that if they submitted to a journal that I would referee, that I could recognize what they're getting at right away. And that's a big challenge. I definitely am open to it. Now that I have my tenure and my promotion, I'm willing to try any of these places and these outlets. It's just a matter of learning their language.
>
> Well, sure, I've used newer communication and publication outlets, but not so much in my straight economics writing, because I've been doing a lot of work, interdisciplinary work, in information economics. And some of the things that I've written are quite appropriate for an interdisciplinary audience, but not really a straight economics audience. So, for these works that are inter-disciplinary in nature, I've often used online publications…I've published through those a couple of times.
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> That's why we focus primarily on the general science journals. Having said that, now we've started to write for economics journals to start speaking to that population, but my view is that the work we do is so transdisciplinary that we ask, of the 13 camps we might speak to, "Which camp is going to be the most excited about this? Will it be neuroscientists, will it be a

> general science audience? Will it be philosophers, will it be theologians? Will it be psychologists?" I think that's the way we choose.

For those scholars in new fields, finding an appropriate audience can be a challenge. Early feedback from colleagues can help a scholar predict the types of questions subsequently asked by reviewers in the official peer review process.

> I always recommend that whatever you're interested in, just do it…Some people are very strategic about what projects they work on. They say, "This can be placed here, this can placed there…" If you do good work, even if you have to fight battles and you get reluctant referees in journals, if you're really invested in it, and you find that to be the really interesting question, you'll just keep working harder to sell your message. Well, it sounds kind of stereotypical, kind of clichéd advice. If you actually follow it, it's not. Because it's tough…When you get back these reports dismissing what you're doing because they don't recognize it as new, you can get pretty beaten down. And young people, if you have that tenure clock running…But, at the same time, you have to know who your audience is, and that's the hardest part. You have to know that your audience is going to have this objection, so then you write it, keeping that in mind to assuage all of those fears. It might not work, but you'll have a much better product if you do that…That's where conferences become important, because you get feedback, you get those questions in a very informal, light way. And then you can work with that.

Established scholars exercise more flexibility

While prestigious outlets are highly desired among scholars during all career stages, tenured scholars may no longer be invested to the same extent as pre-tenure scholars in continuing to build their reputation. Some established faculty not constrained by rigid publication practices aimed at building reputation may seek instead outlets most appropriate to their target audience or other goals, regardless of prestige or peer review.

> I'm sort of the senior person in my field and so I don't really care too much about publication. I'd like my writing to be accessible to a variety of people, and that's more important to me than publishing in a very high-prestige journal, so it's not much of a concern. If I were younger and trying to build a career and reputation, then I think I would tend to be much more conservative in my choices.

> As you get older, if you're like me, your interests become a little more applied, you're more interested in policy. I'm really much more concerned with the impact and import of the paper and a little less concerned with getting all the bells and whistles…With my last paper, the editor was very bright, but didn't have very much perspective in my opinion. But, the editor got the paper through and it's a good paper and I'm pretty happy about it. But thinking about the next step, do I really want to go through this again or should I publish this paper in an edited volume where I have much more control? Well, as you get older, you tend to take that route more often.

> I'm as established as I feel I need to be, so I'm more interested in writing things I want to write, and putting them in places where people can find them if they want to. But, clearly, when I was looking for tenure, I tried to always publish in the top journals if I could. And now I don't always do that, but sometimes I do that.

> Some research right now suggests that at least tenured faculty, and the faculty at the best institutions, are beginning to move away from the traditional platforms for attention. And that

> is to say, they're more interested in getting their papers out there and drawing attention to them, even if it's only the papers and proceedings, like the *AER* has papers and proceedings. I think this is based on some kind of informal surveys…but they care less about getting traditional papers published in traditional platforms and prefer stuff that's faster, like papers and proceedings, and that has more eyeballs looking at it.
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> Some people slow down when they get to be my age…And I'm sure older people certainly have broader latitude…not investing in building a reputation in the discipline to make themselves marketable.

Only one senior scholar we interviewed advises students to distribute work widely by posting on the Web in tandem with traditional publication, though pre-tenure scholars are often reluctant to do so.

> Almost all of my articles are available by the Web and they get much more attention and citation than the physical print copy. I've had some things that I've published in books or conference volumes, and they're really hard to access, and also we've put up the preprint version on the Web and it would have hundreds of times the access of the print version…But I need to emphasize this is, in part, because…I already have a recognized reputation. Even so, I think for young people in my field, they should absolutely make sure that they can make all of their writing available on the Web…I advise younger scholars to be a little more risk-taking in their publication practices, but they don't listen to me. I had a paper with one of my students that I thought was a pretty good paper, and I said, 'Well, let's publish it in this journal and have this available online.' And he was not interested in doing that. He wanted to publish it in a more prestigious, traditional journal.

E2.2 Perceptions of the Publishing Environment

Peer review and editorial quality

As we found in other disciplines, peer review is the coin of the realm and the process is perceived as generally effective, if not efficient, in economics. Although working papers coexist with archival journal articles in economics, the latter are distinguished by the level of peer review they undergo.

> I have to say that it's still a good process even though it's unpleasant at times. The refereeing process, overall, is a good thing. Every year I find the process more painful, and I keep saying that some year I'm going to stop publishing in refereed journals…But, I'm always going to go through to the final peer review process, because it still does matter, and, for me, at least, it finalizes it. It gets it out there in a final form that everyone can accept. But it's not that important for me because my reputation is already established.

Perspectives on editors, editorial quality, editorial environment

Navigating the editorial process is especially difficult in economics because long lag times, in particular, can discourage unseasoned scholars and can inhibit originality.

> When I talk to younger people, I always encourage them to be patient. I've had young people come to me with a referee's report in economics and they were really depressed…and I said, "Excuse me, this is a great review, you don't understand. Actually, this is about as good as it gets…They're saying they're happy to consider a revision. No editor who's doing their job says that unless they think this thing is publishable."…So the one thing that has to be done—and

> we do this in the department—is give the young people the right encouragement because it's a tough process. We've got a lot of very bright young people…It's very tough and competitive and they have to understand how the process works. I've gotten a number of papers published over the years just by patience and persistence, just by continuing to write letters to the editor, explaining what's going on. And, usually, most editors are pretty reasonable people.
>
> I'll tell you what happens to a lot of people. They get discouraged as hell. They go through the submission process, they get their papers rejected, even though they're pretty reasonable papers. All this stuff is a little field-specific; in some fields there's so much mass…and more agreement about what constitutes good work. But in some fields, people are competing over ideas and then they say, "Oh, let's just pick the best possible journal and send it there," and then they keep getting rejected, rejected, rejected. I tell them, in private tones, for example, there's one journal right now that's a top five journal, "Don't send your paper there because there's no editor in your field. He's going to send it to this one guy. I like his research, but he will give you a hard time…I know because I've refereed his papers, he's refereed mine…He's not going to like your paper. Go send it over to this one." This will be the editor that gets it—this will be the associate editor; at least they'll give you a fair shot. Because this one journal, they might take you through three years, maybe four years, three, four rounds on the paper, and kick it out at the end of that time.
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> I am currently trying to bring another discipline into understanding economics and the results we're seeing, and I am getting a huge pushback. The editor one of the major journals said, "Well, there's nothing empirical in this," but I said, "I know, but I'm looking at how we think about what we see in our empirics, and this is very important." So, at least from my perspective, that's been frustrating. It's just a challenge for me to improve the quality of what I'm doing in order to reach that audience. But to be successful right now, if you're a junior person trying to get tenure, you have…being innovative in that sense is probably not going to be helpful, you're going to have to publish just like the standard has been.

Concerns about the review process

Though, overall, the economists we interviewed found great value in peer review, they also perceived long lag times as detrimental to the review process. Some scholars also complained of reviewers writing shoddy reviews and feeling overburdened by the sheer volume of requests to review.

> I would say peer review has both deteriorated and improved in my field. The deterioration is that in the last 10 and 20 years, the time it takes to get an article reviewed has gone from months to over a year. And there are several rounds of that, so it can easily take five or more years to publish a paper in economics in a good journal.
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> I think it's deteriorated, primarily because it's gotten much more slow. And part of the problem there is because there have been a lot of journals, new journals, that are niche journals. And I'm getting these requests for refereeing from journals I've never heard of, and I think the people are just getting somewhat overwhelmed with these chores.
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> I got to know some people who did strikingly shoddy work. It actually changed my view of who they were, because I thought, "I read this article. How could they write such a superficial review?" But I would say more people than not are very responsible and do good work, so the system works out. What I learned as an editor is I just stopped writing to people who did shoddy work, and the rest of the profession bore the brunt of that…The correlation between

> who is reliable and good and what schools they're at wasn't that high. There are terrific people at second-tier schools, and people at the top schools who aren't.

Changing traditional peer review: A new metric of quality?

Some of the scholars we interviewed envisioned new forms of or venues for peer review, particularly as economists begin to embrace new (especially online) outlets for their scholarship. Some scholars envisioned a future in which quality publishers will create all-electronic offshoots of journals, but the certification aspect of peer review will be preserved. Other suggestions ranged from download counts to blog comments.[77]

> The print published version plays this role…of being the formal publication of record. I don't think that's an equilibrium, so I think that some day—but I would've thought it would've happened more by now than it has—but five years from now—10, certainly 20—there will still be mechanisms of some kind of formal peer review somehow. I'm not quite sure what they're going to look like. There will still be copies of record of things because the bibliographers need that, but I don't think that printed journals will be of any consequence at all.

> SSRN keeps track of how many downloads you get, and actually, one of Glenn Ellison's claims, which I do not believe, is that we're moving away from the traditional publication outlet toward just evaluating things on SSRN, and my view about it is, if that's true, it's only at that university, it's just not happening anywhere else. I don't even believe it's happening there…but what I can tell you is definitely true is this: if you get a paper in the top 10 downloads, you're going to get offers to publish. And when I say a bunch, I got five offers on one of mine. The day it breached the top 10—I guess some journals are checking the top 10 downloads—I got offers to publish, and this is without peer review. That is to say, they're viewing downloads on SSRN as a self-sufficient peer review. Which I think is kind of psychotic because this could be downloaded, and then what happens next is the people who download it say, "What a crock this paper is." It's got a great title, that's what's going to get it downloaded, so this is a really terrible way of choosing your journal. And not surprisingly, 100 percent of those efforts come from for-profit journals. They're just trying to fill the journal, right? That's their goal.

In the future, a scenario is envisioned whereby post-publication peer review will be conducted by the community (the *PLoS ONE* model*).*

> This paper published in *PLoS ONE* garnered a lot of attention, from tons of people. They have a blog now where you can make comments on it, you can reply back to people, and it's a much better way of publishing. In fact, I think that…the future is going to be perhaps not refereeing at all or very light refereeing, and let the whole community write things, post it, and let people just write papers. Why have two or three graybeards deciding what's good or bad? Let the whole community decide, and I think in the natural sciences there's more of a sense of, "If it meets the minimum standard, we'll publish it." Let the journal decide, we'll let the citations decide what's good and what's not good. So the next step is to just have people write papers themselves, read it, rank it, make comments, generate discussion. I think that it decentralizes the power…like *PNAS* [*Proceedings of the National Academy of Sciences*], like the academy members, *PNAS* has decentralized, but the academy members have this special outlet and they can identify papers and that's just crap to me. It's a very hierarchical, old fashioned, top-down system, which just isn't good for anybody in science, except for those 300 academy members and their friends.

[77] Google is also working on an online peer review tool that could open up the review process to a wider audience. See GPeerReview project page at: http://code.google.com/p/gpeerreview/

> The advantage of these new things is you don't have just one or two people reviewing your paper. Maybe there are two referees. You have the possibility of hundreds of people reviewing or dozens of people reviewing your paper. And if a paper is getting a lot of attention, a lot of downloads, a lot of comments are coming back in from good people, the benefit is that the communication, the two-way communication, is much more robust. Now, instead of having comments from the people I've sent the paper to, from the referees, from seminars where I've presented it, I can get comments from all kinds of people, people I don't necessarily know, and I can learn a lot, I can get a lot of different perspectives. So the feedback is a lot greater. The other thing is that way if something comes back from a referee that doesn't understand the paper, you can go back to the editor and say, "Look, you ought to really look at the online reviews of this paper. I should forward you the emails and the comments I've gotten, and you should look at the number of downloads and the number of times this paper is being cited, because your referee missed an important paper here." Okay, so there's more of a market process that's brought in to validating the research and to responding to the research, and I think that's a very healthy thing.

The problem of speed and long lag time to archival publication

The exceptionally long lag time to publication is an overriding concern for economists when discussing the dissemination of their research.[78] The problem drives much of the observed publishing behavior in the field. In economics journals, there can often be a year between submission and acceptance, and as long as two to four years between submission and final publication (although lag times as long as six years were noted). Sole submission (submission to only one journal at a time), multiple rounds of revisions, and unresponsive reviewers can all contribute to the delay.

> The number of rounds has gone up, has doubled…so, in other words, you send your paper in and they say they're interested in this paper. "If you make changes A, B, C, D, E, F, G, H, I, J, we'll consider it again." And then you make all those changes and you send it back and they say, "Well, cool, except that we've got 10 more changes for you." You make those 10 more changes, and they say, "Great, but we've got five more for you." My record is six years start to finish, but typically three or four years later they may finally say, "Okay, well, I guess we'll publish it."
>
> In economics, the process can be very slow…and you might get rejected. Everyone gets rejected, no matter how good they are, some of the time. But, even if you get an encouraging reply, then you're going through rounds of iteration. It could take a couple years. And that's a good result.
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> Assuming that you can get enough quality papers written…first of all, you expect to have revise and resubmit, but, at a minimum, they will come back six or seven months after you submit the paper and they'll tell you whether it's adequate. Then, depending on how much work you have to do, you have to revise the paper and maybe you'll hear back again in six months. So there are the initial six months and then there's a revision maybe that's going to take six months of work and then another six months to hear back from them, and maybe they'll say "yes" or "no." So, this begins to look like two years.
>
> It can take two years for a piece of work to appear, and the obstacle is in the way that we do the process. You submit to one journal at a time. They send it out to a referee. Eventually, the referee gets the report in, always much later than planned. Then the editorial board decides

[78] See, for instance, Ellison, Glenn. 2002. The Slowdown of the Economics Publishing Process. *Journal of Political Economy* 110, no. 5: 947-993. http://econ-www.mit.edu/files/888

> what to do with your piece. Sometimes it's a revise and resubmit—so there's more revision and then you resubmit it, and you go through the process again. Other times, it's a rejection, and then you just have to start again with a new journal; or it's an acceptance, but you have editorial suggestions, and then there are several months until it actually appears. So it's a one- to two-year process in the professional, refereed journals.
>
> More and more of economics is elaborate empirical economics. And in elaborate empirical economics, there's always one more thing you can try. So I have a paper that got published…somewhere between a first- and second-tier field journal. It's not one of the top general journals, but…it's a very respectable place to publish.…They put us through so much crap getting the thing done, and the referee would say, "Why don't you try this?" And it turns out that was hard to do. Then you'd send it back and they thought of something else that we might try. And there was probably a year-and-a-half of iteration of fairly small stuff before actually we finally said, "This is kind of it. This other stuff is beyond our scope, blah, blah, blah." The editor accepted the paper. It was fine. And I wouldn't have put up with it. I would've gone off and published it somewhere else, but my coauthor wanted to get tenure, and did. S/he needed that publication, and it had to be in a refereed journal. But I do think that over the last three or four decades, there has been an evolution. We have more and more empirical papers. There are more and more ways you can quibble, rerun the data, and referees are just asking for more. I don't know if that is structural or just something else that's going on. There's competition for top jobs in top universities—the number of people, the number of publications, none of that's changed all that much. It's hard to get into the AER, and it's hard to get tenure at the top-tier schools. It always has been.
>
> Sometime in the 1990s the lag time expanded by about a year, and that transformation happened quite quickly. So it's now about three years, and it used to be two, or something like that.
>
> In industrial organization, I've had papers take anywhere from two to four years to get published.

Special concerns for emerging or highly specialized subfields

Emerging or interdisciplinary subfields may also experience difficulties with lag times, though this may be partly due to a lack of reviewers with sufficient expertise. One scholar explains how early scholars in one new field avoided publishing in economics journals and opted instead for more general science publications.

> The time to get a paper in press, in an economics journal, probably averages a year and a half, so it's a very slow process…When it comes to the foundational papers, for which a bunch of other people may have the same ideas, you can't wait that long…So when we started, there were two problems. One is we couldn't wait that long because you would lose your competitive advantage if you waited two years to get a paper out, number one. And number two, economists were hostile. And perhaps number three, there really weren't economists who could referee these articles. Very explicitly, a couple others and I said, "We're going to send this to the best general science journals we can, we'll get fast turnaround." This is a new hybrid of natural science and social science, and we were thinking explicitly about doing projects that will excite both camps, so that people in both fields should go, "Oh, wow, I really learned something important and new in this intersection between fields."
>
> It probably took us two and a half to three years to get through the publication process, and it was accepted, not rejected. The referees took six or eight months to respond. The referees liked the article a lot, but the editor—this is typical now—is a very young, hotshot theory

> person…Our paper had a mix of theory and applied work, and this editor said, "The referees liked the paper. I'd really like to publish it, but I don't think you've got the theory right, so I want you to do all the following things…" And half of what the editor wanted us to do, we didn't think we ought to do. It wasn't wrong; we just thought the editor was evolving the paper into something different, but we didn't have a choice. So, eventually, a year and a half later, the paper's going to come out and it's a good paper, and the editor probably improved it, although not in the ways I would have preferred, but I stuck with it…So we had a happy outcome and it's a good journal, and the paper will be a nice paper, and I'm very glad about it, but boy, was it painful.

Exceptions to long lag times

Long lag time is not a problem for all journals and lead times can vary, even in the prestigious economics journals. General science journals (where behavioral and neuroeconomists might choose to publish), in particular, have very short turnaround times.

> Publishing papers, it varies by field…I would say, in my field, papers take anywhere from two to four years to get published…I've published over 20 so far, and I've probably got another seven or eight sitting at journals right now.

> I've had the whole gamut. My best-placed paper was submitted, accepted, and after revision a couple months later, resubmitted, and is appearing in print this month, just over a year after submission. That's very quick for a top journal…I submitted another paper over two years ago, and it was just accepted yesterday. If I'm lucky, it will probably appear in another 18 months…That second paper involved two revisions, one bigger one and then a really small minor revision after that…I will think very long and hard before sending another one to that journal…So, it can be very quick or very slow. To me, that first, top journal was amazing…The paper was accepted, then they got the proofs, and the whole thing was very quick, a very short turnaround.

> Mine is a new enough field, in which there's more of an acceptance of novelty and the value of novelty, and you certainly see economists now publishing in *Science* and *Nature*…Things like the online journal, Public Library of Science One…It's very, very fast…and they do the same thing *Science* and *Nature* do, which is they do a press release. And all the funders I have like the press reports around the research as well, so I think the general science journals are much better at embargoing papers and then doing a splash, when things appear to be big.

Working papers as a solution to the problem of slow publication

As mentioned previously, long lag times have resulted in scholars' increasing reliance on working papers for in-progress communication. Working papers are available both informally and through working papers series, such as NBER and SSRN. The advent of technology and prevalence of a working paper culture has resulted in journal articles becoming the archival version of record.[79]

> People show up to conferences, they read papers, they teach papers. All of us are trying to push our field forward. We're still writing and doing research ourselves and the journals are so pathetically slow that they are frequently seven years out of date from where the field is, so if we relied on the journals, we wouldn't know anything.

[79] Dawson, Michael, and Matthew Rascoff. 2006. *Scholarly Communications in the Economics Discipline*. Ithaka Strategic Services, June 12. http://www.ithaka.org/publications/pdfs/JSTOR%20Econ%20Study%20Report%20Public%20final1031.pdf

Technology has made the journals irrelevant for the most part. Most of the top journals, all their stuff is online, for free, let me make that clear. No one really needs a journal except for certification purposes at this point.

What's interesting is we have, of course, the traditional journals, but then a lot of fields in economics orient around the National Bureau of Economic Research, the NBER…a very prominent meeting ground for economists in several different areas…Most major research universities subscribe to this working paper series, and a lot of the communication in economics goes on through those working papers. So almost everything in economics…well, maybe that's an exaggeration, but much of the important material in economics is available in working paper or preprint form….And there's a review process, a clearance process of whether a paper gets circulated by the NBER. There's a pretty high quality standard that people would trust…There's also the SSRN, the Social Science Research Network…a working a paper clearinghouse. They do not just economics but also a lot of other fields like law and economics, and information economics, and accounting and finance, and other areas of that sort, so it's also quite prominent. Finally, there are the working paper archives, like RePEc, which cover pretty much everything else. So I would say at the current time in economics, a lot of information is circulated by these three working papers archives. In fact, there might be even a substantial majority of the work in economics that goes through there.

There are people who have written about long lag times, who believe that access to insiders is now by the working paper, that it's a work-in-progress, a less refined product, and that has allowed the archival copy to—expectations are that it will—be very polished. Reviewers put a lot more effort into polishing and the editors expect polishing, and the authors are iterating many times, so it used to be that a paper was a paper, and you wrote a paper, and it would be published or not published, maybe there would be a few suggestions, but it was viewed as closer to the letters that people in the 18th century mailed back and forth to each other. But, now, the archival journal publication is a much more formal affair. Lengthy literature reviews, and a lot more dotting of I's and crossing of T's and worrying about all manner of exceptions and subtleties…One hypothesis is that, with working paper access, and the drop in the cost of airfare, people go to a lot more conferences than they used to. They get a lot more interaction and exchange, and they communicate informally. The informal communication is so much better than it used to be that there is then a distinction between that process and the formal publication…It could also be that the discipline has become more hierarchical, that there is more reward for being in the first place, so salary differentials are much higher than they used to be, people are bidding up very top salaries, so there's a huge reward for being in the top three or four in some arenas, and people are willing to work a lot harder to produce.

The advantage that a working paper has is, first of all, without having to wait until your article comes out in a journal, you effectively get your work out there. I'm in the midst of writing a very long paper with a colleague…We just, at this advanced stage in our writing, saw last week a paper come up on SSRN. So instead of having to hear about it by word-of-mouth, see it at a seminar, write to the professors at that institution, and have them mail us a copy or specifically email us a copy, we get notified by SSRN.

The norm is to post, and certainly the National Bureau of Economic Research has a working paper series and a number of leading departments have very strong and lengthy working papers series, so it's the norm.

Paying for reviews to accelerate time to publication

The working paper work-around is only a partial solution to long lag times. Some journals pay reviewers and editors as an incentive to improve turnaround time and the quality of the editorial process.

> I think *Economic Inquiry* pays $25, a pittance, to reviewers. Most of the not-for-profit journals pay something; $100 is probably now about the standard. Many journals, though, actually give you free subscriptions; they pay you in kind rather than pay you directly. That's a pretty sensible policy…The *American Economic Review* pays something like $35,000 to editors, but that's probably the highest…also it is the biggest assignment of them all; an *American Economic Review* editor, or co-editor, handles about 200 to 220 papers a year. That's nearly a paper a day, that's the largest assignment. The for-profit journals tend not to pay or not pay very much. *Economic Inquiry* pays about $20,000 for editorial work.

> I think because the AEA wanted to put a lot of money into the editing of the four new journals…they pay the editor very well. They recruit editors. Not everybody they asked to be an editor accepted the role. They're very careful about who they choose and they want top-flight editors; that's costly. I don't have a number in my head, but in excess of $100,000 for an editor…Yes, yes, I believe reviewers are paid as well…from the American Economics Association, there's some pay. It's certainly not universally true. They have submission fees because of the American Economics Association. They currently publish three journals, one of them is for submission…They're publishing about one in 10 of the articles submitted, and they use the submission fee as a way of discouraging casual submissions, to reduce the cost of reviewing…It is not like *PLoS*. It is not designed to carry any particular cost; it's just designed to discourage casual submission…But basically they could choose the ratio of the submissions getting published by manipulating that fee.

> Some of the journals are trying to find a better set of incentives, but they don't work terribly well. A number of journals will pay you $50 to review if you get it done within 30 days. I think that's fine, but the truth is, for someone like me, that's not going to affect what I do. It's just a message that they're serious, which is a good message…When I agree to referee something, I actually do it within 30 days. But there are a lot of people who just let it get to the bottom of their pile, and they have to be nagged…I've heard some editors writing phantom reviews because they just couldn't get a reviewer to do it. They just said, "Here's a review from an unknown person." One of the problems is there are really no explicit direct rewards for being a good reviewer, even though it's common knowledge who is good and who's not, and it makes a big difference. But there are people who are pretty irresponsible…They say they will do things and then they just don't do it. There are some people who just refuse to review, actually.

Sharing reviews among journals to accelerate time to publication

Requests for refereeing duties have increased following the growth of journals, and scholars are overwhelmed with what has become a tedious task to some. By convention, scholars submit articles to one journal at a time ("sole submission"). As a solution to the increase in reviewing duties, one senior scholar suggested the reuse of reviews across journals similar to the medical profession.

> Here's a change that I kind of like. We just talked about reviewing and we talked about how the process of review has gotten more onerous. Well, part of the problem is that you submit a paper to Journal X, and the paper is rejected. Maybe it's rejected on grounds that it's a good

> paper, but it's not of broad interest to the readers of this journal, or it's good quality work, but it doesn't really fit into the theme of this particular area, so that can happen. When I was an editor, a lot of the rejections we had were of that sort—good paper, quality work, to be published in some other journal, but it wasn't a broad enough interest to the general readership of that particular journal. So now when that paper is rejected, it has to start all over again. One of the sensible things to do, I think, would be to reuse those reviews, so you say this paper isn't of general enough interest to make it in the *American Economic Review*, but it would be good to publish this in the *Journal of Public Economics*. Then, you'd like a way, if the author and the editors all agree, to transfer the reviews to that journal. Maybe you'd want the reviewer to agree to it? There would have to be some process of agreement. And you could then reuse the review rather than do a whole new one. The medical profession does this….So that would be a good thing for us to do, just in terms of eliminating some of the waste in the review process. And I think we can do it. There are obviously a lot of policy choices to be made, but I think once you say it, it's pretty clear that it would be helpful in many ways.

Increasing the number of publication outlets to accelerate time to publication

The economics community has largely looked to itself to solve the problem of turnaround times and cost by developing alternative and hybrid publishing models in addition to sharing working papers. Bepress, for instance, has attempted to decrease time to publication with the advent of several new online journals in the past several years.

> I think we're seeing a discipline that has in some ways refashioned itself in terms of its information services in the last five or eight years…Berkeley Electronic Press (bepress) is an example of that refashioning. And I think that things like RePEc and SSRN came fairly organically out of the economics community as opposed to being provided to the economics community. You could forgive an economist for wondering why they can't just meet their own information services needs. And that may be naïve in all sorts of ways, not least of which is that buyer role that's all the way up there, but there's clearly a really innovative discipline there…It would be interesting to try to explain why we're seeing those kinds of behaviors in that discipline, perhaps before we're seeing them in almost any other discipline, and whether that is prefiguring similar kinds of behaviors in other disciplines.

> I do believe that the journals started by the Berkeley Electronic Press (bepress) have made an enormous difference in that there are at least a set of respectable journals where you can get an answer within 10 weeks in economics, which means that people who are up for tenure or who are concerned about getting an answer quickly can…there is one place where you can get one in economics. And they aren't yet the best journals in economics by any means, but they do have extraordinarily good editors and they are respectable.

> I actually think the system works pretty well, but what I don't like is the delay in timing, and that's what really motivated places like bepress to try to change the process. I would like to see things speed up.

There is a proliferation of new journals in economics, including those developed by reputable societies with prestigious editorial boards. For instance, the American Economics Association has launched four new quarterly journals in early 2009. While the scholars we interviewed thought that these society-sponsored journals would rise to the top of the ranks, their success has yet to be measured.[80]

[80] See: Glenn, David. 2008. American Economic Association Plans 4 New Journals. *The Chronicle of Higher*

> So there's a real question in our field as to how we speed this process up. It's just too slow. And all the journals are trying to get it better…The American Economics Association is starting four new journals. This has motivated, substantially really, the undoing of some, particularly Elsevier's, market power. It was explicitly planned to have the four journals operate in a way that will speed things up. That's part of their goal. We'll see what happens…I think the four AEA journals will immediately become pretty highly regarded because they're sponsored by a professional association, and it's well-respected and well-run, and they will immediately jump ahead of all the bepress journals.
>
> The American Economics Association is launching four new journals…The first of next year will be their first issues, and certainly they have a sense of wanting to provide effective competition for the for-profit publishers, and these have really top-flight editors, they are subscription-based, but the Economics Association has a fairly large membership, so that their fixed costs are spread pretty widely. These should land in the marketplace as top-flight journals, and they're fairly broad but somewhat specialized. They elected not to go open access because they want to pay editors.
>
> The American Economics Association…they don't really have any other top-quality peer-reviewed journals for main research. They have two other literature review–type journals, but they have the *American Economic Review* and that's it. They're launching four new journals. I think *Nature* has a main journal and they have subjournals. That's the model that they're going on…It is a non-profit journal and they're adding extra tiers, and I will send to those journals for sure.

Another new journal*, Economic Inquiry,* though not open access, maintains a "no revision doctrine" to encourage scholars to publish without the hassle of multiple rounds of revisions.

> You can submit to *Economic Inquiry* under a no-revision doctrine, and what that means is…there's no revision. Well, they might say, "We'll publish it and, by the way, it would be a better paper if you did A, B and C." But you don't have to do that, it's just an option. That becomes your choice…But the point is that they're going to just be in the role of evaluating the paper, not changing it…It is kind of a B journal, not a top-level journal, so a bunch of famous people submitted a paper…One target is the famous people. The other target is people who are third-year assistant professors who realize they've got to get everything in print, and because this is the fastest journal in town, they've actually gotten a whole lot of that submitted. They're trying to shake things up…it's only one round. The median turnaround is three months, which is very fast. The median elsewhere is about nine months. But the key is the one round because even if it took nine months, that still makes it three or four times faster than anyone else. I'm not actually pushing on making them faster; the problem is that the faster you make it, the more noise and the more errors you're going to make. So they're not really trying to be fast…and not trying to be slow, either, just trying to make a good decision, in as much time as that takes.
>
> It would be wonderful if we could advance the acceptance of alternative forms of publication as quickly as possible, because certainly my interest is in getting things out the door and into public use. The delays of publication are, while not crippling, for much of the work that I'm interested in doing, which is scholarship that has an impact on policy, you want to try to be timely.

Education. January 25. http://chronicle.com/daily/2008/01/1378n.htm

E2.3 Do Cost and Access Issues Constitute a Scholarly Communication Crisis?

While scholars voiced several complaints or concerns about time to publication, editorial quality, and the peer review process, none of these factors constituted a crisis. The growth of for-profit journals by commercial publishers, however, has resulted in substantial increases in library subscription rates (similar to biology). Often coupled with decreasing library budgets, dissemination of these publications has left many economists frustrated with the publication process. There are some collective efforts to push back against this problem (discussed later in more detail). One scholar shares a historical overview of journal dissemination in the field.

> Most of economics was covered by relatively inexpensive journals, and then there are a few areas where there are some quite expensive journals, and there's been quite a proliferation in economics journals because they're fairly profitable. People have responded to this recently by trying to create some non-traditional journals online to compete with those traditional venues. Basically, I'm pretty optimistic that those efforts will work because it's really the leading scholars in the area who've gotten together to try to push for more inexpensive access. So I think they might be able to displace the existing, expensive journals, but the question will be, right now, the organizational structure of some of these new journals is a little problematic, because even though they have fairly widespread support, there are a few people doing the work. So you need to figure out a way to transfer the operation of these journals to some long-term, sustainable model. My guess is that university presses might be a good way to do it, or potentially scholarly societies. There have been some discussions within the American Economics Association about moving to broadening the offering of journals to try to help support some more competitive environments in some of these areas…the American Economic Association is a very slow-moving organization, so I think what people generally think is a good idea is sort of proceeding relatively cautiously. The problem with it is there are some areas where things are just fine in terms of having a low-cost, high-quality journal available. There are other areas where there's a high-quality journal, but it's also high-cost, and then there are other issues…In economics, if you look at industrial organization, there are three or four different journals that are major journals—a couple of them are quite expensive, a couple of them are very expensive. It's in a relatively good area because competitive forces can work pretty well. In public economics, there's the *Journal of Public Economics* and it's a high-priced journal run by North Holland. What you would like to do, of course, is to have an offering in public economics but not in industrial economics to compete with the high-priced provider. But how exactly do you justify that, because people might say, "Oh, well, you're offering this little field or small field, and you're ignoring this big field," when it's the big field that's already well-served and the small field isn't necessarily well-served. So doing this sort of thing would require some asymmetric treatment of different subjects, and, of course, that's the issue. That's why I think they're proceeding relatively cautiously.
>
> The Internet has…the ability for scholars to take back, effectively, ownership of how their work is distributed. I, as a scholar, don't have any interest in having a high price for the journal my work is in. My interest is in getting my work out there.

Broadly speaking, journals can be distinguished by whether they are "nonprofit" or "for-profit," and can be further differentiated along the lines of society or commercially based imprints.

> There is a tremendous bifurcation in cost, which is that…in economics the top couple of journals are society journals that are priced very low—*AER* and *Econometrica*—the institutional price of probably $150 or thereabouts per year. If one looks to the top field journals like the *Journal of Economic Theory*, they're owned by Elsevier…So among the commercial publishers, the prices in economics for the top journals are in the $2,000 to $3,000 range.

> The issue is, in economics, the top journals were nonprofit journals, so they were all very reasonably priced—*AER*, the *American Economic Review, Political Economy*, and so on. They had pretty nominal prices for subscriptions. It's pretty common for economists to have private subscriptions to these journals. Of course, like every other field, Elsevier got into the act and there are a few very expensive journals—*The Journal of Economic Theory* is Academic Press, and then there's *Journal of Industrial Organization*, which I think might be Blackwell, I'm not sure. And then the *Journal of Public Economics*, which is North Holland, and those had very expensive prices.

According to one scholar, nonprofit journals take the lion's share of citations while remaining underrepresented in the library collection's budget.

> Academic journals involve both nonprofit and for-profit players. Regardless, most authors and referees work for free. For-profit journals are more expensive. The irony is that nonprofit journals only make up nine percent of a library collection's budget, but represent 62 percent of all citations, while for-profit journals make up 91 percent of a library's budget but only represent 38 percent of citations. Ultimately, choosers do not know the cost of what they demand, because they don't have to bear the cost.

This scholar felt that journals were currently overlooking a key revenue strategy.

> If you think about it, there are a lot of books—textbooks, trade books, scholarly books—publishers sell, and they have a big markup, a 40 percent markup. They target it to a very specialized audience. And how do you reach that specialized audience? Well, they do two things—they do direct mail and they do journal advertising. But you can do much more targeted advertising by putting a little more effort into it. So if you think about somebody who wants to look up homothetic functions, well, the best place to find somebody who's going to buy a book about homothetic functions is to find somebody who's reading an article that mentions those terms. In fact, there is an…advertising problem in terms of matching up this very narrow set of interested readers to this very narrow set of interested books, there's a lot of value to be had by doing that matching appropriately. I think the journals are underutilizing this. They just don't see it as a source of revenue the way they should.

E2.4 Capabilities and Affordances of Electronic Publication

Open access publication and new scholarly genres as a response to the commercial publishers

Open access publishing models have been hailed by some as a potential solution to the problems of restricted access and escalating institutional subscription prices.[81]

> There are three models of access that are going on right now. There's a traditional fully restricted subscription…There is, of course, the open access model, where the author or some foundation pays whatever the costs are of production, publication, and dissemination, and the material is freely available on the Web to everyone. There's also a third surprising, and quite successful, method that the Berkeley Electronic Press has pushed that's exactly in between the two. It's called quasi–open access. And the way quasi–open access works is that anyone in the world can, in principle, get access to any article for free, whether they are a subscriber and whether they're the subscribing institution or not, much the same way as with NPR, you can get access to the radio waves of national and public radio for free, or with PBS, you can see that for free. If you aren't a subscriber, you have to fill out a short form with your name

[81] Bepress offers "a middle ground between the existing poles of free open access and fee-based subscription access." See: http://www.bepress.com/journals/guest_access.html

> and email address, and permission to contact your librarian and tell them of your interest in reading it. Libraries tend to be very good—when they get enough interest, then they subscribe…Then no one else at the institution has to fill out a form for access. Then it's fully open access to that institution. So that's a model that's in between the fully restricted access subscription traditional model, and the fully open access Public Library of Science model…I'd say that each of the three models have their uses.

Some economists have taken action, both individually and collectively, to specifically address cost issues in publishing. For instance, one new open access journal was created specifically to combat the stranglehold on scholarship held by for-profit publishers that often severely limit access.

> There is a new journal called *Theoretical Economics*, which launched a year and a half ago, and is open access. The *Journal of Economic Theory* is an Elsevier title that may be the top field journal in economic theory. And something like 12 of their editorial group are on the editorial board of the new open access journal…based in Toronto…Well, I looked at it carefully when it first came out and they were doing very well. The quality of the editorial board and the reputation of the authors whose work was appearing there was quite good. I've not looked lately. I hope to go back to that sometime but I haven't done it yet.

> *Econometrica*…used to be owned by Academic Press. And when Elsevier bought Academic Press, they started increasing the library price, and now the library price stands at $2500, As a consequence, not that many people have access to my papers, and sometimes I don't have access to my own papers…And this just drives me nuts; it makes me rant and rave. *Theoretical Economics* was started to basically stab them in the heart. That's the goal, to take away that market, and, in fact, the journal took half their editorial board…the good half.

Submission fees

The author-pays model of charging submission fees is one potential way to fund open access publications, but submission fees can vary widely by journal. Those outlets charging higher fees may negatively impact scholars with less access to funding. Though not open access, the online-only journal *Economic Inquiry* was cited by one scholar as offering across-the-board solutions to cost from the standpoints of both subscribers and authors.

> *Theoretical Economics…*is a new start-up open access journal in economics, and…the submission fee is $75 or $100. There are no page charges, and they're breaking even. And so I don't understand what's going on with PLoS…because they charge way too much money…A lot of the PLoS journals are in biology…They've got lots of money, too, which we have none of…and they got lots of donations to start and they got enough foundation money that they should actually be able to operate and never charge anybody anything. Instead they're charging thousands of dollars.

> I guess I have mixed feelings about author-pays models. If journals really use them to defray costs and to defray subscription costs, so that it actually expands distribution on the other end, I don't have a huge objection to the per-page charges and to the author-pays models…But you do have access issues. Independent scholars may not want to pay the per-page charge…Submission fees will stop independent scholars and scholars at poor institutions that don't have those kinds of budgets, like foreign scholars for whom $100 is simply impossible in some jurisdictions. I don't like the barrier that that creates.

> You're going to see a lot more experiments in publication outlets and…*Economic Inquiry* has a new evaluation process for papers, and famous people are submitting papers…This journal is not open access, but it is cheap. It's owned by a society, and the library subscription rate is about $300, which makes it one of the cheapest journals of them all…So while they're not open access, they don't have a problem because they're cheap…There is an author's submission fee of $100.

Does open access mean more access?

Despite the commonly held belief that papers published in open access journals reach a wider audience, publishing in a bepress journal (in this case, a hybrid publication model) resulted in few citations. This may be a failure on the part of open access journals to actively market themselves and, similar to what was observed in other fields, a result of their relative "newness." In addition, since scholars still rely on the importance of the imprimatur for final publication, new quasi–open access journals have been less successful than expected. As one scholar suggested, "Why use bepress if you can just put the paper on your own website?"

> One aspect of open access is that many of the open access models don't really have particularly strong incentives to market content or push content out at people. From the author's perspective…you're worried about being read. So I think that readership is not just a function of price. It's also a function of the effort that a publisher puts in to finding readers. You might think that at a lower price in access, you would get more readership, but that's not necessarily true. So that's the biggest problem from an author's perspective with open access…There are a lot of problems with open access. The questions are: have you designed a system where you have appropriate incentives to market and disseminate material? Many people can put things up open access on their own website, but that doesn't mean anyone wants to read it. It's a very complicated thing, whether you have appropriate incentives to review, and appropriate marketing and sales. I don't think that it's apparent that from anyone's perspective that any of these models clearly dominates in all fields and in all areas more than any of the other three models. I think only fanatics think that there's just one out there.

> It's very hard for these new journals to get the reputation that gets you excited about publishing there…My colleague published one article in Berkeley Press, which has four tiers: one, anyone can publish in, and the top one they publish maybe one article a year, they think it's path-breaking. So this article made it into the second tier, which only seven percent of the articles make, so that should be the equivalent of at least the top field journal, if not even better. And I thought it was a good article. I thought that that was the right categorization. But I've got to tell you, it's not getting nearly as much play as it would have in a regular journal. It's not cited as often as it should be. I don't hear about it from as many people…It gets downloaded a lot, which is true…but I honestly don't think downloads accurately tell you anything.

> There's the Berkeley Electronic Press, which is trying to get off the ground in economics and really hasn't had much success so far. There are a couple people who are very much behind it, but for the most part, it hasn't gained much support.

Some scholars equated open access to a lack of distillation, which is a cause for concern.

> Now, there is a question of how open access pays for itself…there's no problem having a "commons," and it's very easy to maintain a website…but then you get no rating, you get no filtering. Even SSRN reviews pieces, makes sure they're not completely inappropriate or

> offensive, or theft, or something else. They categorize them to make sure they're appropriate. They provide a library function that's very valuable. I don't object to a fee for that, and that's why I think those subscriptions are worthwhile. But I like the commons model. And to be sure, there are lots of working papers series that work on these open access models. Anybody can go to them…and that kind of open access I think is good. What you lose is…you get a lower level of filtering, organization, and promotion. So I think the open access model is great. I don't think it should be the exclusive model.
>
> Open access would be fabulous…but somebody's got to decide what gets in and what doesn't…In most fields, that's done for free by other academics…I guess all you really need is somebody to manage the process, so it could be pretty inexpensive.

The role of established scholars in supporting and publishing in open access venues

While new scholarly genres for archival publication have not been competitive to this point (mainly because they are valued differently than traditional venues), a number of scholars expressed support for the concept of open access.

> I'm in favor of trying lots of different approaches to break the back of this…inflation spiral in general publication costs. I don't know what the right way of doing it is, so I think that all of these experiments are worth trying…I haven't formed an opinion yet, but I'm for the experimentation.
>
> There are certain things I really like about that model. I think it's a great way…In some sense, it is the truest way of sharing ideas. And as long as the right people get credit for the ideas, nobody alters the ideas, no one sells or steals them out from under the creators, I like open access.

Some scholars are sending their papers to open access journals. Tenured scholars might be more inclined to submit to these newer publication outlets (for reasons discussed previously), but a high-quality editorial board can influence pre-tenure scholars to submit papers. One scholar suggested that the younger generation of scholars will likely be more tolerant of new scholarly forms in the future.

> I think that there will be a vanguard that the young scholars, as they get a little bit older, will be more and more tolerant of informal, but also seriously peer-reviewed work, and won't require quite as rigid a hierarchy of venues of record as you've documented. So I think that's quite likely to happen, because I think the economics that link reviewing to publishing have basically already been severed, and eventually the world will want to produce things in a relatively inexpensive and practical way. We spend an awful lot for journals that provide now very little added value, and we will figure out ways to replicate what they do in a way that works better for the scholarly sector.

Institutional support and flexibility are important requirements for success

If newer communication models are to prove successful, resources and institutional support—particularly institutional policy—will be essential, according to these administrators.

> I think that doing some things along the lines of pronouncements that this institution is going to value online journals with respect to their merits and not with respect to the medium…some things that are not so much significant in and of themselves, but rather statements that can reassure people or send a message. That kind of thing can definitely be valuable. But it's

> value and it's accumulation of a lot of small moves. You can't get too far ahead of the profession, but you don't want to lag behind either.
>
> From the point of view of getting more new journals founded or more new means of communication founded, if this university or others are interested in that, then they need to provide some sort of resources for people who do that, either in terms of time off from teaching or money to found some new form of scholarly communication.

Another scholar suggested that the involvement of top faculty could also foster a wider acceptance of open access publications.

> Sooner or later, electronic journals have to become dominant or at least very important, but to make it happen, I think you need something to kick-start it. I suspect you need some top people to invest in it and decide that's where they're going to put at least some of the stuff that they think is most important, to cause some people to go read it.

The administrators we interviewed pointed out that variations in emerging publication models serve different purposes and may all be necessary, though one suggested looking to best practices in other fields.

> I think open access publishing models are fine, and my view is: let a thousand flowers bloom. I don't know what model is going to be the most successful, ultimately, but I think that author-pays and open access are definitely worth trying. I don't think there will be a single model that will work across every field. There are different standards, there are different production requirements, there are different refereeing practices, so different economic models can work in different areas.
>
> I think things are definitely improving in terms of academic publishing…I think competition is working, the field is enlarging, the online access is very good now. So these days I'm reasonably optimistic in terms of things working themselves out. What I would advocate is trying to look at some of these fields and nudge things along a little bit, and maybe take fields that are not as far advanced and say, "Well, look at this model. You could be doing that." And get them onboard. I think that we'll eventually move toward a sustainable model. It's not so much a question of making a dramatic shift, but really a question of just trying to understand the forces at work, and seeing what we can do to nudge things along and get them moving in a positive direction.

Expanding quantum of output

Despite the obstacles that new or emerging publication models face in economics, electronic publications, regardless of who is publishing them, may be useful in extending the quantum of output. Indeed, some economics journals (like science journals) are beginning to require the posting of data in tandem with publication of an article. Similar to political science, biology, astrophysics, and most disciplines that are data-driven, electronic publication modes lend themselves to linking, if not integrating, data and demonstrations.

3. HOW DO YOU SHARE YOUR WORK WITH OTHER SCHOLARS AND KEEP UP TO DATE IN A FIELD?

The majority of scholars in economics appear to be open to pre-publication sharing of work-in-progress, which may be largely motivated by long lag times to publication. Most economists typically use email to circulate drafts or research ideas and to seek feedback from informal networks of trusted colleagues. As work is refined, it is posted on websites, and presented at conferences. (Scholars in neuroeconomics and econometrics may be exceptions to this pattern of early sharing.) For the most part, economists stay abreast of new scholarship in the field by keeping tabs on their networks via working papers and online resources such as listservs. Blogs hold some interest for a few; they are generally considered outside the realm of scholarship (with a few notable exceptions).

> I think economists are not very secretive. They share quite a bit. They don't share as much as theoretical physicists do. I think the astrophysicists probably behave pretty well, but if there's a one-to-10 scale here where one is "I don't share much" and 10 is "The moment I have an idea, I put it out there on my blog," economists are in the sort of six to seven to eight range, I would think.

E3.1 The Importance of Informal Networks

Economists rely on a close network of peers, often working in similar research areas, for sharing ideas at their earliest inception. "Bouncing" ideas off colleagues using email or face-to-face communication before sharing work with a broader audience is the norm.

> Let's say I have a working draft of a paper and I'm waiting to distribute it. Before I even send it to a journal, first, I'll send it by email, to four or five people whom I know relatively well, who I went to grad school with or I'm friends with, for feedback. Half of them will probably actually give me feedback, some of them will say, "I'm too busy" or, "Can this wait three months?" or whatever. And I'll reincorporate that feedback and send it out to a wider range of people. And, to be honest, that wave is going really to determine whether the paper's influential at some point or not because those are the people who are going to care about it. But sometimes I send it to people whom I don't know, for whom I think it's particularly relevant to their research. I still have to send it to the journal. I'm soliciting comments before I submit. Then, in that range, I might send it to 10 or even 20 people, but, again, only less than five are going to respond. They might say, "Thanks, this looks interesting." They may respond that way, but I'll only get comments from five and I'll probably only get rich comments from one or two. That's what you'd expect. Then I'll incorporate their comments and then I'll submit to a journal…The first run I think of it as informal vetting because it's people I'm comfortable with, who are going to tell me, "This isn't a very good paper." You need those people…In the next round, I'm sending it to people who…it'll be vetting but it'll be in a different way. If they respond and give me rich comments, it means that they find it interesting. They are going to be the people who are going to be reviewing it in the editorial process. So it's good to know their opinions in advance. By the time I submit it to that group of people, it may already be on my website, but it won't be widely distributed. And then after *those* comments, then I'll submit to a journal…No, that's not standard practice with my colleagues. It's standard practice within my own social network, but I think too many people submit to the journal before they show people the paper…Most often, they're introverts…In addition to that, they are younger. They're not as plugged into the social network, at least the academic network in terms of who you know. It's not that who you know means the

publication process is easier; the lower-quality stuff will get through. The way I view it is: who you know means that you'll get higher-quality comments from people before you even submit it and you'll be able to get rid of the obvious criticisms *before* you get into the referee process. So who is a part of that? Well, if you're in a top-tier school, you don't even have to email it to other people. You probably have the people down the hall.

I will disseminate it to friends and people I hope might read it and give me feedback, and I do that before I post it. The posting is really sending a message to the broader world. The difference I notice is, when you're part of a network of the top people in the field—let's say, if you're one of the top 20 or 30 or 40 people in the field—you have access to most of the people who are doing the cutting-edge work, so you can just write to them directly. I know the people who are really interested in what I'm doing. I will typically just write to them. When I have a first draft that I want feedback on, I'll just send it to seven or eight people I know well and who might be interested in it, and usually I'll get some feedback from them. Then after revising it, I'll post it at these other places. And the posting is a little bit to get feedback, but it's really more to tell the world what you're doing…I view it partly as advertising my work for obvious reasons, but also a social service, because if you're sitting at a second- or third-tier school, then you don't have quite the access to the same network we have. You wouldn't see this work otherwise. I give lots of lectures and I'll go to places that are not of the quality of this place, but there are still some very good people doing interesting work. One of the things I wish I did more in my career was go out and talk to these folks because what you really want is for them to get interested in your work so they can build on it. So it's partly helping them, partly spreading the gospel.

Email, as far as I can tell, at this point in the world, is really the most efficient tool for sharing, and everyone's pretty good at using it…There's a whole bunch of research saying that information technology is increasing research output at second-tier schools…Before email, you needed to have someone down the hall who would give you advice. But now, you can email a paper to anyone, so you only need a friend who's smart, or someone you can trust…It's not that email lets you skip a level of informal review, but rather that you can substitute someone who's far away and experienced for someone who's close.

Establishing informal networks

Graduate students can also play an important role in informal networks, and informal networks may first be established locally among peer groups and between graduate students and their advisors. Often there is a reciprocal process of sharing information among advisors and their students, particularly as a means to filter and keep up to date with the most current research.

If you go to a good graduate school, you'll be in a class with 20 students, maybe, and then there are a few classes before or after you, so maybe there's a set of 100 people and the faculty, and the people who come and give talks. But you need to continue to meet people who are at the other great graduate programs and if you go to a good institution, these people will circle through or cycle through and give talks. So that's one way. And then the conferences themselves are where the whole process gets amplified even more.

That has worked both ways. Graduate students have given me things to read and I give them things as well. There is something about this filtering process, because graduate students, not all of them have that skill. Some of them feel they have to read everything. No. You'll never get to what you need to be doing if you do that. But they play a very key role in sending me things. Basically friends or students will just email me links to different things that they think I might be interested in.

> Graduate students are a good resource for keeping up to date. We have weekly meetings in my labs. We cover a paper a week, most of those are papers I pick out of the literature and one of the lab members will present it and we'll discuss it. And occasionally graduate students will push papers to me or colleagues will.

E3.2 Widening the Circle: Conferences, Seminars, Meetings

Conferences in economics are valued and may function to expand existing networks. Specialized meetings, in particular, can encourage a dynamic exchange of ideas that provide scholars with helpful feedback for work-in-progress. Indeed, attending and presenting at conferences is important in economics, and some scholars may be willing to share less developed ideas at this stage. The interpersonal relationships that conferences help to build and maintain, particularly through face-to-face contact, are essential.

> The idea that you're working on a certain area of research and you know who else is working in that area, that leads you to share papers with people immediately, just for commentary…It's directly something you're working on. You're talking about the people who are working in the closest area to you. That group, of course, is always changing. There's always some young person or some person who decided to begin thinking about this based on your own research, and so you'll hear about them because either they'll send you a paper or you go to a conference and you find out about it. But I could probably name 10 people who were working on this stuff and I might send them copies of my posted paper and send them an email saying, "Here it is." So that informal kind of stuff has always existed, and unlike science or history, there's a tendency to share and comment on things at conferences long before something's published, whereas the sciences, of course, the stuff gets published before you hear about it.

> Conferences are actually really important and, not only attending conferences…and I'm just constantly speaking…So it's not only going to conferences, it's talking to people, and there's just…I can't overemphasize how much work gets done…having coffee or a beer or taking a walk after a conference…It's nice that anyone wants to hear what I have to say, but there's also a very rich amount of information being transferred and collaboration set up and all that…It's pretty valuable. So I think my most valuable source probably is conference attendance.

> What's amazing is, despite all of these new ways to network, the conference—the face-to-face stuff—is still critical…So getting your research known, it still requires this face-to-face stuff…We're not talking now so much about how research is done but rather how you place yourself in these institutions, given that you have research that is known by people. When you first come out of graduate school, the advisors are the gateways on both ends, getting your stuff out there, and then making decisions about whose letters of recommendations they're going to take seriously. At that point, it's sort of out of your hands, you've done good stuff but basically the decisions are being made not based on personal knowledge of you but rather contacts between senior people…Then once you get your position, then the responsibility is on your shoulders to continue to publish stuff and publishing stuff is a function of reading the literature. But getting out there, going to conferences, giving talks is important, and editors at the places you're giving talks or at the conferences will have a better sense of who you are, and will favorably or disfavorably, based on that interaction at the conference, accept your papers—they'll send papers for you to referee, and so it's this gradual process. The face-to-face stuff is still important. The digital stuff, the sharing of papers, is a complement but not a substitute…There's somewhat of a pyramid and, in each field, there are these stars. There are a handful of people that every conference wants to invite, to give their plenary talks or their

summary review talks at lunch or whatever. Then there are the active mid-level professors, and then all the younger people.

Submission to a journal is, I believe, going to be delayed until people have gotten some kind of a conference reaction or a more general reaction. The delay times from the top journals are pretty long, the turnaround time is slow. So I think people want to have a more polished document before they submit. But that's not universally true.

Conferences are useful for increasing a scholar's visibility in the field and staking a claim to ideas. As a result, the work shared at conferences can be at different stages of refinement, which varies by subfield.

I wouldn't say conference attendance is either discouraged or encouraged. This is more my point of view than anything else, which is: the point of doing research is to have people read it and see it. And people absorb the information a lot more when they see it, than when it's just shows up on their desk in a journal. So going to these talks lets people see what I'm up to…Really, I view it as: as soon as I present it at a conference, the idea is known and it's branded as mine.

Basically, early sharing is the role conferences play, and experimental economics has this tradition of even presenting work very early in the research process…At the Economic Science Association, many people are coming with a very crude draft of the paper. And I actually find that a little bit frustrating because it means that the quality of what you're getting is lower. Now the tradeoff is they're getting more feedback early before they invest in the development of the paper. I don't know where that tradeoff is…There are a lot of people who are very happy with the way it looks right now, much earlier. Now you go to other fields and I know that's not the case; the economic history people have a very strong system, a culture of completed papers. In fact, economic history papers have to be accepted to journals; they're screened out. Whereas the Economic Science Association basically takes any paper that anybody wants; they don't screen people out. Again, I think there are costs and benefits to that that I haven't thought about a lot.

The field varies by the extent to which scholars are willing to give a talk on stuff that isn't quite done…If you go to a public finance seminar anywhere, for half of the papers the authors will send you a pretty finished working paper, which you read, but for the other half of the papers the authors will not circulate written work. And the presentations given by this second group of authors are actually, "Here's this thing I'm working on. This is as far as I've gotten." So, people are willing to give talks about work-in-progress, even though they haven't gotten a paper done that they're willing to circulate yet.

Attending conferences is also an important activity (in conjunction with utilizing online resources) to help scholars stay abreast of current research in the field.

There are the National Bureau for Economic Research summer meetings in Boston…You don't actually have to be a fellow to go to these meetings…The bureau's emphasis is empirical, applied research, and there probably are 20 or 25 fields that the bureau covers. They're fairly specialized; it might be health economics or law and economics, etc.…They meet during the year once or twice, but then they have a summer session where people just go and give papers. I don't go that often because I'm pretty busy. They're having a refresher on new techniques, which is meant as a primer for people who didn't know very much, but I know one person who is going who is very sophisticated, so it's going to be a pretty high-level session. That will be pretty typical. There will be a lot of people there and very sharp people from all

> around the country, and they'll all be talking about what current work they're doing, and there's a lot of sharing of stuff pre-publication.
>
> This is part of what I try to do as a scholar, is to figure out who's writing good research where, what should I be updating and learning…I view that as a big chunk of my business, so it's not just over the Internet, but that's part of the reason I go to conferences. That's part of the reason I like to interview job candidates on the assistant professor market, because…frequently somebody's most original research will be at the dissertation level, and by seeing what young people are working on, sometimes you get a sense of where fields are heading…That would hurt the feelings of some older people, but…for a lot of people, their most influential work is what they write within a year or two of their dissertation. It's probably the median outcome. There's a lot of variance around that…so I like to go see what the young people are doing…Well, keeping up to date is why I go to conferences. That's why I get on the phone and call up my friends, and that's why I invite people out to give seminars…That's why I look at their webpages.

One scholar complained that European colleagues were less "plugged in," making access to their work difficult.

> You post a working paper on your webpage and people download it from your webpage and you see it at conferences and you hear about it. I don't view that as a problem at all…I find it interesting when I go to Europe that people are a little more entwined in their own social networks there. My subfield's not particularly good in Europe at all, and those guys, when they do come up with a good paper, can be a little slow to penetrate because they're not showing up at the same conferences nearly as often and there aren't these routes to hear about the work as easily.

Conference proceedings

Conference proceedings are not widespread. Typically, papers are posted on a conference website, but those often only have a temporary presence. It may be possible that the early sharing of ideas through informal networks and the working paper culture may make conference proceedings redundant.

> The American Economic Association meetings do have papers and proceedings, but relatively few other conferences do.
>
> Usually, a conference paper goes up on the conference website, but usually those websites disappear. They're not up forever. And if they are, then that's just how it is…I'm sure there are exceptions, but I view them that way, anyway.

Exception to the conference model: neuroeconomics

Neuroeconomists may be more inclined to hold research-in-progress much closer to the chest and share developed work with only a few, trusted colleagues. Unlike other subfields, these scholars' first round of sharing may not occur until work is publication-ready or published. This conservatism may be fueled by access to faster archival publication outlets.

> There's a huge time element because people are really at the point where they're stealing other people's ideas. The social scientists in particular tend to share ideas. They have working

> papers. They discuss unpublished stuff in conferences. That has ceased to happen in neuroeconomics. Really, until something is published or nearly published, it's not presented in conferences now. It's much more like the natural sciences, because we have huge low-hanging fruit that's quite valuable. Getting a paper in *Science* and *Nature* is career changing, and grants open up. There's a lot of money and prestige and potentially a Nobel Prize sitting there, so fast turnaround is important…Of course, you have a core group of people who you know and who you see at conferences that you trust.
>
> Unless you share, you can't actually generate collaborations and do new work, so there's inevitable sharing that goes on…In fact, we're running a really exciting experiment at the moment, and my collaborator said, "Oh, we can present it to this and that conference," and I said, "No, we're suppressing this because we have other studies to do in this and we're going to suppress everything until we've at least collected data for those."

E3.3 Open/Public Sharing: Working Papers and Personal Websites

The working paper is the standard (and often essential) form through which research is disseminated, though the field has a long history of sharing. As a result, scholars often are well informed about in-progress research long before archival publications are available.

> In economics, I believe it's downright encouraged to get your work out there in occasional paper or working paper form on the Web for feedback and for attribution, so that people know that this is your work, because it can take such a long time to get into print in the major scholarly journals. So, what they do in economics is you get an occasional paper done and out online and get reputation credit for it as a contribution to the field. You then immediately also send it to a major peer-reviewed journal in hopes that it will be accepted, revised, and then published. That's the standard approach in economics these days.
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> I think how economists work varies depending on whether they're tenured or not. But I think everyone works at this pre-publication level.
>
> I believe that people are sharing with people they know and, for the most part, in working papers. A suitable way to do that: post the working paper and then let people who are likely to be willing to comment know about it…And they may well print out and send some paper copies to some people who they'd like to have respond.
>
> The one thing that has improved is the ability to disseminate your work without being published. That's clearly improved in the last 10 years through the working papers. So that's a big improvement in the last 10 years.
>
> Well, we've got a working paper mechanism to learn about research. I don't think the problem is getting access to the research…We all live in fairly small worlds within our subfields, and we hear about what's going on pretty quickly.

The majority of working papers are shared online through the National Bureau of Economic Research (NBER), the Social Science Research Network (SSRN), and RePEc, and many economists also post papers on personal and departmental websites. Some scholars exhibited preferences toward repositories that use a more selective approach to accepting papers.

> The other thing is that—and this is typical of most of my colleagues in economics—we use working papers very, very widely as a means of dissemination of information. So for one thing, I have regular access to the Social Science Research Network, and I have it set up to

> receive about 10 emails a day, for the fields I'm in, of all the preprints…So, everyone on campus has free access to this. Well, it's somewhat free given that we pay their annual fee, which is probably substantial. And SSRN has, for economists, become a common source of information…Certainly, anyone who does empirical applied work will, at the right time, put their papers out on SSRN. And they have a pretty good historical backlog so you can search to see what's been written about X. If I have a new project I'm starting on in a certain area, the first thing I will do is go to SSRN and see everything that's been written on the subject…Let me say one other thing just to complete the picture. SRRN is not the only avenue for research. For one thing, I will post my papers on the university repository as well. But that doesn't seem to have quite as widespread dissemination…
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> Usually people would put their essay in a working paper series from their home department. And then they might send those out to people who they know and have interacted with. And, at a conference, they would call attention to the conference's working-paper place as a way to look at their work. It is standard practice now.
>
> You rely on working papers series, talking to colleagues, going to conferences, and seeing what's going on…SSRN and RePEc are not terribly selective, so I do not find them to be very useful. NBER Working Paper series, I submit my own papers there because folks pay attention to that.
>
> I do put working papers on the Web in a variety of forms: on my own homepage, as part of the university repository, and as part of the Social Science Research Network.
>
> We don't have the notion of a preprint. We only have the working paper, which means it's not the final archival paper. And moreover, it's not in an outlet that's considered archived.

Research ideas are often highly developed, frequently to publication standards, by the time working papers are submitted to repositories, though the scholars in our sample had varying experiences.

> People have varying practices. I don't post papers on my website, with one or two exceptions, until they're published or about to come out. And often I don't do it until they're actually in printed form.
>
> But I agree that people don't typically circulate papers broadly, which is to say they don't put them up on their websites until they believe that there's at least a good case that something like that is genuinely publishable…By the time the articles are there on a working paper repository, they're pretty well developed. I haven't been as active in the field for a while as I used to be, although I'm still publishing. I think the norm is for almost any publication in economics, there will have been a widely circulated, not infrequently cited, working paper that is often quite different from the final published form, although sometimes that's not so different. It is something that the author is willing to put out there, but it goes out there expecting to be criticized and revised…I think it is common, almost universal, except perhaps in economic history or for a few of the more discursive fields of economics, but it's not a discursive field. I think it's common for there to be quasi-formal or informal circulation. And there are very large working paper series that are taken very seriously. The work is not just somebody's random musings before giving a talk, but it's not necessarily, not generally expected to be the finished product.
>
> It's all over the map. Working papers range from missing sections and with a bracket that says "insert reference here," all the way to things that are beautifully written and ready for publication. So it's all over the map.

Fears of having ideas stolen

Early sharing can help scholars stake a claim to ideas. Once in paper form and circulated, stealing others' work is taboo, though pre-tenure scholars may worry about it nonetheless.

> In the economics realm…once you write a paper, you lay down the gauntlet and if someone else wants to publish something, they have to cite your paper regardless of whether it's been published or not.
>
> Economics is a big sharing group. You don't steal the ideas of your colleagues. If you do, you're going to get a really bad reputation pretty quickly, so it's enforced through reputation. People who are viewed as stealing other people's ideas and publishing them as their own would be ostracized very rapidly. It almost never happens. We sort of treat it like plagiarism. As a result we're very open about ideas.
>
> The young people who are starting out are a little nervous about it because they're a little worried that someone will grab their work. I may be naïve, but I have never worried about that because once you put out a working paper, the intellectual property is yours, the world knows it's yours, and I've never had a problem. Maybe my ideas weren't worth stealing, but I never had a problem with that. So when I talk to young people, I encourage them not to worry about it. Maybe it would be different in the sciences, where you have a basic result and you want to make sure you've checked it thoroughly. But in my field, if you come out with a good working paper and you send it around to the right people, it's out there, and you're going to get credit for it. I've never seen a problem with that.
>
> I think economics is fairly open about early sharing. Now if you're starting on the idea and you think it could be easily implemented by somebody else, then you probably just don't say anything about it until you have it into a paper form. Once you have it in paper form, people are very open about sharing things.
>
> Well, there are…some people who behave differently. Some people guard their work a bit more.
>
> In hard-core econometrics, I've heard of people who do not post their papers until they send it to a journal, because they feel like somebody will come along and scoop up their results. And I've seen people essentially give a "revise-and-resubmit" verdict on somebody's paper at a top journal, who's an assistant professor candidate. That makes for some bent feelings along the way…It's like that. All this stuff is field-specific but the scholar will be looking at a general problem and somebody will come along looking at the same general problem but with a little bit different statistics to analyze that, and just improve the estimator…And some people play a game of being very aggressive in terms of claiming everything in the world flows from their idea, while other people are more generous…There's a very famous economist who, whenever there's a new paper in the field, will send emails, "Oh, you didn't give me enough credit." I just had a student…who experienced this…Welcome to the club. If such and such hasn't claimed you've plagiarized him, you've done nothing relevant…In some fields, where they're proving technical results, it can get a bit competitive over who's found what when, and…how you attribute credit and so forth. And there's a lot of competition and hiding.

Versioning and ownership concerns

The widespread posting of working papers at various stages of development can result in multiple versions. The published archival paper is often very different from posted working

papers and versions can take on a life of their own. It is the responsibility of the author to reconcile multiple iterations by removing the old version from one's website and checking for the most recent version. The economists we talked to indicated that multiple circulating versions could be problematic.

> I just change the date on the front page and then reload it up, and…on my own website, if the change is somewhat minor, I'll keep them up to date. If I use SSRN, I only give them major updates and go through that process.
>
> If you make really substantial changes, they're generally dated, and so there are papers…People put a paper out and then they realize there's something that needs to be changed…The best case is, they figure out something they didn't know and the paper gets better. In some cases, there was something that was wrong with it and they fixed what was wrong with it.
>
> Sharing working papers has become so widespread that some people think that it's more important than final publication. So one of the things I tell my younger colleagues is, "You don't really want to put your preprint out on SSRN until you're really sure it's the final draft because once it's out there, even if you copy over it, some people will already have downloaded copies of it. This is maybe a negative of Web posting. I don't post on SSRN until it's pretty close to done: it's either been accepted for publication or at least I'm very comfortable with whatever happens to it.
>
> If you look at my webpage, you'll notice that I post all of my papers on there, and people will come and check it out. They will definitely snoop around your webpage to see what you've been up to, and that's why I keep mine up to date. When I get a substantially different or new version, I update it. In fact, I also put all of my course notes online. I get emails from graduate students at some place that's a good econ department where they don't teach my course, and grad students will say, "Oh, I kind of gave myself that course by reading the papers and reading your lecture notes."

Economics journals are generally flexible (don't ask, don't tell) about copyright concerns such as non-journal publication and distribution of preprints, although polices can vary by journal.

> Different journals have different rules, so…on my publication list I have pretty much working-paper versions of every paper I've written, on my website…Those are up, free, and pretty much all the journals I've published in allow me to do that…Some of them allow me to use a working papers site, which I find much easier, so most of them you access through that working papers site…Yeah, through SSRN. There are a couple places that only let me post it on my website. And then those are the ones that you'll see are posted on my website and you don't go through SSRN…I am careful about following those rules. I don't see any reason…since I'm allowed to post them, I don't really care.
>
> It depends whether I take a working paper off of SSRN following a paper's acceptance by a journal. I haven't heard what the *American Economic Review*'s rules are yet. It hasn't shown up in print yet, and they haven't told me. So I'm waiting for the email saying, "Here's what you're allowed to do."…And I haven't got that from the *American Economic Review*…Yes, that will vary by publisher…I do pull older versions of papers off SSRN. For example, the next one down…*was* up on SSRN, and it was accepted and I was told I had to only have it on my own website, so I changed the link to the one on my own website, and not SSRN…If they ask me to do it, I'll do it.

E3.4 Data Sharing

Many economists rely on publicly-available data, but access to project-specific data sets is also valuable, particularly in experimental economics. In the established procedure for sharing data, scholars contact the authors of a publication to request access to the data set underlying their conclusions. Sharing these data allows others to replicate research and validate or challenge the author's conclusions, but some scholars hesitate to share data without explicit knowledge of the requestor's intentions. Some scholars may also share analytical programs or procedures for statistical analysis.

> I believe that in the established culture, if you want to use a data set, you would go to the author of a publication who's created a data set for the work they've done, and ask to have a look at it. I don't know that data sets are published or posted on the Web. I don't know that that's part of the culture.

> Oh yes, definitely, the data that you generate are an important part of your portfolio. It's my job as an experimentalist to do that…I've now been creating separate folders for published papers and the data in case somebody wants to contact me for it. And I have had that happen…in fact, three months ago I had somebody from abroad contact me about a paper saying, "Can you send me your data? I would like to recreate your analysis and then take it another step further." And so I sent them those…To me, that's the hallmark of experimental economics. People need to be able to replicate what you've done, and that confirmation is important. If they can't replicate it, then you have to find out why what you did was different than what the other people did, and you're going to learn something from that. That's also very important. But replication does not seem to be valued highly enough in the field. I don't know how to change that, but it's an important issue.

> We had someone who wrote to me and my coauthor for the data, and my coauthor said "sure" and I said, "No. We paid a lot of money for this data. The protocol is published, it's actually not hard to do; just run the experiment yourself. We showed you exactly how to do it, it's so trivial and easy to do…" I can't imagine why I would give up the data. So the guy writes to the editor of the journal saying, "This is an open access journal, why don't you release the data?" And the editor wrote to me and said, "There's no obligation for the author to release the data; we'd like them to do it but we don't require it." And I just feel like I can't imagine the benefit I could get out of that. And this guy actually had a commercial email address from a private company…and I wrote to this guy and said, "Tell me why you want the data. I'm happy to talk to you about it, but if you want the data to run it yourself, you need to tell me what you're going to do…" and he refused. So to me that's one of these statistician types who are going to stand on one foot and twirl around and show you how smart they are statistically, and then find some little thing that you didn't do.

> Well, in macroeconomics, all the data are just out there now, so it's much easier to do things…With the availability of rich data sources, the first two or three things that you'd look up are available, making it much easier to do all kinds of research. And so the data that economists really want to use are just much easier to share, to find, to comment on, and to check than used to be the case. I think that's probably all good.

> There are software communities. STATA, for example, is a statistical package that's fairly commonly used. It's also a programming language, and people contribute routines to that environment. So I believe people share STATA procedures. When a person develops a new procedure, they might implement it with this data file, and share that one way or another. That's one example. I suspect there are other environments that work similarly.

Most scholars are reluctant to share data prior to publishing their interpretation. The decision to share "uncooked" data often depends on the role the specific data play in the final research product: the more critical to the content of a paper, the less likely the scholar will be willing to share. Overall, there seems to be little fear of being "scooped" among scholars collecting unique data sets.

> In my area people tend to develop unique data sets, so you're collecting your own data. You're not going to a canned public source, so the fact that you collected that data set means that it's more difficult for other people to come along and just rip you off…In the empirical end of what I do, I think people are collecting unique data sets, so who else is going to go through the hassle of spending nine months to build precisely the same data set you did and do the analysis on it? You would really look like a creep if you did that and came up with the same three numbers…so I think…it varies by what scholars are trying to do, the amount of sharing.

> The issue with data is that no one's going to reproduce this data set that we have put together. There's no threat there. It's just not going to happen in the short term, while we're trying to get this stuff published.

Journal mandates and data archiving

Some funders and journals (such as the *American Economic Review*) are beginning to require that scholars make their data publicly available upon publication. There are no set guidelines or standards for sharing data, however, the Interuniversity Consortium for Political and Social Research (ICPSR) is building a data deposit service. At the minimum, scholars may be asked to provide modified data to enable the replication of published work, and these data may be shared formally through appendices to publications or informally by posting online. Where data are proprietary, authors may be required to disclose this information early in the submission process (which can affect the decision made by the editorial committee). Scholars may also be limited in the posting of data by individual privacy concerns, a reluctance to allow other scholars to "riff" on their data set, and the high costs associated with data collection in fields like neuroeconomics.

> It depends on the journal whether sharing data is required. More and more economics journals are requiring you to do that. In particular, they're requiring you to make public your final data set and your code, your regressions, or whatever you're doing. This is sometimes fine and other times challenging. With public data, then it's really easy. If it's not public data then…well, then sometimes you can't do it. If a company gave you the data…then you can't make them public. Sometimes you can make parts of them public, so, for example, the raw proprietary data that I used for my recent work, I wasn't allowed to make public. But the data that I was allowed to make public…I did…Making data public is a good thing…I haven't seen much resistance, to be honest. It's really hard to argue with. Now, in terms of private data, there are reasons to allow that exception, because sometimes private data are valuable. But as long as the data are public, you should make everything public…it allows people to verify your work.

> There are two basic standards in the profession. One standard is once you've published a paper based on data, you have to make your data available to other researchers. About a third of the journals have that policy, and the rest say if they're proprietary you must tell them in advance. So that would be a deal-breaker at some journals and at other journals, well, they're willing to consider it but if the data are proprietary you have to tell them.

Now, some websites, like the *AER*, require you to upload the data and they'll have it permanently. The *Experimental Economics* journal as well, at Kluwer [now Springer], also does that, and I think that helps in archiving.

I believe the American Economic Association requires that you submit the data set with the publication. So, yes, there are expectations that the data set be available, and I believe some of the motivation for that is to protect against fraud. I don't know that they're making it available as a scholarly resource…I know that the American Economic Association is also concerned about issues of data preservation as well.

There's been a lot of interest in publishing the data or archiving the data…The traditional publication mechanisms don't quite work, in the sense that we're very much an article-based discipline. So there is some concern, for example, that the actual procedures used are not publishable and need some other mechanism for being shared…In the tradition of academic publication, publishing code or data has been below the radar.

Sometimes I post the data, but sometimes they're proprietary. In many cases, when I'm looking at particular industries, it involves a proprietary component, so I can't. When I do post my data, I either post them on my webpage, or if people ask me for them I'll send them along…The problem is that the best data sets in my field are not publicly available; they're built by people in industries. If you take any industry, there's somebody collecting data about it, and we try to get inside those guys' hard drives. A lot of people get the data by trading their expertise as economists for proprietary data sets, by saying, "I'll tell you five new things about your business, three of which are correct. And I'll do it for free."…and I get beautiful data in the meantime…But I can't post those on the Web. These are just beautiful data sets and they involve an element of hustle.

We can't show some of the data because of privacy reasons. One of the things that I'm doing, though, is creating anonymous data sets so that you can't actually identify the people or companies involved, and those data sets we will make available to researchers. Now what we do with that, though…requires something like the rules for using the national census. If you work with the census data, you have to go to the government, you have to work on government computers, you can't take the data away from the government installation. That's the kind of policy we will use here and will apply to our economics databases. We have adopted government rules. So our data policies are mostly governed by individual privacy.

What is expected is really in flux. In economics, it's not yet standard practice for journals to require data to be published with a paper…Databases are important capital, of course, and scholars in economics are beginning to post the data sets for papers that get published. But it depends on what you do. I've seen scholars who publish methodological papers provide sample data sets so you can test the methodology. But when it comes to a paper where the data are critical to the essence of the paper, in other words, when you're reporting conclusions that derive from data you collected…it really varies. There have been some recent controversies in the field where people really questioned the data underlying some publications and tried to reproduce them independently, but I don't think the authors ever posted their data…I absolutely see things evolving in the direction of posting data, but I think it's related to whether or not the data are publicly available. For example, if something comes from the Bureau of Labor Statistics or some kind of database that many economists use, people are not going to be so reluctant to post those data. But in my case, I don't expect to post the data set I've built personally and allow people to write a riff on my paper. Funders want us to do it eventually, but we have to describe in great detail the nature of the data collection process and it has to be reproducible. We won't do it until much later.

> I think there's a stronger ethic in experimental economics to actually post data, but, for neuroeconomics, there's no such ethic, and there's no norm for doing it, and it's too expensive. You're talking about $500 to $1000 per subject to collect data. That's really expensive data, and replication's very important but you ought to replicate it yourself. I shouldn't have to pay for you to replicate my results. So maybe I'm either paranoid or selfish but…I'll tell you, people are taking shots at me a lot and you get your hands burned a couple times, so you think, "Why should I open myself up. They can read the published paper." The article is there in excruciating detail, and I'm happy to advise, and I can't tell you how many people I advise on studies, but I'll say "Here's how you do it. Here's what the FDA needs, more power to you…" But people who just say, "Send me your data," no, I'm not going to do that. I can't see why in the world I would do that.

One scholar expressed concern about the possibility of commercializing otherwise public data:

> Nouriel Roubini started the Asian Financial Crisis website in 1997, which everybody knew about at the time…It was the first economics research portal, and every day there would be the links to all the articles about the financial crisis and all the data sets, and everything you could possibly ever want to know about the Asian financial crisis. It was a great resource…For better or worse, a couple of years ago…he decided to turn this website into a commercial operation. It's now called Roubini Global Economics, and you have to pay for access…I think this commercialization has posed some interesting questions about intellectual property, defining the resources of the university and how they can be used, etc. Then again, these aren't new questions, because economists push the boundaries all the time. But Nouriel is in a business school, and at business schools you can push the boundaries a little farther than in a traditional economics department.

Data storage and preservation

The storage and preservation of data appear to be less of a concern for economists compared to other social scientists. Data originate from a variety of sources and in disparate forms, resulting in a lack of interoperability. Although many scholars archive their own data privately, obstacles for the storage, preservation, and migration of diverse data formats remain, on both individual and broader scales. (This challenge is particularly acute in neuroeconomics.) Non-academic stakeholders, such as private companies, may also maintain separate standards for preservation. Some scholars fear that the *ad hoc* nature of data archiving in economics will result in the loss of important data sets over time.

> I know there are some fledgling data archives and repositories, but I don't know of any, well, successful ones. Let me put it that way.

> I generate my own data…Archiving is a big challenge because if you move from one institution to another, your website's not going to be maintainable, and moving all those things around becomes difficult. The continually changing formats of things are even more of a challenge.

> Internet data sets are very idiosyncratic, and they tend to be laborious to collect. They can also be hard to reproduce, especially if the data are based on online information that changes. The data that we're collecting, I'm absolutely convinced they could not be collected again five years from now…It will be gone…people who were initially there when stuff got digitized and put online won't be there anymore. The companies don't care; they don't care about the same things that scholars care about. It's always a problem in economics. You're collecting a database in order to come up with scientific results and the companies are just interested in

getting stuff online. They're not interested in when it was put online, they just want to know that it's there.

In neuroeconomics, the data are very expensive, in the range of $500 to maybe $1,000 per subject, so they're hard to obtain. And our needs for data management really run the gamut. The hardest data to work with and archive are functional MRI data. We had to buy fast, giant UNIX-based servers because the collection and analysis are difficult and costly and sensitive…There was a database set up some years ago, with federal support actually, to archive all the fMRI data, but it's all so different, the scanners are different, the way they collect data is different, the way they're read is different. There's really no way to actually take someone else's data…The person who collects the data almost has to be a collaborator to walk you through what's there, and there's no standard way or format to put that data out…We've collected so much data and we only published part of what we had. It takes so much time to go through and even just identify all the variable names. We know what they are because we were working on it. We didn't write a big codebook because we know what the names are…Other data, for example…in studies with drugs…are collected using specialized software programs and then dumped into Excel, so there's nothing special, the data sets aren't big. Although those data are generally expensive to obtain, there's nothing special about archiving them. There are some comparability issues across studies, and even in my own lab, so we've begun trying to archive our data in uniform ways using similar methods so that people can go back and mine that data for extra information. We may try to do that again, by building a general codebook and a guide to the data we have.

E3.5 New Technologies for Sharing

Listservs

Listservs and email broadcasts are widely used both to share research and to keep abreast of current scholarship. Listservs can nevertheless be less valued than some other forms of communication.

In the economics world, certainly listservs, electronic newsletters of various kinds, RSS feeds—they get used.

No, listservs are all worthless. They're out there, but they are complete garbage. Nobody who's serious looks at any of those things.

You get on these listservs and you start reading people's postings and links to blogs and so forth…I can think of a few people's blogs that I go to, but generally speaking, you subscribe to these specific parts of the various repositories…I can count three or four of these things that I subscribe to and I'll get updates…And this is, in addition, of course, to publishers sending you stuff. So there is a myriad of ways for you to get stuff, and it's impossible to read it all but at least you can read the abstracts. And this is, of course, stuff that amplifies what existed before the digital environment and it's layered on top of your informal networks, where people will send you papers or submit to conferences.

Blogs

Blogs can be time-consuming, distracting, unimportant, or perceived negatively. Those who engage in blogging—as producers—often do so as a recreational pastime, since blogs are not generally considered part of the academic enterprise. Despite this attitude, we found that some

economists do read blogs, and it seems that economics has been more successful than other fields in creating a public face through blogs.[82]

> I think if you post a blog you are perceived as a time-waster. Blogs are off the record. If you're not such a productive scholar and you just want to shoot your mouth off, a blog's a good thing to do…It varies by department, so if you're in a department where they're really interested in the policy world and who's the mover and shaker in terms of the economics behind this thing, then they'll be all interested in what somebody wrote in the *New York Times* column or somebody wrote in their *Slate* column or somebody wrote in their blog. I think a lot of the real top scholars view it as just cheap gossip, and that you show yourself to be a fool if you're interested in just purely cheap gossip.
>
> There are probably a few people who are into blogs. It wouldn't be me, but I wouldn't be surprised. Brad DeLong is really into blogging…I don't regularly read blogs…my day-to-day life is just too hectic to do that. But others are different.
>
> I have a blog, although I've been too lazy to write it…I was talking to one of my colleagues, and he said, "Hey, you haven't written anything in two months. What's wrong?" And I said, "They're hard to do. I don't like just throwing out some idea I had. I like to have a little data, a little citation, a little support, and it takes a lot of doing." And he says, "Yeah, you don't have the blogging thing and you're writing these little papers. Little papers are hard to write. Blog entries are easy. Just write them." And so I do think that I find it difficult to put something out there unless I think it can stand a little informal reviewing, and that makes it harder to do.
>
> I do read blogs. I don't write one and I have no intention of ever doing that. It's not my forte or style. But I find it useful to keep track of what's going on…So the main ones I read are Marginal Revolution, an economics blog…Some of my research is Internet-related, so I read the Official Google Blog. And then there are about 50 other blogs that I read, I drop in on those every once in a while. There's a statistical modeling blog. Andrew Gelman of Columbia [also director of the Applied Statistics Center] writes it…It's a great blog on stats. And then there's a Becker-Posner blog, Gary Becker and Richard Posner, University of Chicago. They write something but once every month…Those are the main ones. Then every once in a while I'll go somewhere else, like Michael Geist, Canada's research chair of Internet and e-commerce law who's at the University of Ottawa, has a blog on legal issues in the Internet laws of Canada, so I like to check…Essentially I find a new blog because someone on a blog that I read recommends it. So Marginal Revolution, I don't know how I found it. I think every other one I found through them…Marginal Revolution is written by Tyler Cowen, and Gregory Mankiw's blog is written at a level for essentially people who are reading his introductory textbooks.
>
> I don't read too many. I have friends who send me links to things that they find interesting that they think I'll be interested in…I don't spend too much of my time searching out blogs for original content. There's one that I read and that's about it. I read Megan McArdle's blog at *The Atlantic*—Asymmetric Information—partly because I think she's the sharpest writer I know in terms of blogs, and she's not an academic, and so I like that perspective.
>
> When I started the academic part of my career, there were no blogs. But in the last few years, it's become a big deal…I wouldn't say that I go to a blog on a regular basis, but I know some good economists writing in my area (and not just economists, by the way) because you can

[82] Although there is a recent report that some high-stature bloggers may be finding that the practice consumes too much of their time. See: Rodrik, Dani. 2007. Is the Econ-Blogosphere Unsustainable? *Economics*. October 17. http://rodrik.typepad.com/dani_rodriks_weblog/2007/10/is-the-econ-blo.html

> think of these blogs as content or inputs for research ideas. So, just like the Microsoft case or Mickey Mouse patent laws, there's intellectual property and the stuff that's related to scientific publishing as well. There are a number of people you can go to. Sometimes they're economists, sometimes they're law professors, sometimes they're computer scientists…
>
> Well, I suppose some people do read blogs, but I wouldn't say that that's particularly important.
>
> I have a colleague who's an economic historian and he talked about a blog, so I believe some of that's going on, but I don't have personal knowledge of that.

Social networking/Web 2.0

Our interviews did not suggest that social networking tools are used for scholarly practice; it simply was not raised very much.

> I do know some people who use Skype or instant messaging to help write papers…I have a Facebook account. I don't use it. I use it to keep in touch with old friends whom I wouldn't go out of my way to write and contact, but it's nice to see what they're up to.

4. HOW DO YOU COLLABORATE WITH OTHER SCHOLARS? AT WHAT STAGE OF RESEARCH?

Collaboration and coauthorship in economics are growing. Scholars collaborate to bring different specializations to bear on a research question, tackle large data sets, bounce around ideas, and mentor younger scholars in the early stages of their careers. For many economists, collaborative work improves the quality of economic scholarship as well as the efficiency of the writing process. Where interdisciplinary expertise is required, however, the lack of common vocabularies can pose a challenge to collaborative work. Generally, scholars receive "almost equal" credit for their role in multiple-authored publications compared to single-authored work. Young scholars, however, may be required to meet higher burdens of proof regarding their intellectual contributions to publications coauthored with senior scholars. Face-to-face meetings and informal relationships are important when beginning new collaborations, and ongoing work is sustained largely by email.

E4.1 The Nature of Collaboration

Collaborative work has been on the rise in economics over the past few decades, due in part to greater specialization in the field. Collaboration commonly takes the shape of dual-authored articles, although the number of three- and four-authored papers is growing. Larger collaborations exist in some subfields, such as experimental economics or neuroeconomics, where team-based research combining different subspecialities can follow a more scientific research model.

> The fraction of articles being published with more than one author has gone up…I think four or five is rare. Two is more common…
>
> The majority of papers have two authors, but many have three. Having four or more is still pretty rare, though…Maybe a quarter of papers will have one author…I don't remember who

> wrote it, but there's a study that says coauthored papers are cited more frequently. In other words, we collaborate a lot, and it pays.
>
> Through probably the '70s and early '80s, most of economics was done by sole authors. Then there was a movement towards greater specialization, so you saw two or three authors, and now you'll see papers with maybe three or four. Two to three is still probably the most common. In neuroeconomics, because there are so many subspecialties that need to be covered, you actually need something more like a medical model. In many studies, there are M.D.s to do medical screens, radiologists to read the MRI scans…all these people who are subspecialists are doing a little chunk of the project…My lab probably has over a dozen people in it this year, and they come from a whole variety of fields, from molecular biology to political science, economics, and psychology.

Motivations to collaborate

Collaboration can take different forms in economics, depending on a scholar's subfield. In some cases, scholars from different subfields play specialized roles in a collaboration, such as an economic theorist collaborating with an econometrician or experimental economist. In other subfields, such as labor economics, two scholars from the same research area will work on a problem together. All scholars describe collaborative work as beneficial in two respects. First, at a conceptual level, scholars collaborate to seek another's particular expertise or to reap the benefits of "bouncing ideas" off of a trusted colleague. Second, at a pragmatic level, scholars note that coauthorship is simply more convenient and efficient, providing "fresh eyes" on an article and speeding up the writing process.

> I think there are two things you gain from collaborating. One is a standard division of labor. You're a theorist, the other person is an econometrician, and you can make beautiful music together. And, actually, you each know how to do things the other doesn't. It involves a process of sharing in detail. If you have a coauthor, you can freely bounce every idea off each other and really make the paper better. The second gain is that, if you have a coauthor, you have someone to go to to get the work done, which can be useful as well. Personally, I love doing coauthored work, mostly because of the continual bouncing back and forth of ideas…I just think it's fun.
>
> Every paper that I've written, I could have written on my own in principle. It just would have taken me a lot more time. So, by collaborating and specializing in the areas that I'm good at and that I enjoy doing, and having my coauthors specialize in areas that they enjoy doing, the papers get better. And, also, it helps to have a second pair of eyes on every paper. I find, especially in the final write-up, that once I've read through and rewritten twice, it's hard to find improvements. So I send it to my collaborator, who works on it for a few days and sends it back to me. Then I find it easier to correct the things that I wasn't comfortable with before, because, first of all, you have some time away from the material, but, second, it feels like someone else's writing and ideas. So I find the final product is much more polished and specialized in terms of different parts of the research. It's just more efficient, the classic gains and trade story. Now, with that said, every collaborative paper I've ever written could have happened in principle without one of us. So, sure, maybe someone came up with this idea, someone came up with that idea, but nothing is so hard or requires specialized equipment or anything like that…I think adding a coauthor increases quality, because of this bouncing ideas off of each other. Two people have a stake in a paper…It's fine to ask people for comments on your paper, but that's not the same as having a coauthor who really cares. So that is part of the motivation. The other part of the motivation is you really get almost equal credit for a coauthored publication as a single-author publication, but it is less effort and the quality of the

output is better, it's almost a no-brainer. The quality is better because you have this back and forth, because of gains from trading specializations, and it is less work in the sense that you're not doing it alone…Two heads are better than one, quite simply.

The norm in experimental economics is joint work because an experimental project is a pretty big endeavor. Besides running the experiment and analyzing the data, you also write up the theory beforehand. All that requires somebody to be specialized in a specific part of the project, and to do it all by yourself is just very slow, and, personally, not fun. I like the interaction with other people, that's part of why I like my job. The social part of this job is very important to me.

For the most part, people want to work on the same problems, and by working together they're more productive. But in this subfield it's not necessarily like people are bringing their own specialized roles. There's a bit of that, but it's not like the sciences, where one scientist owns a particular piece of data and another one owns an instrument, and they have various intellectual properties that they put together in assembling a new piece of work, with everybody's name on the publication. Economics is not like that…Collaborative work means that people have contributed something intellectually to the product, and it's not necessarily in specialized roles…There might be more emphasis on specialized roles in econometrics, but I think our culture's not like the sciences.

E4.2 How Do Collaborations Arise and How Are They Sustained?

Collaborations typically arise from pre-existing relationships or from scholars meeting at conferences or symposia and agreeing to work with one another. Most scholars prefer starting new projects with colleagues that they know well. To a lesser extent, cold calling can result in collaborative endeavors, and several scholars described collaborative projects that arose from a serendipitous meeting or email.

Collaboration has grown…It hasn't always been common, but a big factor in its increase is the growth of low-cost airfares and the extent to which people go to conferences and present their work on other campuses. So, it's much more common now than a generation ago. These factors seem to spawn collaborative work.

In terms of finding collaborators, you have to know someone really well to start a project with them. So, essentially, almost all of my collaborators are people I went to grad school with or were at some point at this university. Well, there's one exception, and that exception is when we come very much from the same school of thought. Once the project's off the ground, though, we can be on the other ends of the world, it doesn't matter, although it's easier to be in the same time zone. But I have a former student who went to an overseas university, and I find it a little hard to work with him/her. Although there are things that are convenient, in the sense that you can work all day and email it at night, and my collaborator works essentially all night—there's a 24-hour process—but, in those cases, just talking things through is hard. With someone who's in New York or Chicago or Florida or Vancouver or California, that's all close enough, so that it's fine.

There was an interesting paper in the *American Economics Review*, which looked at the early Internet and how BITNET affected collaboration patterns. Unsurprisingly, the Internet makes it easier to collaborate. The interesting results were where that effect was. First, collaborations were increasing among people who were nearby…within 100 miles. And, secondly, tier-2 schools seemed to be increasing output by collaborating with co-located tier-1 schools…like Northeastern with MIT and Harvard, Santa Cruz with Stanford, Drexel with Penn, or Notre Dame with Chicago. So, the Internet is increasing access for people at the second tier schools.

> There's other research by Kim, Morse and Zingales, which has shown that tier-2 schools seem to be becoming more and more important to economics…The ability to collaborate with a tier-1 school allows the tier-2 schools to remain plugged in. And their hypothesis—although they don't prove this—is that these collaborations arise from two people who were buddies at grad school, or a student who graduates and keeps working with their professor…This goes along with the thought that to start a collaboration, or even to spark an idea, you need to know someone well. And for a successful project, you often know people well if you can interact with them face to face. So, you can see that these technologies are almost a complement to being nearby…If you think about most people's email accounts, the vast majority of that email is from people who work within 100 yards of them…If you think about most people's Facebook accounts, they're mostly populated with people who are in the same cities as them.
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> I like to be pushed in many directions, so from a collaborative point of view, a lot of that occurs by meeting people at meetings and getting to know them. But, a lot of times, people cold email me or cold call me and say, "I've got some wacko idea," and I listen to them. So we have a lot of collaborations in which I've never met the person, and maybe I only finally meet them after we start working, but they initially present good ideas.
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> Collaborations are mostly about ideas. Often, I'm just vetting an idea with somebody and they have a major insight, or a glimmer of an idea, and then the other person says, "Hey, if we did this it would actually be more effective." At that point, you're in a coauthor situation, since both of you have already made a contribution. That's just the beginning of the work. After that, there are various things that need to be done. But, after that, it also becomes much more like a factory, or a production process. Once the key insights are there, then you both just do the research, based on your respective specialties. Only once in a while do I go specifically looking for a coauthor. For instance, one time I needed someone to be a coauthor who could understand what a particular body of literature said and comment authoritatively on it, because our paper intersected with work in this area. So we went and shopped for a coauthor.
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> When I go to conferences, I want to hear what people are up to. As I've gotten more senior, they frequently want to come up and talk to me about what I'm working on. So I generally try to be a good citizen and be accessible and maybe I'll learn something from them about a hot new data source…I was just away at a seminar, and some young scholar I never met before said, "Oh, I found a way to mine data from a website…If I collected this data, would you tell me something to do with it, and maybe we could collaborate a bit?" So, people will bring up those sorts of things to you.

Overcoming disciplinary barriers

Economists collaborate with scholars drawn from their own field as well as from other fields, such as political science, business, psychology, law, and even neurobiology. Most economists felt relatively secure when collaborating with other economists (even across subfields), citing the existence of "shared vocabularies" within the discipline. In contrast, some scholars described a "language acquisition problem" when working with scholars in other disciplines.

> You develop a specialized vocabulary around the specific project or specific paper, it is very efficient, and you learn a lot from each other getting the thing done together. Economists tend to have very detailed, powerful, shared vocabularies, so it's relatively easy for them to talk to each other all the way up to the most particular aspects of the work. But I know that in math, for example, there are some areas that are so arcane that only three people really understand what you're doing. Whereas economists tend to understand each other across subfields pretty well, which makes it fun to collaborate both within and across subfields…I think what most

economists do in these new interdisciplinary areas is they work with people in different disciplines, they learn a different discipline, and then other economists want to work with those economists who have learned this other discipline. So rather than try to actually work with somebody's who's doing neuropsychology, you work with an economist who's worked with someone who's done neuropsychology, who's already learned enough about it, because that's a lot easier. The language acquisition problem is a lot easier if you do it that way. But I don't think it's faddish at all. I think it's quite natural and very interesting work.

Certainly there are developments in the discipline of economics that signify a move towards multidisciplinary work. For instance, Kahneman and Tversky are psychologists who were awarded Nobel Prizes in economics. So there is a part of economics that is doing that kind of work. That's very important…The core of economics is very mathematically driven, and to go to graduate school in economics you have to have a lot of mathematics. So a mathematical background is more important than having a background in economics, and the facility with some mathematical modeling plays a central role in most economics. That discourages a fair amount of collaboration across disciplinary boundaries, so it only tends to happen among people who are similarly equipped. So there is interaction with people in political science, but they're quantitatively oriented political scientists.

I have not yet collaborated with scholars from other fields. I have worked with mostly economists…As an experimental person, I work with the more traditional thinkers as a way of trying to break them out of their molds and to help to push them, but I have not worked with anyone who's not an economist.

E4.3 Judging Multiple Authorship

As several scholars observe above, collaboration is common in economics and, consequently, tenure and promotion committees often reward coauthored publications alongside single-authored work. Traditionally, authors on coauthored publications are listed in alphabetical order. The attribution of authorship in larger collaborations tends to follow the hierarchical scientific model used in biology of negotiating authorship early in the research process.

In economics, the authors are usually alphabetically listed and you have to explain a little bit more about who played which role. I think economists understand that.

We try to do the work beforehand of assigning the order of authorship, particularly who the first author is, just so there's no hard feelings. And, oftentimes, your collaborators are also your competitors, so as much as we like to work together, we're also after the same set of prizes: the big grant, the big publication. Most everyone gets along, not everybody does, but most people that I work with, we all know each other pretty well, and you run in the same circles. So I think it's nice to work it out beforehand. In traditional economics, the standard is alphabetical order.

Intergenerational collaboration

Collaboration between generations of scholars is common in economics. In some cases, young scholars or graduate students seek out the expertise or advice of a more senior scholar. In others, senior scholars look to help or work with younger scholars who will also perform the more "boring" or data-intensive part of the work. Many scholars see intergenerational collaboration as a form of mentorship, helping junior scholars to gain writing experience and to place papers in prestigious journals.

I think most economics papers are coauthored…I don't know if it's standard practice to include as authors all scholars who have contributed an idea, but it's not uncommon to ask someone to be a junior author if he or she has a really good idea and you take off from that idea and write a paper. I've certainly seen that happen…If you're senior, you get a collaborator who is junior who's going to do a lot of the boring part of the work. If you're junior, that's a very good deal, because you learn a lot and get some of the luster of the senior person who might help place the article well…I suppose someone could try to manipulate that system by saying, "I think I'll put Famous Professor X on this paper so someone might publish it," but I don't know if anybody's ever done that.

I'm working with graduate students and undergraduates…One student was interested in doing an economic experiment instead of a more traditional research project, so I worked with him/her on that. That led to a working paper, which we just revised and resubmitted to a journal.

What I'm looking for in a collaborator really depends on the particular question. For example, I have a collaborator now who is a well-trained theorist, and so we spend a lot of time complementing that theory with my experimental work. To take another example, when I was younger, this other scholar emailed me out of the blue—s/he didn't even know me—and said, "I know you're busy, but you'll get lots of great ideas there. If you want to work on something let me know." I never actually met this person, but within two months I had a really interesting question that motivated a research project and we started working on it. This scholar really taught me how to write a paper. When I submitted the first draft of the paper, my collaborator said, "Well, this is kind of what I had in mind," and showed me his/her draft, which was nothing like mine. I learned immediately through that process why what this scholar was doing was basically better than what I was doing…And what's amazing, to tie this back into the electronic age, is that we coauthored two or three papers over the course of a year before we actually met in person…

I view my work as bringing together theory, a bit of data, and some hardcore statistics, and I've trained a lot of Ph.D. students that are now all over the place…And so what I do is…first of all, I want to help the young guys that I've trained get tenure so they have a better and less nasty experience than I had. I did not find that process to be fun. So I say, "Look, I have a surplus of ideas. I'm going to tell you about a data set. You and I will work on it together." And I'll say, "I've never placed a paper below the top field journal. I don't know if we'll go to that top field journal, but we will publish it." And then, if it looks like the project needs some hardcore econometrics, I'll have a friend who does some of that…It's like assembling a team. Some parts of hardcore econometrics are very insular, and they only talk to each other, but the scholars who are really good know that the only way you get citations is by communicating to applied guys…and that makes your work relevant for something. So I can bring them a problem that's well motivated. They're better than I am in proving limit theorems and function spaces, and it's a mutually beneficial trade all around.

In the science world, being last is the best place, you're the godfather, or being first as the primary author, so we kind of work that out beforehand. In particular, when you're working with younger people who are sweating issues like tenure, or even my own graduate students who need to get a job, it's very important for them to be first author on papers…My success depends very much on the people around me being successful. I think when they're successful, I am therefore successful…In traditional economics, that would never happen because it's pretty much lone rangers looking for a Tonto, and economists are traditionally very bad at mentoring. For neuroeconomics, it's much more of a biology-based model, where if you did a dissertation in that area you've got to plan on doing a post doc. The funding issues are quite binding for young people, so they need to collaborate with more senior people who

> have more funding…All of that means you've got to really take care of the people around you and mentor them and make sure they're making progress on their careers as well.

Judging younger scholars' contributions

Although collaboration is rewarded in the field, it is nevertheless important to distinguish the contributions of individual scholars. This is particularly the case for young scholars, who need to demonstrate that they are capable of publishing independently and do not simply carry out the "grunt work" for a senior scholar.

> One of the criteria for tenure is having people who are well known know who you are…If they publish coauthored work with you, though, then are less credible for saying good things about you. So, in fact, you still need to publish on your own to show that you are capable of it…In terms of whether things count, in my experience, if you have anything up to three coauthors on a paper, it doesn't make a difference, as long as one of your coauthors isn't a superstar. In that case, they may figure it's their idea and you just did the grunt work…It works against you if you don't have anything on your own, otherwise, it's neutral. For example, if you only publish with your advisor, people think you can't come up with any of your own ideas. If you publish with your advisor, but also have a great couple of publications without your advisor on your own or with people who are at your level, then people start to think that maybe you actually had something to do with the papers with your advisor beyond doing the grunt work.
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> There certainly is an effort to try to distinguish the contributions of individual authors in shared work, and that can be difficult. So that's an issue.

E4.4 Mechanisms for Collaboration

Given the importance of informal networks in collaboration, face to face interaction plays an important role in starting collaborations and generating ideas. Once collaborative work begins, the Internet and email are cited as incredibly useful for "shifting stuff back and forth cheaply." Economists typically use basic technologies such as the phone, email, and, to a lesser extent, online chat software, to sustain collaborative work. Few scholars had any interaction with wikis or shared workspaces of any kind. Instead, scholars' use of different typesetting platforms (like LaTeX, LyX, or Scientific Word) can pose problems for standardization in the writing process, and one collaborator generally "takes control" of managing the final document.

> Generally, the collaboration starts in person. So I could be visiting somewhere or it could be one of my colleagues and we go for coffee, and we talk about an idea, and that's how the collaboration starts. And, from then on, the whole thing goes through email. We trade versions back and forth, and we talk. Occasionally we'll talk on the phone but mostly it's by email. I think people are different about their communication technology. I use email a lot…Usually, I try to set it up so that somebody holds the pen—one person is in control of the document and the other person is not—and I don't care whether that's me or any of my coauthors, but I always think somebody ought to be responsible. And since many people use different writing technologies, it's really important for one person to have ultimate control. If the paper's going to be written in LaTeX, for instance, you need to have the LaTeX author be the writer. If it's going to be written in Microsoft Word, a Microsoft Word writer has to be the author.
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> My last collaboration was by phone and email. We sent documents back and forth very quickly, and then when we would talk on the phone, we'd both bring up the draft of the paper

> or other things and work them out verbally. And I don't think that would have been possible without email. Sending hard copies of stuff back and forth would've been too tedious…I have been using GChat with some coauthors. And I think I might be investigating more of that if we have two or three people at different locations. I could see using it more extensively down the road. That's basically how I communicate, via email most of the time…I haven't gotten to wikis yet.
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> I have a computer here with a hard drive, and I've set up accounts for my friends. They can go run some statistics on it if they want to. I have a set of RAs, and sometimes I'll tell my young coauthor, "Look, your job is to assemble the data. You make sure the RAs don't do anything crazy that will embarrass us later." So there are a lot of phone conversations, a lot of emails, networking types of things. Then, we see each other at conferences and we sit down together to try and get it done…During the writing process, we just send drafts back and forth…We don't use the tracked changes function…we usually work with some version of LaTeX…There is a sense in which people get on different standards and it's not always convenient. One of my old students loves this LyX program, which is like the freeware version of Scientific Word. God, I hate that program…People will get on different standards and your LaTeX commands don't work with your friends' LaTeX commands, and when you start collaborating with lots of different people, it can be a bit of a hassle. But if it gets to be too much of a hassle then I make my RAs do it. For example, I had a book where I wrote the paper in LaTeX, and the publisher said, "We need it in Word." So that was one of the joyous functions my RA got to do. I said, "Take this document, convert it to Word."

5. WHAT DO YOU NEED TO CONDUCT YOUR RESEARCH?

Economists study the creation, circulation, and consumption of goods and services from a variety of perspectives, spanning historical, statistical, behavioral, biological, and geographical approaches. In the process, scholars use and produce many forms of data and secondary literature, both generated within the discipline and drawn from related fields. The Internet has created new avenues for data collection, and new methodological tools for text mining, simulation, and experimentation enable increased levels of empirical research to build and test economic theories. Although some research in economics requires sophisticated laboratory environments and research teams, other work requires far less in the way of resources. Young scholars can play an important role in pushing forward new research areas in the field and by providing technical support to their established counterparts.

E5.1 What Do Scholars Do in Their Research? How Is What They Do Changing or Not?

Empirical research in economics takes on a variety of forms and methods, including the generation and use of public and proprietary data sets, Internet data, fieldwork, geographical distributions, computational models and simulations, laboratory experiments, and even blood tests and brain scans. In recent years, the field has witnessed the growth of experimental, behavioral, neurobiological, and spatial approaches, aimed at complementing the mathematical understanding of the "rational economic agent" with an exploration of the psychological, biological, and contextual bases of human economic behavior. The research methods and analytical approaches in these new and evolving subfields are being gradually incorporated into many areas of mainstream economics. Although the mechanics of data collection and analysis may be changing, the presentation of research data generally takes the familiar shape of spreadsheets and graphs.

Data collection

Economists collect quantitative data from a variety of different sources, depending on subfield. These sources include government agencies who make some data publicly available (e.g., the Bureau of Labor Statistics, the Census Bureau, and the Federal Reserve Bank), industry publications (often accessed through campus libraries), regulatory agencies that track particular industries (e.g., the Federal Aviation Administration), professional marketing firms who harvest and sell data, and data repositories such as IPUMS (Integrated Public Use Microdata Series) and ICPSR (Inter-University Consortium for Political and Social Research). Some scholars may also work closely with private companies or government agencies to collect proprietary data sets, or may create their own data sets through survey research. Transformations in Internet and digital technologies have enabled "quicker, faster, and better" access to high-quality data, and have created the ability to collect new kinds of data through Internet trolling in fields like commerce. For scholars with sufficient funding, "hungry students who will work for pay" often perform much of this "scut work."

> We use a mix of public and private data. So, for example, some people use publicly available data sets from the current US census survey…You can download them via the website…It really only takes five minutes to get those data. And then you, obviously, adjust the data with various tools. But at the end of the day, it is 100% publicly available data, and relatively easy data-wise to work with…A second way to get data is from private companies…and essentially you call a whole bunch of companies and say, "Does anyone want to share data?"…and then you do your work with that data set. A third way to get data is to hire a graduate student to look up more publicly-available information to add to data sets that you already have…A fourth way to get data is to buy data…like from a private marketing company. So there are all sorts of different models to get data. There are purchased data, there are companies giving you data for free in exchange for some deeper understanding of their data, there are public data that you just download and use, and there are public data that you either have to hire someone to collect or collect yourself and spend a lot of time cleaning and worrying about it…Internet data are, by definition, only available because of technology…Before the Internet, I would have had to call somebody, they would have had to agree to put it on a disk or tape, mail it, and it would have been a lot more costly and might not have even happened.
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> All the IT that was implemented in the late '90s, when companies spent a lot of time computerizing all their records, was really a boon to my field, because that meant that writing a paper about an industry just entails getting on somebody's relevant hard drive…I tell my students there are four places for data. In the first, somebody tracks an industry, either by looking at firms within that industry or publications about it. So, for example, if you went over to your business school library, you'd find a section there that has grocery store news, and those guys have digital information somewhere…The second place to get data is regulated industries, like electricity…The government made certain types of mandates about what kinds of information had to be put out there on regulated industries, and that's all digitized. E-commerce is another place where people get data in my field, so you can go to eBay or Amazon, download webpages, and convert those into data sets…We see what the consumers see and those webpages don't have lots of mistakes because they are a contract, so access to this higher-quality data has made a big difference. And the final place for data is professional marketing firms that study consumer and firm behavior in detail. All those guys have really become digital in the last decade, and that has really changed data…It's higher quality. My subfield's a little unique. Labor economists or macroeconomists may go to really crummy data sets built by the government that are embarrassingly bad, but…we have a deluge of data to

look at now. That's probably the most important thing that has happened in terms of technology.

To get data, you used to have to contact the companies directly, or the best thing was to look at a regulated industry in which the government regulator was collecting and publishing data. For example, the FAA would publish fare prices and the routes being flown and which aircraft, all this stuff…Then with the advent of the Internet, you could get data from a company collecting scanner data and selling it to marketers…So, digital technology has been used to generate data in ways that were not possible before. But now the Internet takes it to the next level. First you had government regulatory bodies generating data, then you had digital collection methods within companies generating data that you had to buy, and now you have the Internet generating data. If you're smart and you have good enough graduate students, you don't have to pay for it nor do you have to use the government to get it. I have graduate students collecting data in ways that were never possible before…For example, in IO [industrial organization]…you really have to understand a market, and to do that you need to collect data specific to that market. This is historical data, and if the appropriate *natural* experiment has taken place you can begin to generate results that look like experimental results. IO economists have always collected data at the market level, and at the industry level. But with the introduction of digital goods and digital information, like the Internet, there are new ways of collecting data. Some people will basically troll the Internet and collect data. They develop these autobot samples, get data from Amazon or from various sales websites and say, "Okay, here's an empirical question in economics: with the Internet you'd think that the price of a good would converge to one single price because anyone can search for the best price, but I've found 25,000 different prices."

The National Bureau of Economic Research has a bunch of statistics. The Federal Reserve Bank of St. Louis has a bunch of statistics. The census has a bunch of publicly-available statistics. In Arkansas somewhere there's a federal government project that has demographics by zip code data set. I use a bunch of different data sources…and the ones that I've named are all free. You just download an Excel spreadsheet…There's a world stat database produced by the OEDC, the Organization of Economically Developed Countries. They produce a database that looks like our census base, except on a whole bunch of nations, and it's about 20 bucks a year. They charge something, but it's cheap.

There's the Inter-University Consortium for Social and Political Research (ICPSR) housed in Michigan, which collects and archives and makes available lots of survey data that are generated across the social sciences, not just economics. And then there are big projects that collect data of various kinds, and I think they're made available quicker, faster, and better than used to be the case.

International data are becoming much easier to get a hold of…There are people using foreign census data, with over 20 million observations. It's amazing, and it's available through the university library's site…It's all online…I use census data and quite a number of government databases. I wish that the interfaces were a little nicer to use…I used to be able to use other kinds of data…by going on the Web and doing a search and finding different data sets, but now it's getting harder to find some of these data and you have to pay money for them.

I use the Internet on a regular basis as a source of information for my work. I'm working, actually, on finishing a draft of a paper and I want to be up to speed on what's happening with some of the new ventures out there in the industry I study. So I can just trawl across the Internet and find an amazing amount of information.

You get graduate students to do this stuff, to troll the Internet and collect data. It's usually very idiosyncratic and specific to a particular research project…Unfortunately for our current

> project, you can't troll. It's more work contacting companies. We've got some people to help us do it, but it's a lot of scut work.

As one scholar explained, locating and collecting data can involve varying degrees of time and cost, which depend on a range of uncontrollable factors. Advances in the automation of data collection, such as text mining, may help to streamline the data collection process.

> Let me contrast economics with science. In science, there are high fixed costs in putting together a laboratory…and there is this huge infrastructure, this superstar professor in charge of everything, Ph.D. students who do experiments, and all this money coming in. Once the laboratory is in place, the experiments themselves may only take a few weeks or a few months to conduct, and the replication issue is easy…Contrast that with the standard economics environment where there are very, very few situations that involve a laboratory. That only happens in the experimental context, and that's a new phenomenon. In the traditional economics Ph.D. program, you've got an advisor who's doing empirical work. You go out there and you collect the data, and you actually have to contact companies. Sometimes you may find data that you can buy or you find a company that's willing to offer data, but the whole process can take months to years to collect the data, and then figuring out how to analyze it, being innovative with these new methods, can take months, sometimes a year or two as well, just to estimate. You're running an estimation procedure, which may converge after a couple weeks of iterations, or sometimes they'll run it in a few hours, but…it depends on the nature of the beast.
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> New ways to automate data collection would definitely make life easier. I had a student go through thousands of websites and essentially look at the fine print to get a data point. It was too hard to write a program that would let you do that, and it was much cheaper to hire someone to do it 100 hours. I'm not going to become a computer programmer all of a sudden, so I would love some off-the-shelf program to help me automate data collection. Similarly, I can see text mining, which is another version of automated data collection, becoming more useful. It's already starting to. There are a couple of interesting papers that use text mining now in economics, and I can imagine them becoming more prominent…Text mining allows you to see what people are saying and see how those communication patterns spread. So, for example, one paper looked at the congressional record and found a bunch of words that seemed to be Democrat words and a bunch of words that seemed to be Republican words. They matched these words to newspapers, and got a very good sense of whether a newspaper is right- or left-leaning. You couldn't do that 10 years ago. It was impossible.

Statistical analysis, modeling, and simulations

Statistical analysis and mathematical modeling have traditionally played important roles in economic research. Driven by increases in computing power, some scholars are developing complex simulations to build and test economic theories. As an analytical tool, simulation extends the power of traditional economic modeling based on econometric techniques. Simulation can also be a methodology in its own right, when scholars build agent-based models to study and understand economic interactions on a broad scale. While graphic visualization techniques can be important for presenting the results of simulations and statistical work, the visual elements of data analysis are generally limited. Although intersections between computer science and economics are creating new possibilities for empirical research, one scholar doing more traditional work commented that, "I'm still a long way from hitting the computational barrier on my PC."

> In economics, because its intellectual history is more derived in some ways from mathematics than from the empirical sciences, there has been an overemphasis on theory. But now with all the data and computing power, there's been an enormous growth in empirical testing, as well as experimental work.
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> Down the road, we're going to see more agent-based modeling. Merging simulations with experiments in the laboratory is also going to be a very big growth area. It's not yet, but I think it's only a matter of time. It's all based on the increasing complexity of computing power you can put onto one machine.
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> There are new statistical methods that make extensive use of simulation, very large-scale simulation, the kind of analysis that's only possible with computers. These have broadened the scale and scope of what people do with simulations and iterative methods for finding statistical results. Simulation seems to scale up relative to the speed and size of the computers that are available to do it.
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> This is all happening in the interaction between economics and computer science…For example, you can run a simulation based on building an exchange—an exchange is actually a bunch of computer algorithms—so it's like making trading rules…That's a whole new field that's starting to boom…Actually, computer science economics is dominated by young scholars, and the set of senior people is relativity modest…Another growing area in the intersection with computer science is the study of networks, social networks as well as networks of suppliers and buyers for firms. There are lots of different networks being studied.
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> In my generation, visualization was very important. I think of myself as a visual person, having been attracted to economics because of the visual way of characterizing it, with graphs and diagrams. When you teach students in an introductory course in economics, that's how they see the field. But today, graphs and diagrams are relatively rare. I'd say there's less effort made at visualization than there was formerly, and it's hard because some scholars doing mathematical analysis use multi-dimensional spaces that are not easily represented with diagrams, but the mathematics captures those things pretty well…Statistical results are presented in graphic form, and simulation results have to be captured in graphs. We do see some color, but I can't recall seeing color used in an economics journal. So I think that visual communication doesn't quite carry through to where the frontiers of economics research sit.

Younger scholars are identified as being more technically savvy than their senior counterparts, particularly in computational work. There are some research centers and programs that train young scholars in new technologies and experimental methods.

> I have a graduate student who took a class in statistical visualization and is learning all of that stuff, and I'm kind of learning it through him/her. My student is using a specialized statistical software environment for the analysis and for the data visualization. And so s/he has advised me on some natural ways of building a graph and told me, "Here's why you could do it better and how you could do it better." And so I'm doing that through students. It's not common in the field for graduate students to take data visualization courses.

Experimental economics

In contrast to research based upon the gathering and analysis of extant economic data, scholars in experimental economics use experimental methods to generate and collect new data. In an effort to test the validity of economic theories and market systems, these economists use controlled experiments in the field or laboratory (often using cash to motivate research subjects)

to directly observe and study economic behavior.[83] As one scholar observed, "Experimental economics will be like econometrics. Every department that's worth a grain of salt is going to have one." The Internet enables scholars to conduct experiments online, following online markets and user activities.

> Experimental economics has changed a lot and gained a whole new head of steam since Vernon Smith won the Nobel Prize in 2002…The methodology is definitely more accepted now, and I think it's become much more critical to how scholars go about their experiments. That's a very good change for the field…As the technology changes, the types of experiments you can run are going to change in ways that we're not going to be able to anticipate. For example, when Vernon first ran his experiment, he used pen and paper and a chalkboard. Then when he went to computerizing it, he thought, "This just means we will be able to collect the data more precisely and with fewer errors." But we can also use new technologies to ask and answer new questions…and now machines are getting smaller and smaller, so you can take your lab to your subject out in the field. Those things are very exciting and as technology becomes more and more wireless, it's going to be hard to anticipate the different things people will come up with, but it will change and open up new questions…For example, some economists are studying how people look at pictures, how a smiley face, static face, or crying face affects cooperation among people across large distances. You can set up labs at different institutions to look at groups of people that have no physical contact but still have visual contact. And technology makes those things possible…I think more and more younger scholars are using the Web in a way to run experiments, and they're thinking about the world very differently than the generation before them.
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> There is one other thing that I'll flag, which is that people are starting to do experiments online. Experimental economics is a pretty vibrant field for doing experiments on the Web. It's still a fledgling thing, but it's likely to explode…So people play games and you can observe how they behave. It used to be that they had to be in a room together linked up on PCs that were connected to a server, and now they can use their home PCs to do this.
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> Experimentalists will test anything…and they often use students and small amounts of money to examine basic questions about economic behavior, for instance, "What do people do in light of uncertainty?" Of course, people always ask whether looking at kids in laboratory settings really tests stuff of real value to the marketplace…but this work is gradually spreading throughout the discipline. For example, in industrial organization…firms are doing many more experiments around pricing or advertising in the online marketplace than they ever did before the Internet took off…As a researcher, you can often persuade the company to do online experiments, which helps them figure out what's profit-maximizing and, at the same time, allows you to draw some conclusions about strategic interaction. The idea that the economist steps back and simply observes what's happening is dissolving…we're becoming much more ethnographic in our practice. In other words, the tools and the techniques of economics have become refined and sophisticated enough to directly assist companies with sophisticated marketing schemes in their online communication, for instance…Because of this, I think being an economist is much more exciting than it used to be.

As several scholars observed, the use of experimental methods requires more effort to communicate the nature of research data to others in the field.

[83] As observed by Dawson and Rascoff (2006), economists are becoming more like scientists in their research practice: Dawson, Michael, and Matthew Rascoff. 2006. *Scholarly Communications in the Economics Discipline*. Ithaka Strategic Services, June 12. http://www.ithaka.org/publications/pdfs/JSTOR%20Econ%20Study%20Report%20Public%20final1031.pdf

> No one has ever given a demo of a lab experiment at a conference…That should really happen at some point because reading about these experiments is not the same as experiencing them like a subject…I want my referees to have experienced it—not just have read about it—before they review it. And if I can find a way for technology to do that, I will have solved one of the key problems.
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> When you're doing experimental work, there may be issues about how you communicate your findings that are different than in other areas.
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> For people in the experimental fields, if you're not in on the experiment, it can actually be a lot of work to get up to speed.

New directions in economic analysis

As evidenced by the introduction of simulation and experimental methodologies to collect data on economic behavior and systems, economics regularly incorporates perspectives from other disciplines to deepen its work. In particular, scholars described behavioral economics as the "hot new area" among younger scholars. To a lesser extent, spatial analysis was mentioned as an important way to understand economic externalities, or the side effects of economic activity. As one senior economist described, there are only a small number of people "who shake the field," but on average one "new rookie" every other year can play an important role in shaping research practice in a subfield.

Behavioral economics

Over the past century, some economists have looked to psychology to inform their basic assumptions about human behavior. In recent years, behavioral economics has grown as a separate branch of economic analysis from an effort to apply these psychological insights so as to enrich economic models of economic behavior and human decision-making. The behavioral approach to economics focuses on the study of economic behavior as a "bounded rationality," restricted by time, cognitive capacity, and other factors. Work in this area examines the role of thinking, emotions, and social factors in individual economic decisions and market behavior, rather than simply following the predominant economic assumption of selfish actors and efficient markets. Scholars in this area are "methodological eclectics," and may draw on field data, laboratory experiments, computer simulations, brain scans, and other research tools to gather data.[84]

> The field of economics—if I were to oversimplify it—has continued to evolve because economics is always reaching out and combining with other disciplines to develop new areas. So the hot area this year and last year is behavioral economics, which has got a heavy component of psychology to it. And there's a lot of experimental work going on there…Work in this area is driven by a combination of people in the business school and the economics department.
>
> There have been fields that were marginal, seen as outside the mainstream 10-15 years ago, that now have become solid mainstream fields. So it's certainly possible for the tastes of the profession to move. Over my career, I've seen it move several times. There are a lot of critics

[84] Camerer, Colin F. and Loewenstein, George. (2004) "Behavioral economics: Past, present, future." In C. F. Camerer, G. Loewenstein, and M. Rabin (eds.), *Advances in behavioral economics*. Princeton, Oxford: Princeton University Press, 3-51.

who say, "Oh, economics is too conservative. It doesn't change enough. It doesn't welcome new ideas." I think the evidence is really quite to the contrary. It's pretty open to new ideas. It's just that they take longer to penetrate than some people would like. A prime example is the field of behavioral economics, which only a few people did 15 years ago. It was viewed as a little bit unusual, out of the ordinary, non-mainstream, but now it's a very hot area, and all the graduate students want to do behavioral economics. It's become a major thing.

There's the core of economics with its mathematical model built along a particular stylized view of humans as optimizers, and that has served economics well for a long time. But there's been increasing challenges to that model coming from a more behavioral view of the world, which is shaped by evolution and the growing knowledge that our brains work in funny ways and aren't necessarily optimizing. I view that as the main tension in economics, and, if I had to guess, I would think that the mathematical model is going to give way a bit to the more observational, evolutionary point of view. But I'm not sure exactly how that will play out…I can envision an increase in interdisciplinary collaboration taking place…Personally, I think it would be a positive thing for the field…There is some resistance, though. People who have made their careers on the basis of facility with really powerful, sophisticated mathematical modeling are resistant to other points of view.

Behavioral economics is a general phenomenon that has begun to touch industrial organization as well as other fields…"Behavioral" can mean different things. It could mean, theoretically speaking, that there are implications from not assuming that people necessarily try to maximize utility all the time; they may engage in altruistic behavior or do things in a way that is not consistent with profit maximization…This is a new class of economics.

Economists have been going beyond economics to try to understand both how to apply economics in other areas and what the foundations of the field are in other areas, so there have been interactions between economists and psychologists for a long time. They're more frequent now, but they've been going on for over 100 years. Economists care a lot about where preferences come from, whether that is psychology, neurobiology, or evolutionary biology. And those connections are very natural.

Economic geography and spatial analysis

For some scholars, integrating a spatial or geographic component into economic research can produce new insights to understand the ecological, social, or other implications of economic transactions. Like archaeology, economics is described as an "application discipline" of existing geographic information systems (GIS). In particular, the field of economic geography (originally seen as a subset of geography) has made great inroads into studying the location and distribution of economic activity.

There are two arguments in economics regarding space. First, there is a theoretical component that sees space as increasingly important in economics, and the new economic geography, which was started a number of years ago, has tried to re-inject the spatial component into economics. Second, on the more applied side of economics, space is becoming an important way of examining data and the spatial context becomes important in dealing, for example, with externalities.

What I spend a lot of time thinking about is causality and trying to identify a very specific relationship in a very big data set. At this point, it doesn't seem that most GIS technologies are going to matter that much. Do I know for sure? No. I do enough economic geography that I can imagine that it's a great way to communicate an idea, to show a map of the United

> States and have a different color for each county, depending on how they perform economically in some way. And I guess I can also imagine taking maps and figuring out a way to glean data from the maps. The technology allows me to go through Google Earth and find every river, or everybody that lives near a river, and use information about those rivers to understand something about the economy. So, spatial or geographic analysis of some kind could potentially present some interesting possibilities.

Neuroeconomics and fMRI

Neuroeconomics combines the methods of experimental economics with neurobiology and psychology to study the role of the brain and other neurochemical and neurophysical factors in human economic behavior. It employs experimental methods to collect data using a variety of laboratory tools, including functional neuroimaging tools (like fMRI), electroencephalography (EEG), eye tracking, and blood tests. Although still a comparatively "tiny" field, the field has grown from about 40 people worldwide in 2003 to roughly 150 scholars more recently, generally clustered in particular institutions. As with experimental economics in general, neuroeconomics is predicted to become more mainstream. Research in neuroeconomics requires a highly specialized skill set, however, and some scholars express concern that poorly-trained researchers could dilute advances in the field.

> Neuroeconomics is a new field, where researchers scan people's brains or watch what they look at with their eye tracking. These are new tools that allow us to have a glimpse into human behavior that we couldn't have before, and that's starting to boom.

> It's not enough just to have the psychology behind the economic decision; you really need the neuroscience as well…Even if you're building a mathematical model, I think everyone realizes that you need to have at least a basic understanding of what the human creature is doing and why, from the brain on down…Most neuroeconomics labs use 100 percent functional MRI and brain imaging data, so that's almost all visual data…Some labs though do blood work with drugs and other measurement modalities…so once the blood is analyzed, then it's just numbers in a spreadsheet, nothing super fancy. Of course, these data are hard to get; they're literally painful to obtain from the subjects…I think in the next five years we'll see an increasing use of different measurement modalities for brain activity, from eye tracking to EEG to genetics. All that stuff is going to be used to understand human behavior in the laboratory and in the field…Even though research in this area is not that simple, there are a ton of clinical applications for it…I think it will fundamentally change economics. In 10 or 15 years, neuroeconomics will be a standard working field within economics, perhaps within psychology and neuroscience. Literally, the textbooks are being rewritten as we go through this.

> Six, seven years ago, most economists were hostile towards neuroscience…Two well known theorists wrote a paper arguing, "Economics is about price and quantity. Why would you ever look at the brain?" I used to try to convince economists that this was important stuff: "Economics is about behavior and if you're interested in behavior you've got to be interested in the brain. Theorists and neuroeconomists both create behavioral models."…Having said that, I now actively discourage economists who are getting into this. I also see a lot of psychologists who are getting into neuroeconomics, and they don't understand the neuroscience or economics well enough to do good work…This is a field that requires a weird skill set, and I think most people should be reading it, and reading it skeptically, but are not actually doing it. Of course, you do need people who can replicate and refine work…So neuroeconomics, at least in the next five years, holds the promise to make some fundamental new insights, and after that it'll be much more about insights based on refining the basic findings.

> One thing that I think a lot of the enthusiasts forget is brain scan data are only particularly useful in a social context if they're giving you information that you can't otherwise get. So if you can ask somebody, "Who do you prefer for president, Obama, McCain or Clinton?" and they can answer you verbally, what do you gain by putting them in an fMRI scanner and showing them pictures of the three and looking to see which parts of the brain light up. I think, to some extent, that the neuroeconomics crew is going to be somewhat disappointed, because it will turn out that brain scans don't actually show you that much more than what you get from talking to people. Take neuromarketing, for instance. Why would you put people in an fMRI or focus group instead of having them talk to each other normally? The idea is that somehow you're getting something truer, and maybe you are and maybe you aren't. I think some of the legal applications will be cases where you've got real reason to suspect somebody isn't telling the truth…

Search and discovery of secondary literature

As in other fields, economists have become "aggressively enthusiastic" about the growth and use of electronic resources to access secondary literature.[85] Scholars commonly use subscription-based archival journal databases such as JSTOR. When searching for working papers, economists rely on online repositories like the National Bureau of Economic Research (NBER), the Social Science Research Network (SSRN), and Research Papers in Economics (RePEc, a decentralized international database of working papers, journal articles, books, and software components). Google Scholar and Econ Lit, a bibliographical service from the American Economic Association, are widely used. Many economists also cited the benefit of general Web searches and keyword alerts to locate working papers and other tidbits of information outside of the libraries, such as in related work in other disciplines, government documents, blogs, or grey literature. The "information overload" associated with a general reliance on online searching was not identified as problematic among economists. One scholar complained, however, that, "If it's not online, students don't think it exists." The library remains an important way for scholars to access resources not available in electronic form.

> When we look for archival material, we have JSTOR, which allows us to capture historical journal articles very readily. So, really, economics is in quite good shape in terms of the individual researcher's access to information.

> The electronic availability of literature basically allows me, before we get into the filtering process, to spread my net much wider, and I come across things that I probably would have never come across if I had to go to a library to find them. Even searches in Google Scholar or just plain old Google give me access to different things that I would have never come across, particularly things outside my area, like work in philosophy…If online searching piques my curiosity, then I will go in deeper, and as soon as it doesn't, I throw it out. I think the biggest benefit of electronic literature is that I just get exposed to more things…I don't have a problem with information overload. For whatever reason I think I've acquired the skills to filter pretty quickly.

> I can search for other people's research much more effectively and cheaply than I could 15 or 20 years ago…At one time you used paper, and then for awhile I would get a CD once a year, and now I use SSRN if I know the source. Sometimes I'll use Google Scholar, or just do a regular Google or Yahoo search, and cross reference for an idea, and often I can find papers

[85] Dawson, Michael, and Matthew Rascoff. 2006. *Scholarly Communications in the Economics Discipline*. Ithaka Strategic Services, June 12. http://www.ithaka.org/publications/pdfs/JSTOR%20Econ%20Study%20Report%20Public%20final1031.pdf

> that I wouldn't find otherwise, and stuff written about a certain topic and so on. So that search resource has had a really big influence on my life.
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> I certainly use Google Scholar extensively, particularly because it is cross disciplinary, and it also provides access to government documents and working papers and various kinds of grey material that are often very useful…all of these things that are maybe on the periphery of academic work.
>
> I do use filters. I signed up to get the table of contents from journals that I'm interested in, and that's the primary way I filter what I read. The second way is to use a Google Web crawler with keywords, and so every day or so I'll get a list of popular articles and blogs that will include the keywords I'm interested in. I'm in so many fields at some level that it's actually very hard to follow all of that, so the keyword search certainly helps me…I get a very low percentage of valuable hits from the Google Web crawler, and I scan them really fast, but it's surprising how I sometimes find really interesting weird and wacky stuff, like people's blogs. A lot of it is picking up my research or related work, but oftentimes I'll find a posted abstract from a conference I hadn't heard about or I'll find a local university newspaper in which someone got a grant to do something that's similar to what I'm doing. For example, I discovered just recently that a graduate student got some federal funding to do a related project, and I got a little overview of that project and I could figure out who the advisor was. That's great intelligence if you're really gunning to be the first to do certain things. So that's quite useful.

One senior economist hailed portable reading devices as having profound implications for reading academic material.

> Well, I just bought what I think is the neatest device since sliced bread, and that is the Amazon Kindle. It's fantastic to be able to read books and have a book with me at all times. Really, I have a whole list of books, and if I need another one I just do a couple of clicks and download it and it's there to read. Once it becomes easier to put other documents onto that thing…which right now you have to take a Word document, email it to one of their websites, and then you either email it back and upload it yourself or they download it wirelessly to your machine. That takes a little more effort, but once you start getting working papers and journal articles available on the Kindle, just right there on a machine that's easy to read, that is going to make things even more exciting.

E5.2 What Do Scholars Need? How Are Their Needs Being Met or Not?

The needs of economists vary greatly by subfield and the nature of the research being undertaken. Generally speaking, economics tends to be better-funded than other social sciences. For scholars whose research relies on external funding—such as experimental economists who need to pay research staff and subjects and purchase expensive equipment—federal agencies, like the NSF and NIH, and private foundations are the most likely sources of support. Scholars studying particular industries may receive support in the form of data or services from private companies. As the scholars note below, however, they are largely responsible for paying for their research expenses and technical support through external funding, and may receive little in the way of additional institutional support. Economists working with more publicly-available data sets are able to pay for data and software packages from their individual research accounts.

> From a monetary perspective, I would say we get middling institutional support. We have very little of our own equipment, and we often run experiments and collect data at other university

> labs…So, rather than buy the fMRI scanner, we rent time when we need it, fairly cheaply. Having said that, my university did give me a little space for our computers and conference room…They're enthusiastic supporters and they're more enthusiastic now that they're getting overhead from my grants.
>
> I'm pretty fortunate to have great technology in terms of computers and laboratories to do my research, so my group is pretty blessed in that sense…We have somebody in our group who's an expert in computational work, and we actually hire a software engineer to write the software for experiments. S/he keeps us up to date on those things, and that's who we go to if we have questions…I'm not typical in that sense; I have colleagues for whom it's much harder, for example, to secure money to pay their subjects. That's a barrier for entry into experimental economics, but I don't have such constraints. So I'm very fortunate…I'm not afraid to invest some of my own money into a project to convince somebody that it's worthwhile. So if it takes 1,000 dollars out of pocket, I'll do it.

Furthermore, as the scholar below notes, the exploratory nature of much economic research is not always supported by grants targeted at researching specific hypotheses. This factor may pose a barrier to young scholars trying to establish their reputation in the field.

> The grants are weird in our field…they frequently stipulate, "Do three quarters of the research and then say why you need money to figure out what you already know the answer's going to be." But if you really followed these guidelines, you wouldn't learn anything. I'm taking five gigabytes of data and trying to tell a story about them…I'm not examining this very specific narrow hypothesis, which I know precisely in advance…I don't know what the patterns are going to be in the data. If I knew that, it wouldn't even be called empirical work…When I tear apart five gigabytes of data…I may be led in a completely different direction than what I thought was initially going to happen. And if I don't follow that evidence, I'm a bad researcher. I want to write the best papers I can, not sit down and follow preconceived notions about what's going to be interesting…It varies a little bit by subfield, and fortunately the National Science Foundation understands how research works and they basically fund you for being a good researcher. You put up your proposal, but they know you're probably going to do about 10 things, two of which are directly related to that proposal…and the program officers don't bother us too much…They say, "Give us your reports, make sure they're published…and maybe write about the broader impact that you had."

6. TO WHAT DEGREE DO YOU OR YOUR COLLEAGUES ENGAGE WITH THE PUBLIC? HOW? WHY OR WHY NOT?

The expertise and research of academic economists are highly relevant to the public and private sectors, including government agencies, trade associations, private companies, marketing firms, and financial institutions. Economists engage with these groups, as well as the public at large, through articles and interviews in the popular press, educational courses or lectures, and research consulting positions with government agencies or private firms. While the degree of public engagement varies by individual scholar, such activity is better advised after a scholar has achieved tenure and some level of reputation in the field. Although most universities encourage the public visibility of economic work, scholars get little or no academic credit at the department level. Some faculty observed that scholars interested in the marketing or policy applications of their work may be more comfortable in public policy or business schools.

E6.1 Why Do You Engage with the Public?

Public engagement in economics varies by a scholar's personal goals, age, reputation, and subfield. Economists hoping to advance public policy arguments see the broad dissemination of research as an important part of their scholarly duties. Establishing a reputation as a top scholar in a particular research area, however, is an important prerequisite for establishing credibility in the policy arena. For academics who secure external funding, some type of public engagement may be encouraged by the funding agency in question.

> I think public engagement is an age thing…I'm at the point now where I've been fortunate enough to have some real impact on policy, but that wouldn't have happened if I hadn't gotten a reputation for doing good work…This reputation allows me, when I read other people's work, to comment on it with some credibility. I got involved in some political campaigns earlier in my career, which was really interesting, but I would not advise people to do that early on. It's very distracting. And now I'm in this wonderful position where people actually care about what I think and they listen…But even when you get older, people have mixed emotions about public engagement. There are still some people who say you shouldn't be engaging with the public, but there are a lot of us who think that public engagement is an important part of your function as a scholar. And I would say that as I've gotten older, I've realized that it doesn't do a lot of good to publish in a narrow way…If you do the kind of work where you're trying to advance science, but you're also trying to actually send a message out there to the broader policy world, then you ought to be available to disseminate your ideas more broadly. Within economics, though, that view varies by field and by the type of individual.
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> Some private funding bodies have a business ethic and metrics on how successful you are with their money, which includes things like where a paper is published and how many citations it receives, as well as how much media attention you get. And their view is that if they're going to dedicate hundreds of thousands or millions of dollars on you, someone ought to hear about it, more than ten pointy-headed folks in the academy. And I agree with that. If your work is exciting, get it into the press and get people talking, provoke people to think differently and more clearly about hard issues.

Why not: The contested nature of the "public intellectual"

While universities in general appreciate and encourage the positive press inspired by high-profile intellectuals, public engagement can be actively discouraged at the departmental level, particularly for pre-tenure scholars. In traditional economics departments, writing for or speaking to the general public is seen as a distraction from core research and publication advancing the professional field. This may differ for scholars based in public policy or business schools, where a scholar's research output is evaluated by a broader audience and there may be some reward for work with policy or industry applications.

> When you're a young person doing economics, you know exactly what the game is. And if you're someone who really feels like you've got to go out there and be doing policy stuff right away, you probably shouldn't be in the econ department. Those folks should look for jobs in a public policy school or maybe a business or law school…In the econ department, I would say if a young person were asking for advice, they would be told that public engagement is not something they should be doing…

At the university level, I'm encouraged as an assistant professor to engage with the public. At the more immediate level of the department, it's different.

Public engagement does not count in promotion decisions…but the university at large seems to value it. Universities care about their place in the firmament, and they value the public relations benefit of higher profile public intellectuals, but in terms of promotion I would say it absolutely doesn't matter. At the departmental level, there's a more rarified sense of pure intellectual wattage. There's really no expectation of public engagement there, and there are some people—even some great scholars—who have no business trying. I think the cautionary tale is Linus Pauling and his vitamin C enterprise. He was a great scientist and nearly discovered DNA, but later in life he became a little obsessed with public health issues.

There's the question in academia about, "Do you work and accumulate articles in this very narrow area and become the world's leading expert in it, or do you try to be much broader?" The safe thing to do is really the former, but I don't find it very satisfying and there are a number of people who are trying to get a little more breadth into their writing…I think there's a fair amount of reward in the university system for trying to communicate more broadly, but there really aren't rewards offered through academic departments, and maybe that's appropriate. I write for the popular press to some degree, and I think that's an important role to play, but I don't think I'd get any academic credit for it. And that's fine, because I get other credit. So it's a choice that people have to make, and they have to think about what their challenges or interests might be. There are lots of different ways to be incentivized, from working primarily for an academic community to working for a broader community. It's really up to the individual's choice.

The actual tenure process is still pretty conservative. Presumably that will change, but the idea is that public engagement beyond a professional citation in the *New York Times*, for example, in the editorial work that Paul Krugman does, is something that you do after tenure, after you put your nose to the grindstone. Before tenure, it's not good to give TV interviews or write newspaper columns. The most important thing is to publish in important journals…Now, if you're really amazing and you're writing on something that's very topical, perhaps public engagement could have some benefit for you. But as far as I could tell, in my tenure process, there was absolutely no weight placed on that kind of outreach, even though it benefits the university. If you make too big a splash, envious gazes point your way because you're not doing it the way others did it, and they can vote you down. So my advice is to be unobtrusive, get stuff published in solid journals, and then wait for your career to blossom beyond that…Now a public policy department or a business school is going to be a little bit different…In a business department, "marketing journals" or "management journals" are just as important as the econ journals, a little bit easier to publish in, and you don't have to necessarily be as theoretical and rigorous. So, public engagement will have more value there because of the broader audience that is evaluating your research output.

I'm in public policy, as well as economics. Policy is actually a place where scholars publish a lot of op-ed pieces, and we want to engage with the public, at least a little. Having a blog would probably be excessive though…

If you can write a book that will compete successfully with Greg Mankiw, you can get a million-dollar advance. That's a huge amount of work, but it's a huge amount of money. So it's not surprising that everybody is trying to create the next Mankiw and not doing what the profession actually needs, which is writing books that are tuned to particular audiences.

E6.2 How Do Scholars Engage with the Public?

The "public" for economists refers to a wide spectrum of groups, including the general public, trade associations, government agencies, and students. For the wider public, engagement can take the form of newspaper editorials, contributions to publications like *Newsweek* and *The Economist*, popular press books and lectures, and interviews with journalists in print, television, or radio. During recent financial crises, for example, academic economists including Paul Krugman (the 2008 Nobel Laureate) have been daily fixtures in national and international news. Exposure to the popular press can be created by universities producing press releases about topical research, or journalists "mining" scholarly papers deposited into the NBER (National Bureau of Economic Research), which have a high public profile. Additionally, economists may write for trade publications in their research area, or deliver educational programs for particular professional groups (such as federal economists).

> My colleague writes a newspaper column and talks about recent work in economics. I would say at least half, maybe three-fourths, of the papers this colleague talks about are available via the National Bureau of Economic Research.
>
> No, I don't do much public engagement…I do the odd press interview if it's on something that I'm specifically studying…Essentially, if the press is looking for a quote, they call us. If it's on a class that I teach, then I'm stuck doing the quote. So in that sense, I do engage. I probably do that about once every two or three months, not a lot.
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> Sometimes the school puts out press releases on different projects. I worked on one project that somehow caught the attention of different people, and I had an interview on NPR about it…but it's not something I usually do. It's not something I seek out, partly because I don't know how to and partly because I'm interested in talking about something if people want to talk to me, but I'm not out there advertising myself.
>
> I conduct programs for trade commissioners, congressional staffers, things like that, and all of my research gets channeled into those activities at some point. I also do a lot of public engagement through education, whether it's high school, undergraduate, or graduate students. I really enjoy making that connection to real people, even though it can be difficult sometimes to make that communication work. It's up to you as the teacher to bring that out for the students. You can run the same economic experiment with different groups, and what you pull out of that lesson is different for each group…I don't find it as hard in experimental economics as in other fields to make that bridge, in part because experimental economics is about discovering what's going on and that's what education and learning are all about. So, those two factors go hand in hand.
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> You go out and you give talks, and if the local high school asks me to help out, I'll do that. Also, people seem to track us down so about once a week you get a random phone call from somebody who wants to know something about the economy and you try to help them out…Newspaper reporters can be lazy, and they mine the NBER working paper series because they don't know how to write papers about the economy themselves. Other than *The Economist*, which is probably the only place that has reporters who know anything about economics, the journalism is embarrassingly bad. So what do they do? For example, I write a paper on something of interest, stick it on the bureau webpage, and I know there are reporters who mine that source, search through Google Scholar, take your paper, and regurgitate it into a little piece…Of course, if I worked hard on something I want somebody to know about it. I know that quoting my paper is better than what some random, crazy person

> will say about the issue…And after you've been cited on one issue they'll call you up again and again.
>
> People tend to write books for wide audiences, that's certainly one mechanism for engagement. Some people work for agencies, like the Environmental Protection Agency or the Department of Labor, and write policy pieces that can influence the agency. And others write for politicians or people involved in the policy process.
>
> I wrote a book that was picked up by the trade and popular press. It was a very positive experience, and it was fun getting attention from the world at large…There was also another aspect to the process that I hadn't really understood before. When you write a book that's a popular success, the real money is in the speaking engagements that follow. These things are amazing because, back in those days, it wasn't uncommon to get a speaking fee of $15,000 to $25,000 for a one-hour talk, plus business-class plane fare, and the other trip costs. So it was pretty lucrative. Now, it's more towards the low end of $15,000, but it can still be a quite rewarding experience…In my own case, certainly, I gave pretty substantial talks with quite a bit of intellectual content. I've thought about writing another book like that one, but it's not really worth it unless you follow it up with the talks, and I'm not sure I have the energy for that right now…There are only a few people who can do that today, like Jerry Diamond at UCLA who wrote *Guns, Germs and Steel*. That was a very good book. It summarized a lot of scholarly research, it advanced stimulating topics, and he does a fair amount of public speaking. I'm sure it's probably rewarding to him both financially and intellectually, because he's getting a broad message out.

Although the work of many academic economists is highly relevant for government and fiscal policy, scholarly research and suggestions are not always met appreciatively.

> The government has many economists working for it, and sometimes the Federal Trade Commission, for example, will ask scholars to teach a research course that they can apply in their current work. Federal government economists are all trained by us. Some of our Ph.D. students go to work in the government, and when they want to learn about a question they call us up. Within the academic world you get known for being good at a certain set of questions, so every time a scholar writes a paper about telecommunications, for instance, the FCC reads that and comes to them with questions. Other times, scholars will go and give talks for the government and sometimes it's not a friendly audience. Economists have tried to beat up on the Bureau of Labor Statistics, accusing them of being sloppy in computing inflation and giving examples of their miscalculations. Sometimes the government audience gets mad, but sometimes they try to think about it differently.

SELECT RELEVANT LITERATURE AND LINKS

This is not meant to be an exhaustive bibliography; as a courtesy, we are providing some of the literature—scientific and popular—that we have collected over the last few years. Please see the main Relevant Literature section and various footnotes for additional citations.

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CHAPTER 6: HISTORY CASE STUDY

CONTENTS

INTRODUCTION AND OVERVIEW OF THE FIELD

History is the study of the past. Scholarship in history is divided into a large number of subfields defined by geography (e.g., American, African, Asian, world), time period (e.g., classical, medieval, early modern), and other thematic criteria (e.g., public, religion, technology, economic). Some areas of specialization overlap with general area studies, such as African or European studies. History also interacts with the neighboring fields of geography, economics, anthropology, literature, political science, and linguistics, which can all play important roles in historical research. Generally considered to be a conservative field, historical work emphasizes the lengthy incubation of arguments, a rigorous and established chain of transmission of ideas, and the importance of peer review. In comparison to other large academic fields exhibiting a good deal of fragmentation, history is a relatively "commodious" discipline, with a shared culture and an overall understanding of common methodology.

As a book-based field, the standard form of final publication in history is the scholarly monograph, ideally published by a prestigious scholarly press. Historians also produce peer-reviewed journal articles, chapters in books, documentary editions, and book reviews, which supplement, but do not replace, the monograph. In general, historians, especially those pre-tenure, appear to be quite conservative in terms of publication. Multimedia websites, archival databases, and other digital activities are seen not as full-fledged scholarly products, but rather as methodologies that support or extended the monograph or formal articles.

Pressures in the publication environment have grown alongside the expansion of subfields within the discipline. While some see the rising bar of tenure and promotion requirements as producing a "glut" of low-quality books in American or modern history, monographic publication has become increasingly difficult in smaller, specialized subfields. While the publication crisis might, in some cases, be in the "eye of the beholder," there are concerns that publication challenges in specialized subfields may be driving scholars toward more readily marketable areas of scholarship. Experiments with electronic monograph production, such as Gutenberg-e and ACLS Humanities E-Book, have made inroads in combating the negative perceptions associated with electronic publication, but they remain outliers in the publishing landscape and are hard-pressed to compete with the prestige of well-regarded university presses. They also present great challenges to reviewers and review committees, especially among genres that present information in nonlinear and difficult-to-print formats. Similarly, despite an overall proliferation of specialized journals, publishing in nascent online-only journals carries much less prestige than the flagship print journals.

Historians engage in extended dialogues or "ongoing conversations" within their areas of specialization, which may occur over long periods of time.[86] Speed to publication, with the exception of the pre-tenure scholar's first book, is not a pressing issue, and older publications remain vital resources. In particular, book reviews, accessed through subscriptions to the flagship journals or H-Net listservs, play an important role in scholars' filtering practices. The visibility of some historical blogs and online resources, notably the History News Network (George Mason University), is increasing, but scholars are generally skeptical of non-peer-reviewed material. History is on the "slow side of sharing," and historians cautiously share well-polished work with trusted colleagues. Conferences are the main venue of public sharing of work-in-progress, though published proceedings are uncommon.

[86] Griffiths, Dawson, and Rascoff (2006).

Traditionally, the root of historical scholarship is the archive. Multiple authorship is very rare and takes the form of edited volumes or coauthored research articles. Historical research relies on multiple lines of evidence, and thorough, internal footnotes play an important role in publication to ensure rigor and validity. Some say history is becoming more evidence-driven, as high-quality, freely accessible online databases and other archival resources change the way historians do their work. Furthermore, like archaeology, historical research can be exceptionally visual and concerned with issues of time and space. Experimentation with GIS and other visualization technologies is supporting innovative work in spatial history and digital history. In a field that traditionally emphasizes sole authorship, projects that employ heavily quantitative and visual elements, or the collaborative building of digital data sets and archives, present new challenges to assessing scholarship. Bringing such resources to bear on relatively traditional questions of historical significance and analytical readings of archival documents, however, is still the primary use of innovative technology in the discipline.

The field of history has a strong public component and can be relevant to public policy and cultural heritage. Public engagement through news outlets, museum talks, documentaries, and work with local historical societies is common for scholars working in topical areas. While publishing or producing work explicitly for popular audiences is embraced by some, too much public exposure can work against a scholar during institutional review.

Despite a thriving journal culture, the monograph published by a prestigious university press is here to stay in history. There is a real monograph crisis for some young scholars, scholars in less competitive institutions, and scholars in smaller subfields that university presses determine to be less commercially viable. While electronic editions have sought to solve the cost problem, the preparation and peer review of digital monographs still requires much in the way of financial support. Just as important, few scholars or reviewers are accustomed to reading book-length work in digital form and are uncomfortable with non-linear narratives. More successful moves to address the publication crisis could come with print-on-demand services and subsidies to university presses to ensure that good scholarship can be published, regardless of subfield. Additionally, scholars seeking to publish copyrighted images in their work—and scholars using GIS, extensive data sets, databases of archival materials, and other media not readily supported in traditional publication—will need new publication forms and support to present and discuss such resources. While experiments in hybrid publishing abound, more nuanced reward mechanisms are needed to evaluate such non-traditional work, and scholars face a higher burden of proof to demonstrate directly the value multimedia publication can add to the development of the closely-reasoned argument that defines traditional historical scholarship.

1. REQUIREMENTS FOR TENURE AND PROMOTION: WHAT ARE THE QUALITIES OF A SUCCESSFUL SCHOLAR?

History is a book-based field often described as uniform and conservative in its scholarly communication habits.

> There is the idea that any historian's work should be understandable on some level to a historian working in a completely different field. There is a lot of crossover, methodologically, so…even if you're not terribly interested in 13th-century field tillage practices, there might be something in the way in which that argument was developed and the kinds of sources that were used that is relevant to you working in 19th-century development of Kansas.

Departments in competitive institutions require "one book for tenure, two for promotion." The publication of articles can be important but rarely substitutes for a book. Increasingly, institutions are requiring more in the way of book and article publication (two books for tenure at the most competitive institutions, and at least one book and substantial progress on a second project at less competitive institutions). New and emerging forms of scholarship (e.g., curating data sets, creating Web-based resources, blogs) are valued only insofar as they are ancillary to the book; electronic forms of publication (such as multimedia monographs) are still perceived by some as ephemeral and are difficult to evaluate. As a result, tenure and promotion requirements may be determinants of the medium that scholars choose to disseminate their work. Young scholars may be particularly conservative in this regard, with post-tenure scholars oftentimes being the catalysts for experiments in new forms of publication. According to some, the increased pressure to publish monographs is putting immense pressure on pre-tenure scholars and is creating a "glut of books."

H1.1 A Suite of Achievements Anchored by High-Impact Publication

Historians are almost universally judged on individual scholarship; multiple authorship is rare except in edited volumes. Tenure in research universities generally requires publishing at least a "significant" first book (usually based on the scholar's dissertation), and promotion to full professor requires a second or third book (sometimes acceptable in manuscript form). A scholar's value is demonstrated by the reviews the book receives, and subsequently, how their book shapes or defines the field.

> It is very, very next to impossible to get tenured at my institution without what is thought to be a proper publication record. You can get promoted if you have that, even if you have nothing else. I'm not saying you always will, but that's the dominant consideration. First of all, the kind of language that is used, and I think people think seriously about it and try to adhere to it, is you want to have a person whose publication record places him or her among the leading scholars in his/her field and the world. And of course those are somewhat subjective considerations, but the procedures used to ascertain whether that's true or not are pretty good. I don't have any particular suggestions to improve the technical ways that we go about doing that. Now, as to the question of quantity and type, here is where I do have a particular point of view that lost me some friends when I was an administrator. I have never seen any equivalent that wasn't a book, because that is the scope of an intellectual problem that begins to test your qualities in a way that no collection of essays will do. I take articles that are very good very seriously and they're a very good sign when they're good, but it's not enough of a test. The test is: Can you tackle a problem large enough, significant enough, broad enough? That requires a book. You have to write a book, and it has to be good, and we use the usual criteria, we hope, to determine whether it's good.
>
> We expect excellence in research and in teaching, and in research we expect faculty to have published a book or books that are field-shaping, that have really changed or are expected to change the way in which their subfield, or interdisciplinary area, will develop. I can't think of an exception. I think that that would be the standard, a book.
>
> You have to prove yourself to be a scholar of stature in the field, and that is done basically by a book published with a top university press and a minimum of three articles in refereed journals, preferably more, and participation in national, important conferences in one's field, so both in my field of subspecialization, but also in the larger field so they can see that you're active. You need excellence in teaching and that's measured in a variety of ways. One has to

> teach a fairly broad repertory of courses. You have to have a minimum number of different courses taught by the time of tenure. And they have to include some survey courses, but also advanced upper-level courses as well, so you have to range in that way and be versatile. And then teaching evaluations are taken quite seriously, numbers are crunched, and you need consistently high evaluations. And then the final piece of it is you need to prove yourself to be a good citizen in the university community through service, which is largely measured in terms of committee work, but also in terms of doing things you have to do for the college or the university, like speaking to alumni, that sort of thing. I gave a talk to parents. So I don't quite know how to categorize those because they're just one-shot deals, performances. Here, you're also expected to participate in the graduate program, so part of the teaching thing is also working with graduate students on their dissertations, oral exams, and so on. So, those three things, with research being the most important and teaching a close second.
>
> The book, and hopefully the field-defining book is the coin of the realm. That's the number one priority.
>
> In most universities, you need to publish significant pieces of scholarship, and traditionally it's been pretty literally imagined in terms of a monograph, preferably from a scholarly press.
>
> There's a lot more involved in the promotion to full professor, of course. It's a more general scholarly profile of excellence and prominence…For full professor, the standard is still a very high level of achievement, not just having a second book, but having a big impact on the field and having a lot of endorsements by faculty from the top 10 universities.

Furthermore, a scholar is defined as successful with regard to an accomplished career trajectory, and hiring committees do their best to hire scholars whom they predict will have "world standing."

> In the old days you had to have a published book to make tenure. And then if you had a few other things surrounding it, that was nice. That wasn't the only criterion. You had many other criteria—your teaching, your service, whether your colleagues thought you were intelligent, all kinds of things—but that was to make tenure. Then to advance to full professor, you needed to have another set of publications, usually at least another book. Sometimes it was sufficient to have the book in press without yet being published, but the university wanted to know—the review committees wanted to know—that the publication was forthcoming, even if it actually wasn't out on the day that your appointment was to take effect. So it is quite crucial that you have a publishing record, all the way from the start.
>
> People give papers at conferences, but that is not nearly as central as it is in the scientific careers. And so I think finding other ways to demonstrate that the person has really arrived at a point where their work is taken seriously and has been responded to, and that they're in the conversation at a significant level, is ultimately a crucial part of the tenuring decision, as opposed to narrow gate keeping. It has almost nothing to do with an abstract quantitative: you are at level X above the bar or you are at level Y below the bar. It's really: what is this career trajectory all about? And so you have to be as concerned with "Where is the person going?" as "What is it that they've done?" Everything that they have done and everything that's in motion is an indicator of what kind of productivity and stature can be expected over the course of the 20 or 30 years for which they'll be potentially enjoying the privilege of tenure.
>
> We tenure about 85 percent of people here. At Harvard, it's about 30 percent, I think. They're trying to do more. They're very defensive about it. My friends who have chaired the departments of those places are very defensive about this. Our tradition has been to hire a lot

> of people young and bring them along. Most of the people of my generation that have a world standing, they were brought here as assistant professors, so often it works. Sometimes it doesn't work. We've got some people in their 50s and 60s that are sort of disappointments to themselves and to all of us, but not very many, and that's the chance you take. And also, you can hire somebody at 50 and they sometimes don't do anything until they're retired at 70. So I think that the system here actually works pretty well. And I think that the fairness of it, we've got so many safeguards, and it's actually very hard to terminate somebody. They really have to foul things up in order not to get tenure here. It's not that way with every place but, as you talk to faculty here, I think you'll find not so much complacency, but you'd find a sort of a reasoned conviction that it's better here than it is a lot of places.

One for tenure, two for promotion: The importance of the book

Publication models have changed little in history; most scholars still produce monographs and articles. Historians argue that it takes years to form an argument, and, as noted above, producing a monograph is the standard for tenure in the most competitive institutions. The book continues to be the mainstay of historical publication because it allows the exposition and presentation of a solid, sustained, and closely reasoned argument that can endure into the future. Some department chairs indicated that a manuscript that has been accepted for publication, though not yet published and reviewed, may be accepted in some cases. As a result of these standards, university chairs and deans may work in close contact with publishers to access the reader's report or follow the production schedule of a book.

> Requirements vary a lot from institution to institution, probably more than they do from field to field in the humanities. What graduate students and young scholars typically face at most institutions, other than perhaps some liberal arts colleges, is the expectation that they will get a book out plus a handful of articles, and in the most competitive research universities, of course, generally speaking, the pressure is there for the second book, at least the embryo of the second book or maybe something six months shy of the book. And that pressure has undoubtedly grown over time, although I don't think it's grown markedly. I don't really see a lot of difference from a quantitative point of view in what people have been looking for. As far as in a quality sense, I think that over time, in research universities, there's been increasing pressure for that first book *not* to be simply the dissertation pumped out the door, but to be something that is redone, reconfigured for a broader audience, made more readable by more people, rather than be as technical as dissertations often tend to be…
>
> Ideally people are producing work that is going to represent the state of the art, or the state of the question. So the ephemeral or perceived ephemeral nature of other kinds of scholarship, especially digital scholarship may be part of the problem…I think what colleagues want to see when the junior person comes up is something that's a monograph—an extended engagement with a problem that takes print form. History and the humanities generally, don't have a rapid turnover in terms of what represents the state of the question, and so scholarship has a kind of durability that will stand maybe for a generation. That justifies the kind of extended thought that's involved in a book, whether it's digital or print, and it's the kind of display of scholarly investment and engagement that people expect at the moment of tenure.
>
> A longer and more extensive, large-scale development of an argument, such as occurred through the classical monograph. I think that's a serious argument, and I think it is true that, in evaluating a young scholar, it's very important to see whether that person can, over 300 pages, reach an understanding of life in the past that is deeper and more fully developed than an article-length argument.

> The book should be about the presentation of an argument. Thus, it should be a strongly felt argument and a closely reasoned argument.
>
> As a historian, in most departments, you need to write a really terrific monograph that's largely based on your dissertation. That's what people did, that's what I did, and that's what people do now.
>
> If you can't turn what people thought was a promising book when they hired you into a book in six years, that means you're not going to be a productive scholar for the rest of your life.
>
> You're not going to get tenure if you don't have a book in press, and you're not likely to get hired for a position if the search committee has the slightest hesitation about whether you're going to be able to get that book into press.
>
> A scholar needs to have written a book or the equivalent.
>
> My feeling is that tenure requires a book or some reasonable equivalent thereof. It's very strange. This is an era in which everyone talks about diversity, but when it comes to tenure and promotion, there's no diversity at all. They want those two books.
>
> The field of history is pretty traditional. It's always been at least one well-received monograph, published for tenure, that is, promotion from assistant to associate. And then usually another monographic book or publication—these are minimum requirements—for the promotion to full professor.

While a second book for full promotion is common, high-profile articles, a manuscript-in-progress, or other evidence of a wide-reaching second project can sometimes substitute for a second book (at least for evaluative purposes).

> And the second book, it has to be a good, solid book and recognized as an important book as well. In other words, textbooks don't count, obviously, or if you wrote sort of a long extended essay that the publisher turned it into a book, like a general history of the American Revolution, I don't think they would count that. But they really do want that second book, or a series of six to eight really good scholarly articles from top-notch journals. And they really do want that, and I think that's being a bit rigid, but it's typical of research universities, the two-book rule.
>
> For tenure, you're supposed to have a book and some articles, and for promotion to full professor you're supposed to have at least a substantial portion of a second book manuscript.
>
> In my experience in history, the classical printed book is crucial, so there should be a monograph that is already out. There have been occasions when the book has been accepted for publication but not yet out and not yet reviewed. That seemed to be adequate, once or twice, maybe even a book that has just been submitted or accepted.
>
> The publisher often gets put into a position where they get phone calls from department chairs who want to know, "Is this book going to be published?" "Where does it stand in the production schedule?" "Can you give me a reader's report?" Tenure committees are sometimes looking to publishers to help them make their decisions. But leaning on publishers, that's not right…How we respond to that depends. If the author wants us to release a reader's report, then we try to be accommodating because, after all, they are our authors and their tenure is at stake.

Articles

While articles cannot take the place of the monograph in tenure and promotional review at the most competitive institutions, scholars write articles when (1) discussing a specific/technical question, (2) discussing data not addressed in a book or, increasingly, (3) testing ideas for a future monograph approaching publication. Articles can also be important to claim a topic/position, as a way for young scholars to establish the quality of their Ph.D. work for hiring committees, or receive tenure at less competitive institutions. Finally, articles are commonly produced in lieu of a book in more "technical" subdisciplines such as medieval studies.

> You've got to be realistic: I would say it's still the book…Well, the most important thing is a book, and then general articles, and that's about it. Those are the two things that really count, and my understanding is that journal articles don't count for that much.
>
> Each of the fields has a slightly different set of factors, and medieval history is the one exception that tends to give more weight to articles than U.S. history…The kinds of questions that are asked often are more likely to be very specific, technical questions that can be best answered in a short article, and those are not the kinds of questions that are generally posed in modern history, by which I mean everything from 1400 to the present. So a larger interpretive framework is what historians are looking for, and the book is what allows you to deploy that interpretive framework and to position yourself in the various fields of literature that your book intersects.
>
> In my field you only really write books, and the articles are drawn from the book. So it's all with an eye toward a book. An article's just regarded as a chunk, something that's going to come out in more developed form later in the book anyway.
>
> In history, we usually want a book. The book is usually crucial unless somebody has a whole string, say, six to eight really good articles in peer-reviewed journals. That would perhaps substitute for the book. In fact, I think it usually would, but most people would write the book, because it's easier to publish a book than it is to publish six or eight peer-reviewed articles.
>
> History is still a book-oriented subject, and, especially in a research university, you're expected to write book-length contributions. On top of that, some articles, chapters, pamphlets, a great variety of other publications. Then come a lot of other kinds of communications, some of which are partly by accident: somebody asks you to contribute to a dictionary, for instance…
>
> In history, the role of journal articles as a measure of productivity is smaller. There are plenty of journals that publish articles, but the books loom much larger in terms of the publication objectives of historians.
>
> Journal articles for young people are important for a few things. One is that, at small universities or non-research universities, they will help people get tenure. I have a student teaching at a less competitive institution. If s/he publishes three scholarly articles either in a book collection or a reasonably respectable journal, s/he'll get promotion and tenure. And there are a lot of places like that. So they're important for that. They're important for young scholars to get a foot in the door. Again, it's outside validation. It's not just that I'm saying they're good, that they've published in a journal, the referees thought this was good, and they can send that article off to a hiring committee and, instead of having to read the whole dissertation, which is a chore, say, "Okay, here's the journal article, it's good, it was published in this journal, people like it. We like it." So it helps people get interviews and jobs, and then

it also helps them get funding, because if you want to write a book and you've got a good article out, you can use that as a basis for it.

In my field, it's a book, preferably published by one of the six top university presses. Other presses will be considered if particularly strong in the topic, but it's pretty rigorous. Articles are not required. I will discourage grad students or postdocs from thinking about submitting articles, taking the time away from completing their book and focusing on articles. Sometimes articles are appropriate, but for both the initial hiring and for tenure review, the book is all that counts, and whether you have authored zero articles or 10 articles, it doesn't matter.

A lot of history departments are extremely hidebound institutions...Sometimes highly competitive institutions are actually the worst about things like this, because we're always wondering what the neighbors think. There was a guy in my field at a less competitive institution, who in the course of his entire career wrote six or seven articles, every single one of them a gem. They're brilliant; we still read them 40 years later. He was a full professor at this less competitive institution on seven articles. Here, he would have died. There's just no question about it. Here, it's always if we tenure someone who doesn't have a book, what will the people at other institutions think?

My understanding is that journal articles don't count for that much. It kind of depends on where you are and where you want to be. Some places will count them. I can't remember what the ratio is, if it's three journal articles equals a book or something like that.

Two for tenure and the trajectory of a career: Institutional variation in tenure requirements

The most competitive departments and/or institutions are now requiring two books for tenure (or at least a second in press, or in good manuscript form), as well as three to five peer-reviewed articles in top journals. According to scholars at highly competitive universities, this requirement for the second book, or at least significant progress on a second project, separates the wheat from the chaff by demonstrating a scholar's ability to sustain a strong and independent research trajectory beyond the dissertation.

We used to have a notion, certainly, that there should be one book, but a first book is a peculiar thing. It tends to be a converted dissertation and often bears the stamp of the dissertation advisor, so we often said to ourselves the really important thing is the second book, but we weren't rigid in requiring a full completion of the second book, but at least a couple of articles that indicated the candidate was doing something further, had new ideas, was building up momentum for the postdoc stage in a career, and I think that for many of us it was this second work, which needn't be a book but which would be often a couple of articles that would be rich conceptually and that would indicate that the candidate had been working in promising archives, located a vein of material, had new ideas, that would be, often for me, at least, the crucial consideration.

This may sound mechanical, but in history, I would never, or next to never, give anybody tenure without a second book. Just for tenure. Promotion doesn't require anything that's deadly specific. You just have to have tangible written evidence that this man or woman is making progress. Maybe there are some articles and s/he's still going to turn out those couple of books when the moment comes. But it can't be just hopes and good will, there has to be something out there to make it persuasive. So you want to be persuaded—if the man doesn't have a book yet—that the quality of what he does write indicates it will be a very good book when he writes it. And you want to know, have you done any of it yet? And you want to see if he has done it yet. But the most controversial position, at least it was controversial to my

colleagues, was a fairly rigid assertion that it had to be two books. Why, one might ask, does it have to be two books?…This was not controversial so much in history as when we were asking the other humanities departments to meet those standards as well. I think most historians would agree with me, although not all. But, as to the question "why?," there are really two answers. One is when a person has written a dissertation, which he turns into his book, which is almost always what the first book is, you don't know how much is him and how much was his teacher. And so it's just not enough clear-cut evidence as to what happens next. And the second reason, I had a wonderful former colleague who made this statement, "A tenured professor should have at least two good ideas in his life," and that's very important…I don't know the statistics specifically, but do you know how tiny is the number of people who ever published one book? And have you any idea how much tinier is the figure of those who wrote two? It's a very real borderline between those scholars who are going to practice their craft at a high level continually after they have tenure, and those who won't. So that's the reason for this rather apparent rigid standard that I have, but if you don't have those I want to have a heck of a good reason why we should give you tenure.

We also are looking for evidence that this is not a one-off success, so we like to see something that gives us a sense of direction for a second research project. That can take the form of draft chapters of a second book, maybe a couple of articles, something that gives us a sense of the intellectual trajectory beyond the first book.

There was a very interesting discussion and debate in my department over this very issue. Currently, if we had to actually write it down on paper, the tenure requirements are a monographic book, generally based on your dissertation, and evidence of a second project. Basically, that's it. There's flexibility in this. They also like to see articles. It changes slightly depending on the circumstances, but basically it's the book and then progress on a second.

You have to show trajectory in your scholarship, that is to say you have to have a well-developed second project…Not a fully completed manuscript, but a piece of a manuscript, a book proposal, preferably one or two published pieces from the second project…Lots of people can't do that, but that's what is hoped for. A lot of people fall short of just that second thing, but they have usually a chunk that's unpublished or out being considered by a journal or something like that…

Some places, I suppose, it's fairly mechanical. If you have the book then you're in, and if you don't then you have a higher burden of proof. But I think in most of the better universities, there is at least the opening there to a broadened conception of what it is that needs to be demonstrated.

The research universities have no trouble getting people, so I doubt their standards will change. At liberal arts colleges, at state universities—which are teaching institutions—things vary. Some of them want books now; some of them still just want a few articles or various combinations of teaching, service, articles, and so forth. But at the research universities, they stick to the two-book rule.

Places like Harvard and Princeton and Yale are in a class by themselves (with regards to their tenure and promotion mores). And here it's not like that. One thing good about this place is if you're on a tenure-track job, there is no quota. Everybody gets tenure if you meet the requirements. We don't mess around and we want friends. The main thing is we also want people we can get along with. There are a lot of smart people out there. There are lots of good teachers out there. We want people we can get along with and not give us a hard time, who will be happy and stay, so we don't have to have another search in five years and lose our friends. And our department has almost no factionalism. We're all friends and we're all happy people; other places may be different.

The "trickle down" effect: Raising the bar at less competitive institutions

Senior professors at less competitive institutions mentioned that the emphasis on the second book for tenure at major research universities may be trickling down. While these institutions may not require a second book in press, they are looking for movements toward second projects, such as an article, grant, or research activity.

> In history, the tenure and promotion requirements are changing quantitatively but not qualitatively. Here, I would say what they're still looking for is a book published with a good press, half a dozen articles, and some sign of significant progress on a second big project, either in the form of a couple articles about the new project, or fellowships for the new project, or you've got some sign that you're moving forward on that. Quantitatively it keeps creeping up. As you probably know, the Chicagos and Columbias of the world increasingly want two books.
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> It's pretty much all tier-one universities and all the tier-two universities that emulate tier one. I can't think of a single history department where this is not the factor. And if I were to go down to the teaching universities…the departments that really pride themselves on what they have to offer…they really want to see their faculty publish books. And articles are fine, but really, the book is what they're going to value in terms of their internal promotion reviews. Now, obviously, they give much more weight to teaching than we do. But still in their assessment of the faculty as scholars, it's going to be the book, not articles.
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> The pressures in terms of the constricted number of tenure-track positions has raised the bar so that people really need to demonstrate not simply that they've done a dissertation and been able to get it published, but that they have embarked on a second project that has some kind of legs to it and is demonstrable in some sort of concrete way, whether through grants received or chapters published or a book contract or so on.

The increasing need to demonstrate progress on a second project at less competitive institutions may encourage a certain amount of "games-playing" to the detriment of good scholarship.

> I think at the level of institutions that are quite good, but don't have the prestige of Harvard, Yale, or Princeton, what is encouraged is a certain amount of games-playing. So that, at a place like this (not Harvard, Yale, or Princeton), they're not asking for the second book *yet* for tenure in history, but they are asking more than they used to for signs of how far along are you on the second book. And frankly, I think it encourages people to fake it. That word may be a little bit strong, but to take very tentative chapters and pretend that they're much further along in thinking this thing through than they probably should be, to often hurry with defining the second project. I know there are all sorts of problems with letting people drift too much, we all know stories of people who got tenure and never did much again and so on and so forth, and I'm aware of those things.

As with tenure requirements, criteria for full promotion may be increasing as well so that nothing can be substituted for a second book that is finished and has been well received.

> There is a kind of trickle-down model that you can see emerging…An historian famously said several years ago that the typical university professor of history and humanities broadly publishes two books over the course of a career: One book to get tenure and a second to get promoted to full professor. And I think that's still true. I know that in some departments, there's been some wiggle room on the second book, that if there was a collection of scholarship, mostly articles, essays, chapters, and volumes, that represents a significant new

direction, but still appearing in venues that are peer reviewed or marked by distinction, that that might be accepted. But the golden road to promotion to full professor is still the second monograph.

The glut of books and journals

High-level administrators also complained that the need to push out books for tenure and promotion can lead to unnecessary and conservative books being published, or low-quality books that could have benefited from additional research (although this is not true in all institutions). These quantitative requirements may discourage scholars at the most competitive institutions from engaging in more creative, topic-driven research. This has implications for the relationship between academic promotion and the publishing environment.

> Most monographs are probably boring, even to people in the field. And it is often then said that a lot of monographs can be condensed down into a long article. In which case, some have also said, "Why not simply allow someone to accumulate very good articles? Why should it be a book?" The argument for the book is historical. That's the way it was done. And it's a sustained argument over a lot of pages, so you can really get your mind into it and develop a topic, and enrich it, and show innumerable sources. But often enough, the results are just okay, but not spectacular. So there is a debate within several scholarly fields, and each one would have a different way of approaching this, as to whether the monograph should be as significant as it has been, or whether it would be sufficient to have a collection of literary essays. There are some scholars who produce collections of essays. And everybody welcomes that because they're exceptional at it, and their essays are better than other people's books. So the rules can be broken. There are exceptions to the rule. Talented people break the rules. They break the rules in music, they break the rules of art, they break all the conventions because they're exceptional. And you say, "Okay, they can get away with it because they're exceptional." If you can't, you can't. So it is an ongoing scholarly debate.

> There are some books that really don't need to get published that could have been a couple of articles or that are the core of a bigger book that requires more research and more time but don't because the author needs to get tenure. There doesn't seem to be much movement within the university in terms of recognizing publishing expectations…A book shouldn't be the bottom line for tenure. That should be changed. Everybody complains that there are too many books and sometimes we're selling 400 or 500 copies. There has to be a more complex system. Yet publishing from a list of publishers that we already know about is the gold standard. A book can't be the gold standard. There have got to be other ways of making judgments about the quality of work.

> I think the requirement for a second book is encouraging people to choose relatively timid second projects they can get done quickly. I think this goes back a long way. If you think about the institutions that have been asking for two books for a long time—which would basically be Harvard, Yale, Princeton—and you were to go through it, you'd find a lot of distinguished people at those institutions who did quick-and-dirty second books. This doesn't necessarily mean it's a waste; one of their lesser efforts is still very much worth reading. But I do think it doesn't encourage people to do what I would like to see more people do, which is to say, "Now I've got tenure. I'm free from the idea of having to tailor my project to something that can be between the covers in six years. What do I really want to know about?" I would like to see more people be able to take a chance on going for a big second book or some breakthrough kind of project. I think raising the quantitative standard probably discourages that, rather than encourages it.

> I think the second book is the result of pressure from the universities, in the sense that that is the message that gets back to people about what committees are looking for. And of course, it's a pressure that's advantageous in some respects to university presses because they are the ones who are better able to satisfy this, than are, let's say, European academic presses, which are generally oriented toward publishing more technical things.

There is an increasing debate among many historians over the extent to which articles and other forms of publication could substitute for the historical monograph. Historians are concerned on two fronts: the increasing difficultly of publishing monographs in narrow historical subfields, and a glut of books being published in general due to quantitative increases in tenure and promotion.

> With tenure, quite clearly, younger faculty have to pay a lot of attention to publishing in major journals, peer-reviewed journals, and meeting some sort of quantitative criteria, which really is quite different from university to university. And the result is that I found, both from serving on journal review boards and on innumerable tenure committees, is that it drives junior faculty to be more and more cautious, and that there is absolutely no percentage taking a chance.

> A more long and extensive, large-scale development of an argument, such as occurred through the classical monograph…I think that's a serious argument, and I think it is true that, in evaluating a young scholar, it's very important to see whether that person can, over 300 pages, reach an understanding of life in the past that is deeper and more fully developed in an article length argument. Having said that, I'm now going to contradict it. This is a radical position and I originally thought I could try to convert people to it here and change the structure of the Ph.D., not just in history but in the various areas of the humanities and the social sciences, and I'm now much less optimistic about that, but I'll just say roughly what I would advocate, and I think we should give up these traditional Ph.D.s. In its place, we should ask graduate students to write the three publishable articles, and we should expect them to do it quickly, and then we should invest the resources in postdocs. Of course, not everyone can get a postdoc, but it's amazing to see how many now exist in fields like history and other fields of the humanities; they used to be restricted to physics or whatever. Now there are all kinds of humanities centers scattered around the country and many, many of, at least the graduate students I've known, don't begin as assistant professors, they get a two-year postdoc and their strict academic teaching careers begin after that. In any case, I think we should invest resources in postdocs, and the newly minted Ph.D. can then combine those article-length studies into a book, or continue to publish articles, all of this online, and come up with a serious C.V. of publications. But the book itself would not be among them, and this person might not write a book until age 50 or 45.

Young scholars' perception of tenure requirements

For some pre-tenure scholars, there can be a lack of transparency surrounding tenure requirements.

> Candidly, the whole tenure process remains opaque. A senior colleague of mine said to me, "Hello there. It's two for tenure." And that two for tenure is preferably one published book with very good reviews and a second manuscript almost done. Then along the way, I got told that, "Well, it's not just two for tenure, it's two for tenure, and, oh, at least three or four peer-reviewed publications." Then they say, "Well, but we do want to know that you are known in your field. Have you organized conferences and panels?" And they say, "Well, we also like to know that you are a scholar who is recognized, and so, have you given any talks at major institutions in your field?" So, what starts out as reassuring just ends up becoming the raising

> of the bar. And so, here, I'm not entirely sure, but I am going on the assumption that I will need a published book, a completed second project, or at least a substantial amount completed, then three or four peer-reviewed articles in addition to some evidence of organizing conferences, panels, talks at various universities, but they have to be major places, so it would have to be Princeton, Michigan, Cornell, and the like, and sizeable teaching. So it's those three things that sort of come through to you, but not always clear.
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> The only clear standard is a book and significant progress on the second book. Other than that, it's not all transparent. It's far from clear whether writing articles, being a decent teacher, or any of the committee work matters at all. They're pretty good here about not overloading…In some ways, what happens here is there is this chronic anxiety about tenure, where every time you think you're all right, somebody else, who is well-meaning and wants to protect you, will up the ante on you. I want to be very clear in saying that it's not done as a way of intimidating. It is done, actually, as a way of saying, "Look, I want to make sure this is fine. I want to make sure that when your case goes up nobody says this and such." But, over years of various such well-meaning faculty advising you, you'll end up feeling like you're just going to not be able to breathe at some point with the pressure.

Some senior faculty observed that pre-tenure scholars may respond to this pressure by being exceptionally conservative in their publication behavior.

> I think our department would be perfectly willing to consider a case in which someone said it made more sense to publish five interlinked articles in major journals than it did to publish a book. We have never done it but I think we would be open to that argument. But, in fact, young people are still very much caught up in the old expectation of a book and a couple of articles, and so they tend to put an enormous emphasis on the book.
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> As one graduate student demonstrates below, while articles or other publications are not absolutely necessary to get a tenure-track position, they are helpful, plus newly hired faculty are expected to hit the ground running and produce a book in two to three years.
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> For historians to get good tenure-track positions, usually they have to come from top universities, top departments. And it varies sometimes. One or two published articles is standard in the field. In our field, unlike in the sciences, the dissertation really is the magnum opus. And it should be the first book. If it's not the first book, often that can be problematic, because it takes so much time to prepare this piece—that in terms of the tenure clock it would be hard to start a completely new project and see it through to a published book in that timeframe, in addition to moving and starting teaching and all of these things. So usually to get a good tenure track position or any sort of tenure track position, you don't have to have publications, but it very much helps. And I think at the top places most people do. Never, almost never, do people have a book, obviously, when they're coming out, but two to three years is pretty quick and good to get a book out after you've gotten a position. So a lot of times, people will get great jobs with not even one publication, so it's a bit capricious from my vantage point. But I think it's sort of a pedigree of institution and the people you've worked with, and then, also, depending…a lot of it is what departments want, what niche you fill.

Visibility in the field

A scholar's reputation in the field plays a very important role in advancing his or her career trajectory. As one senior historian stated, "What distinguishes the top guys is that they have an agenda and they want to pursue it. They want to do something and change the way we think about the issues that they work on." As in most other text-based fields, publication in journals or

articles is the main vehicle for establishing a reputation, something also reflected through "dialogic indicators," such as professional leadership roles or invited presentations.

> What is the ultimate point of doing a monograph? What's the ultimate point of publishing? It's not to have words on paper. It's for careerist, academic people. It's reputation. We cater in reputation. That's what gets us hired into tenure-track posts or poached to universities. We are in the business of creating a brand of, "That's the guy who knows a lot about X." And you do that by going to conferences and presenting things. It's part of the reason you circulate your work to other people in the field in informal and formal ways. The ultimate end goal is you want to be known as an expert.

> It's luck. Making a name for yourself is a complicated process of acceptance, and, in the beginning, it's difficult to know what is going to happen to you. You've been a good student and got a good job, but you've got all these hurdles to go. A publisher has to decide along with the anonymous readers that your work is worth publishing. Sometimes when you have been published successfully, then it becomes easier because they say, "Yes, just do it, okay, no problem." But if you go to another publisher, they know to start the process all over again. So it is simply another aspect of making the reputation in your field. It's part of your career, and it's something that you're deeply concerned with because it's a published culture for research universities in the humanities and social sciences, in particular. A different summation in the sciences—they have to publish, but they get it out there. They're reporting on their research and so on. But historians are writing history. So that is simply an aspect of your career, and is involved with making a reputation generally, as a scholar.

> There's a real sense of wanting to know that the person is engaged in a significant conversation in the field, that they have some place, that they are a person of note, that other people pay attention to them, that they are active in advancing the field. So that begins to raise both the possibility and to some extent the necessity of what you could think of as kind of dialogic indicators, invitations to present, professional roles that are not simply kind of road service, but really indicate leadership. This is something that ends up coming into the letters and the way the letters are read. It's not simply a matter of somebody with authority saying X person has done a good piece of work, but a real expectation that the person has established a scholarly presence for themselves and are highly estimated and taken seriously and are happy in a professional way that's ongoing.

> For me, my name has come through a couple of articles. I don't know if that was at all considered in the tenure process, but the things that have gotten me invitations and attention have been two articles that I've published, much more than the book.

Professionalization of younger scholars: Building reputation

According to the scholars we interviewed, graduate students and pre-tenure scholars are increasingly professionalized in their publication and communication practices.

> Today's graduate students are far more professionalized than I was: worried about jobs, worried about doing conference presentations, worrying about how to professionalize all the way through. I think their advisors, even for undergraduates, give them the kind of advice they need to do this. I think this is a change. I wasn't nearly so professionalized. I don't know if that's me, or if that's the university, or what, but I wasn't professionalized. I'm just astonished at how they, in the very beginning, think of everything in terms of how they market themselves and how they fit into what's supposed to be done.

> I've seen this sense of professionalism among younger scholars. I would say it's, in many cases, a question of having the forms of professionalism without all the content. I find it irritating as all get out! It often comes across as very self-important or pretentious, and I don't care much for that. And it does sometimes gets in the way of their doing substantive things. I think that is true. I don't know what to do about it. I don't know any strategy on this one. Sometimes they've come into graduate school with these characteristics already. Or, they pick them up from their peers, thoroughly, in graduate school. They also give conference papers when they have nothing to say.

Some advisors may try to "professionalize" students to enter the job market, encouraging conference appearances and early publications, and also pushing them toward more topical research areas.

> I tell so many young scholars, "You know what you *have* to do to get tenure." I say, "Err on the side of safety. Get your book out, have a couple of articles, get it done a year or two early and don't fuss too much with it because the publisher is going to want changes anyway." They're going to send it to two people and want changes, so why make too many changes before you send it to the publisher? Unless your committee said to change your dissertation in such a way to make it more publishable…but otherwise, *just send a dissertation*. I try to tell my students that their dissertation should be a good first draftable book that's ready or almost ready to be sent to a publisher, that's what I want in a dissertation. And I've got one like that.

> I tell students that, when they come to work with me, just the recruiting stage, be prepared that there may not be a job. I've had very good luck recruiting, but…you have to be prepared that there are not going to be jobs, you can only do this if you can see yourself doing nothing else. And then I work very hard to prepare them for the job market, make sure they go to conferences with me, then they start giving papers that they get to publication before the dissertation's out, that sort of thing, doing a lot of professionalization, this is how you interview, this is how you write a cover letter, what your C.V. should look like, that sort of…Also given the job market, I want to make sure I can place the ones that I have in the pipeline, and I think it's very labor-intensive. The problem is that some people basically take a sink-or-swim attitude with their students. I've been trying very hard in the last two years, steering people out of the postwar period of history, because of the job market. I say, "Let's look at something a little bit earlier."

External letters

Letters of recommendation, in particular, play a large role in making hiring decisions, as evidence that a candidate is making a meaningful impact on the field and achieving widespread external recognition. Reviews of a candidate's work by prestigious scholars in the field can be more important than where something is published.

> What a scholar needs to remember is that you're having an impact on the field, and if people are recognizing your impact, they'll say that in your letters of promotion.

> You know how the tenure process and promotion process works. We go out and get letters from six to 10 people who are experts in the field, and we expect them to say, "Mr. Smith is really great. If we could rank him, or Ms. Smith, against the top people in the field, they would be near the top." At least that's what places like Michigan and Texas and Berkeley say, and you need to be able to say that. Those are exactly the standards that you have, is to be able to have people recognize that what you're doing is important work.

> It doesn't matter where it's published, but it matters who reads it and what they think of it. In other words, when you send a guy's name out for comments to people who are judging tenure possibilities and you put them up against the list of other people, and they write back, "I don't know Mr. Schwartz," that's not good. If the time is the right time, he should have had enough time to have his work around so that people who are in the business would have read it and made some judgments. So that's a fair criterion.

Job offers

The occasional competitive job offer reflects a scholar's standing in the field, and, like external letters, may factor into a tenure and promotion decision.

> Although it's also clear that job offers matter, probably secondary only to the book is if you get a job offer somewhere else. Figuring out how to present a job offer is tricky because everybody advises you that job offers don't matter, it's not a good idea to go look for jobs, but it's been extremely clear that people who do get the job offers or even look, everything gets accelerated and goes much more smoothly. Not to be cynical, but other universities make the decision for them.

Conferences

Although they count for little in the absence of a book, conference appearances are an important indicator of a scholar's visibility in the field.

> Conferences are important. No one is going to get tenure because they've been to a lot of conferences and no one's going to be denied tenure if they don't go to conferences if the book is there. Although there will be some eyebrows raised as to why this person never gives papers or something like that, it won't be the deciding factor if there's a good book there. It really won't matter.

The importance of extramural funding

Extramural funding is often not a large consideration in promotion or advancement (except where it might be evidence of outside validation or support of the second project/book). Funding in the humanities, and in the interpretive social sciences, is minimal when compared to the sciences. There are exceptions, however, most notably within younger departments, less competitive universities, and/or institutions that support and encourage innovation with digital tools.

> Early American history has a lot more funding than almost anybody else I know. It's easy for these old historic institutions to raise money. Say, Philadelphia—American history. Boston and the New England area, the Mass Historical, the Newbury, the Peabody Essex Museum, John Carter Brown Library, these places. You think, "Old money, old city; they have a lot of fellowships…" All graduate students get fellowships in one or more of these places. And so when the department or the college sees they're getting outside money they're also inclined to kick in a little extra money because they see these people are not just depending totally on them. They're going out and doing some work and getting some outside validation. That's important that there's outside validation. Everybody's going to say their people are great. And these are peer-reviewed, too, most of these. For instance, the Huntington Library, there's a board of referees there, who read over all the applications and they put a list in order and they gave out, say, thirteen one-year full-year fellowships, and a couple of hundred, month by

month. In fact, the department really likes that. There's a whole list of fellowships in the college that are considered really top-notch to get.

I probably could've easily gotten tenure without some of my big publications, especially because I've done work that brought in a lot of grant funding. At a young university, that counts for a lot. Actually, that probably counts for a lot at most universities, the ability to bring in funds and all that that entails.

H1.2 Evaluating Other Scholarly Genres

Web-based projects amplify an already-existing debate about how to evaluate non-monographic genres of scholarly work produced by certain historians, such as museum exhibitions or oral histories; they may not be considered as scholarship in the narrow academic sense. As demonstrated over the next few pages, historians seem to be very clear on why the book constitutes quality scholarship in the field, and there are no clear guidelines for evaluating digital scholarship or alternative forms of publication. New scholarly forms are generally seen to be ancillary to the monograph, even by innovators, but they still represent an emerging category of work that needs to be accounted for in the institutional review process.

There are no criteria among historians to evaluate Web-based projects, and, indeed, most historians don't even consider that genuine scholarship. The criticism is that these projects are just books put into electronic format and there's nothing different happening there. That's exactly the criticism that you have to be prepared for and you have to be able to demonstrate what is new about it. And right now the associations, the organizations, are talking about it—mostly in terms of public historians who work for government agencies, museums, or places where the product is not a journal article or monograph, it's an exhibition, it's something else, how do we evaluate those? That's where a lot of the discussion is now, and that has now filtered over a little into Web-based stuff, but it's at a very preliminary stage. The organizations know it's going to be an issue, but I have seen no sign that they know how to handle it yet.

For many years, the problem that tenure represents is not so much all these newer technological things, but a whole range of ways in which people are doing work that traditional conceptions are not particularly useful in recognizing. So what do we do with what Ernest Boyer called the scholarship of engagement? And all of the ways in which people are doing collaborative work in community settings, with community partners, or they're doing international work that may have a more applied dimension that ultimately feeds back into their scholarship in all sorts of ways and their teaching, but it does not take the normal track of monographic publications and so on. What about historians who have produced museum exhibits? What about people who have made documentary films? What about people who are working on a teaching an American history project in the schools, out of which come, essentially, data and research about the nature of history education and history itself, that come through these kind of vernacular interchanges and so on? And there's been a huge struggle over widening the visibility, or the legibility, as I've come to think of it, of different kinds of scholarly work. In other words, it's not like scholarship is a fixed thing and we're talking about different modes of publishing it. What about when scholarship itself is highly plastic in its definition and there is as much stretching that has been done and needs to be done in terms of recognizing what is scholarly about things that take in other than conventional or traditional forms?

Clearly it seems to me that these things are emerging; there will be lots of nodes along a fairly fluid spectrum of things. So it's not just: a scholarly book is peer reviewed and we know

what that is, and these things are unmonitored and, therefore, we don't know what they are. It's clearly going to be the spectrum and it's certainly not beyond the imagination to come up with all sorts of ways to think about them.

Few new forms of scholarship in tenure/promotion cases

As described below, some historians are using digital technologies for spatial and quantitative scholarship. Yet, the chairs, deans, and provosts we interviewed report seeing few alternatives to traditional scholarship in tenure and promotion cases at highly competitive universities:

I went to a conference held in Chicago, I think Stanley Fish hosted it; he certainly spoke at it, he was the unforgettable speaker, naturally. He got up and there was this sort of general anxiety about change, publication, and it getting tougher to publish and Stanley got up—this was a Big 10 group of provosts—and he said, "This is all way overblown. I don't know a single case at my university where a tenure file failed because of some unconventional dissemination form." And then he asked around the room, and no provost sitting in the room could think of a case where the medium of distribution turned out to be an issue in the case. They were still getting traditional cases…We aim to have faculty who can have their choice of where to disseminate their work, and up to this point, I've not had a case where a faculty member who could have published with a prestigious university press, for example, deliberately decided to do something entirely digital instead.

The question of how the tenure and promotion committee and other reviewers would view non-print, non-traditional publications hasn't been a pressing matter. It's not as though there are big issues about it, because most of the publications still take the recognizable, traditional form, along with the Web-based and the electronic forms that they might also have. I can't think, really, of a case in these last several years where there has been an issue where people have said, "Gee, how are we going to assess Professor X? All of his work is done in a non-traditional form." It just hasn't happened…The heart of our review process is embedded in an annual statement of everything you've done in teaching and service, but also a list of your publications. So this form now has wording that acknowledges non-traditional forms of publication, so it's accommodating. Electronic communications or publications can be listed there, but it really hasn't made much difference in what's actually being submitted. So I'd say that the door is open, but not too many people have walked through the door.

I thought I would see much more digital innovation than I am. I think the digital innovation that's coming is coming out of what you would expect, which is film and media studies. I'm not seeing it, for example, in history at all.

There are still many of my younger colleagues doing pretty much what scholars have always done…There are transnational studies coming across, but that doesn't call for particularly new techniques. A lot of graduate students really jumped into the intersection with computer and Web-based technologies in history, but I'm not sure where they're going with it right now. Some of the projects I've seen are quite traditional. They're just illustrated projects. So if something's bubbling up, and I usually can fairly keep track of what my graduate students are up to because I learn a lot from them, I haven't seen it yet.

I don't think that digital media really has as yet an appreciable effect on how people count scholarship at the senior level or the junior level, for better or for worse.

History is a book field for advancement. Well-placed articles are counted much in your favor, but, essentially, at the top research universities, you would need a book at a minimum to probably get hired these days, certainly for tenure. They would want to see that you had the

> equivalent for a second book. Now, there may be sort of up-and-comers who are doing it differently, for example, constructing massive databases that are available and that have commentary embedded within them. But I think that is way under market in advancement in academic history.
>
> I don't see much experimentation with e-publication. Not so much. I see a lot of conservatism.

Judging technological innovation: Ancillary to the book

For some scholars, integrating GIS and other new technologies, or creating massive websites or databases, are activities that complement the traditional narrative format of the book, but do not replace it. These practices will receive much less academic credit at the most competitive institutions if they are stand-alone. Websites, multimedia work, or other forms of digital scholarship are seen as useful to the field, but in a separate and subsidiary category from the traditional publication formats. Identifying a digital equivalent of the book (that isn't actually a book) in promotion decisions appears to be elusive.

> Scholars are supposed to produce knowledge, not acquire skills. Now if you happen to have the skills and you could find time in your day to do that, I think that's great, and ultimately the kind of control it gives you is really rewarding. But when colleagues evaluate colleagues, they want to see the quality of the scholarship. Unless the technology feeds that directly, I just don't see the point. If it does feed it, it's going to show up in the quality of the scholarship. It really does come down to that.
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> There are no criteria among historians to evaluate Web-based projects. And, indeed, most historians don't even consider that genuine scholarship.
>
> There's increasing recognition that digital publications are important as well, and so they are definitely counted in a general profile, and respected, now that major university presses and journals have been participating in the digital publication process. Those are all good things; however, there's one big missing piece, and that is nobody has yet figured out what the digital or new media equivalent of a book is. So there's a recognition that some digital articles are like an article, and that online resource sites, which are basically archival resource sites, aren't really peer-reviewed publications, but just are what they are: they're just a resource site to do research on a topic. There's a recognition that those are important, but nobody knows quite how to fit them into the traditional criteria…It's not clear how they are evaluated. I know that they were evaluated in my case, so I was promoted to full professor without having published a second book. As I was told—you can't see these files, there's just so much confidentiality going on — but in my case they made a case for the scholarly contributions I had made with the various digital archival resources that I had produced and my digital publications. But I think that's still up in the air and nobody's got any clear way to make a standard on it yet.
>
> Well, the most important thing is a book, and then general articles, and that's about it. Those are the two things that really count, and my understanding is that journal articles don't count for that much. The book is the Holy Grail. And it's really the only thing that counts, is my understanding. It's the book and the next book. And we continue to emphasize that we're not trying to change that. We write books, we want to write books, we understand that that's the important thing, and we're going to continue to do that, but this ancillary multimedia allows us to do some other things that contribute to the book.
>
> Absolutely it's the monograph. That's the gold standard and you're not getting tenure at a competitive school in the history department without a monograph, and articles and evidence

> of a second project. The second project usually is considered the second monograph, but the evidence is maybe a research grant, perhaps having an article, certainly that sort of conceptualization, but the idea generally is towards the second monograph. I don't think, for example, we're at the point where if someone did a very elaborate website, that…that would be considered nice but it wouldn't take the place of a monograph.

Electronic monographs: Gutenberg-e

Many scholars are skeptical about the quality of e-books, which they see as unsatisfactory. Indeed, there were very few indications of monographs produced by Gutenberg-e or other multimedia monographs being evaluated for tenure and promotion. Multimedia monographs may be perceived as ephemeral, and therefore not yet equivalent to a print monograph, although Gutenberg-e has certainly made inroads in combating this perception.

> The expectation in virtually all the subfields is that the young scholar, the new professor or assistant professor, is going to produce a monograph. And that can be in digital forms, so while the Columbia University project would be an acceptable way of meeting that criterion, we're not yet at that point. I haven't heard any discussion, really, about accepting other forms of scholarship for tenure and promotion. So that's still really hard, and it may have something to do with the way the field works. Ideally people are producing work that is going to represent the state of the art or the state of the question, for a general issue. So the ephemeral or perceived ephemeral nature of other kinds of scholarship may be part of the problem.

Junior faculty are eager to experiment with digital publication in theory, but "not with my book."

> I'm thinking about how different scholars work. For some scholars there is the status of the book. "Will my colleagues see it, will people buy it, will they read it?" There is this question of prestige and status that you get with a monograph with a pretty cover. You get input with cover design, etc. It's very high-profile. What motivates people to publish? When it comes down to "my book" there is a mismatch. Faculty like to be involved with the whole print publication process. And even if a faculty member is enthusiastic about electronic publication, there is still the risk factor involved. A typical scholar may produce three, four, or five books in their life so there's so much personal ego, in a neutral sense, that is invested, whereas, for us, if something doesn't come out quite right, it's not the end of the world. So we can sit around all we want and say that we should experiment with new forms of publication but the author is going to say "not with my book."

> I don't know very much about e-publishing, but it doesn't seem to have as much prestige. So that would concern me. I would be open to it if that was the way of the future. I'm just being conservative and trying to maintain my position in the field, such as it is.

Developing criteria to judge new/emerging models: Peer review and impact

Administrators toying with how new and emerging forms of digital scholarship could be evaluated in tenure and promotion note the continued importance of peer review, as well as the need to locate impartial experts who can evaluate this kind of work.

> If what you've written can be read and read with a profit, then why should there be a different standard of evaluation for it than there would be for traditional print culture? So it appears on a screen. You can read it. You can tell whether it's intelligent or not. And then you can print it and study it. So it seems to me that the standard can be the same.

> Unless there are some really conservative bean counters, and there probably are in some of these promotion committees who just won't recognize an online publication for some reason…But the key to me is that they're peer-reviewed. If they're peer-reviewed and if they're published in association with a recognized press or scholarly association or university, something other than Coca-Cola—something that would obviously not be scholarly—then they should be aware of that. Scholars should make sure they indicate in their promotion file what online publications are peer-reviewed, that's for sure.
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> There's no reason why a website, for instance, can't be peer-reviewed. And they are. It's happening some. UC has a digital publishing thing, which publishes good stuff. There are certain places, but at this point I think it's still very uneven. We're still sorting out what this means. It would be nice if five or 10 years from now things have shaken out a bit to the extent that there were a dozen or so websites out there that had the same kind of reputation that the *American Historical Review* does. That if you saw that URL you would say, "Frankly, this is in a subfield I know nothing about, but if it's posted there that means the people who are really the experts think it's good." There's no reason that couldn't exist, but I think so far it doesn't.
>
> As long as there's some element of peer review, of documenting peer review, I think that that would be fine, and a way in which online publications would not be manipulatable. It's not like Wikipedia where everybody can say anything else, where there's a way in which there'll be some protection for people of intellectual property.
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> I do think that we are one place where there will be some very serious redefining of the tenure guidelines to encompass something larger. So, if someone did do some kind of very substantial—and, yes, peer-reviewed—digital work, then I could conceivably imagine that that would be acceptable.

Given the importance of peer review, there are few outlets for multimedia publication, in part, because there are few people who have taken a stake in this work and are interested in judging it.

> I think there are things far short of expensive multimedia projects that would be very nice and at the moment are happening informally. The question is: How do you get a critical mass to settle on…? Okay, the field, collectively, is going to invest the time and the attention in making these half dozen or dozen sites the go-to places. It requires that scholars want to publish there. What I think actually may be even harder is it requires that scholars want to do their service there. When you get a request to review a manuscript for the AHR, it may not be the first thing you really want to do at the moment, but there is this part of you, if you're a responsible citizen, that says this is the flagship journal in my field. It matters what they publish.

Along with peer review, audience reach may be another way to measure the impact of an online publication. Perhaps bucking the trend, some of our senior administrators could envision crediting scholars for creating informational websites that receive large numbers of Google hits.

> I think the new forms of publication hold the promise for advancement, because the core value here is supposed to be the impact. And, in principle, new forms have greater impact because it can be made more available. It can be accessed more easily. A monograph that might be expected to sell fewer than 1,000 copies is going to have a hard time entering the conversation of the culture. It happens, of course, but, in principle, a work that can come up when you Google its components can have that kind of impact. Now will it? That is the question…Google is likely to kick me into titles or sites, that, for whatever reason, lots and lots

of people, from what they consider to be credible places, are finding interesting. So people, even in my generation, I'm 60, I think there's something to that. It isn't just a sponsored link, or it isn't that somebody paid them off. If I'm interested in the history of X and I start looking at Google and I find certain things mentioned, I'm going to go there and think I'm going to read that. And if that thing, if it's a website maintained by a graduate student somewhere and he or she earns great stature because of the way this information is laid out, I think, spinning this out a little bit, that someday a review committee would give this person academic advancement on the basis of just that.

If you were to write up a peer-review or reputation system from the ground up, would you rather have our current system, where a single work is what defines you for a decade, or would you rather see scholars having multiple open access documents, with pieces of variable length defining you as an expert in a particular field?

Blogs and other non-peer-reviewed work

Two scholars spoke about the possibilities of blogs and other non-peer-reviewed material posted online as a way for scholars to share work-in-progress and demonstrate their impact on the field. Scholars generally did not see this kind of material as helpful to a tenure or promotion case at this time.

The real danger in a digital age is invisibility, not peer review. When we sit in department meetings and we think about trying to do a hire…everybody Googles people to see what's out there. I think that having a good tight presence online that shows your best work, whether it's links to pre-publications or open access pieces, is really critical. And it's only going to get more so…The biggest danger is for nobody to know about you or what you think about something. So it's up to you to put out the best possible material you can.

I don't know that new modes of publication summation are affecting the tenure and promotion process, but I'm thinking potentially that they could. Let's say you're the chair and you're writing a letter for somebody and you have to demonstrate not just that X number of reputable professors have said that they've done good work. Then you would really want to bring in evidence that they are part of an important dialogue so that if there were an Internet forum, for example, that was something other than just a bulletin board, in which they had been involved in a sustained dialogue with other leaders in the field, then both their invitation to participate in that and to some extent the demonstrable response to their ideas would be something that a chair would be able to talk about as an indicator that this person's work has been noticed. I haven't seen this directly, but maybe other indicators of the kind of Web visitations and so on that people have received…I know that others more directly involved in this have talked about the dilemma that we don't really always know qualitatively what Web hits mean and don't mean. Nevertheless if there are emerging forms that are not quite closed or at the same time not quite fully open in a Wikipedia sense, then the degree of visibility that these have and that the roles the person plays within that is imaginably something that would be of significant credit, but I can't imagine that being the determinant in isolation from other things…Usually the way these things are framed is that newer modes are eroding peer review, because we don't know what to call an electronic publication. And a Web log…is not monitored in a way that allows us to think of it as peer review, so it's only seen in terms of problems for legibility of credentials. And I'm intrigued by the fact that it often increases legibility of things that are actually harder to demonstrate in conventional modes.

At this institution, in fact, pushing the envelope would go against you…if I were to say that, "Look, I've got 18 pieces in this very well-cited blog in the subfield," I think that would sink like a stone. Particularly for historians, my impression is that if we went in the direction of

> pushing the envelope, I don't think it would hurt you but it surely would not help you, and it's not substitutional.
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> But what has emerged that had never really existed before are these electronic newsletters and almost chatty information about people in a particular subdiscipline, where they can communicate with each other. That hadn't existed and now it does, but no one submits things like that for review. So from my perspective as a high-level administrator, we're looking at the cases for evaluation for advancement and promotion, these things are pretty much invisible.

Age, digital innovation, and tenure

As described previously, young scholars, despite being touted by some as having the potential to be more innovative or digitally minded, seem to engage in especially conservative publishing behavior in their pre-tenure years. This can result in an ironic situation in which younger scholars (who may be more familiar with new technologies) are less inclined to work with them in their scholarship.

> The advancement process as it currently stands makes people cautious. It's a conservative force. In considering how you want to communicate your scholarly work, you're not only considering what are the best ways to communicate just in and of itself, but what's the best way to signal to a university that my work is highly regarded. And the best way for that is still what it always has been, which is if you get into the most difficult journals and get the most prestigious university presses to publish your work. And those continue to be defined as old media, rather than new, and there hasn't been a breakthrough there where it's preferable to publish in a different way, so there's that conservative force.
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> Younger scholars, they often, for lack of a better term, "get it" a little more, but they're not free agents. They need to get tenure, they need to get promoted, and if they're not at a particularly great institution, they may be looking to leave. They need to publish in the right places. That is a constraint for a lot of them. I think some of the more interesting, innovative things I've seen, which are not quite at the point of online publishing but are certainly taking advantage of electronic communication, are actually things that very senior people have done.
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> Younger scholars have to just stick to the conventional paradigm, which is these peer-refereed journals, monograph with a fancy press, blah, blah, etc., etc...And it's still true for me, I'm an associate professor so for me to make full professor I will have to come out with my second monograph. My textbook doesn't count, this other book won't count, or it will count much less. So you have to think about the counting. There's all kinds of stuff: money, for example, and job security. So I think that the way in which scholars go off into their ivory tower does have a lot to do with the way in which the career ladder is built.
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> The irony is, of course, it's the younger people who are the most interested in these newer modes. I'm thinking less of the publication than the various kinds of electronic collaborations that are possible. So to say to all junior scholars, "Don't do any of that until after you get tenure, but just work through this other conventional work," is a very complex and probably inappropriate message. It just doesn't meet the reality that electronic scholarship is more likely presented by people who are relatively younger and coming to this without a lot of preconceptions and are simply trying to get out there and do their work and finding that these are the modes in which they're doing their work. So they're creating these new pathways, it's not as if somebody's created a whole model and everybody else is just buying it. It's being invented, almost month by month, as these things emerge.

> For people such as myself in the twilight of my years, it's difficult to wholly assume the practice of using digital resources. But younger people who grow up in this, who are on this thing all the time, and making hypertext and whatnot, for them, I think it's going to get absolutely natural to exploit the powerful resources of this new media. So maybe there's a generational thing in there. On the other hand, there are old fogies, too…

As a result, perhaps, post-tenure, or even post-promotion, may be the best time to innovate with digital technology.

> There are tenured faculty who have the time and the luxury to do something innovative. Well, that's what tenure is for. That's one of the major reasons we have a tenure system: to take risks. And you can innovate and not have to worry about losing your job over it. But it's clear that we have not mainstreamed new media into the scholarly communication process.

> Well, the only thing that I'm seeing that's new, innovation usually happens after people get tenure…I think actually you get a lot of mid-career associates who I think are the most likely, they have a little bit of security, and they're willing to take more of the risk.

> People tend to experiment with new technologies after they get tenure. So, the same was true for me. I was able to do this digital stuff because I didn't have to prove anything to anybody.

> In my role as an editor, I had to pretty much recruit scholars to push the envelope with multimedia work. If they have the skills and resources and the inclination they will, but they aren't necessarily younger scholars. So it's not just that younger scholars aren't producing this stuff. I know they can, there are quite a few out there that can and have the skills, but we don't have a system set up where editors of journals have their arms open saying send me a multimedia submission. Not very many journals do.

> I am now in a difficult position where I have a younger colleague who's working with me on a digital project and has invested a large amount of effort, but who is coming up for tenure. My working on it is utterly risk-free. His/her whole future can be at stake. I, clearly, am going to be one of the biggest advocates, but I'm also going to be contaminated, because they're going to say, which is true enough, "What do you expect him/her to say? S/he's not an impartial evaluator." And I think people will be sympathetic, and I doubt if I'll even be challenged very much, but people will just ignore me. The other thing is when the department goes out to evaluate this, to whom does it turn? There are other people doing some Web-based history, but so far most of them are not very prominent in this profession except for Ed Ayers at the University of Virginia. And Ed has been a voice in the wilderness on this for years, but there are not that many other people in history, though there are some in geography and other social sciences. So, as I push this, I realize I'm in a position where I could push it as the senior person, but the people who are really going to do long-term work in this are taking far greater risks, and they could be fatal risks. And there's something wrong with that.

> If we continue to go down the road we're going, there's going to be a real divide between senior faculty and junior faculty. As soon as I have tenure, I'll have a lot more luxury in terms of where I can publish and what I can publish and if I can collaborate.

Advice from senior innovators: Historical question first, technology second

The scholars in our sample who are innovating with technology encouraged young scholars to experiment with new technologies, but also advised them to stay focused on traditional historical questions and to complete the dissertation and monographic requirements for advancement:

I think that the key thing is always to stay focused on the question, because it's easy to get distracted by technology. It's very important, it's very exciting, but there's a heavy moral obligation that goes with advocating it, in that it doesn't necessarily advance your scholarship. It may be the technology, which is exciting and attractive and may provide some short-term support, but may not actually move you along. The thing I try to tell graduate students is make sure you write every day, whatever else you do, make sure you get an hour or two when you're writing…You have to find a little bit of time for yourself every day where you do the thing that ultimately is going to define you and the quality of your scholarship. I think that is a very clear message and they get it…For 25 years now, we've been hearing about the next generation coming up being technically savvy. But it's not really true. It is true, it's not true. I think they are technically savvy at some culturally relevant functional level, but I don't know that they're necessarily whiz-bangs when it comes to Web design or programming. At that point, the prediction just hasn't panned out and may not. On the other hand, they do think more expansively about whom they create scholarship for, and I think that that's really exciting…But the willingness to experiment with digital tools is the most exciting thing about working with young scholars. They don't need to be shown anything. They come, most of them, with a sense of how engaging and exciting this kind of scholarship could be. I get nervous when the lure of funding steps into the picture, because it is so easy to get caught up in a project simply because the money's there and yet what's produced may not be relevant in terms of their scholarly advancement. The fact is, they still have to finish the dissertation, they still have to finish that monograph, that monument of individual research, and unless they can integrate this digital work into that goal, they run some very high risks of getting delayed, getting detoured…

I think we have to be really pretty careful about how much we're pushing people's comfort zones, particularly around disciplinary boundaries. I think we do have to respect those, because part of the success of this project will be also showing that this is a way of doing serious scholarship that deserves to be recognized within the discipline. The question from a lot of the faculty is, "What are you doing with all these computers? Are you just sitting around? Are you making illustrations? What's the point?" And the question that will be asked, and I think it's a very, very important question that we should continually ask ourselves too, is the "so what?" question, "What is the historical question that you're asking, and what does this technology allow you to do in a way that nothing else could do?" And if it's just making illustrations for your books, that's not a new contribution to the discipline. The argument is that this research and the historical argument that's within the historiography is absolutely hinged on the newly available masses of heterogeneous data, and pulling from them in this new analysis…You're not going to get credit for digital development, so don't get hung up on that. If you really want to spend the next 10 years of your life banging your head against that brick wall, it's a valiant, probably somewhat prosodic effort. Ultimately, I think things are moving in that direction, but I'm not sure that it's going to be by trying to move the whole academy. So the kind of strategy that we're pursuing…is doing the things that the discipline expects. And we expect the discipline to ask us the same questions that they ask everybody else: "So what? What's the historical question? What does this allow you to do that you couldn't have done otherwise?" Because, this stuff, it takes a lot of work and a lot of extra time and energy and it's not worth doing otherwise…There's got to be a payoff and I know there is, and that's why we're doing it.

One of the things that I've tried to do, and that I really advise people who are doing digital work to do, is to publish peer-reviewed articles about the digital work…I try to write about, "What is the intellectual work here? What does it do in the humanities to push scholarship forward or say something about the nature of studying the past?"

I think I could've gotten tenure without the monograph, but as a colleague put it, "It was more of a slam-dunk with the monograph."…I think it's very important that I've also done a

very traditional degree in history, with no digital component whatsoever, and I have a very traditional monograph that has absolutely no digital stuff, so I've served my time on the traditional publishing route.

I try to train the graduate students into doing and thinking about themselves as totally entrepreneurial, totally on their own. If they are just starting out and wait for somebody to tell them what to do, then it's just a job; they might as well work in a bank. A lot of academics want to teach and they want this job and they want tenure and they just deal with whatever is expected of them. If they have to write a book, they'll write a book and then they'll publish it. But that's not a very active way to be a scholar. It certainly doesn't distinguish the scholars that are making it into the top programs. So what distinguishes those guys is that they have an agenda and they want to pursue it. They want to do something and change the way we think about the issues that they work on. So they get out there and they go to conferences and they give talks and they write articles, and they submit them and they get known. But then at the end of the day somebody looks at their whole list of things that they did and how well known they are and then they get the letters. It's in that whole process, you're putting your work-in-progress online and you're creating resource sites, and you're doing these multimedia things, and you're just doing another thing that makes you well known and if people think it's excellent, they'll salute. There's no guarantee that if you're doing multimedia work that people will think you're smart or that you're adding anything to scholarship. It doesn't by itself help you, because any eight-year-old can make a website. Seriously, that can't be the criterion. Is this person doing something that other people are recognizing and using?…I tell graduate students just to innovate and don't be afraid to innovate. Get out there and publish stuff or put stuff online. It's pretty much as simple as that, not to be afraid of it…but talk to your advisor and make sure you don't get into something that's going to take you away from the scholarship…so you could decide that you need to do a multimedia chapter for your dissertation, you could spend a year on it, it might be a bad expenditure of your time. So those are questions, but again, they're similar to any other question you would talk to your advisor about, should I go to this conference and write a paper for this conference, instead of working on my dissertation? So I think that, for those very young scholars, for the trainees, for the Ph.D. students, alternative digital publications should be approached with some deliberation and caution with the dissertation advisor. For junior scholars, I think it's a question of going for recognized scholarly institutions. So if you do something in new media, you should do it in affiliation with either a university press or a university or a scholarly outfit like the ACLS, so that it's recognized as academic, scholarly, not just your own site that you put on your personal webpage. That would be my biggest recommendation, something that has authority, academic integrity, rather than just self-publication, to the extent that you can.

University professional reward structures are pretty calcified, and committees that are not particularly used to thinking creatively will fall back onto fairly conventional measures more often than not. If it's only a matter of putting this all on the weight of the poor junior faculty member who's coming up, then, of course, the advice is correct: that you don't sacrifice your career to a principle, but just keep it in the background and make sure your traditional bases are covered. Once you've got tenure you have a little more freedom to do things that you want. But frankly, the issues return at the promotion to full, which is a huge issue in many places and often very mystified. I think that, sooner or later, it's worth really grappling with them.

Predicting changing attitudes toward new forms of scholarship

We've seen previously that the tenure and promotion criteria in history are perceived as fairly homogenous by most scholars. While there are strongly held views on the importance of the book, some believe that the field will change once "the older generations of people who don't

operate in the digital world are no longer the authorities," but others point out that this is far from certain. A further complication is that faculty may be caught in between the values of their department, which supports scholarly innovation, and the values of the higher administration, which does not (or vice versa). Overall, even scholars who advise a traditional publication path warn against too much rigidity in the academy and agree that it is worth exploring how new forms of scholarship and publication can be judged in a new (and subsidiary) category alongside traditional publication forms. At the very least, it is worth understanding how scholars who engage in these kinds of activities are doing work that is meaningful in the field. As one senior scholar who works on new technologies and methodologies for historical scholarship pointed out, "I don't have to worry about coming up for tenure, but if I were in that place…I would want to feel that the structures I was dealing with were able to recognize the fact that people do their work in different ways, and end up in surprisingly relevant places."

> On a tenure case, you talk about teaching and service and scholarship…but by forcing people to toss things into those three baskets, you're going to miss huge concentrations of significance. Because it's not either all about teaching, or it's not all about scholarship, or it's not what you think of as service, so we need to stretch so that we don't fragment coherence that may be integrated in somebody's work, and that's what really defines what's interesting and important about their work, by categories that are ultimately artificial. All we're trying to do is to allow things that are there to be legible…It's not simply that there are conventions, but people are invested in them and they're, frankly, very frightened of new things, and I think they're frightened by technology stuff because it really is challenging exactly what it is that their own professional self-definitions have been all about. Ultimately I think, in general, although I'm not wild about some of the evangelism, that the "cyber-future is going to change everything and set you free and make everything different…," but I generally do align with the idea that, as the modes of production change, the culture has got to change in response to that. Otherwise you're dealing with a kind of calcified structure, which can't be as useful or productive as we want it to be.
>
> So the argument used to be that people will be cautious until they get tenure and then they're going to do what they want. But the culture of the academy is such that you can't spend seven years being cautious and suddenly shed it after tenure, and people don't. As a matter of fact, very often they end up replicating precisely what they've gone through. And so I see that as a real problem. I'm a deep believer in peer review but, oddly enough, as somebody who thinks there's a certain point and certain kinds of peer review, sometimes you just have to step beyond it and see what happens.
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> I think one thing that we need to be conscious of is that the academy is obviously traditional in respects, nothing wrong with that, but it scales over and that's not necessarily good when you're talking about new media. Currently there are more than 1,000 faculty positions. Six people in that group are under the age of 30. So it scales old. The average age of the faculty is close to 50. So considering that new media really is a very recent arrival, and people are naturally familiar with things that they have grown up with, not necessarily as children but as scholars, it's asking a lot of people in their 50s and 60s to adapt as quickly to these new communication forms as people may in their 20s and 30s. Again, that wouldn't be bad or distorting if the academy had equal representation but it doesn't. It's complicated because there are graduate students and there is a renewal through students. But it turns on the advancement decisions and what counts.
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> I think as more people get more comfortable with the digital medium, we'll see some of the conservatism erode a little. This has happened before. Look at email, for instance. Email penetration was really slow in the humanities, but it was really rapid in the sciences…The hard

part is that it's very difficult, particularly for the older group of professors who are used to the monograph definition of tenure, to really think more broadly.

Just keep going, that's good, because more time has to elapse until the older generation of people who don't operate in that digital world are no longer the authorities in the field. I think that's all for the good. I think that the way in which historians use technology has basically only enhanced the field. It's only been a good thing.

We should never accept the fact that what's happening and what has happened must continue to happen. The historian in me tells me that that's one thing that's never true. The only question is: when is there a change, and in what direction?

H1.3 Teaching and Service

As one newly tenured scholar points out, "The field doesn't care about my teaching…The field is all about one's scholarship and that's it, essentially." The importance of teaching and service varies by institution, and comes in a "distant" second to research at the most competitive institutions. As a result, scholars described extra pressure at institutions that emphasize teaching and service, on top of rigorous research requirements.

Pre-tenure scholars are especially discouraged from distracting themselves from serious scholarship by focusing too much on teaching or service activities, such as committee assignments, strategic planning, and the like.

I would discourage young faculty from doing service if they really needed to get their book done to get tenure. What I would tell any young faculty member here, or at a comparable institution: Don't take on committee assignments. Don't get bogged down on things like strategic planning or teaching extra courses or being on time-consuming committees. And we tell our young people not to. Some of our young people can't restrain their enthusiasm. And the saddest thing, and I've been on a lot of tenure committees, in a place like this, 90 percent of the people who don't get tenure, don't get tenure because they do everything except publish their book. They're good teachers, they're on committees, they do all this wonderful other stuff, but they don't get the book out, and it doesn't matter. And we tell them that very clearly. And some people just can't get the book out. But, they've got six years after their Ph.D., everybody gets at least a semester off, more if they need it, research funding, and if you can't turn what people thought was a promising book when they hired you into a book in six years, that means you're not going to be a productive scholar for the rest of your life.

I've been here a long time—there's a better understanding, certainly on the part of our administration, of the kinds of pressures that faculty are under, and while they want to keep up the pressure that exists, I think there's some attempt to relieve the pressure on certainly incoming faculty—it doesn't apply to me anymore—but incoming faculty are given course releases and so on in the years leading up to tenure, with the understanding that there's a lot being asked of you. So, I wouldn't say there's more pressure, I would say there's lots of pressure, but that at my college that this particular administration has shown a lot of empathy and has been helpful to our junior faculty.

As with service and teaching, textbooks are projects best left for senior scholars. Textbooks are not counted for tenure and promotion, but can be embraced by post-tenure scholars:

In addition to my own scholarly monograph, I was involved in a textbook, which was a huge amount of work and you could say that that does do something to my name in the field, but it

> was dismissed at the time of promotion as not a contribution to scholarship, in general. So that's something that actually does give you some standing in the field, but doesn't help you get promoted here, textbooks.

H1.4 The Pressures of Academic Life

According to some, the increasing tenure and promotion requirements in the field of history are placing extreme pressures upon young scholars. Furthermore, as discussed below, budget restrictions are leading to university presses cutting back on monograph publication, particularly in narrow historical subfields. These dual pressures are having a notable effect on the job market: career structures are not reconciled with the publishing environment, and orthodoxies regarding areas of concentration are dominating the job market at the expense of smaller research areas.

The job market

The Ph.D. in history may commonly take a decade or longer to complete, and may not be immediately rewarded in the job market.

> I see young people devoting frequently 10 years of their life to completing a Ph.D. It's quite common. They are doing many other things at the same time. They don't get their Ph.D., frequently, for 10 years, and very frequently for eight years. And having done that, they find that they can't publish the monograph. They're passionately interested in some very esoteric area of research and they just can't break into print. And then if they can't break into print, well, they're sunk, and they find themselves having to change careers at age 40 or more. And furthermore, I think it's linked with a straight line of causality, but it's linked with this population of adjunct professors living…I'm exaggerating slightly…like Okies and Arkies. They bring their stuff, their lecture notes, in the back seat of their car…I see that happening all over the place. I am very concerned about an exploited underclass of Ph.D.'s. And so we have got very severe problems in the academy concerning the whole structure of careers and publishing, and of course the two are linked.

One high-level administrator pointed out that there may be more Ph.D.'s graduating in history than the job market can tolerate.

> And some of these institutions…they take in 75 graduate students in history a year, and Princeton and Harvard and Yale have cut their take to 15. You've got a less prestigious place that is taking in maybe four or five times as many students. How are they ever going to place these students? And I know the other argument, which is, "Well, these are grown-ups, let them make their own decisions." But I believe in birth control, and so I think it's irresponsible of any institution to take in too many candidates for the Ph.D. Often they do so and charge high fees, and they're very happy, thank you, and their faculty want to have graduate seminars and so on. I just think it's wicked.

Given the competitive environment of academic history, the existing career trajectory may not provide enough time for new Ph.D.'s to complete a good dissertation, find a job, publish at least one book, and carry out their other research and teaching commitments, all before tenure. As the following high-level administrator describes, it takes significant time to produce a "really finished piece of work," and shortened Ph.D. periods mean that a scholar must spend more time

writing the first book as an assistant professor, leaving little time for the second project before tenure review:

> It begins with the problem that at places like here, that are good but are not Princeton and don't have Princeton-style bank accounts, is we're under enormous pressure to get our students finished promptly. I understand the reasons for that; a graduate student who takes nine years is very expensive, especially if they're learning Arabic or Chinese or something else that takes time to master. But what that often does mean is that people finish the dissertation and it's far short of what it could be. It's good enough to get them out the door and to get them the first job, but it's missing either a certain amount of conceptual stuff, or more often it's missing that second trip to the archives. In their fourth year of graduate school they went to Shanghai or Cairo or wherever, they Xeroxed and Xeroxed and Xeroxed until the machine broke, especially if they were lucky enough to have a machine. Then they came back and after they've read all this stuff they realized there's this other interesting aspect that they weren't looking for systematically enough. Halfway through the year it started to pop out of the documents, and they said, "Ooh, this is important." But you can't do that part of it because by that time you've got six months left and you're scrambling. Fulbright or Mellon or whoever doesn't want to fund you for a second trip back. They want to fund you to write up your findings in one year, get out the door and start your job. I understand the reasons for that, but it does mean that very often even very bright students wind up with a dissertation that can be vastly improved by a second trip back to the archives, either to the same place or sometimes to a different place.
>
> I think that people do rush the second book. It depends somewhat on what they've done with the first book. And I've had conversations with young people facing this question: Do you try to get the dissertation out rapidly and concentrate your assistant professor years on book number two, knowing that if you don't get it done, then you're cooked? Or spend four or five years turning the dissertation into something with a much bigger impact and then not having anything to subsequently outline in the sample chapter to show of the second book? This is a real dilemma that I think people face because often there really isn't time to do both, especially if they come under pressure to get out of graduate school faster. And that is what I think is driving part of this, is people drifted into doing nine-year Ph.D.'s—at least sometimes they finished up with the dissertation that was in pretty good shape, but if they are pushed out in five to six years, the odds are overwhelming that the dissertation is not really finished. It's submitted but it's not really a finished piece of work, and then it takes more postdoctoral time to get the dissertation into shape. I plead guilty to being part of this…but this is one of these things that, no matter where you squeeze them, it comes out somewhere else and they remain the same size. But if they don't spend as many years on the Ph.D., then they have to spend more postdoctoral time before they're in the same position they would have been if they had spent more time doing the Ph.D. And there's some kind of signal there that I think is worth listening to, but I'm not sure from a practical point of view what the way to deal with it is. But I think this has a lot of impact on the second book. If they are in that kind of a rush then the question is: what do they do? I've just been spending a certain amount of time in the past year working with one of the former Ph.D.'s who got a good job offer at a point when s/he wasn't really quite ready to finish. The dissertation had been, in part, written, but if s/he had another year on it, it would've been a much better dissertation. It was still a very good one, but s/he cut out stuff and so on, and, in the end, when s/he went to turn it into a book, s/he decided that s/he needed to put back in the stuff s/he hadn't done because s/he got that job and hustled out the door.
>
> Well, I think that there's a tremendous waste of time, of life and talent, that, first of all, people take too long to get their Ph.D., and then I think there is a difficult stage in your scholars' careers. They finish the dissertation, they've got a job but they find that they are

> moving to a new place, getting to know it, getting up their first set of lectures, which in history is a very big deal, and if you're teaching new courses and not just one, but maybe four, in your first year, or some other combination, it's just night and day, right, writing those lectures and getting them to be halfway decent. And then on top of that, often these people are married and having their first child or moving into a house, and learning to run a lawnmower or something. You put it all together and I think the pressures on people during their assistant professor phase are tremendous.

Rethinking the Ph.D. dissertation

As a result, some of the more emphatically concerned scholars we interviewed suggested changing the nature of the Ph.D. dissertation to fulfill graduation requirements, but also to lead to more realistic and achievable publication practices.

> One of the things that I've tried telling my students is to meet some of the publishers halfway—and only time will tell how it's going to work as a strategy. That is, you do a dissertation that you can get done in six or seven years. And it may be strictly bounded by one national space, but that has the potential then, with a second trip to the archive, to turn into something wider.

> A converted thesis is often a very mediocre book, and it's a forced exercise because the person is trying to qualify for tenure instead of expressing something that he or she has to say after years of research and reflection. I think it would be a better world of learning if we gave up the classical Ph.D. that evolved out of the 19th century, developed a quick, fast-track kind of Ph.D. that would lead to a career of publishing online articles that were based on serious research, not that they would be trivial at all, but that would be serious contributions to scholarship, but that would not involve this enormous investment of life and time and energy and hope and fear that has gone into so many books that also often turn out to be mediocre books.

> It should be possible to build a fast-track to the Ph.D. and graduate school in certain fields, and students should have the option of three articles if they want to do it. And then if they do a good job of it, they could be given two-year postdocs, and the university press should be complicit in this through a mentoring system whereby the editors from the press help the postdocs develop book-length electronic texts, or hybrid texts that could be part print and part experimental in the online sense. If we can do this at highly competitive institutions, where we think we have high-quality students, it could possibly set a standard and serve as a model for other places. I've talked it over with various people…and there are a lot of people who think that this is an experiment worth trying.

Different subfields and departmental politics

One eminent scholar noted that the real problem in tenure and promotion was orthodoxies in the field (except perhaps in certain subfields), that discriminate against scholars working in other areas. By this, the scholar meant that personal politics, as well as the fact that certain departments prefer certain types of work—be it social history, economic history, political history—may prejudice whom they decide to tenure. Several scholars mentioned that academic careers in history are highly dependent on trends in the field, openings in particular areas, and other criteria. This may lead young scholars to be more conservative in their choice of research area or method.

> What younger faculty fear the most is having one or two prominent people attack their work, because if, in fact, there is any sort of doubt, and the danger is not so much in the department, because I think what happens in the department is people are quite capable of evaluating where the opinion is coming from, how complicated the opinion might be, but departments at some highly competitive institutions no longer make tenure decisions. We make recommendations. So it goes up very often to a college-level or university-level board, where, in fact, people are from many disciplines. They don't get the nuance. They're mostly looking for negative things. And when the negative things come, that's what they pounce on. Again, younger faculty are very, very aware of that. And that's another thing that tends to make them incredibly cautious.
>
> It's my tribe, but it's a very stuffy tribe. Getting credentialed into the tribe is something that I knew would require certain things. And one of them was that for my first book—particularly because it was not a conventional label in history, economic history, diplomatic history, political history, any of those sorts of histories that are considered history—because I knew I was taking on something slightly riskier, I protected myself.

Trends and specializations across the field

Currently, history is becoming more and more transnational, requiring scholars to think about their work in comparative terms. Some historians offered predictions that scholarship will grow in Asian and African areas, outside of American and European history. Here, scholars may not be trained in different methods or languages, and there will also be increasing questions as to whether a project on the Muslim Brotherhood, for instance, falls into the realm of Europe, Middle East, Africa, etc. For young scholars, however, jumping on the boat too early is still risky.

> The field is competitive. The gut level is that everything's getting more homogenized, more repetitive…And global history really doesn't have a firm and comfortable place where scholars can interact with students who, at least in their heart, want to innovate and are willing to. So, I think even despite professionalization, it's still going to be the same proportion of those who do safe things versus the proportion of those who don't do safe things. I don't know what the long-term implications are. It's really easy to get a lot of archival material and impose a fairly common or acceptable interpretation on it…You read the first paragraph, you already know what the argument will be regardless of what the data are. Or, from the perspective I give, most historians are pretty much bound by certain geographical restrictions. For me, the geography shouldn't necessarily shape the historical merits of it, so that's something innovative and not necessarily fitting within the geographical divisions of history. And that's something that students have legitimate worries about, because most jobs are still posted for the history of this nation and that region. And so it takes a certain risk, not to necessarily write a dissertation that will fit into a region so well. But, again, to my position, despite the intense professionalization, I still tend to meet students who are willing to take this risk, for whatever reason.
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> I'm in a dying subfield of European history. So I have to stay alive and be reputable and be known, but I also have to engage with people outside that. So it's made me think about my work in more comparative terms, and that's why this other project I'm working on is a comparative project. It's not from the point of view of a national history, which is really outmoded even though that's what I'm trained to do. So in my own life history as a scholar, I'm caught between two ways of doing history, really, an older way, which is national histories, and then a new trend toward comparative and transnational history. The problem is (a) I'm not trained for it, (b) doing transnational history, which is all trendy and you can get published more easily and so on, requires then really the mastery of several different national

> histories, a lot of language preparation, a lot more travel, a lot more intellectual investment, basically. That's not really an answer to your question, but that's a different quandary that I've faced, and I think a lot of people in history face.
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> I think one of the things that's transforming, at least the history department that I'm familiar with, is not actually technological. It's a global phenomenon, and that is, I think, the growth of a much larger middle class than we've seen in earlier centuries or earlier decades, whatever you ascribe the causes to be, whether it's the global world or globalization or American imperialism. What's changed, I think, and is changing rapidly, are the student demographics on campus. And I think that is going to put increasingly more pressure on, not just my discipline, but on others, to be less insular. And so I think what we're going to see in the couple of decades is many, many, many more positions in the field for African history, South Asian history, Middle East history. Last year alone I think there were more jobs than graduate students for the new jobs. And so I think that as that happens, my hope is the dominance of English-language–based research would change a little. I don't know that it will, but it's my hope that more and more work will get produced that relies on languages other than English and European languages. I think that's the change that we're watching with great anticipation. Just in the last five years there's been a job explosion in certain fields—Africa, Latin America, South Asia, Middle East—and a simultaneous decline in job listings for American history, French history, etc. I think that that's going to change some things. It may change the way we think of history departments and whether or not one can think of the discipline as solely bound by what used to be national language boundaries—German history, French history, Italian history. Well, what do you do now when you have students who are working on, for instance, the Muslim Brotherhood in Libya, only to find that the Muslim Brotherhood in Libya was created during the Ottoman Period. So, you would need to study the Ottoman Turks, who were used by the French. Then, you'd need the French archive, but they were bureaucratized by the British. So from there you'd go to the English archives, but eventually it all got annihilated by Italian fascism. And then what was left of the Muslim Brotherhood went to Tunisia and Chad. So what project is this? Is this a European project because it's Libya? Is it a Middle East project? Is it an African project? And I think that those are things that will crop up more and more and more.

The move to more transnational approaches in history may sacrifice historical depth.

> There are a lot of very hyper-specialized books being written that very few people will ever read. I would concur with that. The younger people, my graduates, seem to be working more in the transnational field and training themselves that way. So they produce monographs, but of a much broader scope. So I do see a change there. But you do lose something there, also. You lose the depth sometimes when you have more breadth. So it's not only a change for the good. You can't cover in equal depth when you cover more than one country or region, even though you get other things. So I have mixed feelings about that. But I think, in general, it's true, there's too much specialization and too many monographs being produced.

2. CHALLENGES AND OPPORTUNITIES FOR DISSEMINATING RESEARCH: WHAT ARE YOUR CRITERIA FOR CHOOSING A MEDIUM?

As described previously, the book remains the mainstay of publication in history, due to the scholarly tradition of demonstrating an extensive, closely reasoned argument within a larger interpretive framework. Articles are seen as serving a complementary role for smaller "bites" of scholarship. Stringent peer review plays a central role in the field to ensure that only high-quality scholarship is disseminated by the top presses and journals. While there has been a

proliferation of new journals (many of which are online-only), these are generally perceived to be less prestigious. Although the work of historians generally "gestates slowly," there may be a relative rush to publication for pre-tenure scholars in order to qualify in time for promotion.

The combination of high publication standards for tenure and promotion and the limited market for many specialized historical monographs has led to a crisis in monograph publication in some subfields. Yet this crisis is tempered by perceptions that too many monographs are being produced in mainstream areas (such as American history), and that the intense competition is a healthy filtering device. Although the future of publication in history is by no means certain, many scholars suggested that a move to digital publication could solve the dual crises in the publication environment (both too much and too little), as well as better present scholarly work integrating GIS, images, or extensive footnotes and other supplementary data that cannot be accommodated in a more traditional print monograph. Moves toward digital publication forms, however, are hindered by the difficulty of evaluating non-text and non-peer-reviewed scholarship (as mentioned previously), a perceived lack of prestige, high programming and technical costs, scholars' lack of training in implementing necessary technologies, and the nonexistence of easy-to-use publishing platforms.

H2.1 Criteria for Choosing a Publication Outlet: Prestige, Peer Review, Audience, Speed

Publishing in a prestigious press or journal (as defined by high selectivity, high standards of peer review, and wide readership) is the number one goal for scholars at highly competitive institutions.

> Just to summarize every element associated with the leading research universities, you try to get into the prestigious publishers.

> It hasn't changed. The colleagues of mine that are preparing for tenure or for career advancement are publishing at Cambridge University Press, at Princeton, at Harvard, at Oxford University Press. They're publishing their books there. They're publishing articles in the *American Historical Review* and the *Journal of History of Ideas* in the best peer-reviewed journals in the English language.

> But from my point of view, as a reader of these things, as a referee for them, as somebody who supervises a lot of graduate students, I tell these people to go with the best print journals and the best university presses in the English language. That's always been my advice, and it always works. Every one of my Ph.D.'s who has wanted to publish a book has done it.

Books and monographs

In general, most scholars look to publish scholarly work with a prestigious university press (Cambridge, Princeton, Harvard, Oxford, Chicago, and the University of California being among those cited most frequently), or one of the small number of second-tier university or commercial presses that may provide legitimacy in a given research area.

> Up until tenure, I think the criteria are fairly set. So you would need to publish in a major press, the Ivy League presses, Oxford, Cambridge, Chicago, Berkeley (UC), and so on. But, if you published at Louisiana State Press, it's one of those things, then; it's not clear whether it would be an issue or not. And because it's not clear, most people in my position won't even go

> near it. We'll just work to try and get into Oxford, Cambridge, Harvard, Princeton, Yale, Chicago, Berkeley (UC), etc.
>
> It's fairly straightforward: You need to publish a book, which is usually a revised version of your dissertation, and have made some progress on a second project. The book should either be with the university or well-respected commercial press like Norton, Harper & Row [now merged to become HarperCollins] or something like that…If a commercial press is ranked as high as a university press, no one would have any trouble with that. In fact, they'd be happy. They'd probably make more money. But they usually want what they call a good university press. No offense to places like Northern Iowa or Susquehanna, but a book that was published there would really have to get some very outstanding reviews or you'd have to get some really outstanding letters from the people in your field concerning the book, which would make up for the fact that it's not in a really well-known university press.
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> Like most people, for serious work I would be looking to a university press as the most appropriate publisher or one of a small number of presses that come close enough to that to hit some of the same areas of legitimacy.
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> I would think NYU, Columbia, Stanford, and University of North Carolina are very good presses, and in some areas they would be probably the best places to publish in a specific thing, but they're not really in the all-star league.

Selectivity and peer review also contribute to perceptions of some scholarly presses as more prestigious than others.

> I don't know if it's true or not, but some presses are less hard to publish with than others. But almost any good respectable university press will want two or three peer reviews, and then it goes through the editorial board of the press, which is usually composed of separate faculty members.

Institutional variation in the rankings of imprimatur

Perceptions of prestige can be somewhat relative to a scholar's institution. This creates different "leagues" of scholars in the field, and means that good work may not necessarily be published by the top university presses.

> If you feel that your chances of being published by a press that is prestigious are not very great, then you will seek out the next level. So then you might feel less successful. On the other hand, let's remember that we have different gradations of universities in the world, and this institution is not what some other place would be. If you were at…the next tiers, a good solid state university or a really commendable private university, but not one with a world reputation, you would probably be happy just being published…In that institution that would matter. They would just care that you were published. There, you're not aiming at Harvard, you're not aiming at Oxford. You're aiming at a different level perhaps, but they want their people to be published. So in that sense it's relative. It's relative to the level or kind of institution, and it's relative to your career.
>
> I've spent a lot of time giving lectures and getting to know people in various circuits of what you might call second tier and third tier, even fourth tier, institutions of higher education. And my impression is…that nobody is publishing with the Harvard University Press or the University of California Press. So, they have their own brands and their own systems of distinction. And so within that almost separate world, the resource points are simply different and a university publisher that we might think of as really second rate, is first rate for these

> people, so that the same phenomenon of "brownie points," let's call it, can exist at different levels, and can penetrate the whole world of scholarship, without their being one single league, but maybe several leagues with top players and bottom players. And you notice it when people give papers and they refer to organizations or occasions or whatever it is, there's this sense of shared deference to certain publishers or places or organizations, it's quite striking. I think academics are very good at creating what Pierre Bourdieu called symbolic capital, and the symbolic capital comes in many varieties, so that I think the problem of the need to publish with a prestigious publisher, one, exists, but two, it exists in different ways, at different levels of the scholarly world. So it's a matter of great concern, especially since something can be really of top quality and somehow not make it to the very best publishers.

Reaching different audiences, commercial presses

While there are a restricted number of top outlets for publishing "serious" work, scholars will consider a wider variety of outlets for publishing work aimed at different (or more popular) audiences. Given that commercial presses are seen as less prestigious by the tenure and promotion committees at highly competitive universities, post-tenure scholars are best poised to publish more commercially viable scholarship.

> In terms of putting material out there, I think in some ways we can learn from what scholars in other parts of the world have done. In most of the world, in fact, a lot of scholarship gets published by commercial presses. In Europe, in Latin America, if you have a book to publish, you're probably going to do it with a commercial publisher. So you can separate out those worlds and you can say, "Here's the journal or press where I publish with my colleagues, and here's other kinds of media where I try to reach a different audience."
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> So with respect to the book, most go to university presses because they are not going to sell, but a few go into the other publishing houses, either because the publisher thinks it's going to be particularly prestigious to have that, or because there is a market that is beyond academia.

Journal articles

The criteria for publishing an article in history are similarly influenced by concerns about prestige and audience. Scholars in the US reported that there are three major prestige journals that span the discipline (the *American Historical Review*, *Past and Present*, and *Comparative Studies in Society and History*), but that particular subfields have their own journals that reach a specific audience. Ultimately, as in political science, scholars aim to publish general articles in the most prestigious publications, as well as specialized articles in the most prestigious journals in their subfield.

> Journals go entirely by your subfield. There is an overall journal for history called *The American Historical Review*, there is an *English Historical Review*, there's the French Review, the *Dumond*. Every country has such things, and it would depend on your particular field the most. Sometimes you have a general article and you want it to be in a prestigious journal that features general approaches, or sometimes it has a narrower, specialized approach, and you want the journal in that field that is best and most prestigious for the specialization. So this is going to be a big list. People will all give you different answers because of the great variety of specialties…When it comes to the subfields, then you usually go to what are considered to be the prestigious or leading journals in the field. There are hundreds of these, and some are very, very obscure. So in some sense, your standing is related to the standing of the journal, and you would try to get into the journal that is considered to be the leading journal. That

> may not be the journal with the greatest circulation, but it will be the one whose name means something. So to say that you have published in such-and-such, or to say that Oxford has accepted your book, or that a journal published by Oxford, because Oxford, Cambridge, and Berkeley are all big publishers of books...Those are where you would aim in the brand-name research universities.
>
> My goal was always…to speak to the largest set of people in my field that I can. And prestige is certainty a factor because I always have to keep an eye on promotion, so I look at main journals, also, because they count more, rather than just something that people read a lot. So it's a combination of reach and prestige of the medium.
>
> With historians, there's simply no doubt that the major journals are *Past and Present*, The American Historical Review, and Comparative Studies in Society and History. You get published in those and you're fine.
>
> Selection is instinct and experience…Just to be clear, it's nice to publish in *Science* and it's nice to publish in the *Proceedings of the National Academy*, but if what I want to do is reach historians those are useless publications. And even if I want to reach sociologists or political scientists, they are still pretty low-value publications. If I want to reach historians, I might go for the *American Historical Review*, although people don't really read the *American Historical Review,* it just takes up space on their bookshelves. But you might publish the right thing in *Past and Present*, which has a lot of prestige, or in the *Journal of Interdisciplinary History* in some other fields, or in *Social Science History*, or in the *Journal of American History*, depending on the field. And it just depends on who you want to read your work.

As with monographs, some scholars, though definitely not all, may care less about the prestige of a journal after tenure.

> I'm old enough and entrenched enough now that I don't need to worry about the imprimatur of any particular journal. I also don't have the time right now to do the final polishing that a journal would ask for. And so getting it posted and available and citable online is quite tempting, it's useful.
>
> I'm finding now I'm increasingly less picky about where it gets published, though. I got published in the status journals before tenure and I'm not sure even that matters at all for the tenure process.

Online-only journals: less prestigious

Some historians suggested that the proliferation of new, online-only journals has made it too easy to publish. Several senior scholars perceived that these journals have lowered editorial and peer-review standards and, therefore, lowered prestige.

> I don't think there's any obvious kind of deterioration in terms of how journals do their work. It's probably been going on forever. There are more and more journals. The commercial publishers have generated a large increase in the number of journals in recent years, some might say to supplement, you might say, the more traditional discipline-based journals sponsored by learned societies and disciplinary organizations. They bought some of the old ones, but they also introduced many new ones. And so if you didn't get a good review with some journal A you can go to journal B. That was always the case, but now the options are much larger. You begin to wonder if anything doesn't ultimately get published through peer review. Now, whether you can blame the peer-review process for that, I don't know, but today I think it's not sufficient simply to say, "Well, if you got published in a peer-reviewed journal,

> you must be fine," because there are just too many of them, and…I think it's too easy to get published. Despite what people say about the difficulties of publishing, too much gets published.
>
> I just think most of what is published is drivel, and I would say that we have had an inflationary currency in the economy of scholarship as we've had a proliferation of journals, and I see the standards getting worse as people are able to do more electronically. So the idea of maintaining high editorial standards seems to me under enormous pressure. It's easy to publish. You go into one of these electronic things, the standards are not this high. "Oh," the response comes, "they can be just as high, what we need is people like you to serve on the editorial board of our new electronic journal and it'll be just as good as the *American Historical Review*." So I'm quite familiar with the line…So that if you have an inflationary currency in the economy of scholarship across the board, then the electronic thing seems to make it worse unless there's some quality control introduced. And that's where I'm not up to date on it. I haven't seen it. And the people that I know in the United States and the United Kingdom and Germany that are involved in these things are generally investing in the traditional media. And, it's not that we're not able to learn about something else, but these journals are doing fine. And so the only problem appears to be that some of them are billing the university librarian $1,000 a year for the subscription when it ought to be much less, so that there are real issues in the commercial base of the information systems. I don't doubt that that's a big problem. I don't have a solution to it; there are a lot of people around who thought their way through this and they have ideas. I don't have ideas on it, I just know that there's a problem there to be addressed.
>
> Though some online journals have emerged, those, because they're newer and the editorial boards often consist of younger scholars, are less favorable. They're more *accessible*, which is good, but they're less favorable.
>
> There are online journals now. I've never used them, but I was asked to contribute a review to one of them, which I did because it was for a friend whom I admired…and I wanted to do that for her. Normally, thus far, I wouldn't go to those kinds of sources.

The physical constraint on page numbers in print journals is a contributing factor to their selectivity.

> Why has there not been this big change in terms of final output? I think it is because of a concern that the name recognition and the prestige of the traditional forms of publication would be lost if it were done in a radically new way, and questions about the adequacy of the review process would be there. I suppose, ultimately, it comes down to this: a physical journal has a finite space. They have so many pages they can fill, and if they were to become larger, there would be a financial constraint that would be quite pressing. Journals I'm involved in have a fixed number of pages by agreement with their publishers and the people who finance it. An electronic medium doesn't have that constraint. And so, no matter how often you say this is rigorously peer-reviewed, in an electronic form the physical constraint isn't there. And so the claim to rigorous review lacks a certain credibility, no matter what people say. I'm not saying this is a problem that can never be overcome, but I will say the initial reaction is to say, "Well, it's one thing to say it's peer-reviewed. It's another thing to say that the peer review has also been highly selective." Just to give you an example…Suppose you are the editor of a journal, and the journal comes out a certain number of times a year and has a limited number of pages. And so you know that in the course of that year you can't publish more than a certain number of articles, but you get hundreds and hundreds of submissions. The peer-review process probably yields more or less positive responses on many more than you can publish. You still have to select only a small number. So you might say the review

> process is rigorous. But if you didn't have that constraint, the peer-review process in that same journal for the same submissions would say, "Well, there are many articles that are probably worth publishing. People looked at them with some favor. They thought that the community of scholars would benefit from reading them. And why wouldn't you do all of them?" In cyberspace, it would be literally no cost to you. Some cost of preparation and getting it online, but that's small compared to the cost of physical publication.

Conference proceedings, edited volumes

There is a gradual emergence of multi-authored volumes, including proceedings, for various reasons (the need to cover broad fields, be attractive to libraries, etc.), but quality varies widely. Some scholars complained about pressures to write essays for *festschriften* (honorary volumes commemorating leading scholars in the field) or other collected volumes. Because it takes historians a long time to produce an article or a book, scholars tend to save their work for peer-review, rather than publication in conference proceedings. Many senior scholars we spoke with generally discouraged young scholars from writing anything that takes time away from the book.

> Publishing conference papers rarely happens in historical conferences. Grad students, especially, will usually want to save it for the peer-review kind of thing. Because, for historians, especially, it takes a long time to produce a paper. One paper a year is a lot of work for us.

> There are people who don't like articles. Sometimes very well-known people write books aimed at other audiences and never write an article between them. Donald Kagan would be a good example of somebody who's hardly written an article in his life, except on political matters, but turned out volume after volume. That I think is exceptional. Most people do write articles. Even if they don't get around to writing them for periodicals, they're under close pressure to write them for *festschriften* and conferences and collected volumes. I found it difficult to find time to write articles in recent years to send to journals because there were so many demands for these various types of collected volumes. It got to be a little bit of a plague in my view. I think in many cases they are substitutes for individuals writing synthetic works. Nobody is feeling self-confident enough to write a general book on the subject, so they get together with 12 of their friends and divide it up and each of them writes a chapter, and that makes them feel better.

Book reviews

Book reviews are one of the most important ways that scholars filter new scholarship in their field. Writing book reviews is also seen as prestigious, and reviews are the main way that scholars evaluate each other's research in a public forum.[87] While scholars read book reviews regularly and may write them as part of their professional work, few mentioned reviewing itself as a prestigious scholarly activity.

> I write book reviews for a major daily newspaper.

> Well, I am a book writer and so to me that's the ultimate medium. But in terms of writing articles and publishing articles, I guess the answer would be it's been a combination. I've written some things that go into slightly more mainstream publications, those were short

[87] Griffiths, Rebecca, Michael Dawson, and Matthew Rascoff. 2006. *Scholarly Communications in the History Discipline*. New York, NY: Ithaka, August. http://www.ithaka.org/publications/pdfs/JSTOR%20History%20Study%20Report%20Public%20final1031.pdf

articles and book reviews, and so those are selected based on the places that would be interested in this kind of work, and that's not very many places.

H2.2 Perceptions of the Publishing Environment

Peer review

All scholars agreed that peer review is an essential and, for the most part, desirable function in the scholarly enterprise, primarily to filter the sheer number of publications and guarantee the quality of published material.

> I will always trust peer-reviewed stuff more than other stuff, even as I recognize all the problems with peer review.

> I feel that peer review is crucial, to continue to present and subject ourselves to those kinds of questions and critique. I think that's maybe the most valuable thing about the whole academy.

> I don't pick randomly what publications to read. I do what most people do: find a carefully selected group of things that you respect, that we should know about, or that are stimulating to some. So that serves as a kind of filter. New forms of communication, unless they have some way of rising to the top of things to even look at, are in trouble.

In performing its role as quality filter, peer review was described by historians as a "double-edged sword," potentially promoting bias and orthodoxy in published scholarship.

> I think for the health of academic life, intellectual life, some gatekeeper function is important. Now, when I say gatekeeper, that's a double-edged sword. It can restrict the publication of worthy things because they don't fit particular molds or expectations, and that's bad. But no one has the time to read everything. And so everyone needs to be guided in some sense to where to read the best stuff. And that editing and selection process is still critically important. And so any innovation that undermines that I don't regard as an unalloyed good. Sure, something can get published that wouldn't otherwise and maybe there are works of genius there that would be suppressed by evil cabals of traditional scholars or whatever, but the other side of the coin is that you're overwhelmed with stuff and no one can find what they really need. So I just see it as a challenge rather than "there's a good side and a bad side to the forces of good and evil" in this matter.

> Most historians are *really* committed to peer review as the thing that maintains the standards and all that. But it has bad effects, too…Predictable, boring articles and conference papers. And, often, articles that lead to the right political interpretations…Politics are somehow diffused throughout historians' approaches. If there's not a sufficient critique of power, for example, or of neo-liberalism, then what you're saying is suspect, you're an aspect of power…which leads to a very ugly thing I find most frustrating as it works out to, for example, an instinctual rejection of anything an economist might do. Unless he just lays it out very explicitly that he's not orthodox, he'll be rejected immediately offhand.

Editorial quality

While peer review plays an important role in publication, historians expressed concern about editorial quality sliding in the review process. In particular, some scholars complained of editors

who will not go against peer reviewers, which may increase the conservatism or bias in the field toward predictable forms of scholarship.

> In a larger sense, I'm a bit frustrated with the peer-review process and the way historical articles and knowledge really are incestuous and predictable, and hearing the same thing over and over in conferences. In part, it's professionalization. Here, we're going to be safe and focus on getting a job. In part, it's advisors wanting to reproduce themselves. In part, it's the difficulty of having new ideas. In part, it's that I'm just so afraid of making somebody angry, and having to go through peer review and getting publicly criticized. I've been lucky. I've always had good editors. I've written lots of things that were published and have really mixed peer reviews and the editor has gone with it anyway.
>
> There are relatively few journal editors who will go against a peer review. And the idea is not that these people don't know their field, but the whole point of this argument is it's challenging virtually everybody who has reviewed this article. By and large, most editors won't do that. Most editors will back off and say, "You know, this is interesting. The scholarship seems sound, but I can't go against my own reviewers." So that kind of article, which very often will turn out in the long run—if it ever does see the light of day—to be the most important work, is not going to be published or won't be published easily.

The majority of established journals in history are published by university presses, and many are affiliated with scholarly societies. Scholar-editors play an important role in the field, but reap little in the way of institutional reward, a situation that may have something to do with perceptions of sliding editorial quality. One librarian offered a solution to the editing problem by asking faculty who are less involved in advising graduate students to take on more of the editing responsibilities for the field:

> What you really do need are strong editors, but those editors have to be not only good editors but strong enough in the profession that they are willing to know when to step over peer review and when not to. But, again, editing is not something that has much power in the profession among historians. Editing is something that people always appreciate when there's a good journal editor, but it's not going to bring you a lot of rewards. It's this odd powerful position, but not a position that gets you much respect or many rewards. I mean, people are grateful for somebody to do it, but most people don't want to do it. So getting the kind of strong editor with the academic credentials to be able to do this is actually quite difficult.
>
> The quality of editors has declined enormously. There used to be many, many years ago, a species of editor, very well educated, usually liberally literary-minded, and sometimes writers themselves, but chose, essentially, to be in the publishing game…That changed, so that I think the rank and file editorial staff, their ability to spot mistakes is poor, their own command of the language is poor, and they just aren't that careful or have that rich a vocabulary.

Rethinking peer review in the digital age?

In contrast to the argument above that too much is getting published, two scholars of varying ages (although both innovative with respect to digital technologies) noted that peer review was unnecessarily limiting scholars' access to the diversity of work across the field. In their minds, the function of peer review should be re-thought, and some alternative system should be developed to make work more openly available outside of the confines of peer-reviewed archival publication. One scholar perceived a personal blog as performing this function, as well as enlarging the audience of peer reviewers who comment on his/her work-in-progress.

> We're going to have to radically rethink the peer review. What does peer review really do? And peer review, if I think about it, it probably developed as a rationing system. When you have limited resources, you have to have a way of deciding how you're going to allocate those limited resources and who makes that decision. And, at the beginning of the 19th century and the middle of the 19th century, it was purely market-driven, and the peer-review system developed as a way of saying "no" for university presses. And it actually was a question of "we're going to publish this and not publish ten times this, or twenty times this." And we may be leaving the realm of the scarcity economy, so why should peer review play that function in the future? There's got to be an alternative way of deciding what's important research that needs to be published. Wouldn't it be going back to an older form of scholarly discourse where you put your stuff out for review and you get criticized, often heavily criticized, before it even gets to formal peer review?
>
> Think about the self-filtering systems of the blogosphere…Looking at the world of digital history, for example, which would you rather have: a journal that gives you three to 10 articles four times a year, or the combined production of the 250 people working in the field that you can see as a scholarly stream, that you can decide whether to pay attention to, and that through the networks of people reading it, highlight important publications within that stream? I will freely admit that out of the 300 posts on any site, maybe 30 of them are really worthy of a longer-term archive. And maybe five of them will have a major impact in the field: people link to them, people read them, and people discuss them. I think that our reluctance to go this route is based on unfamiliarity with the digital realm, and I fully understand that. But, I think if a journal or a professional organization were to put together an RSS feed for different subfields, say, "Here's one page that will give you a stream of thought on the history of X," that would be *very* compelling. This would be much better than what you get out of a journal, which is too reduced and doesn't allow for micro-climates of scholarship that might feed across disciplines. So in terms of finding things, yes, peer review is good, but it's the only thing that people are used to. They think it's helping them, but it's restricting them in other ways that they don't see.
>
> I read some literature blogs, and if you think about book reviews, they're really fascinating. Here's a great example. In the *American Historical Review*, one person reviews your book. But in the literature blogosphere, I've seen books that have been reviewed by 80 or 100 people, and I'm talking about substantive reviews. So I'm not sure how you could say the article…the one "official review," is any better than what's happening on these blogs. How is that not of tremendous value?

On the other hand, a senior scholar pointed out the problems with non-peer-reviewed publications (often confused with "open access") by complaining that it sets a dangerous precedent for self-publishing work whose quality has not been verified:

> Web-based publication at this point, or blog postings—whatever you want to call that—in very different ways, some of them are good, some of them are not good. About five years ago or so now, I got a request to review an article for…a pretty prestigious journal. It's a person who had done something that was potentially very interesting, but I read the work and it was pretty far afield…So I wrote a very long reader's report, going through the thing, noting the many ways it was wrong, but also telling the author, "If you're serious about pursuing this, here are the things you need to do." I didn't hear anything of it. The journal didn't print the thing. And then a few months later I got a request to review an article from another journal. It turns out it's fundamentally the same article, so I cut and pasted my report and sent it back. Several months after that I got an article from another journal with a very different name by the same author, who is doing something different now…Basically s/he's self-published one

> piece and now footnotes it and says, "Given this new view of X, we have to rethink the history of Y." The outsider is not necessarily going to know that this is flawed.

Posting non-peer-reviewed work publicly may be able to solicit reactions and address errors, but only a rigorous peer review can really indicate its importance as a scholarly contribution.

> I think my biggest concern is that new business models take into account the cost of peer reviewing. I think peer reviewing is really important, it's critical that it be done well. It was something that was built into the budgets of publishing journals at my university press…I believe in a world where a paper prepublication can be posted and reactions to it can get rid of mistakes. I'm not sure that I yet know of a world where that kind of give and take will tell you how important a paper is, which is quite different from the question of whether there are mistakes in it, how important a paper is in the development of the field. For the foreseeable future, I think peer review is important, and I hope that whatever the new dissemination modes are, they'll be able to maintain that and to cover the cost of it.

Speed

In general, publishing work rapidly is not a concern in history; the quality of the work and a well-thought-out argument are the most important considerations for choices in publication. Work in history has a "long shelf life"; its value is not reduced with passing days.

> In areas where the shelf life of publications is much longer—in the humanities and history, and a lot of the social sciences would fall into that category—there you don't see such a profound change, and the advantage of electronic media isn't so profound. There's a convenience factor. On your computer, you can go to JSTOR and get the journal article. That's great. But the people aren't trying to devour the material of their colleagues for their own research purposes within months of publication. The intellectual process doesn't take on that form. So I'd make a distinction here between those disciplines where the published research papers are quickly used as inputs into other people's research and where they're paying attention to each other in an intense way, where months or weeks, literally, can make a difference, and contrast that to where this all happens in a much more, I'm not saying leisurely pace, but where work that was published 10 years ago can still be relevant to a new project today.

> Turnaround's not so important for us.

> When you don't need to go spend a year and a half in an archive or if your archive is at hand in your library, then I think the books get produced quicker. I think historians' books still gestate slowly, so I don't have the sense that there are far too many monographs in history. And I haven't heard that in my department.

Additionally, scholars in most subfields (aside from, perhaps, very recent contemporary history) do not feel pressure to publish quickly to avoid being scooped.

> There are exceptions. Especially the closer you get to contemporary writing, the more they worry about someone's going to beat them to it. But that's pretty much very contemporary, so I think for the most part, there's not too much worry about that, no. I think when we're doing our job right we are more interested in getting it right and putting it well, than somehow beating the guy to the punch. And there must be some little bit of that, but not much…I think that the people who choose the fields of study that I work in, seem…it's the self-selection process. They seem to be more like me than like the scientists. It's something about them that makes them feel comfortable with that kind of work, they like the pace.

While a rapid publication turnaround is not important in the field, *per se,* it is a growing problem for career advancement. In particular, pre-tenure scholars are very concerned with speed and are anxious to get articles and books in print prior to institutional review. One graduate student suggested that "if push comes to shove…'forthcoming' is essentially the same as a publication."

> If you're coming up for tenure, there's a rush, I'll tell you that. There's a 24-month turnaround going from an acceptance to a book that you can hold. It's a stately pace that I think most junior scholars probably don't want to endure. But maybe in other fields where the shelf life of an idea is shorter, then getting it out there is especially important. It's just an article, so it's not just something that you're waiting to put on your C.V. to show your colleagues that you're producing, but something whose impact is going to be reduced with every passing month.
>
> For getting tenure, speed is an issue. But now in this stage of my career, the pressure is resisting all the requests to write this or write that or write something else, and being able to focus on a more long-term project itself…My only issue now is how to resist requests to do all kinds of work, searching for it, and feeling the need to get stuff out so quickly.

Complaints about publication lag times

The monograph publication process can take a long time, usually about 24 months from acceptance to publication, on top of the time taken to conduct research and develop the argument. Article publication may be slightly faster, but long delays in this arena are common as well. The time to publication seems to vary by authors, editors, and presses.

> Articles don't necessarily take less time. A lot of journals have backlogs of manuscripts two years from when you submit to when it comes out. Not all of them, but it's rare to get an article out faster than about 10 to 11 months, unless you've made a special arrangement with the editor to slip it in at the last minute in the work flow. And I think it's not uncommon for a book to come out in 15 to 18 months. Now, there are presses that have much worse records than that. On the other hand, I've known books to make it out in six months. So, it's not clear to me if one is a lot worse off with books than with articles.
>
> The speed of turnover? I find it all to be equally slow. Speed would enter into it if I knew that something was faster.
>
> Speed is a negative way of putting it. I think the question is more, "Why have the lag?" than, "I want to put something out quickly."

Smaller presses may work more closely with authors to increase the speed of publication, avoiding the psychological toll of waiting incessantly.

> A lot of people have had bad experiences with some of the really top-name presses, because they just put it in the list. You'll see it in the *American Historical Review*, or you'll see it at a convention, they have a list of 50 books. A smaller press sometimes will give you more attention getting your book publicity and big ads rather than just having your book in with 15 other books. And it's important to have an editor you can work with, a press that gets things done and doesn't fool around and keep you waiting too long. I find that's very important at this stage, not for financial reasons or tenure reasons, but for psychological reasons. I've got a lot of work to do and I don't want to have to mess around with worrying, "When is this coming out?" or "How long are they taking to review this?" That just gets in the way of things.

> Despite complaints about publication lag times, few scholars seem willing to sacrifice quality considerations or peer review to speed up the editorial process:
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> If the problem is haste, getting the stuff out, and in the modern, frantic world in which we live, getting things out fast is important, everybody wants fast, fast, fast, fast reputation, fast this, fast that. If that's important, then carelessness will occur.
>
> The remarkable thing is that I think the commercial presses are faster in getting material out, simply because they don't sometimes put much into the quality of product…obviously it varies significantly.
>
> It would be nice for publications to be quicker, but there is a logic to the review process, and I think it's right. So I don't know, quicker peer reviews?

H2.3 The Crisis in Monographic Publication

The crisis in history scholarship is described by some as the result of traditional publishers and university presses cutting back the number of books in history, combined with increasing the number of books required for advancement at competitive universities.[88] Ironically, the root of this problem stems partially from a glut of books, and the fact that, after being the primary market for specialized monographs, university libraries are now forced by dwindling budgets to curtail their purchasing. The crisis in scholarly book publishing is especially acute for younger scholars (particularly pre-tenure), but less so for established scholars who may have an easier time finding publishers for their work. Ultimately, the problem seems to be that the requirements for tenure and promotion have not adjusted to changes in the publishing environment.

> Everyone thinks there's a crisis about this looming but nothing has really changed. That is, for tenure, you're supposed to have a book and some articles, and for promotion to full professor you're supposed to have at least a substantial portion of a second book manuscript, and yet everyone knows that book publication has become much, much, much more difficult, especially for beginning people. But what they don't talk about, however, is that there has actually been a proliferation of hurdles, so it's actually easier to publish articles and harder to publish books, and this has not been recalibrated in the way that we think about this.
>
> The reason I agreed to do this book series…is because I thought, "Wow, this is a great way to really promote some wonderful junior scholars, a great way to help them shape their first books." I was pretty successful with a couple of books, but because of publishing prices, I've been told by my editor, "No first books, we need to start recruiting books from senior scholars, unless you can argue that they have a wide market appeal." Things are getting a lot tougher…I think that if you're a senior scholar you're going to get published. I think it's harder for junior scholars to get published now than when I was a junior scholar.

The crisis in monograph publication is specifically acute in certain historical subfields that are not seen by presses as immediately commercially viable. In particular, university presses in history suffer from a "presentist bias," and audiences favor work of immediate relevance to US and global current events. As a result, it is next to impossible to publish in particular subfields, such

[88] For more background on the "crisis" in history monograph publishing, see: Estabrook, Leigh, and Bijan Warner. 2003. *The Book as the Gold Standard for Tenure and Promotion in the Humanistic Disciplines*. Committee on Institutional Cooperation (CIC), Champaign, Ill., March. http://cirss.lis.uiuc.edu/Surveys/BookGoldStandard.html.

as colonial Latin America, Africa, 17th and 18th century Southeast Asia, Central Asia, and Enlightenment Europe. In contrast, presses eagerly seek out work in US history.

> I usually cite a couple fields where it's actually impossible to publish a monograph: one is colonial Latin America, another is Africa, and there are many. American history is by and large not affected by this; however, now we are finding that in European history, including what I call classical fields, such as the world of the Enlightenment and revolutionary Europe, publishing is now becoming extremely difficult. So, I see a very severe crisis in the publishing of the traditional monograph, especially the monograph that is a converted dissertation.

> Increasingly, unless you're in U.S. history, having a really good monograph is not a guarantee of getting it published…I think of, for instance, a very, very bright scholar who works on, I guess you'd call it, early modern Asia. It's fascinating work. It's going to radically change the way we think about two centuries of Asian history. But it's the wrong two centuries from the point of view of someone looking to sell books. It's 19th and 20th century Asia that has an audience, right before, to be blunt, white folks show up. When I got involved in helping to find a press, I was amazed by how few presses were willing to express interest and how many said, "We don't have a list in Asian history and we're not going to publish books that don't fit into a list because we don't think we can promote them effectively, etc." It's not that s/he's going to be shut out completely, but the options are a lot slimmer than one would hope. I think for the person whose project is good but may be a little less exciting, the prospects are a little scary.

> Not only is it difficult for work on Asia to be considered, but it is a serious uphill battle, in terms of even persuading people that, look, you're working on a subcontinent with 15 centuries of history, and getting that work out is basically very difficult. So an article that you sent to *AHR* has to be connected with something current in the American imagination. And so I couldn't agree more with that idea of a crisis; it's very difficult…My book went through its first printing in a heartbeat in another country. But my editor here still says, "Well, we haven't sold any copies because it's a small field." And I know that, that it's almost impossible to get things recognized if they're not completely American. The American publishing and reviewing world is very insular.

What crisis?

According to the high-level administrators at highly competitive institutions in our sample, however, all this talk about a "crisis" may be a false alarm. While young scholars may have trouble completing their manuscripts in a timely manner, good work by scholars at the most competitive institutions gets published by good presses. Rather than limiting good scholarship, constraints by university presses are acting as a filter by ensuring that only the very best scholarship gets published.

> I've always felt that that crisis was greatly overblown. And the way I judge that is: Essentially the market signals that A) almost everything I know of, that was really worthwhile, has gotten published; and B) there are editors in presses out there beating the bushes for manuscripts and it's not just that they're coming to me, because I'm old and established; it's that they're going and talking to assistant professors, looking for manuscripts. And people that I have taught have—or my postdoctorates or whomever—have succeeded in finding publishers, good publishers, in general, so I haven't perceived a crisis there at all. I do know that it is true that the presses are selling fewer copies of the books and that from their point of view there's a crisis, but I think that classics books are perhaps still selling better than some other fields. And, at any rate, they seem to figure out ways of putting them out…But all of this is an old

> story that's been in every report on the crisis of scholarly communication since I was an assistant professor. And we can keep getting told that the monograph is in its death throes, but somehow it still seems to be here.
>
> And the way it's worked up is a kind of triage process; that is, if you're at a major research university you'll probably get your book published, probably at a lesser publisher than would have been the case in the past, and you'll have some trouble getting through as a result, so it's much more hierarchical. The very best people with the very best book manuscripts are going to get published by Cambridge, Harvard, Princeton, Cal, whatever. People with the slightly less good books are going to have more trouble, and so the publication process if anything is *more* of a filter than ever because it's so much more difficult.
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> American history is a field where books will sell…Someone once told me that you could write anything on the Civil War and sell 2,000 copies. In fact, that's almost a danger the other way, that too much is still being published, which is that we've had students who've written marginal dissertations, and we really don't want them going out and publishing these as our dissertations if they're not terribly good.
>
> I don't see the crisis in practical terms. Now, my students have all had pretty good luck getting jobs, but I know sort of across the board, there are more dissertations acquired by publishers to be turned into books than there are jobs. I hear people talk about it, including my editors, but I still don't see it in actual practice. Someone may not be able to get it in the appropriate tier of publishers, but generally, if you really want to get it published, you'll get it published. The issue might be whether you can rewrite the dissertation.

Indeed, one high-level administrator welcomed the so-called "crisis" in scholarly publishing in order to help address budgetary shortfalls in libraries and the increasing costs of buying and shelving new books:

> There are different ways of thinking about this crisis in scholarly publishing. I am enough of a curmudgeon to think that not everything that's published needs to be published. As a high-level administrator who had to figure out what to do about the library when the shelving of each new monograph costs 10 dollars just to put it on the shelf, I think restraint on that for purposes of quality is not a bad thing. That's a pretty steep price to pay, so the vetting, the refereeing that goes into restrictions on publication are a good thing.

Although it may be normal for scholars in certain specializations and narrow subfields to have difficulties locating prestigious university publishers, universities have various strategies to deal with it, including accepting books from respectable foreign presses or commercial presses. The main issue here seems to be finding ways to subsidize scholars or presses to publish work *of good quality* that is not commercially viable.

> I do not think that there is a crisis of scholarly communication here. I'm not talking about any other university. The people we hire and the people we expect to get tenure here are people who have no trouble getting a university press to publish their manuscripts. They have trouble finishing their manuscripts and sending them out to a university press, but once that's done, in my six and a half years as dean, I have not seen this as a problem. Now, there are episodes. When the Soviet Union collapsed, it was difficult for young Ph.D.'s who had written dissertations on the Soviet Union even to get the university presses to publish them, because the university presses, under financial strain themselves, wanted the post-Soviet excitement to be reflected in the books. But that was episodic, and that probably happens in an analogous

fashion in varieties of fields…The history department here, I do not see their scholars having trouble getting publishers for their books once the books are written.

There's really no shortage of presses to publish in history. Some fields are hard to publish books in, but history is really not one of them. There are a lot of university presses. If you're working in a field of African history or Asian history, where your book will not sell that many copies, there are usually subsidies or else you could maybe even publish with a foreign press. We've taken books from respectable foreign presses like Brill in the Netherlands and so on, University of Manchester in England, where they're not so much concerned with the economics of it…And there are organizations that provide publication subsidies, like the Spanish government helps subsidize books about Spanish literature and related studies. A colleague is working on a history of a religious group, and the group is putting up a ton of money to publish the book, so $25,000.

Let me put it this way: I have never encountered a case of somebody who had a manuscript that I and others judged to be worthy that should be published, that didn't get published. Now, on the other hand, I don't think it's anywhere near as straight as it used to be. I'll tell you a couple of cases that are very close to me. One colleague…wrote a book from his dissertation…His/her field was Eurasian history…S/he couldn't get a university press to publish it, they often said, "We won't read it. We simply can't sell enough copies so that we can afford to publish a book, no matter how great it is." Some would read it and say it's a nice book but the audience isn't enough. These are university presses! Now that book was published. You know how? A commercial publisher liked it, they published it. It was a very well known book for commercial publishers, nothing shameful about it. But, the world has been turned upside down. I thought university presses existed to publish good scholarly works that couldn't get commercially published, so I do think that's a problem…Take this highly competitive private university, and it is a little peculiar in this one sense. It's fabulously rich, but the issue still remains: here we are pouring millions and millions of dollars into this or that or the other worthy thing, but it is a fact that scholarly works that we believe to be of a quality necessary to formal scholarship can't get published because of money. Why isn't the university spending money on supporting the university press, specifically for the purpose of publishing books that can't get published for any other reason, which are worthy? This is an area I have heard nobody say anything about.

Hierarchies in the field

While most scholars at highly competitive institutions view the "crisis" in monograph publication positively, as a quality filter for the field, there are enduring questions about how selective publication practices may create hierarchies of subfields within universities and departments. This echoes the crisis in the job market discussed previously. One professor suggested looking toward scholarly societies, such as the American Historical Association, to take the lead in addressing the difficulties in disseminating commercially non-viable scholarship.

It's incredibly difficult. All of my students, including people who are not at front-ranked institutions, have managed to get their books published even by very good places as long as they stuck with it and persisted. So, there's no question that it is still difficult. If anything, the filtering process is more effective than it was before. The big problem that isn't being faced up to is that it's the university creating its own hierarchies that is not being examined. That is, it is easier to publish a book of medical anthropology, in Guatemala today or the US today, or wherever, than it is to publish a book in 17th century French literature. And overall, personnel committees in the university are not taking that into account. "Look at this French literature book that's published by XYZ Press. We don't care about this. It's terrible." They're not taking

into account the fact that no major publisher right now will publish work on 17th century French literature. Look at one university press, it publishes virtually nothing pre-1900. They publish nothing literature, period.

What's actually happening is it's having an impact on the questions people ask. It also has an impact on the fields people enter. So it's manifested in a slightly different way. I think the Americanists are still feeling pretty good. If you have an American manuscript that you could get a high-profile publisher to pick up…promotion is not going to be a problem, but, in terms of the scholarly effort involved, it may not measure up to something that's done by someone who's working on ancient Persia, for example. But those are the realties of the situation. So I think that the market is the tail that wags the dog, and it's now coming to bear on scholarly questions and even the fields young scholars choose.

I think that there is a problem, and it is undoubtedly related to the fact that…the crisis is more acute in fields that have no realistic commercial prospects. For my colleagues in medieval studies, my colleagues working on Central Asia, my colleagues who are working on the ancient world in virtually any geographical realm, they all face some significant problems. Obviously there's good scholarship being done. The question is how do we make it available, how do we give it the kind of credentials we want it to have so that it's properly validated, so the professional advancement isn't compromised by publishing it in venues or outlets other than the print monograph. I don't see this being necessarily addressed in any satisfactory way, and in the absence of that I think what's happening is people are still expecting junior scholars, including those who are in fields where publication has really dim commercial prospects, to come up somehow with the publisher who will carry their work. We have the *appearance* of a consistent standard for promotion, but it's a standard with differential effects.

H2.4 Digital Monographs and the Future of Publishing in History

The primacy of the book is not likely to change soon, and history seems well behind the sciences and social sciences in transitioning to electronic publishing formats. Though scholars at the most competitive universities do not feel a squeeze in the scholarly monograph publishing environment, they might adapt to new publishing models should a crisis become apparent.

I guess it's a matter of where the pressure points come. And if we're dealing with a system at highly competitive institutions where in most of the social sciences and humanities we have a communication system that seems to serve us pretty well, and it interacts with the personnel evaluation system that enough people think is fair, there's no sense of crisis. If our communication system is broken, then we need to hear a sharper understanding of why that's true, so that types like me might be more responsive if somebody came in and said, "Well, we have the following indicators that a lot of really good work is not getting out there, that the information track is just failing." Then we say, "Oh, okay, so tell me about that." Then if we understand that, then we would participate in a mode to fix it. And if somebody said, "Well, the only way to fix it is to get rid of the system we have and go to entirely electronic stuff and with a different editorial board," then we'd say, "Well, okay, where does ownership or copyright come in and all that?" Then someone comes in with a plan, we all read it and think about it and maybe we're happy with it. But that's not what's happening and we're not told convincingly that there's a terrible problem, and everybody in the department and all of our Ph.D.'s are able to get things published…

In the history profession, in that discipline where books are so important, as long as I've been in academic life there has been the sense that traditional publishers and university presses, in particular, are cutting back the number of books in history. And, since publication of a book is pretty much essential for an assistant professor to gain tenure at a research university, that

> will create a crisis. And how will we overcome this crisis? So beginning about 10 years ago, the American Historical Association began seriously looking at alternative forms of book publication, to electronic media or books on demand, or online publication versions. People immediately thought, "Oh, gee, I wouldn't dare go in this direction because it wouldn't be thought to be the equivalent of a book, a physically published book." In fact, this project hasn't gotten very far and there are a few books that are only available in this form but not very many. And you might say the project was something of a failure. But was it a failure because people like me wouldn't acknowledge the value of such a publication for scholarly review? I think ultimately the reason it failed is that the claim that there's a crisis in publication simply isn't true. The number of books being published by presses is growing every year. It might not be growing as fast as some people would like, but this constraint really isn't there, and so very few people really find that they can't get their book published by a university press, if they have a chance of getting a tenured post at a research university. That is, the pressures to move to something else because of limitations in traditional publication really aren't as intense as people claim. And, secondly, there are some real disadvantages to publishing in this way. You don't reach as large a scholarly public, in history. If you were publishing papers in electrical engineering, I'm sure the matter would be different. But if you're publishing books for historians, this medium doesn't function in the same way. It doesn't have the same advantages. So there are many other factors than the policies and traditions of universities in assessing merit that stand in the way of faster progress or faster movement in this direction.

Yet there are arguments in favor of electronic or digital publication, including easier text searching, electronic indexing, reducing publication costs, integrating non-text media, and the presumption that young scholars prefer electronic resources. One scholar suggested that "ultimately, it's the job of the profession to catch up with how people are doing their work." The shift to electronic publication may only be a matter of time.

> I'm a print-culture person. But what happens often enough is that you give talks, or publish some articles, and they're put online without you even knowing it by organizations and conferences and so on. So you find yourself online, and people are citing titles of yours, even though they don't know where they got them, but they're going online because somebody else is putting them online. So I think the electronic universe has come in, and it's quite conceivable we will see more of that. And book publishing is getting harder and harder despite all the books that are published because the costs are so high and because the returns are so little for a scholarly book. So unless a publisher is willing to absorb the cost because it's important to that publisher to have that book, it's getting harder and harder to publish in print. So I suspect that electronic communication is going to be much more prevalent.

Indeed, we have spoken with many scholars who were enthusiastic about the possibilities of publishing with the online medium.

> I am optimistic in the sense that I'm a big believer in new technology. After all, in my department, I did have the very first personal computer. I have always been fond of all these things and I think there's great potential there, but it is amazing how hard it has been to move to that next step.
>
> As much as the newer modes complicate some of the issues of publication, they actually open up more opportunities for demonstrating scholarly potential, and in that sense I think it makes for an interesting situation.

> My feeling is, "Let's try to push electronic publication forward." And people who make these arguments about "the current system does a lot of things well" leave out the fact that it does a lot of things extremely poorly.
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> I honestly believe that attitudes are changing. It doesn't mean that the old attitudes have gone away, but I think there really is a significant change, and you would have to be awfully unobservant to fail to notice that all kinds of forms of publication are now taking place online, whether or not you are an enthusiast about an online book.
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> In terms of replacement of books, I don't know that. A week ago I had a conversation with a prestigious scholar and colleague, who was over-the-top excited about his new digital reader, and to his mind—and this scholar is reasonably conservative—he thought that the majority of the issues had been overcome. And he was beside himself that, sitting in an airport, he had decided he wanted to read some other book and he was able to download it. So that may come faster than anybody imagines right now.

Barriers to digital publication

While many scholars spoke about digital publication as the future of scholarly communication, it seems to be nowhere near the "tipping point." One of the biggest problems, again, is that there is no clear understanding about what a digital or electronic equivalent of a book could be.

> It's not a question of not being able to get published. It's a question of in what form it's published. And what has proved difficult is to establish the digital realm. For example, there is the California Digital Library. It should be a forum for this, and it isn't. It's a forum for the publication of electronic journals. There are actually no stand-alone, born-digital books on that site. There are digitized versions of previously printed books, which is a completely different thing.
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> We're seeing much more extensive practice of online-only publications…I think those are still…not institutionalized yet. So, for instance, one thing that's on the horizon that's quite needed is some kind of standard for what is the digital equivalent of a book in history. Call it a B-L-E, a Book Labor Equivalent. It's like the British thermal unit of BTU. So what is a book labor equivalent?
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> My gut feeling is that that technological transformation is still at the phase of very early design…So in a few years, it's going to be something completely different, but also something that should have been completely obvious. So I think that the electronic media is going to actually push something that's going to be much more radical than that. I don't know what it will be because I didn't grow up with it. It's still a foreign language for me, even though I use it all the time. I would say as a historian, particularly as an intellectual historian who works in ways of thinking about how these things happen…The one thing, even though historians are terrible predictors of the future, it seems to me that the past suggests that we're not quite yet at the breakthrough moment, and the breakthrough is always something very different than was originally imagined.

Many barriers remain in the effort to develop a comprehensive system for the creation and evaluation of digital publications in history. First, there is a perception that junk is published on the Internet and that electronic texts are somehow not as good. Second, scholars have an aesthetic and psychological attachment to the printed book as an art form, something linked to the fact that it is difficult to read book-length texts on the screen and more convenient to read a printed book. For this reason, digital books do not reach as large of an audience as print books.

Third, several historians complained about a lack of training and expertise necessary to author multimedia publications, even among young scholars. Fourth, there are still significant costs involved in digital publication. Fifth, no one is accustomed to evaluating these works. And finally, librarians expressed frustration about how to ensure consistent scholarly access to these publications. As described by one publisher, this has resulted in a current "logjam" on the subject:

> There is what I call a logjam on the subject of digital publication, and I'm not quite sure how we're ever going to get past it. That is, it is extremely difficult to publish in digital form directly, and it's hard to do: one, because it's expensive, two, because people who will do it charge money for it and therefore it's not as available as are books, and three, how it fits into the criteria for tenure and promotion is completely unclear.
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> I think that working incrementally is the key here, staying focused on the question is what matters. Obviously I think we'll see a lot more digital scholarship. The big problem is with the cost savings involved when you go from print to digital…The really expensive things are the human costs, and they're still there…unless you're going to fire copy editors…Well, that's not the answer.
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> Gutenberg-e was a great idea but it was way in advance of the time and therefore did not have that much resonance, because it was hard to talk young people into thinking in those terms, and it was hard to get people to be used to looking at material online. Looking up material online for book-length projects is still a very big issue. There's also the issue of the production of digital works, which is that currently the Institute for the Future of the Book is trying to develop a platform that will make it possible for everyone to do a digital book on their own, but they're nowhere near at a place where this can be used by the public. So as it is now, if you do something with the Humanities e-Books of the ACLS project, it cost several thousand dollars to have a digital book actually programmed so that it could be put up on the Web. And then you had the problem of people not being used to looking at books in this format, and then you had the problem of, as a result, no one is used to evaluating works. I consider this actually terrible because I'm very interested in doing a digital book, and I've spent a lot of time trying to figure out how to do one, and we basically had to give up and decided that we'd be better off getting an incredibly expensive, arcane European publisher to do a print work than to have a digital book available to everyone in the world. I consider that tragic. So we have a project that's perfect for a digital work, we worked with several prestigious institutions on it, and basically no one is in a position to do this unless you want to pay staggering sums of money. That's because this has to be all done with XML markup, at least that's how the Humanities e-Book does it with ACLS, and they say, "Oh, it's not bad. It only costs a few thousand dollars." Well, most professors are not in a position to spend a few thousand dollars to have a digital book whose review process is uncertain, and, in other words, what it will do for them is unclear.

Additionally, a librarian noted that digital monograph collections would present the same problem as the electronic conversion of journals, namely that they would have to pay large sums of money to "re-purchase" the books every year:

> You think of the new media being beneficial the way that it is. It's also potentially an enormous drain. By new media I mean digitizing works. Every book published in the 18th century, there's an example. You can buy a digital book, every book published in the 18th century. Very expensive, and you don't really own it, you are just gaining access to these materials so there's an upkeep charge year after year after year. Notice how different that is when a library would buy 18th-century material, put it on the shelf, and the cost of storing it

> was the expense. Now, it is a continual expense to keep the electrons flowing and advancing in proper order. And it's maddening in some respects because what you are really doing is paying a large fee upfront and then a forever fee to gain access to content that you owned before you started. And 18th-century books, we probably had virtually all 18th-century material on microfilm. You know that was the new technology of that day. So, this is the third time we are buying the copy and bills will just keep coming forever. Now, you can see that I'm grouchy about it but there's a great advantage because once that material is digitized it becomes useable in ways that the content, even if we had all of it, is most usable. So people can ask research questions, put things together and study things, in a way that makes them incredibly valuable. Digitizing the publications has added considerable value. Well, that's an example of helping us in some respects and, at the same time, sort of hurting us.

Gutenberg-e, Sophie Project

Electronic books are acknowledged as being useful for searching, but scholars perceive reading expansive works online as very difficult. Google Books, the Institute for the Future of the Book, and the Gutenberg-e Project, among others, were cited as exciting developments, although not all historians were aware of the Gutenberg-e Project; some described it as "not very radical" or more of an "exhibition" than a book. As a result, scholars noted that History eBook (now ACLS Humanities eBook) has been very successful at making electronic versions of core literature available, but less so in propagating new multimedia-based formats.

> I think so much of this stuff is psychological and possibly physiological. The physiological part of it is that I myself would rather chew nails than read a book on a computer. It's difficult for me, and it just doesn't work. If you give me a book, I can curl up on a chair or lie down on a couch, and that makes all of the difference in the world. I can't do that with a computer, so nobody's ever going to communicate to types like me on a computer the way they can in a bound volume.

> Digitized books are useful if you're just using a book to look things up and do research. But in terms of books that you want to sit down and read with any kind of pleasure and understanding cover to cover, I find that impossible online. I want to sit back in a chair; I don't want to be hunched over a computer. I like a glass of wine, I like a cigar…So for research it's fine, as long as you're looking at specific things, but in terms of books that you need to read and you want to read, I don't think books are going out of existence, I just don't.

Digital book projects such as Gutenberg-e and the Sophie Project are ahead of their time, but are also slowly making inroads in persuading people to the value of digital publication.

> The problem is that the older generation of academics, especially in a field like history, often feels that an electronic book, a book published online, is not a book. The director of the Gutenberg-e project had to draft a letter to department chairs explaining why this was not only a book, but, in many ways, a better, more ambitious book than the conventional codex. So there's been a lot of debate about this, and I must say I did notice, after seven years of Gutenberg-e, that this objection was far less widespread.

One high-level administrator's institution is supporting electronic publishing through the library.

> One thing that probably lends a certain amount of prestige to electronic communication is the efforts of the library to move in that direction, to acknowledge that, "Yeah, the library does this." There is the digital library making these things available, recognizing them as legitimate forms of scholarly communication. We've gone quite a long way in that direction. And that is

> tangible support from an institution. Beyond that, there are faculty here who want to set up electronic journals. And I don't know how they're being financed, but there's probably been some institutional support there from research institutes to help make that possible. So, there is some support but it's diffuse. There's not a project from the top down that is coordinating it.

Print-on-demand

A conservative solution to online publications seems to be the availability of print-on-demand alongside digital publication.

> Print culture is not going to disappear…but I do really think that electronic publishing is going to cut into that situation decidedly. Publishers will produce online. That means they can publish on demand, and charge you the cost of that or more. So it's easier for them. Instead of printing 1,500 or 2,000 scholarly books and pulping some of them, they will just print on demand. That is going on already.
>
> Print on demand would be an improvement over nothing. There's no doubt about that. I'm glad to hear that that exists, because some people just don't take note of this real fact that some people just need to read books. The codex is an ancient invention that seems to have a great deal of utility.

H2.5 Capabilities and Affordances of Electronic Publication

As historians seek to produce high-quality publications in the confines of the traditional publication environment, three publication capabilities occupy their minds: access to primary sources or supplementary material, the integration of multimedia data forms, and the ability to reach a large audience. In the absence of scalable models for digital or electronic publication, some self-taught scholars are working independently to develop multimedia publication formats or database resources.

Supplementary material, hyperlinked footnotes

For purposes of reliability, historians commonly create extensive footnotes and other references to data sources and descriptions of data collection. Due to their length and high degree of specialization, many of these references do not make it into the final published book. Scholars concerned about this omission suggested placing such detailed material online to make it accessible to interested readers. Several scholars voiced a desire for hyperlinked footnotes or online articles linked to primary sources.[89] Some scholars eagerly noted that this could have ethical implications for the field, forcing scholars toward a higher level of intellectual engagement by making their data more transparent and keeping their work "close to the sources."

> I envision that in a few years we're actually going to be seeing electronic articles where, at least in our field, you can click on the footnote and the reader's going to be able to go back to the original source, or many of the original sources. I think that's all the better in my field, because part of our stock and trade is…"I went to this obscure archive in the central highlands of some far-off country, and I went through all the boxes, and I'm the only person aside from the archivist who knows what's in there and I say what it means and you have to trust me." I

[89] This supports a finding discussed in Griffiths, Dawson, and Rascoff (2006): Griffiths, Rebecca, Michael Dawson, and Matthew Rascoff. 2006. *Scholarly Communications in the History Discipline*. New York, NY: Ithaka, August. http://www.ithaka.org/publications/pdfs/JSTOR%20History%20Study%20Report%20Public%20final1031.pdf

> think in a few years all of that material is going to be digitized and Web-accessible and everybody's footnotes are going to be live, and that's going to change the way in which people argue. In the last 15 years, there have been two controversies over falsification of data in the history field, the US history field. And in both cases, somebody, a senior scholar, got so outraged by the argument that they went and looked at the original sources and found in both cases that it wasn't simply a question of how you interpret the sources, but actually the sources were presented in a way that actually…they claimed it was deliberate falsification. Verifiability. That's probably a more appropriate term. You might go back to any given set of sources and there might be competing interpretations of what that source means, but you should all be able to agree that it says what it says. Also, if your argument involves the kind of strained reading of the material, you're going to have to acknowledge that and explain why your reading is permissible. So I think that's actually all going to be for the better of raising the level of discourse.
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> You hear of these celebrated cases coming out of the science world about a company's doctored lab results, and I'm always impressed by that, when one scientist can look at the work of another scientist and reverse-engineer it to the point where you can say, "Well, this is a valid result or this is an invalid result." I think that's really great, really powerful. I can see why it hasn't been done in the past, in the humanities in particular, because our sources and our note-taking haven't lent themselves to that. But we're now at the point where that could happen, and providing incentive for people to stay close to the sources I think could be a good thing. Close to the sources is not a bad word in my dictionary…In other words, let's be sure that your interpretation or your argument is grounded in the sources, or to be clear when it's not. That that's the kind of obligation you have to your audience.

Digital publication also could be a good way to disseminate the valuable technical work in the Ph.D. dissertation that only concerns a small audience and does not make its way into the published book.

> In certain subfields, you get a dissertation and what's the person doing? They are, in some sense, proving that they are masters of the craft. So you'll have a dissertation with a 60-page methodological appendix that tells, "Here's how I selected the sample of data I used, etc." Except for two people who are directly in that person's field, very few people want to read that. And of course then the dissertation has to be turned into a book. The first thing the press said is the 60-page methodological section has to go. I can't tell you how many times over the years I have read a new book in my field, and I get to the footnote that says, "To see how I came up with this, see my dissertation, appendix three," and then I go and order the dissertation. There are also a lot of extra trees being killed because I now need both paper copies. It would make oodles of sense to have that stuff on a website, and of course some scholars do it on their own.
>
> Ninety percent of history dissertations are not published. And, in that case, the digital dissertation would be extremely useful. On the other hand, most dissertations are hardly ever used. If you find they're being used, they'll probably get published, and you can get them through interlibrary loan. The other thing they would be useful for is, let's say, you write a really massive dissertation and a lot of it doesn't wind up in your book. That would be useful in your book, to say, "If you want to see all this other stuff, it's online here somewhere." Perry Miller did that with his footnotes in *The New England Mind*, he deposited them in various libraries. They didn't have big databases, but he said he had copies of his footnotes available at certain libraries all over the country because they were *so enormous*. And then, finally, they published them about 40 years later when the book becomes a classic! They published the book with footnotes, so instead of a 500-page book it was an 800-page book.

Publishing multimedia work: images, video

Despite the logjam on the subject, many scholars who work with visual images, radio, video, film, or oral histories are eagerly embracing electronic publication as a way to better present high-quality work and integrate all of their data and analysis directly in with the analytical narrative. What electronic publication does not solve, however, is the high costs of securing permissions that many scholars must pay in order to include images and other copyrighted material in their publications.

> Electronic publication just transforms the possibilities of visual materials, because you'd no longer have a static image printed on a piece of paper. By the way, publishers these days tend to print terrible versions because they use cheaper paper to save money and the reproductions are awful unless you're talking about a serious art book. So what this would allow would be not just a non-static image, it would allow you to prepare images, focus in on certain things, and draw the reader's attention through the technology…I'm thinking about something that's even a little bit different in the sense of allowing you to focus in on parts of a print, for example, dynamically over time, while you're developing the argument, so that the reader could really see what you were talking about, rather than flip to page 49 where the illustration is and try to figure it out. There are enormous possibilities here, especially about multimedia bringing together word and image and bringing in together also, needless to say, radio and video. For the study of film, for the study of modern forms of communication, this has got to be the way it's going to be done.

Although some scholars find multimedia tools invaluable for communicating their research, several historians complained that there are too few outlets for the publication of multimedia work. In music and archaeology, there is a tradition of including a CD or DVD in the jacket of the published book, and some scholars are replacing this model by developing websites to house supplementary, multimedia data. Similarly, some scholars in history have created online websites with visualizations, maps, illustrations, and other multimedia supplements to their printed books and articles. These scholars note the importance of "anchoring" their multimedia work in the analytical narrative to ensure its "scholarly integrity."

> In my case, the analysis, the narrative history that's told, will be deeply informed by this research. There will be maps and illustrations that will come out of this. They won't all be able to go with the published book, but it will all be deeply informed by everything. And, in fact, the whole thing is based on an analysis of what this kind of research and technology allows one to do, but it will still be a narrative and analytical history in a book. There are going to be other parts of it. So there will be the visualizations, the maps online, the data that's accessible online that will do things that the book can't do.

> We wanted to do multimedia publication in general, because the subfield can really use the multimedia to great effect… There are so many limitations on publishing images in your journal articles, you usually get about eight images at the most, but you can really do extraordinary things to represent cities in an online format. But we also didn't want to innovate too quickly. We wanted to establish the scholarly integrity of these publications, so we deliberately anchored them to a print article first. The process was once an article was accepted, we could offer the opportunity to create a multimedia companion to it, but it had to represent the argument in the print journal, but it can do a lot of different things once that criterion is met. So we've done that and it's been successful, we had several really interesting sites that have attracted a lot of attention….You structure an argument differently through interactivity and allow for much more user participation and exploration of different issues. So,

> as you said, nonlinear kinds of approaches. And then you can put raw data—that can be quantitative data or archival documents or photographs, manuscripts—you can put all that stuff on the site, which you can't do now. So a journal article can reference primary documents but it never actually produces them or at least not more than an example. That's a print publication, but an online publication. I don't know if you'd have a footnote referencing the archive, but you actually provide the archive itself.
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> When I tell it in the book manuscript, the first part of it is about 12 pages, but I can get across the essential story in a number of minutes if I do an animation. And that kind of thing is not that hard to pull off…My point was, "Look, even if you can't do it today, 10 years from now you will be able to do it without a lot of fuss and bother. And, at that point, you're going to want this piece of your work in a place where the general public can find it, so that when they continue their research, they go to the other material that you have; they see a piece and it's a lure." Let's face it, it's the kind of thing that says, "Well, here's something, it's important, accessible, and if you really care about this topic, and you want it in a competent, scholarly form, then here's where you're going to get it." And you're going to find this article and this book or you're going to find these other kinds of materials. I think what we're doing is going toward the point where these things are integrated. Here's a piece of information that lends itself to animation and so you do it, and then here's a piece that relies on a close analysis of some memoir literature, so that's probably something you're going to develop as text. But you have an array of things, and I think that's what's really exciting about the technology. Is it a book or is it a digital article or whatever? It's about finding different outlets and different forms of presentation for an idea, so it's about being agnostic about what form has the work necessarily taken until you get into the project…It's about dealing with facets and forms of scholarly production in a pragmatic way, so that you make sure that you stay focused on the question and then let the question determine what the best form of presentation is for those ideas.

The added bonus of having supplementary, multimedia data online, for one scholar, is that it may increase visibility and help direct members of the general public to their more scholarly work:

> What the Internet offers us is a way to get pieces of our work out in a forum that the general public is likely to discover…because let's face it, Internet searches are the global first step in anybody's research in any kind of question. So if I'm working on, for example, a problem in the history of Africa, I want to have stuff up there that maybe only exists as a few pages, or half with animation, that's something that the general public is going to find and it's going to lead it back to the scholarship that I do at a statelier pace, whether it's the article or the polished monograph. It may take the form of a webpage. I also think that YouTube is turning out to be the place where you could put a piece of your scholarship, if it has a dynamic component.

Multimedia resource websites

While the majority of scholars producing supplementary websites or CDs are self-taught, larger-scale multimedia projects, such as the *Valley of the Shadows*, involve great expense and collaborations by teams of scholars.

> There are a few examples of online projects that I think have been wonderfully successful. They have also been very expensive…Ed Ayer's piece, *Valley of the Shadows*, that's wonderful. That was, in fact, the first electronically published piece that I saw where I said, "This isn't just a cute way of doing things, and a cheap way of doing things, but you can really do stuff

> with this that you can't do with paper. That's great." Ed once told me what that thing costs, how much money he got from NEH to produce that thing, and I forget, but it was a lot.

One scholar spoke of an attempt to merge the capabilities of these resource websites with the standards of traditional book publication:

> What I'm trying to do right now is create an adjunct for the big book I've been working on for about 10 years now. I'm almost done with the project, but doing an online version of it as I go, and I call it a multimedia book, but it's not an e-book. An e-book is just an ASCII character conversion of a regular book, so it's different fundamentally. This is something that ends up in multimedia, an interactive version of a book. But the thing is, it's different than a resource site because it has an argument, and it's bounded and it's not just something that has a bunch of links to everywhere else in the cyber-universe, it's my work. You can really tell where my work ends when you leave the site again. So I think that's an important kind of thing to have in the scholarly world, and I'm going to try to make an example of it, but I don't know of anybody who's trying to create that same kind of standard. I just think it's something that we have to get to in order to regularize multimedia communication.
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> I think part of what's in the future is a more dialogic communication, where you're actually in dialogue with your readers. I think that's very exciting and important. It's just a function of the programming, you just set up a database that the user can enter information into, it's just like an open blog or something. It could be a lot of things, your imagination is the limit of how you would use the user input. But it's not hard to program so that any user can add some commentary or whatever. If you want them to be able to come back and do it again, or something like that, there are a lot of questions you face in terms of… does the user needs a login to your site, so they could pick up where they left off the last time when they were reading it, and have a breadcrumb trail about what they've read so far? That's one of the challenges to think of if you create a really complex online multimedia website, how does the user know if they've read it all? How do they read it, come back, and read it again? Because it's intrinsically something you can't… well, you could burn it on a DVD, I guess, but I'm not interested in that kind of distribution.

These large-scale multimedia resources can raise questions about authorship.

> Certainly, you can say one person dominates, but you can't say that the whole collaborative Web enterprise is going to have an author the way a traditional monograph or a journal article has an author. That, also, I think is coming and it makes a lot of people quite nervous. What I'm not saying is that the old monograph and journal are going to disappear. I intend to the end of my career to do both. These are things that are more under my control and the way I write is that I'll always be doing that. But there are other things I want to continue to do. So these are going to be parallel tracks; it's not going to be one or another.

Training/Expertise

Hybrid digital publications blend multimedia data and traditional textual analysis. By and large, scholars interested in this form of publication find themselves doing the programming work themselves and assuming any related costs. This is definitely preventative for some people who may not have the resources to produce a multimedia piece.

> Some procedural elements are now changing and require rethinking on the part of the scholarly community because it just changes the order of things. For instance, it's not yet clear whether people will just go ahead and create a multimedia, what would you call it, a

draft or a manuscript or something like that, and then submit it to a journal, because it can take quite a bit of resources to create such a thing and there are lots of considerations.

Right now, it's very much on an artisanal basis. The two people I know personally who have done the most with this in history have done it entirely on their own. These are people who are totally self-taught. They learned how to do it themselves. Most history professors are not going to learn how to do it themselves.

We certainly require that the author assumes the cost. We don't have a budget for this now and I'm not even sure if it will ever be enough, or how you would do it because usually…people do this all different ways, they have either their own programming skills or their graduate students are programming or they have a programmer in-house somewhere who's not really a scholar but just a programmer who works with scholars. That's very common, or they have a designer or they could have whole teams. And that's common, too. But we just don't have the budget and so we're just relying on the research, the people who can do it, and obviously there are all sorts of implications about that for scholarly publication.

The limited number of scholars who are competent in these technologies means that few graduate students are being trained in their use. As a result, we have heard calls for new, easy-to-learn tools for scholars to quickly and easily author multimedia publications.

It's amazing, the situation of graduate students. Graduate students in history are really reluctant to move in this area of experimenting with digital technologies, in part because we don't provide any training. We don't have classes on how to do a digital book, because none of the faculty know how to do a digital book. So the students aren't really being introduced to this as an option while they're graduate students.

Open access

Although open access publication is nowhere near widespread in history, some historians have expressed interest in the model as a way of reaching a wider audience. The author-pays model is uncommon in history, where most scholarship is accessed via personal or library subscriptions.

It seems to me that online collective publishing could work nicely. Search engines are such that, if you publish something in a printed *festschrift,* that's a great way to lose it, for it not to have readers…But if you publish it in maybe an online collective work, you'll have readers all over the place, and if you put it on an open access repository…you'll have many more readers yet. It's a great way, if you want to disseminate your ideas and your research. I think the open access movement is going to make a huge difference.

As a university professor, as a historian, I publish books, I get royalties. My books have been relatively successful, so I find out that my annual royalty checks are a little larger than those of many of my colleagues. That said, I could never support myself on my royalty checks. It doesn't pay for that much extra, and the government still takes whatever, a quarter of it, or a third of it. I personally could probably even consider giving up my royalties if I thought that what I was going to say actually could reach a much wider group of people and might actually have more impact in whatever is the public arena that's developing that…I personally, as an author, do not necessarily have any real vested interest in maintaining the kinds of controls that the current system is all structured around. There are a number of authors for whom that would be a big problem. Few of them are in the university system.

I have to make a decision between whether I should just stick something on a blog, or whether I should I submit it. But, where's my incentive structure? I have tremendous

> incentive to post work on a blog because I get immediate feedback and I try to make it a thought leadership website. So I need some rationale to put it somewhere else. I think that's what we're seeing in a lot of these studies that are showing senior faculty wavering about it. We end up with an upstairs/downstairs dynamic, which isn't very healthy…I know that the sciences are different than the humanities, but I would love to see some prominent figures in history start up a PLoS for history.

While some suggested that Ph.D. dissertations should be made freely accessible online, one historian noted that this could interfere with young scholars' chances of getting their work published professionally:

> It's useful to have dissertations available for people to look up. They had something like this even when I was coming out of graduate school in the 1970s. They asked me if I wanted to publish my dissertation with them, like a publication on demand, a little typescript book, and I realized that it wouldn't do me much good…I think it's very useful for dissertations that are not going to be published, or people who aren't planning on publishing, or that don't ultimately wind up being published as a book, but I would be very careful if I were a young scholar who needs to get a book out to have tenure…because it's out and available publishers might say, "Well, it's out and available, why publish it?"

3. HOW DO YOU SHARE YOUR WORK WITH OTHER SCHOLARS AND KEEP UP TO DATE IN A FIELD?

Historians are cautious about sharing work publicly until it is relatively polished. As in other fields, early drafts are generally circulated by email among a small network of trusted colleagues for comment, feedback, and improvement (including before the formal sharing of work at conferences). Graduate students and pre-tenure scholars, in particular, may harbor fears that in-progress work presented at conferences or openly shared could be poached. While scholars have varied opinions regarding the sharing of primary archival data, few scholars share their research notes, databases, or other intermediary interpretations of archival material; those who do usually wait until they have formally published their research. Tenured scholars may be more open to sharing early research ideas and other in-progress work. Listservs and various types of websites are considered valuable for keeping up to date and disseminating useful information (such as conference announcements and methodological discussions), but there is little evidence of sharing work-in-progress through these mechanisms.

> We're probably on the slow side of sharing…Historians are deliberate about this and are strong on documentation. You don't just put out an idea, but you really try to support it. So, you're asking me where we would fit on that spectrum, and I think we're probably among the less communicative…History is one of the most pathologically and professionally conservative of the disciplines.

H3.1 The Importance of Informal Networks

Historical scholarship first prioritizes an idea that is subsequently developed over an extended period of time, often years. This incubation of early research largely remains an independent venture. Early sharing in history centers on close, trusted networks that expand as work is refined. Pre-tenure scholars, in particular, feel the need to be careful that their work is well

polished before exposure to experts. Historians rely on email to send highly polished drafts or "think pieces" for feedback to select individuals prior to submitting research for publication.

> …creating the argument, if you don't share your work at that point, then you're nuts. You're nuts! Either you're terribly confident, or you're paranoid, or I don't know what. I think writing is a seriously collective activity…I begin actually by thinking about what it is that I want to do. Am I writing a book chapter? Am I writing an article? So if I'm writing an article, what usually happens is that I have a very hard time winnowing down my material. I've got all of this archival material, and I tend to just rely on the advice of my colleagues to say, "Ditch section three and four because they're not really as relevant or interesting," or "I think section three and four is making you miss what is really interesting." So I produce a first draft, and then I send it to a very small group of people, who I count on to come back at me and say, "This is just not working" or "This is banal, and this is absolutely uninteresting. Try again." And then I get to a trusted group that includes people I disagree with. For me that's vital, because if the article's going to have any merit it's going to persuade somebody who's not already persuaded of what I'm saying. So it includes somebody who says, "No, I don't think it's working. No, I think your data are…" so on. It comes back to me and that's my pre–first draft group read. And then I put together a first draft, and I send that one out. And then I get a final draft, and it goes to some very senior people in the field whose opinions I have enormous regard for, and who I don't want to bother with the pre–first draft and the first draft. So, I have it read two or three times, and at that stage, then, I'll submit it to a journal.

> Not only is it a matter to some extent of individual temperament, but it's also a matter of where you are in the field. If I'm trying something new that I'm worried is a little bit wacko, within some limits I want to send it to the person who is most likely to think it's wacko. But I'm a full professor. If I'm untenured and I don't know who my department is going to ask for a reference when coming up for tenure, do I want to send the raw version to this person and maybe shake their opinion of me forever? Or am I going to wait and send them the fifth version, or maybe just wait and let them read it when it's published?

> It does depend on the scholar. We definitely share drafts of manuscripts; if somebody's willing to read a draft, we're really appreciative of getting feedback, so that's very common. I guess some scholars just are worried about having their ideas stolen, but they are just people who aren't very good at collaborating with scholarly work anyway.

> My dissertation advisor is extremely conservative about these matters of publication. He told me, "Don't circulate it. You've got to sit on your decision for a while. You should go back to the table and do much more work. It's got to be absolutely perfect, because this book is the only thing you'll probably be known for, for 10 years in your career."

Although historians recognize the value of thoughtful, detailed feedback, one scholar who works in the intersection of political science and history noted that the process can be very lengthy, and perhaps move too slowly for scholars in some research areas.

> The issue for me often is time constraints. I'm often eager to get a paper off to a journal before I have the time to let it circulate for a year, because it takes a very long time to circulate it very well. In other words, you don't just send it out and get things back in two weeks and then write it up for a journal. Things have to float for quite a while before you get enough feedback to make it worthwhile. But it's worth doing.

In addition to facilitating early sharing and the maintenance of informal networks, email was cited by several scholars as enabling a new, global "circulation of ideas."

> The really interesting change that's been brought about by technology is that there are different ways now that people can reach an audience.
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> Conversations, conferences, email, sending papers or chapters or think pieces out to people and getting feedback from people I've selected. The other great thing about the electronic medium is that I have a network of friends that's truly international, and it's as easy for me to be in daily contact with people who I've known for thirty years whose opinions I trust, who live in France or Brazil or Japan…Actually, it's, in some ways, easier than with people here on campus…That whole exchange level has changed, and this quality of my daily conversation has deepened and been enriched…and, at the same time, the quality of personal friendships has deepened as a result.
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> I contact people all the time who are specialists in something that I need to know something about, just on email. And I say, "I want to use the archives on X. I know that you've worked on this, can you advise me?" That's a huge thing. I remember when I was writing my dissertation having to write letters and this whole process…but this is instantaneous. I can contact 10 people today in a field I know nothing about and get good guidance. So that's tremendous. I don't have to write letters in that way. Email is just a hugely effective tool in terms of scholarship.

But one graduate student noted that electronic communication can serve to reinforce already tight networks rather than encourage unhindered access to new scholarly communities.

> I find that the old boy network still runs things. And yeah, there's technology, blah, blah, but it's a lot of talking on the phone, who you have personal contacts with, who thanks you in their acknowledgements, who cites you, those sorts of things still reign. It's not a wide-open terrain where everybody is free to play. And I feel like it's getting more and more elite-ized, if I may.

Email is the predominant medium and has made informal sharing much faster and easier.

> I send copies of the stuff I'm working on to selected people to get their views, if they want to share their views with me, and if they're willing to read it.
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> I think people do send drafts around. Certainly the email attachment has made things vastly easier.
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> I circulate my work-in-progress in manuscript form to people that I want feedback from…I send it by email attachment.
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> I share my work certainly with email and PDF. It's really not substantially different than what's been in practice for several hundred years: write to a scholar or write to someone and you ask them to send you their paper. It's as simple as that, and they write to me on email and it's faster and it's more global, but it's really not substantially different.

Establishing informal networks

A scholar's informal network can develop in any number of ways, but historians' most trusted colleagues can often evolve from former advising relationships and peer groups developed in graduate school.

> My informal network started with grad school, with my thesis advisor, who is almost my bibliography. When I'm really stuck because I don't know what to read on a particular issue, I call my advisor. And so in some ways, I have continued, post-Ph.D., to cultivate a slightly different teacher/student relationship with some of the senior people that I have regard for. Now they're colleagues. It's not about status or any of those things, but I think I still feel very strongly that I have a great deal to learn from them still. And that's my last group. I like persuading my graduate students—I know more than them—but I feel like I've got it if I can manage to persuade a senior colleague, and I still have a sense that if s/he signs off on it, then I can defend it to the world. S/he is one of a group of about five people to whom I send things right at the very end.
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> The graduate students work closely with an advisor, and so there's a lot of back and forth there. And furthermore, I have found that there was a good deal of solidarity and *esprit de corps* among the graduate students who would enter and would be there at the same time. It's not a huge group, and they are not really competing against each other, so that there will be all kinds of seminars in which they would present drafts of their dissertations, draft chapters, they would often read each other's drafts, so there was a great deal of what you called sharing, a kind of mutual criticism and support at that level. And, of course, the dissertation director would be reading every chapter carefully and there would be lots of feedback there. In the course of the writing, you're continuing to do this, but I think that this is restricted to a very limited public, the immediate peer group, at whatever institution it might be. There has been, however, a slight tendency for graduate students in neighboring institutions to get together—those who have common interests—and I directed a small group on a research topic, and we had six universities who produced graduate students, not necessarily in history, often in English or French or even sociology, working in this new field, interdisciplinary field…and they would get together once a year and exchange papers, and then they would meet casually, and so there was sharing at that level, too, but I think that's unusual.
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> I think students matter a lot, at the graduate level in particular. When they come to do a field, you want to find out what they're doing and tailor your syllabus to what they're doing, and that sometimes means that you have to go and learn something about something you don't know much about in order to teach it properly. But yeah, I think working with smart students is a great thing…Most of it, from what I've seen, is probably first-hand, where you'll have a conversation with a student who asks, "Have you read this, thought about this?"…That student is already operating at the level of a colleague.

Relationships among colleagues working in the same specialization are also prevalent. But senior scholars, who are most in demand to read, usually have the least amount of time to do so. As a result, intimate, early sharing practices common among scholars early in their careers may decline as the demands of academic success take precedence. Established scholars may therefore rely more on junior scholars and graduate students than on peer groups for keeping abreast of the field.

> People will send things out to colleagues to get critical responses. There's become a problem there and I'm sure it's the same in every discipline. In an average academic year, I'm on a book prize committee—and if I'm not on the book prize committee, I'm usually on a book prize committee one way or another either for a Pulitzer or for academic prizes—I'm reading 80 or 90 books…Then I'm also going to be on review committees, which usually for an outside reviewer is five or six candidates every summer, where I have to read all of their work, which usually hasn't been all published yet, so I'm reading a lot of manuscripts. I'm supervising a lot of the dissertations that I have to read. I'm reading all of that. At the same time, my colleagues coming up for tenure within the department, I have to read all of their work. So

> before I get to do anything I'm interested in, *per se,* my own research or anything else, I have this huge amount of reading to do…When I was an assistant professor, I didn't have to do any of that. It's likely that I'm not going to get that kind of reading anymore, so that avenue of sharing work also tends to dry up.
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> I do think this idea of sharing, as you get older, it becomes harder to do because of so much work to do, and, secondly, the way that the meetings have changed, and the third thing is the price of prominence that I hadn't recognized. In some ways, universities, despite the caution they impose on my junior colleagues, are intellectually stimulating places. And the reason is quite specific, in that junior colleagues are really colleagues. They're not flying off someplace every weekend. Nobody knows who they are. They're not being invited out to do it. So, very often, their intellectual stimulation comes from each other. They read together. They have groups together. They argue about things in the hall. As you get more and more senior, we're a set of separate planets and I don't think there's a solar system here. My colleagues, we see each other, but we don't have substantial intellectual conversations. Those take place wherever it is that I go. But even when I go someplace, and I'm getting tired of giving talks, but at their best, I get real give and take from the audience, but a lot of times it's just a performance, so that's not the same. So I've begun to think, and I'm sure I'm romanticizing this sort of golden age of being a junior colleague, where, in fact, there was much more intellectual life at the university than I get right now. I get it from graduate students, I get it from the project, but I don't get it from my senior colleagues because none of us need each other anymore. We're connected with these national and international networks, and that's how we operate. But everybody in that network is as busy as we are, so we don't get the same feedback in our work that we used to get when we were younger. So it is a real problem.

Exceptions to the norm: Sharing among "quantitative" historians

Some interdisciplinary historians who follow a social science model may be more willing to share work-in-progress. For instance, one economic historian was open to presenting "half-baked" ideas at visiting lectures for feedback.

> I think if we stay in the interdisciplinary historical fields in which I work, and then bridging over into population and even into environment science, I think there's a lot of sharing of ideas. I think there's a pretty good sharing of preprints. Data sharing is a more diverse issue, one we could spend a lot of time talking about. But I think data sharing is a slightly different issue. It depends. The economic historians, who as a group I know very well, are very good. We had a talk by an eminent economic historian and it was very partially cooked. It was very early, it was fascinating, then I went over to meet with him, I thought to grill him on something for an hour with a couple of my younger colleagues, and he grilled us for an hour about what we knew about topics that could contribute to his paper. And I thought it was just a really interesting discussion of how that went, and that's not uncommon. People will do that.

H3.2 Widening the Circle: Conferences, Seminars, Meetings

Conferences and seminars are arguably the most important means of sharing formal in-progress scholarly communication outside of more informal networks. Notable conferences include the American Historical Association's annual meeting and the Social Science History Association. There are other smaller meetings specialized by area of study or topic of interest. One historian remarked that conferences are "a way to try ideas out on your peers, and conference papers will also become journal articles, so there's another level of review that happens there." Conferences

are also particularly important for staking a claim to research ideas, making a name in the field, and raising the visibility of one's work.

> Conferences are very important, and that is the main way in which people announce their interests to the world ahead of time…conferences, and then going and giving talks, generally, to places. But, otherwise, people tend to keep things very close to the chest.

> The reason to go—and there are a lot of reasons to go—is to meet other people in your field, of course, and you get feedback, some of which is really good. I've gotten really good feedback at conferences, both from the commentators and from the general discussions. Ideas for books, for more conferences, and for edited books—I've done a lot of edited books—get started at conferences. I find them exhilarating. You come back from a conference wanting to work harder and to do more. So to me they're important.

> Conferences are good in terms of getting your name out there, getting the attention of a potential publisher, in terms of getting the attention of perhaps a journal editor, getting someone, for example, to give you such good feedback on your work that you ask them if they would mind seeing part of the larger project.

> I think everyone has their circuit of workshops and conferences…But you know that the right people will see your work, and, in my field, we quite regularly present at the Social Science History Association, which meets in the fall. It's a much smaller association.

Conferences can also help scholars to establish and expand a personal network and heighten their visibility for job openings, which is particularly valuable for graduate students and pre-tenure scholars. Many scholars would welcome more funding to attend meetings.

> Conferences are important in terms of networking. When I was chair of the history department I told junior people to make senior friends, people who will give you good feedback on your work but also who you can recommend to write you letters for tenure. You need to be able to have people so that when your chair asks you for a list you can provide some names and not just leave it all up to the department.

> Especially for graduate students, conferences are very important. And this is, in some ways, to help them get jobs: because a lot of times they will be giving a paper and somebody will see them give a paper that's a good paper and they deliver it well and they answer questions well, and a job comes up and they will remember that. And that's how they meet not just people in their own field at their own age, but other scholars, senior scholars, who also get interested in their work and might help them out, because I help out other people's students, and other people help out my students. So I think conferences are very important.

> When you and I are done this afternoon I have a meeting with one of my research associates to talk about some work we're doing, and I promised to give a talk at the university. I really have no clue what that's going to be about, so they're certainly going to get kind of…I have a topic, I don't think I've given them a title yet, but I've got a topic that I want to talk about, and I have some ideas and I have some old results. I want to expose some theory to them and maybe some real preliminary analysis, assuming that we get something done in the next couple of weeks that will go into that talk. I personally like that a lot, that's how I learn things. And I think that's not uncommon, although again, I'm more like a social scientist in this way than I am a traditional historian. I don't get to all the talks, but we see a lot of people coming through our workshops talking about work-in-progress, almost every week there's somebody coming through to talk about their work.

Problems with conferences

Some scholars criticized conferences as no longer functioning as incubators of new ideas or venues to keep up to date with the latest scholarship because they are populated primarily by graduate students and pre-tenure scholars.

> When I was younger, the people who gave talks at the American Historical Association meeting were the top scholars. The graduate students would flock to these panels and listen to all these senior scholars. And now, it's turned into a job fair, with graduate students desperately trying to get some kind of credit and young assistant professors trying to get some points for tenure. The senior faculty are staying away.
>
> The traditional way of sharing has always been papers at conventions, people who will test ideas by doing that. But the problem is that most of those sessions have become fairly dull. And the other thing that's happened over the course of the last 15 to 20 years, senior people rarely give papers anymore. If you go to most historical conventions, graduate students and assistant professors are the ones giving the papers. So that papers as a means of sharing ideas in the kinds of sessions that took place when I was younger rarely happen anymore.
>
> That's a constant dilemma. The older people want to come and schmooze over cocktails, so you get them to be the chairs and then it really comes down to a series of graduate student showcases. That's not necessarily all that helpful.
>
> I keep up to date with a lot of reading, following the footnotes, going to conferences, but not too often …You go to the same conference two years in a row; it all starts to sound repetitive.

Several scholars spoke of the need for alternatives to the traditional conference paper session, but attempts to experiment with new models of scholarly interchange can be met with resistance.

> One of the ideas that the board of the Organization of American Historians decided on a few years ago was to have these sessions at the annual meeting. It was people, usually senior people who had made some very strong statement in terms of a position which had become widely influential and widely discussed in the field, they would meet their critics at a session, that there would be the person who made it and somebody who's well-known for being critical of it and that way we would have…I mean, unfortunately, what they were known as behind the scenes were smack-down sessions. Their real intention wasn't to do that. Their real intention was to set up this open debate in front of your colleagues, and that it would be something that would attract a lot of people, a lot of interest, and give a kind of vitality, which often is not in many academic sessions anymore. To everyone's amazement, or to my amazement anyway, other people might have been more cynical. Nobody agreed to come.
>
> I went to a conference where they created a new conference format called a cluster session. They're driven by opportunity, and there were some terrific proposals that were virtually about the same thing. Rather than reject two of them and only have one of them, they put them all in a bigger room and asked people to do the equivalent of a poster session, not in a giant poster session arena, but within this one focused research area, and then had 40 minutes in which people could browse around and look at the posters and talk to the authors, and then had everybody draw their chairs into the center for a discussion about the issues. It was still listed as giving a paper in the program, because people needed to be able to say they gave a paper at the conference, not, "I was on a panel or a poster session or roundtable." There were some successes with this, but some of us were absolutely stunned by the resistance. People

> said, "Well, I've never heard of anything like that, it is in the nature of historians that we must read our work out loud." Give me a break. In medical research…they have 15,000 people at their meetings and they consider themselves pretty serious about intellectual work and collaboration. And the idea of people sitting up there and reading complex papers out loud to each other seems like a horrendous waste of time…The conclusion I came to was that change to the status quo was a really hard sell because the senior people were too self-important to want to change, and the junior people were too frightened to want to change. That's a pretty good formula for things not changing. And then you add to that the dynamic of having a new program committee every year with a new group of people, and it makes it almost impossible to imagine how really innovative things can happen.
>
> There isn't a conference on my specialty every year, and there is almost nothing presented in the American Historical Association meeting on it either. So I'd much rather have some way of being in touch with about 150 scholars in various fields, and that's where the digital realm is a great help, because it allows for the proliferation of communication. In some sense, there's too little being published and there's too little discussion. This isn't a winnowing problem. It's due to not being able to actually access the full thought in the field as it's taking place.

Circulating conference papers: Fears of poaching

Conference proceedings are seldom published, but when they are, they may be revised and peer-reviewed as edited collections. Graduate students may be less inclined to disseminate their work this way, because it takes a long time to produce a paper and they generally want to save it for peer review and publication in a prestigious journal. Instead, conference participants seem to be regularly invited to circulate papers or abstracts beforehand in some form (including online, but this practice is not widespread). For one post-tenure scholar, this practice "always makes for a better panel, but rarely can be accomplished." Many historians, especially pre-tenure scholars, will not present a conference paper until they are far along with their research. This practice may stem from the long length of time needed to write a paper and the possible fear of having ideas stolen.

> Some conferences will distribute the papers in advance to the people attending. It's rare that they'll be put up on the Web, although it's not completely unknown. They may just hand out abstracts. They may do it totally orally. There's a wide range of practices.
>
> And then I think there are some people who won't do a conference paper until they're further along on it. Whereas, you go to a law conference, and they don't even write them up…It's like a panel, and everybody talks spontaneously about their work. Historians expect to have that paper sent out at least a month in advance, and everybody's supposed to have read it. So there are disciplinary differences there, too.

The danger of sharing in these venues, according to one young scholar, is that "at conferences, people say things that become part of the ether, and people latch onto them, take them, do things with them." Indeed, one graduate student reported being asked to circulate a conference paper online pre-publication, only to have it poached by a tenured scholar. A former dean and senior scholar echoes these concerns:

> It has never affected me, but I have certainly had conversations with people who felt that other people had taken what they had done, fundamentally, without acknowledgment. Sometimes as a result of their having given an unpublished piece of work to somebody to read in advance, to comment on, and then—lo and behold—their ideas showed up in that person's

> work, unacknowledged. Or, something somebody had done in a conference paper that had not been published in print quickly showed up in somebody else's work. Of course, sometimes people are being a little bit too paranoid in their interpretation of these events, because it's pretty hard, if you have this interesting idea, not to refer to it. And some people are better than others in terms of scrupulousness about this. In general, I don't think that generosity in citation is something disadvantageous, but, of course, people don't always feel that way.

More intimate conference sessions or smaller meetings may have more open electronic or print circulation of work-in-progress among participants, perhaps because they cater to existing informal networks. For instance, specialized centers, seminars, and groups can bring people together to discuss their work, promote sharing, and form a community.

> There's been a little bit of change around the borders of conferences, and I think some of the electronic things are beginning to come in there; it's much easier now to pre-circulate papers. I think we'll be getting to really exciting things where you could have a membership blog of sorts even before the meetings so that people would come there already being in dialogue with the author and with each other. There are a lot of possibilities, but, so far, they're only beginning to come out and the forces of cultural reproduction or inertia are absolutely enormous.

> For several of these smaller, research center–based conferences, the papers are pre-circulated…either electronically or in print. Most people, they will send it to regulars in print…But a lot of them are circulated electronically, and people discuss their ideas. The McNeil Center in Philadelphia does this, the Columbia Seminar does this…These are all early American groups: the Mass. Historical, the New England Historical, and the William and Mary, most of them do this, electronically or in print. Early Americanists are a very sharing community. That's because they have these centers that bring a lot of people together, and they're always discussing their work and forming a real community.

H3.3 Open/Public Sharing: Working Papers and Personal Websites

The conventions of the field seem not to encourage the open, informal sharing of early research. Posting working papers online, often on personal websites, appears to be the province of scholars working near the social sciences, with quantitative data (such as in the subfield of economic history), or those who are enamored of Web 2.0 tools for expanding access to their work.

> There's no working paper culture…because I think there's a fear that you're going to get scooped, that someone's going to take your work…People do share very personally in terms of getting people that they know and they trust to read their work, either through the regular mail or through a PDF file. But there's not a lot of sort of throwing it out there and saying "Tell me what you think."

> I would certainly never do that. I just wouldn't want to put out an unfinished work…I would show something in draft form to a particular person. But, I wouldn't be interested in just anybody's view, right? Nor would I want to have it out there for public consumption.

> People will maybe do a conference paper, usually not put it online, and get some reactions to it. And so there will be a handful of people who are close to it. They'll know that so-and-so at UCLA or so-and-so at Harvard is working on this and that, and there was a conference paper on that, and that you can probably write to her or send it to her, stuff like this. There's a lot of that. There's more of it than there used to be. With a conference paper, you could also send it

> around to a bunch of people who weren't at the conference, so that you just get some reactions to it. But just putting it out there for the whole world, I think that's still quite uncommon…We have a lot of conferences, but we're not posting it for the world.
>
> I think people in my field are pretty antsy about poaching and copyright, but I am not sure, actually. That's my sense, but if you told me I was wrong, that would not amaze me. I'm a little out of touch; I'm a mid-career person. But certainly, I wouldn't share openly. I would be very conservative about that. I've had friends who have had problems, so poaching is very commonplace, actually.
>
> I do hear some people say that they're a little concerned that their ideas might be stolen. I'll occasionally have one of my dissertation students embargo a dissertation so that it would not be accessed because we were afraid that these commercial writers would get the stuff that s/he had gotten.
>
> I've gone through different phases as to what I thought about public access to in-progress work, because there are a whole bunch of issues about material that is still a work-in-progress being made accessible to that number of people. I've come to the conclusion that privacy is a very 20th-century idea and that we're going to be all living much more public lives. And, for the younger generation, that won't even be a question for them because they will have grown up with a much more exposed life being common sense. I think it's generational.

For one scholar, however, online dissemination has the potential to guard against poaching:

> I think that being worried about your intellectual property is really a red herring, considering that it's actually better to post something online because it gets a time and date stamp. If you have a thought about something or you just checked out a new archive, it's not as if someone is going to steal your idea.

Most historians do not maintain elaborate websites, citing time constraints, insufficient technical skills, or lack of university IT support.

> I don't have a personal website. I don't intend to get one either. That's too much time. I don't have the time for that.
>
> It probably would be a good thing, but I have limited time. It feels like advertising to me. Some do, and the ones that I see that are up…feel to me more like advertising than scholarship. And that sounds snooty and it probably is snooty—and I don't mean snooty in a good sense.
>
> But part of this has to do with that lack of familiarity with how this could work. Most people are at universities where there's no technical support help, and most of us don't know how to do a webpage. If you have to do it yourself, it's only the Ray Jonases of the world who have taught themselves how to do it and who do it.

Those scholars who do maintain personal websites often use them to share post-publication research. Such an unguarded Web presence can generate miscellaneous email inquiries, which can sometimes be a time drain.

> There's one historian in my field, for example, who has an extremely well-developed personal website…He doesn't put up preprints so much, but he certainly puts up everything once he publishes it, links to his books so that you can buy them, but also links to the journal articles

where they're available electronically. Maybe he puts up some preprint stuff…I don't think he does…but he's much more savvy about this.

You're less protected. I get a fair amount of "Dear Professor, I am in the eighth grade at XYZ Middle School, and I understand you're a historian, and I have a term paper on the Mexican War…Can you tell me about it?" So I get a certain amount of those. It's the price well worth paying for the benefits, I think…I'd say I get more of those now than I used to; I get quite a few of them. But the matter of enhancing communication among people who are interested in the same things, that's very valuable. I'm all for that.

My email takes a lot of time, and there are various people who don't do it as a result. They basically don't respond to these random inquiries. And that's a question of choice of where you want to put your energy. I find that given my interests, this is absolutely crucial because historians now, in general, are much more interested in, "Well, if you looked at things in a global perspective, how would your view of the United States change?" Or "How would your view of the Revolution change?" And if you don't actually talk to people in the rest of the world, you don't have nearly as rich a sense of what the answer to that question is.

I get a lot of emails now from people who have come across my work. I get a lot more emails about work I've published than I ever got letters. It would be hard for me to quantify it. It's a tremendous leap. And sometimes it's just somebody saying, "I read it and blah, blah, blah," and I can just send them back a short note saying, "Thank you for your comments," and sometimes it really is something that gets me to think about something. So the electronic medium has really expanded communication. I would say it's in a good way, despite the fact that I curse email, and feel I probably spend too much time every day on email, and have my various strategies for trying to contain that. Nonetheless, I think for the most part, most of this increase in communications is about stuff I've published or papers that I've given that somehow or another have wound up on the Web even though it's not the actual paper, and sometimes it's a video or an audio. There's a lot out there.

H3.4 Data Sharing

Ultimately, most historians work with publicly accessible data, either existing archives or online data sets. According to one senior historian, unlike the sciences, there is not much overlap between projects that would interest scholars in each others' material. There is, therefore, a question as to exactly what "data sharing" consists of, and while some historians are happy to point colleagues to available data sets and archival materials, few are willing to share their intermediary work, such as research notes and interpretations.

When the book is done, I usually just delete my data and notes or sometimes I save them on the computer…It's just I never thought of that. Part of the thing is that I know where it all is. If it's online, people can find it for themselves just like I did. And I refer them. If they need so-and-so's papers, I just refer them to the paper or collection or reference, and sometimes I can refer them to specific papers: "They're in this collection, go look up this." It's not that I mind sharing it with people, it just didn't occur to me. It's just that we all work on our own projects and they don't overlap all that much. It's not like in a lot of the sciences where these things are much more like that.

The data set that I'm working with on the Internet is available to anybody. It is available. It's available to me. It's available to you. That's available. I've looked at it in the archive. You can't take it away. It's not mine to make public. I haven't annotated it. I just provide an interpretation of the data.

> Sharing the materials…it's not an issue for me. If somebody was working on a subject that's related, I have absolutely no issue sharing data with that person. Because no matter—you could look at the same archive and come up with a different argument, so that doesn't worry me in the least.
>
> It's hard enough to read a book, I find, in my graduate seminars. The idea of reading the author's research notes, or everybody's research notes, or having everybody read my research notes—and that being a deeper form of collaboration than actually finding one's way to a presentable piece that you can then bounce off or respond to—I find that a little odd and kind of fetishizing the process in a way that I think is not really how work gets done. Ultimately there's still a craft there and people still in some way need to get it to a point where there's something to look at. I want to see the statue; I don't want to necessarily immerse myself in all the chips of stone on the floor.

Some scholars who work in archives, however, may feel more possessive of their notes or the manuscripts they gathered, transcribed, or photocopied. This is because the research advance in some historical work comes from the lengthy process of discovery of new archives or new documents in an existing archive, so there is a real concern about being scooped.

> For historians, it's very often, "I sweated a year at a God-awful place where there was mold growing everywhere…Damn it, this is my capital!" I think there is some of that. But I also think there's more of a sense that the notes without the context are somehow misleading.
>
> I've had my work mined...the data, without being told. I got a note saying, "I heard that you gave this talk, and I would really like to know about your sources..." So I sent my unpublished article, with footnotes, to the person, and then later...people at the archive I used...said, "Oh, so-and-so was here and just looked all over the archive."...I had given this other scholar the roadmap to his/her research…I was devastated and I hurried up and got the thing published. It wasn't quite the venue I wanted, but I knew I had to get it out there.
>
> There's a huge nervousness about someone scooping you, going into your archives, finding your run of documents, beating you to publication on a particular subject. That's an anxiety that exists in general in the history profession but especially among younger people. Well, I think basically that that anxiety is not justified, although, to a certain extent…So there have always been incidents. When a scholar is off in the archives in Barcelona or Warsaw, and they spot another suspicious-looking American, they wonder, "What series of the archives is this person consulting?" Then they find out that that person is the student of the rival of their own thesis director. There is a certain amount of that kind of thing. But I think it's exaggerated and a lot of it has to do with the beleaguered psychology of the graduate student.
>
> I think that the secondary products of scholarship could be shared more easily than the primary sources of scholarship, which people are reluctant to share. I think some historians would be reluctant to share in general. They think people are going to steal their ideas. And, for most people…it's too self-flattering to think that your project, in most cases, has tons of people around the world working on it.

Some scholars create unique data sets based on extensive archival work. There is a move among some of these scholars to make their data sets available on a personal website, but only upon publication of related scholarly work. One post-tenure scholar sees this as a way to help students access the research project and archival data. While work goes into compiling a database, the real "territory" or "intellectual capital" lies in how scholars interpret the data.

> I've experienced this with different colleagues, some are more close to the vest than others, and some are very, very concerned about their data. And particularly people who have spent years and years and years compiling a database feel particularly proprietary about it. But I have my questions and I have my work and my research…and I'm a different kind of graduate student. I think that no one's going to go in and duplicate all the work that you've done. So I'm not as concerned about being scooped…
>
> As long as it comes out along with my first article, that shows I was the one who at least, I mean, that for me it wasn't just the data itself, but the thinking to go out and find this data elsewhere. For other historians, it's as much about the interpretation as the data itself. It's almost kind of pointless to hide your data—five historians can go to the same material and write different books. So it's not really an issue…For us historians, it's still more of the process of your personal relation with the data. The data never speak for themselves. It's always the digging around process or the production of data as much as the final interpretation.

Creating access to scholar-generated materials

Additionally, most scholars save the notes and archival materials they collect and generate in an *ad hoc* fashion, what the scholar above termed a mini "archive of the archive." Several scholars spoke about libraries playing a bigger role in preserving and increasing scholarly access to these facsimiles, as well as other notes and materials scholars generate in the course of their research. One senior scholar suggested that historians should consider preservation a part of their research process and make these materials available as a logical extension of footnotes, to aid scholars who follow.

> I think a lot of things could be passed on usefully to other scholars, and this is where the libraries come in. These are preservation and access issues. It's also a point where I think scholars could use a lot of guidance through what they generally are doing so that there are proper standards, so that it can actually be handed off in some usable form to a library or to an archivist. I think we can all imagine the day when you don't have to go to an archive in Rome or Cairo to do work, although there would still be reasons why we would want to go, but that information would be available. But I still think that that day is long off, and I think that there's useful interim stuff to be had, making your notes available, making your scanned documents available, making your photographs available…something that will help the people who come after. I think it's a logical extension of how we operate with footnotes; the difference is we simply make the actual material available…I think a lot of libraries are talking about that. I know my institution's libraries have been talking about it for years, and I know that they do provide that but it's pretty much on an *ad hoc* or by invitation basis. But I think that they are assuming that ultimately they will be playing a larger role in hosting this kind of material.
>
> Yes, yes, absolutely you preserve your collected data. In some cases, when you're working, as have I, on a subject that nobody's worked on…In my case, once I am done with it I will simply turn it all over to university's library…so that it will be accessible.

It is also important for scholars to create copies or paper trails of archival documents for the purposes of verification. Preserving these resources will make history more evidence-driven by providing opportunities for research to be easily verified.

> Funding bodies trust you to be honest and they trust you to have done your research and occasionally someone is exposed, like Michael Bellesiles who wrote the book *Arming America: The Origins of a National Gun Culture* and had his Bancroft Prize taken away because he made

> his stuff up. I could be making stuff up and no one would know it, because…there's nothing like a national gun association or the National Rifle Association that has a vested interest in how my research comes out. If I came up with a bunch of documents saying what a rotten person this historical figure I study was, there would be some questioning and wondering where they were. If you've got something really controversial, or something you think people are going to question, you save it. You make sure that there's a trail to the archival documents and you make a copy of them, or you at least let people know where they are. They will let you Xerox almost anything.
>
> In our field, you could make up documents; seriously, no one could really check. This is an ethical issue. Someone could say, "I went back to the register and it wasn't there," and I could say to them, "Well, they changed the numbering system," or "This page got torn out." But if documents were accessible online, then it would be easy to check someone's claims.

Preserving born-digital personal materials

Scholars who generate and work extensively with digital technologies are particularly concerned with the preservation of the resulting data and work. Many of these scholars rely on their institutions and libraries to manage the logistics of migrating and preserving digital media. Some also expressed hope that the transformation in digital scholarship would elicit new roles and relationships within and between universities with expertise in hosting different types of data, particularly GIS-based work.

> People are generating digital stills and video, and that kind of material needs to find a home, too. So if people are uncomfortable handing over drafts of their work or notes that they take, the first step would be to capture and preserve the visual material that they're generating in their research…I think it would be helpful if the libraries were involved early on so that the materials are handled as they're being created rather than after the fact…and I think it's probably, in the longer run, especially important for visual sources, since visual knowledge is increasingly important…There's a lot of local interest and local support for our work in the technology industry, and the campus itself supports this kind of thing. And we have an excellent library, which is critical…We have computing people who are knowledgeable and who can answer the "how" questions, and then we have contact people in the libraries who can answer the "what" questions, the preservation and access questions. My institution, like all universities, faces some challenging money questions, but in spite of all that, this is a place where people who do scholarship with a technical or digital dimension can feel at home.
>
> We're taking the approach that nobody's going to host it. We certainly want to find a place that will archive our data and our products, and, if possible, also some of the process that we use—the tools to make the final products interactive and transparent—so that other scholars can look at this data, use the tools, and do this in a way that uses open-source tools as much as possible. The data are certainly open so that people can get them, see how we did our analysis, do their own analysis, ask different questions, combine different data across projects…and ask questions that we might not have thought about asking. And so we want to have a place that will host our data and keep all that available. We hope that after we show what we can do and the value of it, that the university library, which is also moving in some of these same directions and considering some of these same challenges…will see the value in hosting these kinds of data as well as the tools and products. But I personally think that there are some parts of it that will complicate how to host and serve that, particularly the GIS stuff. Currently, we're working with a graphics lab at another university…and they are hosting the GIS server in the meantime because they have real expertise in that. So it might be a distributed venture where you find people with the expertise and capability, and you have a

> collaborative relationship with them. But this necessitates creativity on the part of the administration and fundraising and all those kinds of things.

Although most scholars stressed the need to consider data storage and preservation from the beginning of the research process, one scholar noted that it is important not to "get too hung up on permanence because it's all changing too fast."

> I'm not so worried about finding an online home for supplementary and spatial data in a way because it doesn't take very much to set up a website, and we did it. You can do it here, as a student or a student group or as a professor of a class. You can set up a website, you can get lots of space. And I think you want to think about permanence, but then also think that you may not want to get too hung up on permanence because it's all changing so fast…I think things are changing so fast that there are so many new tools and data and so on, that we're nowhere near the time where it makes sense to have a standard approach.

H3.5 New Technologies for Sharing

Historians use both new and traditional mechanisms for keeping up to date (e.g., speaking to colleagues, journals, websites, listservs, blogs). While historians show a willingness to incorporate new technologies that enable a continuation of standard searching and filtering of informational sources, those we spoke with have not embraced social networking tools. As one provost noted, "Even though electronic media have had their biggest impact on the circulation of intermediate products, they have had little impact on history because this intermediate area was never well-developed for communication among historians."

> I keep thinking that the same tools that gave us this plethora will give us a way to deal with it. I haven't seen it happen yet. There's a lot of stuff out there that really has no interest to me, and I could probably put together a "stop" list, as well as a "tell me about it" list. And between them, that might actually turn out to be pretty useful.
>
> It's an effort to keep up to date. I do it by sheer force of will. I read a lot. I spend hours a day reading.

Listservs and blogs

Listservs are used to keep up to date in the field. The H-Net listservs, which address general and specialized research communities, are especially important for conference announcements and the quick, broad dissemination of book reviews.[90] As the scholar below points out, listservs are also used by some for informal discussions in the field.

> You sign up for a few of them. Some of them are in general fields. So there are three things you get through those. One is it tells you about conferences in that field, which is always useful. The other thing is these listservs review books in the field that are hard to find reviewed elsewhere, or they might be reviewed in journals and I might not ever see them. This way, I get a sense of everything coming out in a field that's of importance to me. And the third thing is there are just general discussions, about historical questions, about research questions, about debates in the field, and that's a way of maintaining community. So I read

[90] Griffiths, Dawson, and Rascoff (2006) found that book reviews mark the heaviest usage of *The American Historical Review* and *The Journal of American Histor*y. See: Griffiths, Rebecca, Michael Dawson, and Matthew Rascoff. 2006. *Scholarly Communications in the History Discipline*. New York, NY: Ithaka, August. http://www.ithaka.org/publications/pdfs/JSTOR%20History%20Study%20Report%20Public%20final1031.pdf

> them and so on. I rarely write in and participate that way, so I'm a passive user, but I use them as a tool to keep up in the field.

The History News Network hosts a variety of blogs that discuss various subjects in the history community. Outside of these services, nearly every historian we interviewed dismissed the use of blogs, or accompanying RSS feeds, for scholarly practice.

> There's only a limited amount of time in the world. I don't know about you but I get so much email every day that I don't have a whole lot of time for blogs. My version of blog reading is every day I get H-Net posts relevant to my subfield, and that includes a blog-like commentary by various people, but most importantly it includes basically a book review a day….The other thing I read is something called History News Network (HNN), which comes out of George Mason and is a kind of blog of the latest interesting things happening in the history community about individuals, events, and news and background, so that's like one giant blog. And I read those two things every day (but I tend not to read specific blogs by people out there in the world). And I suspect I read each of these probably more than some people do.

> The History News Network, HNN, has an endless series of blogs, but all the blogs are, I'd say 95% of them, historians, some well-known, some not well-known, giving their opinions about current events of the day. We can all get that around the kitchen table. Some of them I will read if the writer is an expert in a particular field, but most of them are not particular experts, and what they're writing about is just opinion. It's a bad thing about the Web, and I think that's where peer review comes in because so much on the Web is just opinion. And there's a place for opinion, but, as scholars, we want more than opinions.

> On some of the sites I visit from time to time, I certainly have really had my fill of reading endless comments by people who don't know what they're talking about, that trail on and on and on. I supposed that's nice, but it's not worth my time. I'd rather have something where you're getting considered opinions about something that matters, from people who have something to say, and with the capacity to be surprised by who those people are. It still is a lot different than just saying, "We want to see everything that everybody says all of the time."

> I don't make a distinction between writing and platform…I feel like good writing is good writing, so I read blogs that make substantive arguments.

Along with questions of scholarly value, time seems to be the biggest impediment particularly to blog consumption. As one senior scholar noted, "If I followed blogs regularly, I'd never get off my email." Blogs and listservs might be more helpful for younger scholars who need to learn more about a field.

> I don't do any of these, like the History News Network; people send me that stuff, and then there is the Diplomatic History Group or the Intellectual History Group, and I just can't see how people have the time to do all that if they're also doing other things.

> Why don't I read blogs? Every morning at breakfast I read three newspapers that are delivered. And then I get about 200 emails a day, and then I have all my regular responsibilities. So where does the blog come in? Am I going to read the blog instead of the newspaper? I'm not against blogs, really; it's just that it would require so much exploration. Do I want to read the blogs for a year to find out who's a good blogger? And the people who I know who have gotten the furthest into it are not necessarily the more discerning. So you've got to read through these other ideas to get to the one that's interesting and why do that? So it's part of this inflationary currency. When Newton and Leibniz wrote their letters to one

> another, they took some time to figure out what they wanted to say, so that I just feel that we're now overwhelmed with this kind of trivial communication, and people are not so thoughtful.
>
> I look at stuff from time to time but I don't read any religiously. It seems like such a distraction to produce one. I think what happens typically is people find a blog when they're looking for something else and they read it for whatever it has to offer, but I don't know of anybody who reads one systematically for professional reading.
>
> I almost never read blogs. I don't have the time or maybe I just haven't learned what I can get out of it, but I haven't used blogs very much. I just have so much reading and writing of my own to do, I can't sit around looking on the computer all day.
>
> I couldn't be less interested in reading blogs. There are just not enough hours in the day. I don't want to read somebody's blog. I guess I should correct that again. When there's some kind of political controversy on campus, I sometimes will read blogs because that's the latest way of finding out about it. That's a way of informing myself. So as an up-to-the-minute current affairs kind of thing, yes. But I don't use it on a regular basis.
>
> I don't spend any time either reading or writing blogs. So, I've just decided now that life is too short, I can't deal with that. I have too many other things to do.

One historian saw potential in blogs.

> If you look at the numbers of historian bloggers, they have been growing exponentially every year. There's one blog, Frog in a Well, written by about eight bloggers who are all historians of China. It's a fascinating blog that makes sensitive arguments about Taiwanese history and mainland Chinese history and modernity. It's a really terrific blog. It gets a lot of comments. It's got a lot of community around it. This is something that a print article could never attain, a community around a specific theme.

Writing Blogs

Three historians we interviewed, of various career stages and specializations, expressed some interest in creating a blog. For these scholars, blogs had the potential to provide visibility for a young scholar, reach a wide audience, test arguments, and solicit reviews for works-in-progress that may end in book or article publication. The key, for one scholar, was to ensure that "I'm not putting out crap." For these scholars, blogging can possibly function as a form of interim in-progress scholarship to be refined for future archival publication.

> Actually, I have been looking at blogs, and I've been finding them quite interesting and very useful, and it's easy to search for topics that are pertinent to me…And the blog site retains the sort of intellectual rigor that I think is a more methodological exploration going in. And there are other scholars that I found in this country and other countries who are using blogs or Flickr sites, or this kind of more informal publishing…I think I'm probably going to work this summer on actually creating a blog that's related to my book-in-progress. Because I think that that would then allow me to test out certain arguments and see what happens: look at relationships, invite people to comment, and, obviously, I have to have some background information there about who I am…particularly where I'm proposing some things and I want to see how people respond…Blog spots seem, actually, to reach more people and to be easier to learn how to do…I do a lot of what's called, in the trade, "intertextual analysis," which means different verbal texts, but also visual texts and motion picture texts, and that's actually hard

> to do in a book, though I've developed a way of writing about those things, which I'm not going to give up, because I think books are very good for doing certain kinds of things. But the mechanics of that kind of analysis operate much more effectively on an electronic medium. So I think a blog may be a way of allowing certain arguments, then, to get a little deeper and to present them and see how people respond. It's actually doing things that I'd normally do as part of my work, but then taking it and putting it into a slightly more refined state, which I think is always a good thing because it's that refinement that forces you to sharpen your ideas, putting them out, and then seeing how that works and then …on the basis of that, sharpening my ideas even further for the argument that I want to make in the book.
>
> I don't even like the word "blog." I just view it as putting out open content, and I encourage people to put up things that they've decided not to publish as open access essays on their own personal websites…I'd also advocate having a site where you could post open access materials of any size, ranging from a paragraph to a book that anyone can read and get a real sense of how well you're thinking about a specific area. And I just don't see the downside to that…The online versions of my work last year were read by 100,000 unique visitors. Now because of that, I get invited to lots of things. There's a halo effect from that open access publication. The same thing happens with my blog. When I make a point on my blog, it comes out now, not in a year and a half. With one article that I published, it took five years from the time I delivered the paper to when the actual volume was produced. So I missed five years…I don't get, at this point, why you'd want your work cloistered away with a limited audience. I just don't get it. And this is a complete shift for me. I came from a very traditional academic culture…

Indeed, one scholar expressed interest in integrating a blogging component to a collaborative project, but was treading cautiously:

> I think it's partly an "old dog, new tricks" problem, but it's not that hard to do. But, there are some parts of it that could be made much easier. And also, part of it is that it must be attractive, so there is a need for support for that kind of thing...If we had to do it ourselves, it wouldn't happen. And so we have a staff member at the center help us set this up and that is the big deal. But I think it's also partly cultural, so as we're designing this research network, I am telling the staff member, "Don't call it a blog…" I came in more open to these things…having actually blogged, seeing that there are valuable things that happen in that medium, but also realizing that there was this big cultural thing: Serious people don't blog. And okay, great, I got the message, we won't call it a blog. We'll call it "news" or "articles" or something else, but I think we have to be sensitive to that culture. The thing is not to try to move them, but the point is to do things that engage them in ways that are really useful to them.

Online forums

One historian described a new contribution in the *Journal of American History* titled Interchange, where the journal creates an online forum for invited academics to discuss an issue over the course of a month, and then edits the discussion for publication in the journal. According to one participant:

> It certainly put me in touch with a lot of ideas that I might not have encountered in that form. I had a lot to bounce off of. Just as process, it was slightly disappointing in that there wasn't quite as much interchange as there should have been. I thought maybe it should have been a little more monitored. It tended to be a little more people making statements, and maybe

> they referred to some of the other things, but it would have really helped to have the moderator say, "So what do you all really think of what so-and-so just said?"

Social networking/Web 2.0

There was no reported experience with social networking sites specifically for scholarly work. As in ethnomusicology, one graduate student reported using Skype while abroad on archival research to save money. Scholars were skeptical of the wiki model for sharing work.

> In terms of sharing stuff, we will share all kinds of things in the outer level and welcome all kinds of comments and people can take what they want. That will be closer to what economists do right now, but I don't think we will be willing to do what I think economists do: nobody can come in and begin rewriting their paper for them, which is the kind of thing in an ongoing project that we're most scared of. I think that the wiki model, especially the cautionary tale here is always Wikipedia, you don't want anybody to just come in.

Several scholars suggested that some blogs and wikis function more for gossip than scholarship.

> The only thing I've heard about wikis is that they are now the gossip line for tenure-track jobs. Our graduate students in the history department were on the wikis to see who was going out for interviews…It's fascinating, it was the total job line. I have a friend who teaches at a certain university and the graduate students at the history department here knew before I knew that the first candidate that they offered the job to didn't take it.

In contrast, wiki interfaces can be useful for sharing other types of resource knowledge:

> The American Historical Association just launched their Archives wiki that allows for curators to write about their contents, visiting hours, what visitors need to prepare for their visit, where to stay nearby, and all that stuff. So there are ways that we can be collaborative that are not entirely radical. This wiki is just the open sharing of information that used to be passed around by emails or phone calls.

Additionally, as one senior scholar noted, purpose-built project websites can substitute for blogs or listservs to collect contributions around a particular area of research:

> People have webpages…I don't do MySpace or YouTube…I have considered doing a blog or two, because the thing that I actually have participated in is setting up essentially a project website, and then that project website becomes a place for a very special type of exchange… actually, you are throwing out an open net, so you want a lot of people who you might not otherwise have encountered to contribute, and you throw out the crap, but there are going to be perspectives that you might not have thought about. About five years ago I made more use of listservs to put out questions. That was fine, but it proved to be less useful than just putting material related to a project up on our webpage. Sometimes it's somebody else's project webpage.

4. HOW DO YOU COLLABORATE WITH OTHER SCHOLARS? AT WHAT STAGE OF RESEARCH?

History is a primarily monograph-based field, the nature of which does not naturally lend itself to collaboration for those scholars interviewed. While historical research is traditionally based on

the habits and methods of the sole author, scholars may collaborate in a number of ways. Collaborations include coauthoring or editing published work, creating new interdisciplinary subfields, building and mining large data collections, and developing new tools and technologies for the analysis and presentation of historical evidence. While many collaborations arise organically from informal networks and discussions with trusted colleagues, others require significant support in the form of funding, infrastructure, and technical expertise. Collaboration raises questions about assigning coauthorship and judging contributions to a project made by multiple scholars, which has the potential to be particularly detrimental to pre-tenure scholars. While email and face-to-face interaction remain the most important ways that scholars collaborate, project websites with wiki-style aggregation tools have been adopted by some historians to manage larger-scale and/or digital collaborations.

H4.1 The Nature of Collaboration

Publication-based collaboration

Historians were repeatedly described as "lone rangers" who spend extensive time in the archives working on their own conceptual models and analysis. Traditionally, collaboration takes place at a later, more synthetic stage of the research process. Scholars collaborate by coauthoring articles and textbooks, writing chapters for collective volumes, or editing collected volumes of research.

> Certainly in the field of history…you write and research as a loner…It's what I call the loneliness of the long-distance writer, that is, the graduate student who works alone, usually in the archives…You might think that the technology would encourage collaboration, as in Web 2.0 and the general openness of the Internet, but I don't think that's happening. In fact, there's very little collaboration in history. So I hope I'm wrong, but I'm afraid that the isolated quality of the scholarly life is continuing. What you get is collective volumes and people going to a colloquium and everyone writes a paper and they get published in a collective work, which, of course, university presses hate to publish.

> Historians just don't collaborate in a big way. They don't have the habits and the skills. When we do collaborate, it generally takes the form of writing an article, but we're a bit allergic to setting up those from-the-beginning research models that set the trajectory. We're used to setting up our own models and conclusions—not conclusions, but the way we're saying the stuff after we've done all the research. It makes it hard to collaborate sometimes. So the encouragement at my institution and other universities to develop collaborative stuff is not of much use for historians…

> The sole author is the norm in history. It's not forced or anything, nobody is opposed to multiple-author publications. It's just that it's not as common as in the natural sciences or other social sciences.

> Collaboration is very unusual among historians, and beyond that, I know historians often have the feeling that they should collaborate more and they make various efforts to do so in different ways, but I don't think you can point to very many collaborative results where anybody has said, "Hey, that's wonderful."

Data-based collaboration

Several scholars also mentioned successful collaborations revolving around online databases of archival materials or data sets built collaboratively by scholars. Historians who work together around such resources note that collaboration is simply necessary in order to navigate and "think through" all of the available materials. The availability of new forms of digital data in history is predicted to increase collaborative work in the future, and in some cases, interdisciplinary collaboration around data archives is an important component of establishing new fields.

> We're moving from the artisanal kind of research common to historians, which we'll continue to do, but technology has enabled us to find the sources much more quickly. We will subject them to the same kind of close reading, one by one. But I think to be able to take advantage of the new opportunities, we'll have to learn how to use these new tools and to do it in collaborations. That's where I believe there's going to be some really exciting potential. That is also where we're walking on the bleeding edge, and we could use all the help we could get…It sounds like this is a science project, but it is a history project; it is very much at that confluence of using a lot of the same kinds of data and methods that scientists use, which also gets us over into this area of working a little bit more like scientists. We have a lab, we work in collaboration, we sometimes want to share information, we may even publish things that have multiple authors, and so there are interesting things going on in that field.

> I think that more collaborative research is on the horizon, especially collaborative work that is conducted through an online system, like the Hypercities project. There are online sites and interfaces now that allow a wiki-type aggregation of a lot of researchers, but in a curated and edited way…So, for instance, you could have a team of five people and their graduate students working on shared materials or a shared infrastructure for five years, and then they can spin off publications from it. In this case, the site itself is not a publication, it's a workplace. I think that collaborative work, especially in the humanities and the social sciences, is going to increase a lot. In general…history is less collaborative…there tends to just be a single author working alone and a typewriter. But now I think we're going to see many different ways of collaboratively doing humanities research. That's what I think is the most interesting thing on the horizon.

> I think that there will be some digital pressures toward collaboration, simply because once you have particular archives digitized, it takes a lot of people to sort through and think through what's in them. Contrast this with the solitary researcher who, like myself years ago, went to the archives and came back with a dissertation. The Internet is perfect for collaboration. It's a communication medium. It's an interactive medium. So I think there are a lot more opportunities there for collaboration.

> One of the most flourishing areas is global economic history. Economic history doesn't really flourish anywhere else in the discipline, but it's really the cutting edge in world history. Some of the really cutting-edge stuff has done it without using technology in a big way; but as this cutting-edge stuff really sets up, that suggests questions and further routes of more and more detailed research. They're surely going to need to work collaboratively through the economic data, and I already know some economic history databases are being set up and lots of collaborative work being done in world economic history. This is good because one thing that makes it possible is the collaborative work between economic and history departments, with people who are involved as partners.

H4.2 How Do Collaborations Arise and How Are They Sustained?

Collaborations are often underwritten by existing informal networks. They may grow out of topic-based conferences, lecturing with colleagues, meeting visiting scholars at seminars or talks, or existing scholarly relationships. Several scholars cited personal benefits from collaboration, including the advantages and added insight that come from having an extra pair of eyes on a particular project.

> The collaboration I'm doing now is based on having lectured together and realizing that with our individual experiences and research, we can find a way to put those things together…Early ideas very often come out of lectures and classes for me…My current book is working out of class lecture notes. And I'm also co-writing articles with somebody who co-taught a class…and we use our lectures as a conversation with each other.

> I think it largely comes about within an institution, where you meet a couple of colleagues with similar interests and are at a place where they can commit to time, time, time…My sense is that it's still a variation of the old-fashioned conversation between colleagues and, "Oh, wouldn't this be interesting."

> I've always been big on collaboration. For instance, I've edited a lot of books, almost always with somebody else, and I've written a couple of articles with other people. Most historians don't, but I enjoy it. It's a stimulus to have a friend working with you.

> I collaborated just because this colleague's and my own interests and strengths complement one another well and we just thought it would be fun to do, interesting to do, that's all. I've never done anything collaborative before. So it's just really for the fun of it and the idea is that it would be doubly insightful, as two brains looking at the stuff.

> I learn so much when I collaborate. I like bouncing ideas back and forth, having a little bit of an idea and having a coauthor or co-editor, playing off of it and going back and forth on it until we're both happy with what we're doing. I learn a lot from their perspectives.

Challenges of sustaining collaboration

Collaboration takes a lot of time and can be challenging when working with other scholars who may or may not have a shared perspective. Yet many historians agree that the cost is worthwhile to sustain a richer dialogue, which may be international or cross-disciplinary in focus. While collaborative writing is difficult in history, it also can be rewarding.

> There are good collaborations, and then there are challenging ones. The challenging ones are where you establish a collective list of scholars who work in related fields or with similar questions in different geographical areas, and they try to put together a volume, which can be hugely time consuming, and because our disciplines are all interpretive, can lead to some interesting and sometimes interpretative challenges.

> I find that I get a lot of value out of sharing and collaborating; that is really valuable for me. I worked on a project that grew out of a collaboration with scientists around an interdisciplinary team looking at a particular research question…What we found was that the questions that I was asking as a historian were related to the questions that they wanted to ask…As I began going into the archives and asking those kinds of questions that we ask as historians, it changed the questions that they were asking about the scientific processes to look at…As they changed their question, it changed mine. Probably one of the real high points for me was

> when one of the scientists coordinating this team said, "You guys are asking some of the most interesting questions." And I think that that's really important. It's important to me and I think it's very important in the humanities and in collaborations with scholars from other fields that as we work, as we do interdisciplinary projects or work on teams, that we find ways of doing our disciplinary work and doing it in a way that really engages our collaborators…and that we really contribute, so that they get something out of that.
>
> It's absolutely fascinating to work with scholars in political science. I've spent a lot of the last ten years deliberately trying to reach out to other disciplines and trying to understand the circumstances under which an area can transform another discipline…I thought it was a really interesting exercise in trying to figure out what my field meant to other disciplines and how to promote it. And I am constantly amazed at the gulf that exists.
>
> I was involved in a collaborative project, but it collapsed. It was a great project, but some people were very slow in doing their part and other people said, "Rather than wait for the others, I'm going to publish my part separately." And actually some good work came out of the project, but in the end it didn't appear as collaborative work.

Although some scholars and high-level administrators mentioned interdisciplinary campus research centers as a way to foster collaboration, they were careful to state their opinion that successful collaboration relies upon maintaining strong disciplinary identity and emphasizing cross-fertilization between disciplines, not the transcending of disciplines.

> I think a lot of cross-disciplinary initiatives are highly suspect. Strong disciplinary communities still have a lot to be said for them. We find that a lot of our most imaginative people are people who are not hired as public intellectuals but as experts on something specific…There are a lot of stories like this, where people who are the most broad-ranging begin with a strong disciplinary base. They use it to move out from there, but you don't just hire somebody because they're broad or because they're a public intellectual. So I'm really suspicious of some mainstream publications, and we have a lot of people who write for them and that's fine, and I do a certain amount of writing of that kind myself. But initiatives that are designed to transcend what are seen as hidebound disciplinary barriers—the total result of that doesn't seem to me to be so promising. I would rather see centers that enable people to maintain their disciplinary identities and still interact. Topic-based research centers can provide an opportunity for this, but they don't claim to have a discipline-transcending agenda. Rather, they are a canopy under which people from different disciplines can practice their disciplines more productively by interacting with other people who know what they're doing. So, sure, disciplines change, and we want some flexibility, but I think that the hype about interdisciplinarity is exaggerated. History maybe is a little bit different because history is a relatively commodious discipline, and maybe I wouldn't feel that way if I were in a more narrowly configured one.
>
> I think collaboration largely involves bringing people together into some kind of dialogue to find common interests. We probably have too many centers that strive to do that. If I could start afresh I'd be glad to, and, in fact, I would say one of the curses of wealthy universities is that their donors help multiply these centers to the point where they can overwhelm faculty time. So I think the challenge there is not letting them proliferate to the point where the discussions become so fragmented that you don't get the kind of cross-fertilization that you're looking for. These centers have program money that allow for seminars, speakers, and so on, and I think faculty and students come together there, and then it's kind of chance encounters.

Collaborating with technical experts

The success of digital collaborative ventures requires bringing in highly skilled experts, such as computer programmers, artists, librarians, and other individuals, especially when scholars have limited knowledge of or time to develop new skills. As several scholars pointed out, technical experts play an important role in collaborations by giving scholars the tools needed to produce meaningful collaborations around large data and archival sources. In some cases, this can result in full-blown interdisciplinary collaborative work (versus mere "technical support"), as computer scientists and others work closely with historians to build and test new tools. But this can also become expensive or depend heavily upon institutions retaining and supporting these teams (especially since professional technologists may be hired away by industry).

> I think the more successful collaborations are the ones where a scholar who has a project is working closely with a librarian on preservation and access, and with a technical support person in the humanities center. A scholar doesn't have to become a techie, doesn't have to be the self-taught person, but can stay focused on the scholarly questions, get good technical support, and maybe some development time from somebody who has that know-how, and then could also hand off some of his work to a preservation and access person in the library. I think that's where you can have fruitful collaborations—a teamwork model that's not professor, professor, professor. A technical person, a scholar, and a librarian—I think that's the key for the future.

> This is something that we're working on…and it grows out of thinking about the ways in which we could put together my research and some research that others are doing in one subfield of history together with other research on another subfield of history. Are there ways when we begin to put these things into play together so that we see new things, so that we can ask new questions about those relationships?…And so we're starting to do this as a collaboration with folks in computer science and computer graphics…There are a lot of data sources and data sets available…so we test these tools that do what the computer scientists call "scraping, compiling, visualizing, and analyzing" these massive, heterogeneous data sets. I think that's where the questions that the computer scientists are interested in come into play—how can we relate to these huge data sets? How can we find information and create new knowledge? What are the questions that scholars might ask about these things, and how would scholars use them, and how would you create tools that help scholars use them? We're going to be working with them to try to apply these tools to the questions we ask, build them, and then have a technological transfer into the humanities. And we have, in this project, researchers from history, computer science, and other fields…so there's a real human pipeline, if you will, for that technology transfer.

> I'm working on an interactive website with a colleague…and it's because of him/her that we're able to move so fast, and also we also have a wonderful tech person who is really devoted to the project, is totally tech savvy, really knows the material and us very well, and it is a real team effort. If it were just up to me, we wouldn't nearly be ready. It could not be done in a non-collaborative way, absolutely not.

> Many of the new tools are understood as ways to have unbelievable access to all kinds of things, and, in that sense, to be in touch with people all over the world who have gotten together through that. A lot of the collaborative mechanisms being generated flow along that line. There's a lot of excitement about that. I'm a little more skeptical because I think that enthusiasm about the volume of sources can avoid the question of bringing people together around really focused interests…In oral history, for example, people don't know what to do with five interviews, so they're bringing them together in a collection of 10,000 interviews, but

> it doesn't necessarily produce meaningful collaboration. I think the risk is that it becomes a little too diffuse. Instead, I think that what really matters is who's doing what with it. Right now, what are we doing with it aside from celebrating our access to it?…I'm really interested in connecting the research problem with new tools and accessibility and letting that combination somehow drive collaboration, rather than thinking it's going to magically come about through a movement of people gravitating around a giant set of sources.

H4.3 Judging Multiple Contributions

Establishing credit for coauthors is not perceived as well clarified in history. Given the conventions of sole authorship in the field, establishing credit for one's work is a particular concern for younger scholars thinking about collaborative research. One professor did note, however, that collaboration between senior and younger scholars can be a way to help the latter break into a challenging publishing environment.

> The readers of multi-authored publications submitted for promotion have to understand who did the work. But history, of course, is a monograph field, and so people who want to become associate professors of history need to write a monograph.

> I think three percent of articles are coauthored. It's a very solitary thing, and there's this mythology around the solitary researcher. Junior faculty are especially anxious about collaborating. You hear a lot about, "I need to get credit" and "It's got to be my thought."

> There's a very strict process about judging multiple authorship, a very well-known standard. The scholar and then their department both have to clarify what his or her contribution was to the team. So for instance, if a Nobel laureate was the coauthor with a younger scholar…everybody would have to agree that this person who was up for promotion was clearly an equal contributor and not just tagging along because the Nobel laureate said so…It's much more well known how to sort this out in the natural sciences and social sciences. In history, I actually don't know what the real answer would be because I haven't been on promotion committees for my field…but I don't think it's as well clarified.

> I do think collaboration is a great way to showcase the work of junior scholars, particularly in anthologies; you're giving people the opportunity to get some play that perhaps they wouldn't get otherwise. What's been nice is that I'm at a point in my career where if I submit a book proposal to a good publisher, generally it's going to get looked at, and that's been great because if I have a person whose work I think is great and is…on the tenure clock to get a publication, it's a good way to get a publication in a really timely manner that is going to go through the slot machine of peer review in the journal.

Although there are certainly exceptions, collaboration in historical scholarship appears to be more common among post-tenure scholars. As one pre-tenure scholar explained, successful collaboration requires extensive resources, funding, and institutional support, all things more easily achieved after writing one's first monograph(s).

> I've thought about collaborating. I'm not at the stage in my career where I could do it. I think it's something I would consider much more actively after getting tenure. I've seen collaborative things, and I think some of the collaborative ventures in my subfield have produced absolutely spectacular stuff, because the collaboration has allowed three scholars with real depth in three completely different languages to then put all of it together and generate work that is really stunning. So I'm all for it. It's just that at my stage it's not something I can do. A collaborative project works really well when you're taking on uncharted

territory, a period that has been less examined than others in history that requires serious expertise and fluency in early modern languages, for instance. Then, you're starting out with two or three people on a collaborative exploratory adventure, having done your two books, having done all of your articles, and so on. Then that adventure is sort of a 10-year adventure, for which you could go off and get a Mellon grant and, say, the end result of this is three volumes on a specific topic in a particular region. That's something I think requires (A) funding, (B) serious institutional support, and (C) a collaboration among scholars, each of whom has the ability to generate funding and institutional support, graduate students working on it, etc. So that's something I feel I couldn't do as an untenured professor just yet. I think after getting tenure it would be something I would greatly enjoy doing. Grant-writing takes a long time, and then organizing takes a long time. To do this right, you need to both have the resources—the institutional support, the institutional space, the graduate students who are interested and want to help—and a long-term project. I think that it would be just foolhardy for somebody in my position to go off and try to do it right now. It would distract me from what I need to do, which is to write the second book.

I've been involved in the creation of this new field, and that has been wonderfully rewarding for me, because there have been other people working in the field, in the US and in other countries, but we have a sense of solidarity because we're creating something new and we're rooting for each other, even when we occasionally criticize each other, and so I found that later in life that I've engaged in much more collaboration than I did earlier in my career.

Emerging challenges for judging multiple authorship

Problems of credit and judging contributions are amplified by data-based collaborations, particularly in digital history. Several scholars identified this as an important hurdle to overcome in the field.

Historical scholarship is going to be much more collaborative. It is going to be much more like the sciences or the social sciences where it's going to be hard to pick out whose work was whose. You can identify the product, you can identify the people who made the product, but it's going to be an effort when a whole bunch of people were involved in it.

I want to make it so that all of these digital history projects begin to use a common way of organizing databases…Everything should be interchangeable, everything should be open, but this means that everything becomes collaborative. Really, we're used to doing this in history because we mine each other's work and it shows up in a footnote, but we're not used to lifting wholesale from somebody else's model…At some point we're going to have to decide whether my lifting a computer program wholesale and then modifying it a little bit from somebody who's doing work in a related area…is that plagiarism? I don't think it is. I shouldn't have to reinvent the wheel. But on the other hand, given the conventions we have in scholarship now, this becomes a really murky area…These are all problems that are going to come up, and while they're not pressing for me, they are going to be pressing for my younger colleagues when people raise these issues when they tenure them: "Whose work are we looking at here? Is it original? How do we evaluate it?" And there are no easy answers to those questions…

I think a lot of these newer things at least open the possibility of more interesting and complex and vivid ways of people being involved in newer kinds of collaborations, and being recognized and offering leadership. I think it actually offers a real opportunity for enriching the dossiers with surprising and refreshing evidence about how people's collaborative place in the field is actually evident.

Larger-scale digital humanities projects also raise questions as to the contributions of technical collaborators or staff, whose work is integral to the venture.

> I think that they could be coauthors in some way, but I don't know how. Suppose somebody, a technical support person, does an animation for me. There should be a way that that person can get credit for that in the same way a person who designs webpages is identified as the webmaster, who gets not just word of mouth but actual visual credit when something runs. Whether that's a scrolling credit, whether that's just a credit page or something, I think that could be negotiated, but I think that that person needs that kind of support. And in terms of the library, they have their own standards for promotion. I don't know if it matters so much. I do know that my department works very closely with the libraries, in a way we feel like the graduate library is *our* library, and in informal ways we let them know that we appreciate what they do. If, for example, a data set or a collection of images or something that a library puts together ends up getting made available thanks to a finding aid, that's the kind of product that could also be signed by the preservation and access person who's responsible for it. In terms of the scholarship, I suppose there isn't any reason why there couldn't be a larger product that could be signed by all three, or whether respective credits could be recognized. We could just borrow from the conventions in cinema, where you have everyone from producers down to the best boy getting some sort of credit for the work they do in turning something out.

H4.4 Mechanisms for Collaboration

Email and computing technologies have made collaboration infinitely easier for scholars across the board, but face-to-face interaction still plays an important role in generating and working out collaborative ideas. Email attachments and tracked changes are commonly used for the coauthorship of text. None of scholars we interviewed reported extensive use of Skype, chat, or social networking services.

> I think a Word document with tracked changes is probably more likely than Facebook, which, at least in my group of people, is not yet as prominent…My sense is that just the Word document without the preliminary face-to-face contact doesn't generate that kind of close relationship and collaboration—it doesn't.

> Right now I'm working something with someone who is on another continent, so obviously email and the email attachments are enormous. One of our main sources for what we are using is a huge database that's on the Internet. So I collaborate on email, I use the Internet as a source, actually, of the argument in this particular thing. So that is completely shaped by Internet technology.

> The sharing of drafts with colleagues by way of attachments is so easy that I certainly do more of that than I did in the past. Probably, also, the fact that revision is so infinitely easier than retyping a whole manuscript. Corrections are not nearly such a deterrent.

> I collaborate a lot and it's mostly by email…If you look at my C.V. you'll see a lot of coauthored publications. Those are all done by coauthoring on the same document, and we use the tracked changes features, highlighting and so on, to know what the other person has done, so that's primarily how I do that.

Project websites, wikis, and other platforms for collaboration

There was limited mention of wiki use in collaboration, particularly for scholars sharing announcements, data analysis, and ideas in progress. Wikis are not generally used for the

coauthorship of text. In instances where scholars had experimented with wikis, several found that these tools were more likely to be used by undergraduates and graduate students than senior scholars.

> We have a wiki for one research project so far…It's actually a collaboration with students. They are doing research and they're sharing the research with each other, and it's open to other scholars who want to work on the topic. So we've been working with archival materials…and putting summaries of them online, a lot of cross-linkages and so on…That allows really, really extensive collaboration.

> I'd say it's mostly email, early and often and at all stages of the process…Last summer, a student research assistant helped set up a wiki, and so we had a public website, a wiki, and then people also used Google Calendar. But what really works is email, and face-to-face communication. I didn't find that the wiki worked very well. It didn't seem to engage people. There were some undergraduates who got more engaged and actually did some neat things with it, collected lots of resources and interesting ideas. You could see how it could have been useful if it had been used. They also had fun with it, posting photographs and things like that, but I could also see that it was not engaging other researchers, and there's a bit of a generational thing there. With the research network that we're trying to construct now, we are starting from the other side and it really has to work for researchers. And, if it does, then the undergraduate research assistants who are on the project will engage with it. But if it just seems to come from the wiki/blog, younger generation, I don't think that the older research assistants will engage at all.

> At a certain point you're sending stuff back and forth as you're talking. We don't use wikis too much. I think I'm too old to do that. My undergraduates and graduate students do it. Mine tends to be more email.

Some scholars engaged in extensive digital and collaborative work—such as Web-based projects—called for more fluid, collaborative spaces to share tools, ideas, problems, and data within a research group and for public dissemination. Scholars envision that such virtual platforms could be based on an open-source platform like Drupal, which provides tiers of access to databases and programs.

> …we have a common website into which everybody's work goes…What we'd like is to build a level for work-in-progress and open-source programs for the public…Then we'd have another realm, which is for the trusted collaborators. Those people can come in. They can enter data…This will be a place where the work is constantly changing as people change it over time. The final realm would be the people who are actually doing the project. That's where we'll keep the final version of everything, and only a relatively few people are able to change things there. So we'll incorporate the changes made by others, but we'll make the final decision about what's going to be incorporated. We see it as three levels or three walls…The first one is open access, anybody can come through the gates; the second one is you really do need a path; and the final one is the super-secret club of just the people doing it…nobody can come in and begin rewriting their paper for them, which is the kind of thing in an ongoing project that we're most scared of. I think that with the wiki model, the cautionary tale here is always Wikipedia—you don't want just anybody to just come in.

> We're using our project website as a place where we can put tools…and work-in-progress for comment, either for other scholars or possibly even for the public…I know that there are people working on similar things…for creating spaces where you can share tools and ideas and problems and data in various ways, and you can share them within your group or with others.

> You can have a more fluid, collaborative space because, for this kind of work, it really happens in collaboration…We're working on building something…a space…where you could show a map or an image or a scan of a manuscript source and pose a question about it. And people could go look at it; they could download it, they could make comments about it right there, and I think the proof will be in the testing of it. I'm pretty sure this will work with some of the people whom I'm collaborating with in other fields…who are already technology savvy and eager and hip to it. I think they all gravitate to using this right away because it's doing the same things that we do over email, but it will be a lot more immediate and efficient as a way of sharing something and commenting on it. Hopefully it will get past having these endless emails with everybody being cc:ed and others saying, "I didn't get that. Could you send it again?" But for other collaborators, it's going to have to really be useful. There's just not enough time in the world. That's the one thing: I think there is kind of conservation of attention.

Yet, as another scholar pointed out, the success of such integrated platforms depends on every collaborator having access to the necessary technology.

> We're doing all these neat bells and whistles on the project website. In fact, I remember that when we had a conference call to discuss it, I had such an antiquated computer that they kept saying, "Look at the feature we've put in here," and on my machine I clicked but nothing happened.

5. WHAT DO YOU NEED TO CONDUCT YOUR RESEARCH?

Traditionally, historical scholarship is rooted in the close, interpretive study of archival materials, including handwritten materials, visual sources, government records, newspapers, photographs, oral histories, among others. The scale of digitization of many archival materials has increased scholarly access to these primary sources, but has not replaced many of the important advantages associated with working in the physical archive. Advances in the manipulation and visualization of historical data have opened up new arenas for their temporal and spatial study. For some scholars, these new analytical methods serve as an important foundation for understanding archival documents and accounts. Institutional support, particularly that provided by libraries, performs crucial services for scholarship by providing facilities for archival study, preserving data, and offering technical training and resources. New funding sources also play an important role in supporting innovative work in digital history.

H5.1 What Do Scholars Do in Their Research? How Is What They Do Changing or Not?

Historians conventionally locate pertinent archives through a variety of formal and informal means: browsing footnotes, talking to colleagues, using Internet finding aids such as ArchiveGrid, and speaking with archivists. While some archives offer sophisticated scanning services, Xerox equipment, or digital access, others in more remote areas require more time and effort to consult. As scholars describe, the level of access researchers have to archival materials can affect the choices they make about where and how to research their subject matter.

> The conceit of all historians, of course, is that you either reread an archive in a different way or you generate a different archive by virtue of finding material that nobody has ever seen…In my area of specialty, most of the archives that I use are in one of two places. One is a European country, where I study collections in a variety of national archives and private libraries. And the second is an Asian country, where the archives are nowhere close to

> allowing any sophisticated technological information-gathering…In these cases, some of the archives don't even have copy machines…and there is only one clerk there and sometimes the electricity goes out. So in that sense it's a very historical experience to still be taking notes by hand…
>
> As the crusty historian, we sit in old, dusty archives and read old bits of paper, and that's still true to a large extent. In the country I study, that was especially true. There wasn't a computer in sight. There weren't paper catalogues, there weren't lists. No one really knows what's there…and you're not allowed to use a camera. I have friends who worked in London at the Public Records Office, and they said, "I took 20,000 pictures, but I don't know what I have." So they have these 20,000 pictures that they have to go and read through, whereas in my country of interest, I sat there for six hours every day and actually read the documents and figured out what I needed, because I had to copy them by hand or transcribe them into the computer. I had to, at that moment, decide what was and wasn't important, whereas they're going through that now. So, is it better to have 20,000 pictures on your computer that you haven't looked at or to have 20,000 pieces of paper that you have?…These are real issues because you can take 20,000 photographs in a week in England, but to do that kind of archival work in some countries takes two years. This has to do with funding, this has to do with people moving to another country for two years to do their research…The archive is always changing, and different things become available. But the issue of how you use the archive is a very real one that affects the field, that affects how scholarship is done and the things that get published eventually, because it's much easier to use British colonial documents in London than to actually use the records in my country of interest where you have to sit in a difficult place…

Digital versus analog archives

A wide variety of archival materials is being digitized and made available online via open access or institutional subscription by scholars, libraries, and publishers, often funded by private foundations. Scholars value many of the advantages offered by digital archives, noting that they save time and money while enhancing ease of access for scholars around the world. On the other hand, scholars noted that "seeing, holding, and feeling" archival materials is an important part of the research process.

> There are some people in my research area who want to put online a huge collection of archival material. That would completely change the field if archival material was online, because now you ask, "What are you doing this summer?" and people respond, "I'm going to another country to use the archives." If it could be, "What are you doing this weekend?" and "I'm reading the archives online," that would really change the field. I would support that. It would really open it up. Right now, there's a divide between scholars working in these foreign countries, whose archive *is* a home archive, and scholars who have to travel there.
>
> Online archives have some advantages. If you could print them, they'd have every advantage…Suppose you're on vacation out in a remote farmhouse…online access is an enormous advantage if you're looking for material. You're not handicapped. You used to have to travel to archives and sit there. Now many of the major archives are digitized, but not a lot of private collections and not a lot of small collections. The other disadvantage is if you're looking for older forms of material, the older forms themselves are part of the research process: you turn the pages, you look at the type, you feel the covers, you get a sense of the culture that produced that artifact. It's like digging up an archeological ruin. You want to feel it. You want to touch it. There's something, too, about a beautiful book. As a matter of fact, I suppose art books will continue to be published because the quality can't exactly be

reproduced online. So there are aesthetic considerations and very subtle research elements to actually handling the documents. But there's an enormous value if you have your content. The machine version will do for some scholars, and it's important for some. What may happen is that a generation will arise who have no knowledge of aesthetics, and that whole world will disappear…I realize that younger scholars weren't born in the age when we were sensitive to the way things looked and felt. So that may disappear in time.

In the last two hundred years, there's been an increasing wealth of visual materials. I think scholars have gotten a lot more sophisticated about visual analysis in the last generation or so, and that has made a difference in the kinds of questions scholars ask, but also how they think about sources. It used to be that scholars were sent off to the archives and libraries where they worked with text, but historians and literary scholars now increasingly work with visual sources…It's not just that; I think that in a lot of cases most scholars, if they're writing about a topic where a sense of place is important, then the site is part of the research…then you need to go there and recover what you can.

I have mixed feelings about this, because, on the one hand, I like to go places, I like to meet people, I like to check out the city. I like to see what the manuscript collection is like, not just see what's online, but see their reading room, their paintings. It gives you a real feel for the place and you meet other scholars at these places. But, on the other hand, it's much more efficient to just be able to use anything, anytime you want, 24 hours a day, seven days a week.

Serendipity and discovery

The excitement of "discovery" also plays an important role in historical research and consulting the archive. Several scholars expressed concerns about selective digitization, and the risk that digital archives may bias historical scholarship toward more readily accessible archival materials. Although one scholar described this problem as temporary, "a question of capacity and resources," others emphasized the importance of in-person browsing and happening upon items not catalogued in advance.

Not everything will be online in the future. People are still going to have to go visit archives.

The more time you spend in the archives, the more likely it is that you will stumble upon some chunk of, if not gold, at least fool's gold, and then that begins to build up and you get more familiarity with archival research. And the more time you spend doing it, the more you realize that it's an illusion that we understand the past, that we think we've got the past under control because it fits so nicely between the hard covers of a book, that it's all there in books and the books are catalogued in the library, and if you could read your way through it you would have a pretty good mastery of things. But if you spend a lot of time in archives you feel that we've only consulted a tiny fraction of a fraction of a fraction of the records of human existence, and that most humans have existed without leaving any record.

There's a deep danger, too…that the familiar data get reproduced onto the Web and then it's easily accessed, so that you increasingly don't want to or don't have the time to go to the library. With one research project I was really lucky. I was looking through the literature and everybody says the data are not available and they give you really low figures and citations that lead to other secondary sources, and you can see these incorrect stereotypes being reproduced over and over again. My institution stores a lot of this old stuff off campus…and you can't go into the stacks and there's no way you can see it. I was trying to order these old manuscripts and have them sent to the library here, but they said, "You want all of them?

> That's too many. Why don't you go down there and look at them yourself?"…This is back when it was still in a local storage facility. So I went down there to get it myself, and just walking down the aisle, I saw all these manuscripts, all these data people said didn't exist. Had I waited one more year to go there, it would have all been in out-of-state storage, I couldn't have seen it, and my life would have been entirely different.
>
> Now, using the Internet doesn't preclude me from having to go to the archives, not for the reasons some people say, but largely because so much stuff isn't yet digitized…or it's been selectively digitized, which really bothers me, but that's another story. That's a question of capacity and money, and eventually that will get resolved.
>
> Going to the archive is just something I have to do, but it's something I don't get to do often enough. So I'm always trying to figure out how to get around going to the archive, but it's difficult…Now some archival stuff is online. There is a huge online library in my research area that I can use, but it has far from everything that I need…There are a lot of primary source documents I use for teaching that are online. You just Google a text. This wouldn't even be true maybe five years ago, but if I wanted to show my class an excerpt from a classic book, I would just write that into Google and I would find it. There are all these traditional, well-known sources that are all on the Internet, so that's a good Internet use. But again, that's not a research thing, it's a teaching tool.

In contrast to the concerns about selective digitization raised above, other scholars noted that general Web searches can be a form of discovery and serendipity in their own right. General Web searches may also come in handy for scholars locating new kinds of data, such as those found in amateur or crowdsourcing initiatives like genealogical sites or online communities.

> You can't trust everything out on the Web…There's a whole bunch of junk out there, and one of the things that this leads you to do is to narrow it down to these trustworthy sources. On the other hand, what it's also done is open up a whole series of very valuable sources that we had largely forgotten about, which had been relegated to dusty realms of the library…I've become much more reliant on Web-based searches and researching even though I'm an archival scholar at heart, and not everything is always going to be on the Web, but stuff that really does surprise me is beginning to show up there, and I find it an incredibly useful tool.

Online preparation for archival work

Even when full texts are not available in digital form, several scholars cited the benefit of being able to search online catalogues to prepare for and expedite their visits to archives.

> Some years ago the archive I use put its search engines online, so I can actually start doing some of the searching sitting in my office. I can't pull up the documents yet, but I can do the searching, I can get my file numbers, I can get my index numbers. And so if I printed all of those out…Actually, at the British Library…you enter all of your requests in one of the computers. So you can do a lot of this online now.
>
> I love online inventories and archives. The Library of Congress has a lot online now. I'm able to know exactly when I go into an archive what I'll find. I've gotten a much better sense of what's there than I used to.
>
> I go to the physical archives if it's not online. A lot of the things that I use are listed but they're not available digitally yet. But online inventories have been a huge boon for me.

Search and discovery of secondary literature

Over the past decade, electronic access to historical literature has transformed bibliographic research practices in the field. The use of JSTOR, Project Muse, Google Books, and other electronic literature databases is prevalent, and scholars now visit the library less frequently. JSTOR, in particular, offers work dating back to the 19th century, which some scholars cite as enabling easier access to decades of "lost scholarship." Indeed, journal articles are more widely used for initial research than are monographs, due to their shorter length and online accessibility.91 While many historians locate information online, print remains the dominant way to consume articles and books cover-to-cover. Bibliography management tools, such as EndNote, are common, but not universal.

> I have limited technology use, but it is very important. The computer and its capacity to bring written materials to me is fantastic. This has been a great step forward. Basically, to the degree that the computer will allow you to have a universal library, how could anybody not benefit from that?
>
> JSTOR and this new Google Books project have restored a lost world of scholarship for historians, because what happens in history is that, even though we are historians, our working memory is about 10 or 15 years. It's always the most recent stuff that we read and assign to our graduate and undergraduate students. Older stuff tends to sit back there and exist in a historiographical sense when we explain how it is that these problems arose, but the actual scholarship tends to vanish. One of the things I found with JSTOR is it brings it all back…at the touch of a button. And in going back and finding things for my own research, some of this stuff is pretty good. Even though, theoretically, these are arguments that I don't buy anymore, the really hard archival research, and sometimes some of the thinking, is tremendously impressive. And so what I find myself doing, which I never would have done 20 years ago, is finding articles that are 60, 70, or 80 years old for a variety of purposes. Sometimes just for the research, sometimes to recreate a contemporary view of what was happening with something, for a whole variety of reasons, that stuff has been restored to me…And Google has taken a series of texts, which usually I used to have to travel to see, and not only made them available, but because they're digitized, I can go right into them as if they're superbly indexed to find whatever I need. So some of these things…I had to travel and sit in the archive for a week reading, and I find out I could have done it on my own computer because Google has it all up there.
>
> I use JSTOR probably 300 days of the year. I'm on JSTOR virtually all day long every day when I'm writing anything, and also Project Muse and Google Books and other various things…It's just unbelievable. You can find out things that you just wouldn't have been able to find out. For example, I was recently going over a paragraph of a book…I just typed a term of interest in and got some article from over a century ago...Well, I would never have found that piece, not in a million years…I would never, ever have been able to make this link.
>
> I find Google Books to be a really excellent resource, and I use that increasingly…My colleagues often don't know what's available in terms of digital manipulation there. You get a lot of heated argument about the importance of browsing, and I said to some colleagues in some of those debates, "You can go online and essentially scan the shelf, one title after another, online, without ever walking to the shelf." And a number of them didn't know that…Once the Google lawsuit is resolved…and many of these volumes become available and

[91] Griffiths, Rebecca, Michael Dawson, and Matthew Rascoff. 2006. *Scholarly Communications in the History Discipline*. New York, NY: Ithaka, August. http://www.ithaka.org/publications/pdfs/JSTOR%20History%20Study%20Report%20Public%20final1031.pdf

> searchable online, I can't see any argument for the serendipity of walking down the stacks at a library. It seems to me there are just more effective ways to do that. Now I'm also told that there are materials that are not Roman alphabet–based, that the impact is going to be further down the road, and I have no idea how much later it will be. But I think that the serendipity of a Google Books search is far more interesting than the serendipity of walking down through the stacks at the library…I had a historian colleague who was arguing for the serendipity of browsing, and at first s/he thought it was critical to keep all volumes on the shelves and available. Once we figured out that the journals were going to be almost entirely available online, if not now, then very soon, s/he dropped off the need for journal availability and then focused on monographs.

While most scholars rely on reputable and long-standing peer-reviewed sources, such as journal subscriptions, some also experiment with Google or Google Scholar to locate references or work on a subject outside of the confines of library portals or scholarly databases. Wikipedia, in contrast, is used sparingly for quick checks on facts of interest, and many scholars avoid Wikipedia because of the lack of respect for historical conventions and peer review.[92] Book reviews are important filters of emerging monographic scholarship, and, as mentioned previously, H-Net listservs play an important role in quickly disseminating book reviews in some subfields. To keep abreast of new literature, some scholars also browse publisher catalogs, read the books sent to them as journal editors, or track emerging research trends via the job market.

> I do Google a lot. I search for things on Google Scholar. I use the online journals a lot that my university subscribes to, so I search within that outside of Google. Of course I don't Google everything, but sometimes it's very interesting and easy just to throw in the few words of a subject you're interested in and see what comes up on Google, because you will discover things that you don't discover inside JSTOR or another scholarly database that's much more confined. I do use H-Net as well, and I've published reviews on H-Net, and I've looked for reviews on H-Net. That's very common as well. So yes, I do a lot of my scholarly work online now.
>
> I get H-Net every day…and that's my main source of book review reading. They do excellent book reviews and often hold forums on books. And that's changed the nature of things because people are much more likely to read it than most of the journals that come out so much later. This comes out right away.
>
> I use an H-Net listserv in my field and in some other fields, and I read journals. I also read new books when they come out. It's a huge part of what I do.
>
> I subscribe to about 15 print journals, I'm on several editorial boards, and I get books sent to me all the time by publishers to write a blurb or because they think that I'll want them. So my world is a pretty traditional print world.
>
> I keep up to date in a specific part of the field. And that's in part by teaching courses in my research area, keeping a fairly close watch on the job market every year, and knowing who's out there and what they are working on. It's those kinds of things…It's also about sitting with my graduate students and reading new books in the area. Only a dozen or so new books come out every year, so it's a safe bet that you can keep up to date at least with the monographic literature…It's an active subfield in which things are being published, but I'm not completely overwhelmed by it. I also browse some of the standard journals. I tend to read things like

[92] See: Rosenzweig, Roy. (2006). Can history be open source? Wikipedia and the future of the past. *The Journal of American History* 93, 1: 117-146. Available at http://chnm.gmu.edu/resources/essays/d/42

> *CSSH* [*Comparative Studies in Society and History*]…because I think it's an interesting combination of things. *AHR* [*The American Historical Review*] is very America-centered, so I generally don't pay much attention to it. But I do pay attention to the area-studies journals and conferences. And believe it or not, I also keep abreast of the literature by receiving catalogs online and in hard copy from publishers. So it's a combination of things…I would have to confess that, in some ways, it isn't a programmatic thing for me. It's serendipitous because between teaching and trying to write my own work, I probably do a very haphazard job of keeping up with the field.

One senior scholar worries that inequities in subscription access to eBook and JSTOR are resulting in a hierarchy of access to knowledge all over the world. There is little interest in making historical journals open access, except among Africanists and public historians (with the added exception that scholars might want access to use tools like JSTOR while conducting research abroad).[93]

> The great hopes for digitization are two words: democratization and globalization. This is another dimension of the logjam in digital publishing…We hoped that we were going to be moved to a situation in which there would be more access to materials. But, to use JSTOR, you have to belong to a university or you have to pay, and Humanities eBook is a subscription service. So a lot of this material is not available to Europeans because their libraries do not subscribe to these things, and this is going to cause a terrible inequity, a hierarchy of access to knowledge over the long term, because here we can get almost anything, but your average university in Great Britain has none of these things. This research hierarchy is just terrifying. So the democratization promise has not really been realized yet.

Tools and technologies for data analysis

As several scholars described, the issue of "how the archive is used" plays an important role in shaping the research process. A variety of tools and technologies are enabling scholars to use and contextualize archival materials in different ways. These tools include quantitative analysis, data- and text-mining, visualization, and spatial history. Many of these tools fall under the rubric of digital history, or the incorporation of digital technologies into historical scholarship. Digital history is seen by some as presenting new methods of historical research that can break with close textual study and the linear mode of representation.[94] The scholars we interviewed had their own opinions about the impact of these selected research tools on historical work.

Quantitative analysis

Quantitative history uses numeric data (such as electoral counts) or the conversion of non-numeric evidence into numeric form (such as city directories or church membership lists) as a primary source for analysis and interpretation. In particular, recent work in economic history has introduced quantitative methods that can empirically verify questions in more discursive historical research. In particular, statistical analyses in history have enabled historians to examine (often graphically) temporal changes in primary data.

[93] Griffiths, Rebecca; Dawson, Michael; and Rascoff, Matthew. 2006. *Scholarly Communications in the History Discipline*. New York, NY: Ithaka, August. http://www.ithaka.org/publications/pdfs/JSTOR%20History%20Study%20Report%20Public%20final1031.pdf

[94] See: Cohen, Daniel J., and Roy Rosenzweig. 2005. *Digital History: A Guide to Gathering, Preserving, and Presenting the Past on the Web*. Philadelphia: University of Pennsylvania. http://chnm.gmu.edu/digitalhistory/; and Interchange: The Promise of Digital History. 2008. *The Journal of American History* 95, no. 2 (September). http://www.historycooperative.org/journals/jah/95.2/interchange.html

> There was a project going on these past 10 years, a new publication of historical statistics of the United States…five big volumes published by Cambridge University Press. But the real publication that everyone is waiting for is the electronic publication. It's not only all of these data sets and all of these tables—the fact that you can download them and manipulate the data directly, rather than re-entering them from a printed page and doing it all laboriously by hand, is attractive—but all the hyperlinks as well. Those are going to connect to other data sources that will allow you to drill down into the original data from the more refined form that this publication takes. That's going to be a terrifically powerful tool with characteristics that the older print forms could never have. Now, it's still interesting that there is a print form. Why did Cambridge University Press put out these five big volumes?…I'm not sure I have a good answer to that. I don't think it's simply that the people who worked on it wouldn't get credit for it in the institutional review process if they didn't do a hard copy. The market is still there for both.
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> I find that for conveying change over time, a well-constructed chart can do it beautifully, much better than a table. And with Excel you have the tools to do it so easily. You can get into some of the really heavy-duty, quantitative methods, but there are diminishing returns in a lot of this. If you just take some of the simple data, without these nuanced methods, you can still convey these changes and patterns when you see the Excel chart, and suddenly it's so obvious…In my work, there are things I wouldn't really have been aware of, unless I plugged the data into a chart and looked at it…It's absolutely phenomenal…and these are visual displays that even people who don't like quantitative methods like because the graphics are remarkable…Stuff just pops up visually…

Text- and data-mining

The quantity of digital archival material also affords the data- or text-mining of historical materials. This advance at the level of method requires an advance at the level of search tools. As the scholars below explain, the challenge for historians thinking about data mining is not to establish standards for large databases of material, but rather to generate intelligent search and use functions to help scholars navigate disparate and immense data sources.

> For primary sources, open access is a complete win for everybody. Part of what I've been thinking of as a historian is: does the quantity have a quality all its own, and what does that mean for historical research?…Can you data-mine historical collections?
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> The general philosophy of what we're working from is that, in many ways, the era of centralized databases, imposing standards on databases, trying to come up with standardized databases, and collecting big libraries of data and digitizing them…is ending. The real opportunity now is in being able to harvest, analyze, and visualize all the terrific onslaught of massive quantities of heterogeneous data that no one is ever going to standardize. So the trick is…how do you come up with tools for using that nonstandard data?
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> One of the problems with a lot of the Web digitization projects is that people just want to dump it all up on the Web and think that they've done something. With audio and video, the defining problem is that it is time intensive. You've got to listen to it in real time. Just having 800 hours of interviews on a website, with fairly crude ways of navigating around that in most cases, is insufficient…So the question, then, becomes what can be done to provide a navigational exploratory map through the data or footage…The big example, which is really exciting, is the USC Shoah Foundation Institute…through which you can access 200,000 hours of indexed video interviews. There's more and more people getting audio and some video up onto the Web, and of course video on the Web is ever present right now. But what we haven't gotten to yet is really good, serious tools for being able to work with that at a serious level, as

> opposed to just consuming little bits of popcorn that you bounce around and find…We need a much better way to put a meaningful search and reuse capacity in people's hands, and that includes enabling graduate students to do archival oral history research in this way.

GIS and spatial analysis

Some scholars use visual tools and mapping programs for spatial analysis—such as GIS, ArcMap, and Photoshop—to create visual representations of archival data. These activities are creating transformational ways of looking at history over space and time, which one historian described as a "spatial turn" in historical research. GIS, in particular, has two main applications in historical research. First, it is a powerful mapping program that allows scholars to integrate heterogeneous data sets with spatial markings to address historical questions about the migration patterns of people, commodities, and other phenomena. Second, when scholars use GIS to analyze their own GPS data from historical sites, GIS can provide a fresh perspective on the physical nature of specific historical events. Many scholars note that GIS enables scholars to bring new data types to bear on traditional historical questions and archival analysis.

> The geographers' argument about historians, which was true 15 years ago, is that we wrote history as if it took place on the head of a pin. That means not taking space seriously—the creation of space and the construction of space. And to do that, there's this huge amount of historical data that is simply not amenable to narrative history. Take, for instance, Richard White's spatial project work using railroad freight rate tables. These tables are, in effect, the software for reconstructing space in the 19th century. Before, we had no way to look at this, but we now have systems where you can begin to read it out. And once you do that, you can begin to see why people took things that now seem so boring, like the railroad rates, so seriously, and why they were at the center of politics. In fact, you can begin to understand why things took place in some regions and not in other regions, and how much of the North American continent was socially and culturally constructed. This all comes out of these rate tables. But there's no way you can write a narrative about rate tables…There are certain things you can talk about for two hours, but if one screen in five seconds will give you more insight into it than 200 pages of text, why not go immediately to a screen?

> GIS-enabled work is part of what people are calling a spatial turn in the humanities: an interest in space, how space is constructed, how it is perceived, what it means, how it structures people's lives, and many other things…It is also an answer to the geographer's challenge that history is often written as if it occurs on the head of a pin, so that things happen in time, but there's not much sense of how space is important to understand historical events or processes. But how things change in space can be often as important as how things change in time. So the use of GIS in history is not really new, but it has given some important new insights and changed the way that we think about things from the Dust Bowl to redlining in cities to many other processes over widely different geographic areas and expanses of time…One of the things we could do, for example, is use Google Earth to try to reconcile what historical actors understood about the terrain or the world that they were operating in with another reference set or with a base map. This way, if you have a story that turns on the confusion about terrain or nomenclature, then you can avoid being a victim of this confusion and instead examine how that confusion could arise. Geography's just terribly important for that…Something I've done is walk around the historical site I study with a GPS unit, and all of the tracking data that came back were part of what helped me understand what I was reading in the memoir literature and earlier history. It also helped me to situate the photographs I was taking with photographs that were taken earlier…These are tools that are really important for providing a foundation for the type of work that eventually gets done in terms of textual analysis or visual analysis…

> There's a new book that's just come out on GIS applications in history…Just a case in point, Anne Knowles from Middlebury, who is the editor of this recent book, decided some years ago to study Gettysburg from a GIS perspective. And everybody's immediate reaction was, "Oh, no, not another Gettysburg book. What can you possibly say that's new about Gettysburg?" But her chapter is very nice. It looks at the visibility that the commanders had of the field and sharply contrasts the ability of the Northern commanders to see the field versus the Southern commanders. That's done using a GIS analysis of the terrain.
>
> GIS is very important…I also value these archival digitization efforts. Without them, certain kinds of work wouldn't be possible…What GIS allows you to do is to query the Web for different records, download them, find those with geographical locations, and actually put them on a map and see where these locations fall, how that's changed over time, how that corresponds or does not correspond to the history that's previously been told and to other kinds of observations by historical individuals, and in doing so, bring lots of different kinds of data to bear in a very geographically explicit way…This opens up a lot of new questions…and gives historians the power to use these data to ask historical questions…Some scholars digitize their own data from archival records and enter them into spreadsheets…That's an important part of enabling this kind of work. It's also strategically digitizing certain things that haven't been digitized before that help answer questions…Then there's also a sense that history needs to move beyond GIS at some point. There are emerging opportunities now with developments in technology and visualization and computer science, and, just as important, in databases and accessing databases and bringing disparate heterogeneous databases together to look at changes in space and time.

As several scholars pointed out, however, the capabilities of GIS and other new technologies simply cannot be applied to all types of research. Some scholars observed that the historians most likely to embrace GIS in their work are those with a stronger background in the sciences or social sciences, or those associated more with urban planning and public policy. In addition, GIS can be expensive and requires extensive scholarly training or hiring specialized staff.

> It's a lot of work learning how to use the software, and I'm not quite sure what the payoff would be for me. When I was a grad student, I took a course in mapping and we did it by hand. In my first book, I drew all the maps myself, and I enjoyed doing it more than anything else…GIS is not quite worth the huge investment, it's just not something really necessary…I sense that, too, if I want to make a map, I could pretty much still do what I wanted to map with my illustrator program. I wouldn't necessarily need to learn GIS.
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> I think that spatial history will be a new direction for historical research…I have no idea; I don't know a lot about it. I've heard it described in 10 or 15 minutes, but I've never tried to do it myself so I don't know what's going to be required. I do know that…it gives faculty capabilities that traditional historians didn't have. But I don't know what's going to be required for this to catch on and be more widely spread. I gather it is fairly cost-intensive, and I actually talked to a faculty member a week ago about how to provide continuing support for GIS-based work, and I think there will be some fundraising around that here.

Reflections on the role of technology in historical research

The applications of digital technology in history, as described above, have opened up a variety of paths for the study of archival material. These approaches allow scholars to raise new questions about the historical record and process larger amounts of data more quickly. Yet, according to some, technology has not fundamentally changed the nature of the research question or the analytical process, which remain highly interpretive. While text-mining and GIS offer much in the

way of the manipulation of data, the close reading of archival documents cover-to-cover remains an important part of historical analysis. Again, the access to archival materials facilitated by digitization is cited as facilitating scholarship.

> In my game it's very hard for me to believe that anything fundamental will change. At the end of the day, your job is to learn as much as you can about what you're trying to find out. The first thing is, what questions do you have and how do you go about finding what you need to get the answers to those questions? And then, what occurs in your head that produces an idea or a way of understanding things that is different from what somebody else says, and may have some merit? But that's a very one-person activity as far as I'm concerned. The critical place is what happens inside your head. Everything else is a way of getting into your head what you need to think about. So I can't believe that's going to change in any way. What's going to change is *what* you can get into your head and how it will help you to think better, perhaps by having more information in your head than you had before, perhaps by having more ways of looking at it that inspire you to think in a different way, but that's it as far as I can see.
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> I'd just say technology and digital access is supplemental. It's nice icing on a cake, but it doesn't change the question or the way in which I understand something.
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> Maybe in the future I might experiment with technology, but I'm basically an old-fashioned intellectual...I like to think my ideas are pretty interesting, but my methods are pretty traditional. The main thing is having all that technology so that I can get access to so many books and journals and archives right away. That's really tremendous help.
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> I think history as a discipline is like this giant ship, and it turns very slowly. So I think that the way historians use technology—and I can only speak from the vantage point of the university where I teach—is still fairly conventional. It's not as if new technology has changed those things…Having the ability to at least do some of the preliminary searching at home online is hugely time saving. I think with historians there's this sense that you can only get it if you plow your way through masses of materials that are useless. It's a rite of passage you've got to go through. And I think if you can plow through all of that material online, at that point, then the complaint that there are too many historical monographs being published may be a little more palatable to me than now. Because right now I think what's keeping the historical profession plodding along is the fact that we do have to get on a plane and go someplace, and every archive is different. Every single one of them is different, and it takes you a good two, three months basically to figure out what it is you don't want to look at. And if those two or three months of winnowing can be done at home online, then what are the possible changes down the road? I don't know. The tenure bar may get even higher. The possible benefit of it is that if you could save yourself and the students that time, then maybe we'll do better research because it'll give us more time to go off and actually look at a great deal of material that otherwise the one year of research leave time would not allow us to. So my hope is that it will allow the profession to get better, rather than faster.
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> There's no denying that you can do things through technology, working on digitized material, that were unthinkable before. I think text mining is a great advance. And you can also locate things that you could not locate before. It's a clear advance both at the level of finding and at the level of method…and we should rejoice in it. The contradictory statement would go like this: search tools are terrific, and they can locate semantic fields and such things scattered through a huge variety of texts, but I honestly believe that cover-to-cover reading sensitizes the researcher to aspects of a problem or a theme that would escape his or her attention otherwise. This isn't simply saying you need to look at the surrounding semantic context of a key word or concept that you're studying, but it's saying that the context is really the entire

> work and, furthermore, that work in relation to other works, and that to get it you have to read through it and marinate in it. I think that scholars need to marinate in their subject to get the feel of it, to bathe in it, to read through entire books, and to understand the larger dimensions of it all, and there is such a thing as the feel for a language. It's one of these rather mysterious things, but I feel, myself, that the really fine historians are historians who develop a sensitivity to the feel, the tone of life, in a different time and place, and you're not going to that get from searches.
>
> I don't know that many of my colleagues, other than downloading stuff, really use technology to any great extent. Historians still have a quantitative phobia for whatever reason. We're not even all that big on mapping these days. Given the trajectories and things that get kudos and get you tenure, there's not much reward for the various kinds of technology-intensive products. The couple of students I know who do that have very different backgrounds. Whether anybody will pay attention to them is another thing, but I think it's absolutely fantastic.
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> I remember quantitative historians saying, "Well, once econometrics come in, it's going to be imitated throughout the rest of the historical profession; people aren't going to need to be able to write, because they're just going to be able to do calculus." It was just these crazy things that people were saying. And it was over-promised, there was this huge effort put into it, and it came out with things that really didn't transform the way historians thought about much of anything, and by and large, it's retreated into a fairly minor subfield. So I don't want to make the same kind of claims for GIS and spatial history…The challenge of Web-based scholarship—and this is a very pertinent challenge—is that what this amounts to is an illustration. You're using GIS and you're mapping these cities and you're giving us a wonderful visual review of something that we never could look at before, but essentially all you're doing is illustrating ideas that already exist; there's no new intellectual work here; there's nothing that really is going to push things forward; you're just going to be able to allow us to visualize it more clearly. So what we have to do in these projects is say, "There are certain kinds of historical knowledge that we can't get at using the ways we work now. We can't get at the data, we can't ask the questions, and we can't see the patterns until they become specialized in one way or another."

In sum, few scholars question the value of digital work, but one senior scholar expressed concern that it may bias research in the field.

> George Mason University has done some wonderful things at the application level, such as Zotero. I think they've also done wonderful things in terms of content. They've really shown that there is support, public and private money, for digital scholarship…I'm a little concerned whenever digital scholarship issues come up that, again, the technology tends to take over, which is why it's so important to insist on the questions. Once you define yourself as a center for digital history, there's a way you're prejudicing the answers…

H5.2 What Do Scholars Need? How Are These Needs Being Met or Not?

Scholars depend on their institutions to provide a wide array of resources for their work. In particular, scholars look to libraries to play a greater role in managing the preservation of archival materials and other materials generated in the research process. Scholars also look to the institution to provide more robust infrastructure to support digital-born work and train faculty and students in the use of new tools and technologies.

Funding and institutional support

The external funding environment is a great enabler for historical research, on both the scholarly and infrastructure level, and it can play a powerful role in shaping research possibilities in tandem with grantee institutions. Individual scholars can apply for funding to visit archives from their universities, private foundations, and national funding agencies, as well as many archival institutions themselves. Universities generally accommodate archival research trips for faculty via reduced course loads or sabbaticals. In contrast, larger-scale digital work is driven by comparatively larger grants, and as more scholars move into this research area, the funding environment is becoming increasingly competitive. There are different models for supporting this work, and centers for digital humanities or new media can be important sources of funding and technical assistance on some campuses.

> There's a lot of funding for research. I'm just astonished…There may be no money for raises or hardly any money for raises, but there is a ton of money for research, both from the university—I don't apply for it because there are just so many other sources of funding—and a whole number of institutions that will pay you to use their archives, like the American Philosophical Society, the state historical societies, the Huntington Library…I could just go on and on. If you need time off, of course you have the sabbaticals, but we have a way here to get release time. There are other ways you can cobble together grant money from foundations and so forth to get time off.

> Historians don't ask for much money. Most of what we ask for is we want to go to an archive or spend the summer or a year there. So if we get a grant for $50,000, we think it's big money. When I first got a large grant, I thought, "What in the world am I going to do with this?" It's more than I've spent in my entire career on my research. Well…compared to the sciences and social sciences, this kind of digital scholarship is not very expensive, but for the humanities, it's a lot of money. And somebody's going to have to give you the support to make up for it if you don't just luck into a big grant.

> Historical societies are pretty much out of money. They usually have their hand out, rather than giving money out…But there are ACLS scholarships, there are NEH scholarships, there are lots of fellowships. A lot of historians view $50,000 or $100,000 as a lot of money, but compared to chemistry or biology, it's a drop in the bucket. On the scale of returns, there's a huge disparity, but most historians say, "What do you need $100,000 for?"

> Actually, the center here has been very important for supporting things in the digital humanities. Certainly we have some funding from our own humanities center…they have been very supportive of this type of endeavor. And people are starting to write grants. I know one scholar who was on an NSF grant with colleagues and information computer scientists, and I thought this was great. We're always talking about how we need more money for the humanities, so if we can tap into NSF, this could only help us.

> I think a humanities center is an excellent idea, as a clearinghouse for grant proposals, as a place to support scholarship in the early stages, when you just want to try out ideas in a non-threatening environment, or in the mature stages, where you need somebody who's going to give you a close reading. Humanities centers are really, really important. I think a new media center is a great idea, but even better is having that within the humanities center, because then you're really saying that the paramount issue is just supporting the humanities, and whether that takes a digital form or not is irrelevant; you just want a place where people know that they can go and get help and support and find good colleagues. On the other hand, I think we're all aware that there are more successful and less successful ways of competing

> for money across the campus or across the country, and sometimes emphasizing things with new media is going to help you do the kind of generic humanities support that needs to be done. If that's the case, then by all means I think that's the way to go. Personally, I think new media is really exciting…but for the humanities broadly, you want an all-inclusive category and humanities would be it.

As one scholar pointed out, however, there is a fear that emphasizing digital technologies or new media may have a "distorting effect" on the historical funding environment:

> Everybody recognizes that digital scholarship offers some great advantages and can really solve some problems for us in our work and in finding new audiences for our work. It can also have a distorting effect simply because that's where the funding is…Legislators really perk up when we talk about the digital humanities. There are really two things that really capture their attention. One is the digital humanities, just because of the cachet of technology. But the other is talking about the kinds of humanities competencies that a nation needs, and making the point, for example, that the time to ask for new Arabic scholars and specialists is not when there's suddenly a crisis in the Middle East. The humanities are a long-term investment. So there's reason to be hopeful…as legislators begin to understand the broader role that humanities can play. On the other hand, the technical side is an easier sell, and consequently the absence of an audience appeal, as some might call it, is a problem, and that can be demoralizing.

Access to resources

Many libraries also subscribe to digital archival resources, which can be costly for individual subscriptions. Even so, scholars look to the library to make digital archives even more available. There are few finding aids for online resources, and similarly, some scholars advocated for a greater role for librarians in mediating the digital environment.[95]

> I need a librarian…You can just Google if you want, but you may miss a lot and so that's what librarians are for…My institution is developing support by training librarians to refer you really quickly to the librarian who knows the digital resources in your field…What is not set up, though, is the culture among the faculty of knowing that that's what the librarians can do, because they're still thinking about libraries as something that have paper in them. It depends on the field; I think the natural sciences are much more commonly aware of the online side of their research. But it's also a question of setting up the right apparatus in the libraries. It might not be the standard-looking reference desk, where you just walk up and ask a question, and they would look at a screen that you couldn't see and they would tell you what they found. This might be a different kind of setup, more of a lab kind of setup, where you sit down with them and work on things online. We don't know yet. But that's what I think we need more of. I think we also need aggregation sites that aren't just endless lists of databases, which we have now—the electronic resources site for our library is a very, very long set of lists, so you look at the title, but you're not sure what it is—but I think libraries also need to do more work to streamline it to display the databases that are appropriate to your field.

Scholars who were either engaged in digital scholarship or interested in moving into this arena all cited an overall lack of university infrastructure, especially in the short term. In particular, researchers who create tools that enter into the public domain face technical problems, such as

[95] A similar dearth of finding aids was described by Griffiths, Rebecca; Dawson, Michael; and Rascoff, Matthew. 2006. *Scholarly Communications in the History Discipline*. New York, NY: Ithaka, August. http://www.ithaka.org/publications/pdfs/JSTOR%20History%20Study%20Report%20Public%20final1031.pdf

servers crashing. The tools to do innovative kinds of projects vary greatly on different campuses, and they are, for many, inadequate.

> The campus has been incredibly supportive of us, because one of the things if you're going to do collaborative work, especially work that is going to be technology-based, is that you really need a support system. Somebody has to get servers for you. Somebody has to, in fact, maintain those servers. You need a technical support staff, some of whom I could hire with my grant, and some of whom you're going to have to depend on the university for…So one of the things digital history is going to change is there's going to have to be an infrastructure that is supplied by universities to begin to set things up. I think, over time, the infrastructure is going to be less and less expensive because so much of the stuff is going to enter into the public domain. We're simply going to make everything available. People are going to be able to pick and borrow. So that's the one thing that's going to happen.

> I keep getting these memos to get my faculty to do more high-tech teaching, and saying that I should send them to various workshops where they can learn how to do this. I always send these things back and say, "I'm not going to send any of my people over there until the classrooms are fixed, because I've got people who are ready to go into high-tech teaching, they've got their laptop, but then they've got some classroom where they can't do it…Is there enough money going into that? Well, maybe there should be more." Now, occasionally the reply will come back that I can finance this myself, if I want to put my discretionary money into this. Well, I've done a little bit of that, but I don't want to do more. I don't think that individual departments should have to do that; that's a campus-wide responsibility. So whether there is enough money going into infrastructure generally, I would say is a real question.

Archival preservation

The preservation of formal archival collections is an enormous field of interest, and this task is generally overseen by archivists and librarians. The digitization of archival collections is seen as an important part of this preservation drive, but the migration of digital materials is itself a problematic issue.

> I now have an archive of the archive, because in each little archive you can photocopy certain things. For example, the archivist takes this 250-year-old register, this little notebook, tears it in half, completely breaks the binding, and slams it down on the machine…So if he does that 95 times a day, the archive pretty soon is going to be gone. And things get stolen, there's humidity, rats…These things are not going to be around for much longer. I have a photocopy of it now. Maybe in 20 years that will be one of a very few photocopies of it around the world.

> Preservation of archives is extremely important, and that's a huge field…there's stuff out there crumbling, being formatted, and having digital copies made of it. But then there's the question of preserving the digital stuff, which is, in itself, another giant issue that has been addressed as a problem by many, many institutions and people for at least 10 years directly, because we keep making different kinds of media obsolete, tapes, floppy disks, now hard disks, and all these things, so it's been a continuing challenge. CDs and DVDs don't have an infinite lifespan, either. It depends on what we're talking about but sometimes it's only 10 years. So the best practice right now that I know of is to keep refreshing the data, putting it on a new set of DVDs every 10 years…

Training and standards for the use of new tools

Several scholars suggested that young scholars are more likely to turn to the Internet as a scholarly resource. Consequently, infrastructure for digital scholarship needs to be built to enable the continuity of "serious work" in the digital environment. Again, scholars look to their institutions to train young scholars in digital research methods and to develop protocols for accrediting the work that results.

> We just live in this electronic world, all of us. And so for young scholars, the earliest part of their career is already in that world. They're more technically adept. They're more likely to know about new stuff on the Internet. They are more likely to use Internet data, even archival data. I'm thinking now of my colleagues. They're more aware of what's out there, and more willing to use it.

> It's a little hard to tell sometimes, but younger scholars definitely are a lot more electronic. They are less skilled in using traditional libraries. They certainly don't remember the way that I used to find stuff in the stacks when I was young. I think very few of them really are capable of doing that. They are very, very quick on electronic stuff, and they spend a lot more of their time using electronic tools than anybody of the older generation, which is one of the reasons that creating the infrastructure is important to having serious work still go on…I'm particularly worried about younger scholars' ability to use foreign languages, modern languages. I have a feeling that the younger generation basically is not reading stuff that's not in English. I think that's absolutely a catastrophic aspect and I don't know what to do about it. Humanists are beginning to move toward using English more but still nowhere near what's become the practice in the sciences. There's a risk of there being a generation here that hasn't really learned the languages as well, but isn't yet in a world where everything's in English. You really still need French, German, and Italian, and if you have any element of fieldwork in you at all, even archives, you really often need at least one language—modern Greek, Arabic, Turkish, whatever. That's often not so easy for people to learn.

> I think the next challenge would be building out the technical staff to help advise on these new digital sources and the use of them. Then on the other side, and this is not so much research as teaching, I think a glaring gap…is that few universities have any kind of introduction, either for undergraduates or for graduate students, about research in an Internet age, where you don't have the conventional refereeing in a lot of what appears. I think we're behind the curve on that. It will take a lot of work to correct that, because in my fantasy, I'd like to see all incoming students get a course, at or least a part of a course, on that, and that's a lot of faculty effort to organize because I don't think it can be done in mass lectures. I think it's one of those things that probably needs to be interactive…And I don't mean only at the technical level, I mean also at a more abstract intellectual level. How do we think of the function of refereeing in the whole process? How do we think about authoritative knowledge? Is it a democracy of facts? I don't know that enough attention gets paid to those questions, which are directly relevant to how students go about using the Internet.

> The question is, if a country's national archives were scanned, then that would be available online, and if they were available online, it would mean that a student here could do that one day. And I think protocols and regulatory things are going to have be developed so that if a student of mine goes off and does his or her entire dissertation research sitting here, but saw all the documents that would otherwise have taken a year to go off and acquire, I should have some affirmation from a larger disciplinary body that certifying him or her is okay…Of course, they're not going to get to all of the documents scanned in a hurry. But there are, for instance, the papers of an important historical figure available online, and there are webpages

> where things that s/he said or wrote are available online. I think what the discipline is going to have to do at some point is figure out which of these we will accept and which we won't…

While young scholars may be more likely to conduct research online, few have the necessary expertise in more sophisticated tools for historical analysis, such as GIS or computer programming. Again, scholars called for institutions to engage in more technical training of undergraduate and graduate students.

> For 25 years now, we've been hearing about the next generation coming up being technically savvy. It's not true. I think they are technically savvy at some culturally relevant, functional level, but I don't know that they're necessarily whiz-bangs when it comes to Web design or programming. At that point, the prediction just hasn't panned out and may not.

> Training graduate students is a big issue. We don't have any system set up yet to train graduate students to think in terms of the new media, what they can do with their scholarship that's different, or just to actually work in those media. It requires a fair amount of technical training just to know what different file types are and other basic things that you need to know, even before you start doing the tutorial of some program. That's what I found and it's pretty critical. You can't just assume that anybody knows the difference between a JPG and a TIF and a GIF and all these things…Somebody will email an image that's 10 megabytes, and it bounces because it won't fit in the mailbox…So I just feel that that's a big missing spot here. We're working on that at my university by trying to set up some digital training for graduate students, but it's not going very quickly because it's not clear how it fits into the curriculum.

6. TO WHAT DEGREE DO YOU OR YOUR COLLEAGUES ENGAGE WITH THE PUBLIC? HOW? WHY OR WHY NOT?

History as a field has always had a serious amateur and public component, from the History Channel, to amateur historians, to the fact that "everyone" has to study it in school. Historical work is important for cultural heritage institutions, government work, public policy, decision making during political crises ("every President reads history"), and in media coverage during such crises. Scholars in certain areas of specialization may more regularly engage with the public. For example, historians in politically topical subfields, such as the Middle East or US politics, may be active in public engagement when particular issues are in the news. Yet there is widespread debate in the field over the value of being a "public intellectual." While public engagement can combat overspecialization and narrowness in historical scholarship, it can also be seen as "watering down" historical work. Historians who choose to do public outreach engage in a variety of ways, including newspaper editorials, media interviews, authoring books oriented for the public, work with historical societies, podcasts, and Web activities.

H6.1 Why Do You Engage with the Public?

Although historians are generally seen as being publicly engaged, the degree to which individual historians participate in public outreach varies by stage of career, subfield, institution, and individual personality. Scholars engage with the public for a variety of reasons. Some believe that it is important to share research with a public audience supporting the research either financially or in principle. Others reap personal rewards from discussing their research in an open way, such as clarifying their ideas or sparking new thoughts. One senior historian noted that

"most scholars actually want to be known and appreciated by the lay public, so they're actively looking for ways to do that."

> There's something about history where people in the non-academic world feel like they have a kind of ownership of it, such as "I like history" or "Oh, I remember, I studied history." History seems to cross into the public domain much more because, whether we like it or not, we're seen as the people who know the facts about the past. So history is assumed to be a discipline where the public can engage, and there's a serious amateur component. But, obviously, this larger public conception of history is predictable; it's kings and queens, rulers and dynasties, periods and epochs, floods and famines, etc. So in some ways, what people think of as history is something I would characterize as general knowledge: how many roman emperors were there, for instance? And I think for that reason historians are a little more engaged with the public, or they are *seen* as being more engaged, than scholars in other fields.
>
> There are various categories of interacting with the public. In the first category, people just do traditional scholarly work and speak to their own field, period. In the second category, which is where I see myself, people also talk about general trends, not only in their specialty but more generally in history as a whole: where the educational process is going, what the intellectual developments are, why we have the kinds of views we have, etc. That category does some writing for an audience that's cross-specialized and cross-disciplinary, and also very much for graduate students and, to some extent, for undergraduates. Then there's a third category, and that's the category which provokes mixed feelings in the profession as a whole, and that's writing for the general public. And even there you have a range of different approaches.
>
> People are now beginning to realize that we need to do a better job of explaining ourselves. We need to figure out, one, what we're doing, and, two, how to explain what we're doing to the general public, who is ultimately paying in one way or another for most of the activities we undertake…Originally, there was a "how dare they" attitude to the public, but that has largely disappeared, and more students are realizing that it's not a bad thing to write well and you actually learn a huge amount from the process. For example, when I published my recent academic book…I was encouraged by the editor to write it in a more mainstream fashion, by taking out the classic endless historiographical debates and naming of names, etc. As a result, I got invited to do interviews on various local stations and call-in shows with the public, so people could ask their questions. It was great. I learned a huge amount.
>
> I'll talk to anyone who wants to talk to me if I have the time and they pay my expenses to get there. In the field I'm in…nursing homes, churches, local historical societies will ask for a speaker…And high school teachers take courses or go to talks and get recertified or do professional improvement, so the state contacts me and says, "This is the teacher program, come give a couple of lectures," so I do that. I'd say I do a dozen of these programs a year, and even if you only do two or three a year, I don't think it takes much effort…especially if you're talking about your own project. Sometimes it clarifies your ideas or gives you new ideas. When you talk to other people about them…you realize what's important and what will communicate.
>
> I love public engagement; it's my passion…Institutional mentorship has been my passion since I received tenure…I really enjoy going in the classroom and talking to students…For me, public engagement is about showing what is possible for students, whether in high school or in college. When I was in college, I certainly didn't understand what the possibilities were beyond the four years.

> I believe in public discourse beyond the walls of the academy. That's an important part of why we're here and why we're given the privilege and the resources to do this kind of work. So, for me, public outreach is really important, and I continue to do it. I appreciate working with my advisor, too, because contributing to the public discourse has always been important for him/her whenever s/he has something to contribute. It's sharing your knowledge, sharing what you find, sharing your research. I should probably say "no" sometimes, but I tend not to because I enjoy it, and I think it's important to do.

Why not?

Not all historians engage with the public "in a big way." Some scholars noted that while they "talk a good game," only about ten percent of historians are actively engaged in outreach work. Historians described the difficulty of reaching out to a general public and locating audiences who might be interested in their work. Others simply didn't see their research as "newsworthy." A scholar who participated in a joint applied/academic endeavor described it as a "miserable failure" because "practitioners are uncritical about what they do and uninterested in what academics say, and academics live in an ivory tower." Other scholars noted the importance of the university in preserving an independent space for thought and research beyond the obligation of immediate relevance.

> In our field, the lack of public engagement is always lamented. Every American Historical Association meeting has a session or two about what we can do to reach out to the public more.

> I've done some sponsored lectures, and visiting scholar-type things, where I give presentations at different campuses. That's a kind of outreach, but it's not the greater public; it's a broader university and college public. Beyond that, I don't know quite how to reach them. There's no question that there is a population out there who is interested, so there may be other indirect ways to go about reaching them.

> Public communication doesn't drive me in a big way. For departments, such outreach can be important since they're trying to get alumni funding and want to podcast on newsworthy issues. But I appreciate that universities still preserve some small space for people to do work whose implications may not be worked out for a long time to come. You can think about things without getting the compulsion to be immediately relevant and newsworthy. I appreciate that space a lot.

The contested nature of the "public intellectual"

Tenure and promotion criteria act as a significant barrier to public engagement in some institutions. For pre-tenure faculty, too much popularity is viewed negatively; as one scholar observed, "If your book is too popular, watch out!" As public engagement will not help junior scholars in the eyes of their colleagues or in tenure and promotion committees, it is an activity generally reserved for established faculty. Some historians consider writing for the general public as unrigorous and completely dislocated from the academic enterprise. Scholars interested in being publicly visible must walk a careful line between being overly narrow, on the one hand, and commenting on questions beyond their area of expertise, on the other.

> What worries me is whether graduate students these days want a public audience because they're historians or whether they want to be public intellectuals. The problem with wanting to

be a public intellectual is that the "public" part is really clear to me, but the "intellectual" part isn't. It seems that it can descend into a kind of punditry where people are experts on everything. If you're going to be a scholar, you have an obligation to speak out when you know what you're talking about, but when you realize you don't know what you're talking about, it's probably best to keep quiet.

Generally my colleagues and I have failed pretty abysmally in engaging with the public. Mostly no effort is made, and when an effort is made…it doesn't work. But that has a lot to do with the way that scholars frame questions, and I think it also has a lot to do with the criteria for tenure and promotion. Everybody's very narrowly focused on advancing their careers, there are certain hurdles to get past, and you really aren't rewarded for being a public intellectual. You're rewarded for speaking to a tiny group of specialists in your field and putting out a scholarly monograph that few people will read. So, I'm not blaming individuals for our lack of public outreach; I'm saying that we're guided to do things where we end up in our own little world. For example, I'm working on a book right now…that is going to try to be a little less scholarly and tilted toward a broader reading public…which I could never have done before I had tenure…But, I'm still hedging my bets. I also have another straightforward scholarly monograph that I'm working on at the same time…And part of that stems from frustration with the way in which academic publishing and communication works. Specialists talk to a few other specialists and nobody gives a damn. It's depressing…There's no such thing as a public intellectual anymore, and even though a topic is in the newspapers and should be of general concern to the public, the way in which most people approach problems is hyper-specialized, and they don't know how to engage with larger questions and larger audiences. It's a real failing in academia today.

History, unlike most other disciplines, has best-selling books coming out all the time. The problem is that most popular histories are always about the same thing. They're the 35th biography of George Washington or the 20,000th book about the Civil War…If there's anything new about them, it's retelling a story somebody's forgotten about or putting it in a slightly different context. That kind of history is never going to get you tenure. But, at the same time, there are plenty of people who have a real interest in history and it's suicidal not to be able to talk to them. I think some historians are very proud of their ability not to talk to them, and that's a mistake. So you can talk to the public, but there is going to be—as much in history as any other field—a suspicion, and I've seen this come up, that somebody's work is too popular, that they're really just writing for a popular audience and there's nothing new here. And so you should always watch your back if you're an untenured professor, because the popularity argument has come up many times at tenure meetings…Right now, I'm part of the problem because I tell graduate students two things. The first thing is that they have to have a tenurable book. The second thing is that if the aim of their work is to address broader audiences, and their book lacks a willingness to take any intellectual chances, they're binding themselves from the very beginning. So I tell them they're going to have to take both paths, and that it's going to be more work if they want to engage the public. I make no bones about it. Senior people can write popular books, but an assistant professor can't write a popular book, if that's all it is. If the book becomes popular, it's one thing. But if they net a popular audience and they neglect the things you have to do for an academic audience, the result is going to be disastrous.

Some more traditional and narrowly specialized scholars see public engagement as watering things down in order to attract a bigger audience. The kind of person they're thinking of is Simon Schama of Columbia who did a big television series on the history of Great Britain, in which he talked about the entire history of Britain, some of which he knew and some of which he didn't know that well. So there's a mixture of envy and jealousy and dislike of the endeavor. At the same time, I think this is generally seen as a positive development, because speaking to the general public used to be entirely done by non-professional historians, people

> who had historical training but weren't in the academy, who had no connections to the university, who were uninterested in the implications for the professional study of history—Doris Kearns Goodwin, for example, or David McCullough—and who basically wrote for the general public for a living. There's much less distrust of these activities than there used to be. Speaking to the public used to be a completely separate activity. Now increasingly there are historians who move back and forth across those lines, and I consider this, personally, an entirely good thing.

The dangers of not engaging

High-level administrators cautioned, however, that being too specialized risks a "retreat to purity, and a refusal to explain ourselves." This was described as a "suicidal impulse" in the current funding climate.

> The academic stigma related to public engagement is self-destructive because people don't understand why anybody should pay money to support what we do, so we have to explain ourselves constantly to get support for our work. And the retreat to purity, this refusal to explain ourselves, to simply say, "If you were one of us, you would know why this is so important," gets us nowhere. It really is a suicidal impulse…But, at the same time, the realities of the academy dictate that we produce work that you can defend against others who know the field, and there are good reasons for this. Admittedly I can be equally disdainful of popular history, which can simply be a series of claims which are not rigorously defended. And I do think that the peer review and scrutiny that academic scholarship goes through are necessary, as long as they're not carried to an extreme. But it can lead to a kind of narrowness and caution that I've warned my graduate students against…
>
> I think public engagement is a problem and a challenge, and given the way in which the writing in the humanities is going, I think we're swinging back toward more opportunities for public dissemination. And I think there is demand around the country. The model is the Chicago Humanities Festival, which is a roaring success…It's a huge effort to organize that, and I don't know where that effort might emerge from. But I do think that this is a major issue. I think a pragmatic American public sees the value of scientific technological advances, but they're not so immediately captivated by the humanities.

Young scholars and public engagement

Some senior scholars observed that their students and the "younger generation" want to be more publicly active and are "thinking more expansively about who they create scholarship for," although this is not universal. For young scholars interested in speaking to a wider audience, it can be difficult to select timely research topics and locate appropriate public venues.

> You're not going emerge as somebody who can speak to a public audience unless you start doing it immediately. And I think my students want a public audience, but they are really torn in picking a research topic, because whatever you're working on, you picked five years ago, and a lot of times it's just sheer luck that, at a certain point, there will be consuming public interest in your topic. If you pick a topic that's consuming public interest at the moment, you can be sure by the time you're ready to publish that the public will have gone someplace else and this area will have been left behind. So it's tricky. But overall there is much more of a sense of wanting to be public. In my generation, we wanted to be political. The younger generation doesn't necessarily have the political agenda, but they certainly do want to have a public audience…I'll ask my students, "Why?", because I agree that it's important to speak to

> the public, but I'm wondering what they're trying to do, whether it's to make the public more aware of history, or if they have some other agenda.
>
> I do know that I'm not going to get any credit for public speaking, and, in fact, I will get people who will say, "Well, he does that, which means that he's not spending as much time as he should on his research." So, that's a risk I take…but that's just who I am. I do get support from my advisor and others for engagement, although the focus is always on, "How's the book coming?"

The PAGE program (Publicly Active Graduate Education, part of Imagining America) works with graduate students to help marry their interests in public engagement with their scholarship. This and similar programs defy the standard "trickle down" model of "dribbling" scholarship to the masses in later career stages and instead encourage young scholars to explore synergistic scenarios in which community engagement may actually inform scholarship and vice versa.

> Many of the students involved in the PAGE program are saying, "My scholarship is coming out of the kind of projects I'm doing in the community, and I need to have both of those connected to each other now, not 20 years from now."…Imagining America has been working pretty hard on a Tenure Initiative, and there's some interesting preliminary reports on their website that basically describe what can we do as a consortium of universities to encourage and increase the respectability of collaborative community work and to make this kind of work legible enough so that people are not putting their careers at risk if they undertake it. The goal is that they're not being told, "Get your tenure first and then you can dabble in the community."

H6.2 How Do Scholars Engage with the Public?

Public engagement in history can take a variety of forms, including museum talks or consultancy, op-ed contributions to the *New York Times*, *New York Review of Books*, or other publications, radio interviews, contributions to television news, commercial publications or "historical fiction," public lectures or university lecture-series (such as those sponsored by funding bodies), work with local historical societies, consulting for documentary films, and teacher training or curriculum design for AP History or European History courses. The two common conditions for engaging a public audience, described by one scholar, are that the topic is "easy for me to talk about, and significant."

> Particularly in the wake of 9/11, historians are more engaged than they have ever been before…in the sense of writing editorials in newspapers or writing reviews for less academic publications that have a larger circulation, like the New York Review of Books. Some historians will sit on CNN, and some are interviewed on NPR…
>
> Some historians work in professional development for teachers or with underrepresented students and communities where they're going into classrooms…Others work in museums and provide historical consulting advice, which I think is a level of community engagement. Or, there's working on documentary films. There are different ways to be engaged.
>
> I had an op-ed in a national newspaper…and I write book reviews for the local newspaper. I do some public speaking if people ask me to talk about the things I research.
>
> Now that public universities are getting more sensitive to informal appeals to their public, lecture series are beginning to matter.

As in archaeology, one senior historian mentioned the important role that museums play in connecting historical work with the broader public.

> Museums are a lot smarter than universities about their public…and I don't think we talk to museums enough. I think Herbert Muschamp said in *The New York Times*, probably five or six years ago, that museums are the cultural powerhouses of modern cities. I think scholars want to be part of that. They want to be connected with that, and museums have always been an important venue and an important outlet. Again, this tends to be for senior people but not always; some of the junior scholars I know have seized opportunities to connect with museums if they are exhibiting something that happens to be in an area where the scholars have some expertise.

Digital media and public engagement

Digital media and well-developed, interactive websites provide good avenues for some historians to engage with a wider public by posting work-in-progress, "historical fiction," podcasts, maps, animations, and other public-friendly historical information. Another scholar contributes to a public-oriented website managed by a local historical association, something that "doubles as a good teaching resource and also pays well." Still other historians who create project websites or virtual collections see their work as a form of public engagement by providing archival manuscripts, data, software, and other tools and materials to the public.

> I've done enough high school development workshops to know that they're not going to read my monographs…so if I can put some interactive things on the Web, it could be useful for them or for their students, and maybe they'll use them.

> I do a lot of communication with the public through websites. People know my work from websites and sometimes they just call me or email me.

While the scholars above saw the Web as creating important new venues for public engagement, another pointed out that the commercial book still adequately performs that function.

> I don't see electronic media really enhancing the possibilities of being a public intellectual. My colleague published a book with a commercial press, and commercial houses get stuff out there. So it's not necessarily a matter of needing a different medium if you want to do that.

SELECT RELEVANT LITERATURE AND LINKS

This is not meant to be an exhaustive bibliography; as a courtesy, we are providing some of the literature—scientific and popular—that we have collected over the last few years. Please see the main Relevant Literature section and various footnotes for additional citations.

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CHAPTER 7: MUSIC CASE STUDY

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INTRODUCTION AND OVERVIEW OF THE FIELD

Music is a multifaceted discipline that spans academic and applied work in the arts and the humanities. Broadly speaking, the "academic" study of music concerns the history, cultural contexts, and interpretation of music. The academic subfields of music include musicology (the history of Western music traditions), music theory (the elements and mechanics of music), and ethnomusicology (music in its sociocultural context), as well as more interdisciplinary studies such as music psychology and cognition, philosophy of music, popular music studies, cultural studies, and music education. "Applied" scholarship in music concerns the attainment of distinctive proficiency in a specialized field of performance, composition, or conducting. The lines between academic and applied scholarship are blurred by many scholars in academic institutions, such as scholar-performers, composers who engage in extensive music theoretical work, or computer musicians. The institutional arrangement of scholars in various subfields varies greatly; some campuses have departments that embrace both musical practice and academic musicology while others have separate conservatories. Ethnomusicology, a relatively new field, may reside in its own department, or in departments of anthropology or folklore.

In addition, the past 30 years have witnessed the burgeoning interdisciplinary area of computer-assisted research in music, built on work by French composer Pierre Boulez "to engage with the sciences to create new music-like experiences." Scholars in this area investigate the possibilities of digital music creation (e.g., computer-assisted composition, new models of performer interactivity or diffusion, and new instruments), as well as the "music sciences" (e.g., acoustics, perception, cognition, and sound analysis/synthesis). A triumvirate of new music centers leads work in this area: the French Institute for the Promotion of New Music (IRCAM), the Center for Computer Research in Music and Acoustics (CCRMA, Stanford), and the Center for New Music and Audio Technologies (CNMAT, UC Berkeley). All are marked by interdisciplinary collaborations among composers, performers, computer scientists, engineers, and psychologists.

Taken as a whole, publication in music includes monographs, journal articles, book chapters, encyclopedia articles, conference proceedings, critical editions of musical manuscripts for study or performance, reviews, liner and program notes, discographies, CDs, multimedia websites, scores, live performances, DVDs/videos of performances, recordings (albums or single tracks), and software (which can represent new computer-based instruments or protocols for musical performance or composition). Monographs are the common form of archival publication in historical musicology and ethnomusicology, while peer-reviewed articles are important for more technical or theoretical work. Publication practices center around prestigious and highly selective university presses and flagship journals, the latter of which have a considerable publication backlog. The integration of musical examples in text (whether they be manuscripts, scores, audio, or video) is important, but restricted both by the high financial costs of securing permissions and the technical constraints of print publication. Scholars in particular subfields have responded to these limitations by creating supplementary or alternative publication models, such as multimedia websites to host audio and video in ethnomusicology (e.g., the peer-reviewed EVIA Digital Archive Project), and specialized technical websites to publish software and other technical contributions (including some open source products) in electronic/computer music.

Conference presentations are important across music for sharing work-in-progress among specialized audiences, but most scholars in the academic subfields keep their work and data close to the chest prior to publication. Overall, much sharing takes place informally by circulating

polished papers via email within a close network of trusted colleagues. Listservs function in specialized fields to disseminate information and to track the location of archival sources, and may be used to share work-in-progress to a limited extent by some scholars. Visibility is a key ingredient to building reputation in the applied music subfields, and scholars make extensive use of personal websites to promote and disseminate recordings of their work.

Taken together, music scholars work with a variety of musical texts. In addition to monographs and journal repositories, scholars across all music subfields regularly consult *The Grove Dictionary of Music and Musicians*, a thorough encyclopedia run by a professional editor in partnership with academic editors at Oxford University Press. Research in the musicological or ethnomusicological tradition involves lengthy periods of archival manuscript study or ethnographic fieldwork (with a large audiovisual component), while more theoretical work uses readily available instruments, scores, or recordings to explore musical sound structures. Some work in musical cognition or computational musicology is lab-based and generates data sets. Collaboration, specifically coauthorship, is not typical for any musical subfield, with the exception of research in new music and electronic composition. Here, composers, researchers, and technologists work together to develop applications that support musical composition and performance. Networked performance (utilizing high-speed internet connections and sophisticated software to unite performers distributed geographically) is opening new avenues for improvisation and performance. Like the traditional humanities, music receives little funding for research and publication. The exceptions are computer/electronic music research, which may create patentable technologies and foster partnerships with industry.

Music is inherently public and the general public plays a large consumer role. Public engagement can take a variety of forms: educational outreach, media interaction, pre-performance lectures, and writing program notes for a concert or liner notes for a recording. Academic music scholars may also engage in more "applied" work, such as the performance of traditional vocal and instrumental music by ethnomusicologists and artistic consultation with opera companies by musicologists. In computer/electronic music, software tools for musical composition and performance are often made publicly available for use by amateur and professional musicians.

In sum, publication in music encompasses a variety of genres, and the relative importance of both books and journals depends on subfield. The limited number of journal outlets with perceived prestige (and which are operated by scholarly societies) has led to a call for more quality outlets (often electronic and/or open access) that can maintain high standards of editorial quality and peer review. The cost of securing permissions to use and publish copyrighted musical materials is a large problem in the field, and can heavily limit the scope and substance of published work. While some institutions and scholarly societies offer publication subventions, the latter may be called upon to play a greater role in negotiating lower costs for permissions. The growing availability of music in digital formats (including audio and video) is creating new possibilities for publishing multimedia material in hypertext form, particularly in ethnomusicology, and additional support and funding could bring more scholars to use these publication models. There is currently little available funding for scholars interested in this approach to publication, however. In new music technology, where software and other technical components are integral to contemporary composition, scholars have developed Web-based platforms for hosting such work since traditional journal publishers cannot yet provide these necessary services. Music scholars collectively need more databases of primary research materials, which can include archival manuscripts, scores, recordings, fieldnotes, and software.

Online resources could function as digital critical editions or searchable banks of notated scores. In the case of ethnomusicology and new music technology, the preservation and migration of changing data forms are problematic. Several scholars called for a "PubMed for music," in which secondary resources, such as *Grove* articles and instrumentation guides, are hyperlinked with these primary data forms.

1. REQUIREMENTS FOR TENURE AND PROMOTION: WHAT ARE THE QUALITIES OF A SUCCESSFUL SCHOLAR?

Music is a multifaceted discipline that spans both "academic" and "applied" work in the humanities as well as the performing arts. This division within the field is reflected in its conferral of two distinct terminal degrees. The Ph.D., a research degree, is granted for academic work in the areas of musicology, ethnomusicology, and music theory. For scholars in these subfields, evaluation is consistent with the humanities at large and scholarship tends to be text-based. In contrast, the D.M.A. (Doctor of Musical Arts) is an applied, portfolio-based degree, reflecting work in the areas of musical composition, performance, and conducting. There is some crossover between the "academic" and "applied" subfields. For instance, live musical performance or recordings can play a role in scholarly work in ethnomusicology, and musical composition overlaps significantly with theory, history, and analysis and can contribute to either a D.M.A. or a Ph.D., depending on the institution and final research product. Consequently, the types of scholarship produced across the field are highly diverse, and can pose a challenge in the evaluation of individual scholars by tenure and promotion committees.

> Music itself is very diverse, but more unified as a discipline, than, say, classics. So, in music, you're going to get people who are doing text-based scholarship of a very familiar kind. You're going to have people who are doing ethnography of one kind or another. And you're going to have performers and you're going to have composers, and you have a very lively electronic new media contingent. So that's a single department in which you could observe a lot of different kinds of scholarly enterprises or research enterprises, and yet they are united in a comprehensible way.

> Music is the second largest humanities faculty. The reason is that we include practice, history, and also a whole performance side, and no other department does that. It would be as if the art department as a whole, including art history and art practice, also had a performance side, and that's why music tends to be relatively large as a department…Basically, we have not split creation from history and criticism. The two are sitting together in the same music department, which is not true of the study of art. They have been split…Then you get something like computer-assisted research in music…and that's a whole different thing. And they tend to go into music perception, which is part psychology and part engineering, as well as music. So there are many different branches of it, which may make it a more interesting challenge than art history, although art history is a much bigger field than music history if it's just isolated, and there's a lot of money involved in art. There isn't a lot of money involved in the artifacts that are music until you get to pop music. So music does, in incorporating all those different things and new media, pose unique issues.

> In music, really, you can make a distinction between two areas. There's what we call applied music, and applied music would include composition, conducting, performance, the applied areas. And then there are the academic areas, which also typically include music education, which is a big area…Normally people would be either applied or academic, and when it comes

> time for tenure decisions, it really splits. If you're in the academic side you're treated pretty much like what would happen in any other humanities discipline. So if you were a historian or an English professor, something like that, they would be looking for publications and conference presentations and all the traditional things that academics would do.

Some tensions are present between the academic subfields in music. The field is driven in the main by historical musicology, which may result in the marginalization of other research areas. Music theory formally established itself as a separate field in 1977 with the inauguration of the Society for Music Theory and is still considered an offshoot of musicology by some. Moreover, some scholars conceive of ethnomusicology as better associated with the anthropological tradition. Indeed, ethnomusicology is separated from the music department in two of the largest programs in the country: Indiana University and UCLA. Additionally, scholars who work in interdisciplinary areas of academic music, such as music as narrative or music cognition and perception, can be difficult to classify within a traditional disciplinary framework.

> Ethnomusicology was embattled when it first entered the academy. It had to constantly justify its existence inside its own department, as well as to other departments. As soon as ethnomusicologists came up, the musicologists made the argument, "If you want to study Arabic music theory, go and study with Arabs…we study serious music here." So, one of the ethnomusicologists piped up, "So why aren't people going to Germany to study German music, because that's all you're teaching here?"…That question was never resolved.

Similarly, the organization of music at the institutional level is further complicated by inconsistent and complex mechanisms for housing the applied music subfields (namely performance and composition). For instance, some large research institutions emphasizing applied music composition and performance may have a separate conservatory, while others may install their applied faculty within a music department or contract out for adjunct instructors in these areas. The main distinction between composers and performers in a university, and those in a conservatory, lies in the treatment of scholarship as "mental" versus "embodied." The composition and performance scholars in our interview sample represent the former.

> At a conservatory, you typically have people who are more on the practice side. Conservatories are less known for—I use these words probably too glibly—a scholarly side, a publication, a text sort of side, so you have less of the music history side. You have less of music theory as an experimental vector and more of music theory as a historical practiced way of teaching, and then you have a huge cohort of performers who are characterizing their time by practicing eight hours a day. So this is the kind of split between mental and embodied scholarship…Composers in that latter side are rarely paid to publish articles about composition, they rarely are involved in the scholarly side of things. And there's a real craft orientation that pervades the teaching of composition at a conservatory. Most composers at conservatories tend not to be pushing the envelope culturally in terms of the development of music. There are exceptions to that, but the vast majority of them are composing music that's, in a sense, based on dated and tested and, in most cases, loved assumptions. Whereas the project of composers in our research institutions at one end of the continuum tends toward asking questions about, "How can we expand the field? What is the future of it? How can we problematize issues?" It's not about repeating and being able to reproduce things that are known, but rather about testing new hypotheses and things like that. So, in a sense, it's more experimental in the true sense of the idea of an experimental composer as one who aspires to succeed but is prepared to fail. The professional composer, which really conservatories are trying to crank out, can't fail. The professional composer has to get it right. So it's different.

> It's the absence of dialogue between performers and academics that is sometimes disturbing. And one finds at conservatories, for example, that there are too many older teachers, in particular, who don't want their students to take courses in music history because they should be spending every moment they have doing nothing but practicing. And that's a position that I and my colleagues cannot accept. We don't think that they should be spending the majority of their time taking courses, and, obviously, they should be spending the majority of their time practicing. But music is not simply the act of repeating something so many times until you get it in your fingers. It's also reflecting on what you're doing, its meaning, history, and so on.

Finally, organizations that represent an intermingling of applied artistic practice and academic scientific research, such as the Institute for the Promotion of New Music (IRCAM, France), the Center for Computer Research in Music and Acoustics (CCRMA, Stanford), and the Center for New Music and Audio Technologies (CNMAT, UC Berkeley), are often referred to as the 'third category' of music at the institutional level. Electronic and computer-based music research is an interdisciplinary area aligned with research in composition, rather than historical musicology. Degrees in music technology or computer music vary by institution, which affects the variety of researchers and graduate students working at any given center. Scholars who work in this area often have a variety of scholarly interests, including research and development in computer and electronic music, as well as composition and performance in both experimental and traditional music genres.

> In this department, there are basically three main programs and scholars doing research: there is composition, there is musicology, and there is the computer music group. And these are three different programs with three different research foci. There tends to be more connection between the composition program and the computer music program. For example, there is a lot of interaction between computer music and music composition with computers, and perhaps not a lot of interaction between composition and musicology. My colleagues in the musicology field tend to be more focused on really what we would call more traditional music, like studying music from the 19th century. Very rarely do you find a musicologist with an active interest in the current advances in the composition scene. So I think there could be a lot more room for connections between musicology and the history of music, on the one hand, and research in computer music and composition, on the other.

> These centers have become what I'd say are cultural units, almost, which have opened doors to all of those branches of science and engineering, but have also opened doors to all of these different lines of thinking in music and musical performance. At the same time, they're still introducing new research paths. It's like network performance: that kind of just *happened*. The time was right, several things coalesced and, bingo, there's this new thread. And these new threads keep questioning what we call the center. That's the nature of it. And that's a good thing, because if you didn't have that, I would think the field as ossifying and over-academicizing, because all you do then is write books and teach the books. That's great, but you've got to keep it innovating, too. So we're opening a lot of cans in these research centers.

Scholars across musical subfields observed that the agenda in music, as a low-paradigm field, is set by "every single scholar," especially "people doing what does actually engage them." Everyone creates a foundation of work, and the agenda is set by every new person exploring new terrain. In tenure and promotion, the scholar-driven nature of the field results in a wide array of institutional norms and models for the evaluation of work, itself produced in a wide variety of formats. As noted earlier, we have divided music scholarship roughly into two

categories for the purposes of the current analysis: the academic subfields and the applied subfields.

PART A. THE ACADEMIC FIELDS: MUSICOLOGY, MUSIC THEORY, ETHNOMUSICOLOGY

In the academic subfields of music, qualities of a successful scholar encompass both an international visibility as well as a record of sustained publication. Musicology, music theory, and ethnomusicology require publication in monographic and/or article form, the former published by a major university publisher, and the latter in premier, internationally respected, peer-reviewed journals. Some areas of music theory, in particular, are article-based, and scholars here may be required to produce articles in lieu of books. Additional scholarly contributions in musicology and music theory can include critical editions and editing activities. In musicology and ethnomusicology, scholars may also contribute to catalog and dictionary/encyclopedic contributions, and the latter may produce video documentaries, websites, and CDs. Although such activities are perceived as valuable contributions, they count for little without accompanying books and articles.

M1.1a A Suite of Achievements Anchored by High-Impact Publication

While the qualities of a successful scholar are difficult to quantify, a record of high-quality monograph and/or article publication is critical to gain tenure and promotion in musicology and music theory. Irrespective of the publication type, institutional review committees look for a sustained publication trajectory and international reputation.

> I will be coming up for tenure in research. Of course, exactly what that means is a little hard to quantify. There are not really fixed criteria but it pretty much comes down to the traditional things of publication and conference papers and so on. No one has ever given me a specific number of publications or anything like that. I think the best you can do is look at the record of people who have come up for tenure in recent years. It's a little bit hard in music theory because it's a fairly small field, and there are not that many examples to go on.

> I spent a number of years as a high-level administrator. This notion that there's one way to do it and you have to have "x" number of books or "y" number of articles is nonsense. It isn't true. Not at my institution, we never work that way—never, never, never. We look at the quality of the material. If a book isn't published but we have it in typescript, that's fine. We do not ask for a contract. We're interested in seeing the quality of work. That's what matters. Now, I do know that there are places that require you to have a certain number of actual publications. And, what can I say? It certainly is the case that it is harder to get a beginner's monograph published today than it used to be.

> Publish at least one book, probably two; be giving papers, I would say every other year at the national meeting, and on the alternate years at some other meeting, at least once. So I would say at least one paper every year to either an interdisciplinary group or a disciplinary group, national or international, or preferably both. That's basically it…The most important thing is your national and international reputation and you get that by writing a lot.

> Publishing is still important and every year I have to work toward year-end review. So at the year-end review I say, "I gave these conference presentations, these invited talks, and these publications." Maybe in the sciences, it's "publish or perish." In the arts, it's "publish and thrive." You get more opportunities if you publish, so there's no question that publishing is

what I aim to do. What I've learned as a scholar, if I had my career to do over again, I would have published a book earlier. I published my first book long after tenure. There are some disciplines in which they have the "tenure book" in the arts and humanities…I have never heard of that in music.

There aren't any quantified measures for advancement, but there are norms, and they vary a bit from field to field, from department to department. I would say, across the board, an expectation is that someone would not be promoted to tenure until they've published a book. And it's generally expected that they publish some articles along with that, before that quite possibly. And that for advancement beyond tenure people are looking for…if that work is based on this dissertation, then they're looking for another major piece of work beyond that, not related to whatever the dissertation was.

Musicology and music theory: The role of articles

There is a debate in mainstream musicology regarding the interchangeability of books and high-impact articles in the institutional review process. While many music theorists are not expected to publish monographs for tenure, some musicologists have also suggested that "well-received" articles may substitute for the expected book at particular institutions in their subfield.

Article publication counts. In fact, we just promoted somebody who had two books and no articles, and we didn't love that. We thought that articles sometimes have a wider circulation than books do, in the sense that people not in the field might read them…Also many of my colleagues, especially in theory, didn't have a book when they got tenure, they had a lot of articles, and I don't see what's wrong with that. The main thing is that you're known in the field, that you're a force that people want to come to study with you, that's really the point, so if it happens to be that you do it in journals, I don't see what the difference is…Frankly, one senior scholar just published a first book in his/her 60s. This scholar is extremely prominent, at the top of the heap, and didn't have to publish a book because s/he was doing editions and articles, and that should be enough.

In music, articles play a role absolutely, more than in other fields. In music, for many years, there was much less publication of books than there was of articles, and when I got tenure, for example, I didn't have a real book. I had a really large number of articles in all the important journals and they were well received, etc., they won prizes, and that was enough. I didn't publish a book until after I was tenured. That was true of many, many people in my generation. It's less true now, but it still remains true to an extent.

I have two colleagues who have received tenure since I've been here and another one who's up for tenure. One colleague wrote a book published by a prestigious university press, and, of course, was also very active as a speaker at conferences….Another colleague did not do a book, but did many articles that were very well received nationally and internationally. And the person who's there now happens to have just finished a book. So this follows very much the liberal arts model in music theory…A book or monograph is not necessary if there's an equivalent with multiple articles in very prestigious peer-reviewed journals.

I think that's an accurate perception that musicology still emphasizes the monograph. It's certainly not something that music theorists are generally expected to have done before tenure, so in my case it's not something I've thought a lot about trying to do.

Ethnomusicology: The importance of the book

While tenure and promotion requirements can vary somewhat in musicology and music theory, advancement in ethnomusicology requires book publication with a prestigious press, accompanied by article publication in top-tier peer-reviewed journals. Here many institutions are raising the bar, even "going as far as expecting two books for tenure."

> I think it's pretty typical of ethnomusicologists at research one institutions, and I think my institution would be comparable in that regard, and so it's nothing revelatory or surprising, really. You have to publish a book and if you don't, you can probably kiss promotion good-bye. And you have to publish that book with a press that is recognized as important in the field, and there are a handful. And ideally that book is going to be out in time to receive some positive reviews. This is the standard routine for promotion in many fields at research one universities. Beyond that there are the requirements of…at least one article in the flagship peer-reviewed journal in the field. In our particular case that's *Ethnomusicology*. And then a host of articles in other peer-reviewed venues is also certainly a requirement, and these become requirements to a lesser degree on the list of criteria, starting from the book…You don't want to be seen as a one-trick pony. So if there's not evidence that you have moved beyond that first big research project that the dissertation was part of, and that maybe the first book was also part of, or very closely related to, if you haven't demonstrated that you've got a whole new direction and project going, then that's a major strike against you.
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> It really depends on the university but, at a research one university, I'd say a book is a requirement for tenure and, perhaps at the very top universities, they want to see a second research line that's been started and possibly a book coming. That would be the highest of goals. A book at a reputable university press would be expected, plus a couple of research articles.
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> There's still the book fetish, which our high-level administrator was particularly strong on. There absolutely had to be a book, and it wasn't enough to have a manuscript done and it wasn't enough to have a temporary contract. The book had to just be on the shelf for tenure…Then they kept raising the bar…
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> I don't know if there's a formula for it. It used to be in ethnomusicology that you didn't really need any publications to be able to get a tenure-track job. If you had good dissertation progress and you had an advisor who people knew who was willing to provide a glowing letter about you, that was enough. I'm not convinced that's the case anymore…

A glut of books

As in history and archaeology, some scholars and high-level administrators thought that the book requirement for advancement in certain music subfields (particularly musicology and ethnomusicology) is "doing a disservice" to the field by creating a "bunch of half-baked" scholarship. Instead, much interesting work happens in article format, and books should be encouraged only for established scholars with a distinct, reflexive contribution to make. As one senior musicologist noted, "My books came about really serendipitously…because I go into a subject that I suddenly or I gradually saw was book length." Several of our senior music scholars suggested that a series of well-developed articles or long-form articles should replace the book, at least in the early stages of a scholar's career. (In the following chapter, we explore how increased pressures in the monograph publishing environment are also leading some scholars to call for a move to increased article publication in lieu of books.)

My opinion has always been that the problem with the book requirement in tenure is that not all the most interesting work happens in book format. Certainly in musicology, most of your research is done by reading articles, and the books that I find interesting are often books from people at the end of their careers or late in their careers, who have been mulling over a range of issues for a long time and they bring it together in a really wise book, whereas at the beginning of your career, you have an important point to make here and an important point to make there. I would rather see more emphasis on articles, on maybe more creative online ways, also on contributions to major reference works.

The fact that you need books as opposed to really substantial, thoughtful articles is a problem, and I think some places are trying to get away from that. And I think that would be a good thing.

If disciplines remain book-based that's problematic, because it's hard to write a book, especially when you're learning how to teach and becoming a new member of a campus community. It's very hard to write a book within a period of six years. People have trouble with that even when they start with a dissertation, and are turning it into a book. So you can't just stop there and say, "Okay, we're not going to rework dissertations into books." You certainly cannot substitute another book as the expectation or just say, "Okay, you get two more years and then we want a book." So, I think other disciplines may need to think about the value of long-form articles, short-form monographs. I know Princeton University Press has been playing around with some of those ideas. I'm sure a lot of them have been. But, what about something that's about 100 pages of typed script? Where can we find an outlet for works like that? Those might be readable online…There are journals that will publish an article of, in journal pages, as many as 70 pages. It's pretty rare but it's possible.

I believe that the humanistic disciplines are doing a disservice to themselves by insisting on the monograph for promotion to tenure. What you're getting is a whole bunch of half-baked stuff, and the Europeans, including the English system, do not do that. So we're overproducing a lot of junk because of the pressure of that. And in some social studies areas now the triad of highly significant articles will do it. I don't see any signs of that happening in music yet, I honestly don't; you've just got to have the monographs. It's the campus judges in the world that have got to do something about this…and that would be the *ad hoc* committee plus the department. I think it is in principle still true, and probably even in practice still true that you could force the issue on this campus. It has happened when I was dean, where you had the completed typescript but it was not published. You may even have a contract, but, as we know, contracts with publishers are not worth anything, really. The publisher can always say, "Oh, I sent the final thing out to readers and they don't like it. Sorry."…But at least then you still had the monograph typescript. That's very different from having a series of really significant, cited articles. We have a little bit of a problem with articles out there that would qualify for tenure, and I do think this is an issue relating to scholarly communication. This is an issue that doesn't rest so much with a publication system or media, as it does with the judgment system in the field itself. And it's the social sciences where it's interesting—they are slipping over—and it depends on where you are in that.

Visibility in the field

By and large, the requirements for tenure and promotion in the academic subfields of musicology and music theory overlap significantly with activities that make a name. Most music scholars mentioned having an active life of conference appearances in the same breath as publication.

One is presentation of interesting material at important conferences. Another is publication in certain journals and certain academic presses. And along with that, but not necessarily the

> same as that, is the reputation that you have among important people in the field; so recognition by important senior people. There are leaders, people whose opinions really seem to matter in every one of these subfields in arts and humanities. So when those people start talking about a young and upcoming person in this field, then people really start to notice.
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> I guess the tenure activities are pretty close to what I would do to make a name in the field. I guess in terms of making a name for yourself, just being at conferences and getting to know people that way counts for something although that itself won't show up in your tenure dossier.
>
> I'm making a name for myself…I'm presenting at a conference abroad…I'm well known there, although for what some see as a negative reason. I don't know if it's an asset or a liability, unfortunately. But we try to make a name for ourselves here.

External letters, which inform review committee decisions, act as the glue that links reputation to tenure.

> Advancement requirements and making a name in the field are two sides of the same coin. When people come up for tenure we have external letters, which means that people in the field have to be able to write about you. So in addition to publication, you do need to reach out through conference papers.
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> My university is a special case in a way because the demands are so stringent, but it seems to me that if you get outside letters from people who have read your work in various places and know it, that's what you need…Often the people who are asked are not directly related to the candidate but they're just people in the field who will or will not have read and liked the work…they have to ask broadly.

M1.2a Evaluating Other Scholarly Genres

Music scholars may produce a variety of other scholarly products in the course of their research, including critical editions, encyclopedia contributions, museum catalog entries, liner or program notes, and CDs, among others. The consensus among the music scholars we interviewed seems to be that these activities represent "a lower-tiered category" of scholarship at the most competitive institutions, although there are exceptions. Scholarly products in some subfields are increasingly taking different shapes and forms, and making use of the Internet and digital technologies. Yet, as in other humanities disciplines, tenure and promotion criteria emphasize publication in traditional forms and scholarly outlets.

Critical editions

Critical editions of a composer's work are produced by some scholars in musicology. They require careful archival study in order to transform original scores in manuscript form (written in the composer's hand) into printed music for scholarly consumption and performance. Traditionally, critical editions count for less than articles or books for tenure and promotion, although this may be changing. As one publisher pointed out, "there are editions and there are *editions.*" Simple re-comparisons of printed music with archival manuscripts are very different from in-depth scholarly productions with monograph-like introductions.

> At my institution, for a while critical editions didn't seem to count. They maybe were valued slightly less than actual monographs. But now I have a colleague at another institution who I was urging to do an edition and this scholar has to get tenure, but has been told by the department that the edition will count the way a book counts…So that's nice…It seems to me that a lot of really smart people are spending a lot of their time on critical editions, one of whom is the Mellon music winner, Philip Gossett. His critical editions are worthy of promotion. People who edit for him know their work, they're really experts, and they should really get full credit, for what they do…I think that the value of editing is perhaps more recognized now than it used to be, because people like Philip are making so much noise about it…It's changing, the idea that young scholars shouldn't engage in editing activities until tenure.

Encyclopedia contributions

The *Grove Dictionary of Music and Musicians* is the major scholarly resource across the entire field of music, and scholars from any of the academic subfields may write contributions for this encyclopedia. Writing a contribution is credited, but may not be equivalent to a peer-reviewed article, particularly for the post-2001 online version of *Grove*.

> People do put their contributions to *Grove* on their C.V.'s, and to write an article on a major figure or a major topic in *Grove* is like writing a short monograph, and people get credit for that. Joseph Kerman is known for his article on Beethoven in Grove as much as anything else. But, on the other hand…people say, "I'd like to but I've got tenure review coming up and I've got to get three scholarly articles out. So *Grove* is going to have to wait." So, when push comes to shove, you really need to be publishing in a peer-reviewed journal, and *Grove*, although prestigious in the sense that you've been asked to do this, is not enough.

> I had a colleague who did some work for *Grove*…and who was very concerned that the work be published in print, because s/he was afraid that s/he wouldn't get credit. Despite the fact that this is going to be an incredibly important contribution, if it was just in *Grove Music Online*, my colleague was worried it wouldn't count and said, "At the moment, online isn't good enough." And that's going to have to change.

Creative scholarship: Records, CDs, performances

Ethnomusicologists, in particular, may produce records (CDs) or musical compilations as part of their scholarly research. The relative emphasis on this auditory practice in ethnomusicology is due to the cultural importance of performance in non-Western musical traditions, as well as the difficulty of transcribing non-Western musical traditions into Western musical notation. Ethnomusicologists may also perform with the instruments and musical traditions they study. It is suggested that such "creative" work is not valued as highly as traditional, analytical, print publication at the most competitive research universities.

> For people in the arts, there's always this issue of what should count in people's tenure files, what different media might need to be considered and every university figures it out differently. Some colleagues and former students always report that their so-called creative work isn't taken as seriously as the print publication side of the dossier, although people who put out CDs that are works of scholarship with liner notes, or put up a website like mine, did see that work counted in their tenure and promotion. And it depends whether universities make allowances for that or not…My institution is fairly liberal at some levels in the sense that when the appointment is made, the department is supposed to set out what the criteria will

> be, but the tenure committee may or may not really understand that or give full weight to other forms of publication in this kind of a discipline.

Less competitive institutions, in contrast, may be more open to considering creative work as a core part of a scholar's tenure dossier.

> I'm at an elite place where the expectations and the standards are extremely high; obviously this would be different in other places. Interestingly, a grad student of mine just got a job at a less competitive institution. But he says that their expectation is that everything he does will be counted, so if he does concert tours and CDs and things like that, they will be considered part of his tenure case. So that's interesting that somebody's thought that through and has decided to make that statement right at the beginning. No, I don't see other universities gravitating towards that model. By and large it's still print sources.

As with print publication, scholars who perform or create recordings are given greater credit if their recordings are professionally produced and distributed (i.e., peer reviewed). As the graduate student below indicates, scholars cannot simply self-publish their work on a personal website:

> Even the smallest liberal arts colleges who don't care about research do want at least one peer-reviewed something, so I got accepted to an international conference where I had a peer-reviewed article and put out a record. Any one of us can use our laptop to record something and I could sell it on my own website, but that wouldn't count. But that's different than if Rounder Records distributed my record; that would be seen as legitimacy, even if the people at Rounder Records didn't really know what was on this recording; the fact that this is Rounder Records means that someone else approved it. In our field, that is still the case. Someone else who's senior has to have looked at it and said, "This isn't bonkers."

Video documentaries: CDs, DVDs, websites

Alongside musical recordings, some ethnomusicologists also create more comprehensive video documentaries of particular musical performance practices. Video-based work is often seen as a digital accompaniment to the scholarly monograph, either as an enhanced CD inserted in the cover or accessible via an accompanying website. Even though a short clip of a video documentary can convey more information than text, documentaries may not be perceived as equivalent to a print publication.

> In the same way that textbooks somehow get fewer points than other kinds of monographs, there are some senior, tenured scholars who complain loudly that they worked really hard on this DVD or this CD that's all about a practice nobody knows about. And, again, if I'm writing about some music in another country, I could write five papers trying to describe it or I could show you a 30-second clip. And you could actually use that clip in your classroom instead of trying to hunt down a separate thing. Unfortunately, in the tenure process that picture is still not worth a thousand words. This is common across institutions.

Some ethnomusicology scholars are experimenting with sophisticated multimedia websites as a way to integrate video and audio-based data with scholarly text to create a comprehensive publication. (This work is discussed further in the next chapter.) The dynamic nature of Web-based publications is problematic for assessment criteria, however, since such products do not inherently include traditional criteria such as peer review and prestige.

> Some of my colleagues in the department who have been doing some work with webpages, and that sort of thing, we've had to establish a new set of tenure and promotion criteria that included some new formats. And so the same kind of parameters are at play in the sense that is it peer reviewed, then there's this messy (is the way they call it) matter of determining…We all know what the University of Chicago Press means and we all know what Indiana University Press means, and we know what a peer-reviewed book means, but what kind of venue is the website presented in, or how, in what way, or under whose auspices? So these kinds of things people are certainly considering, but it's hard to quantify or get a handle on, that's still a little bit ambiguous…But it's challenging because one difference is that at least the website versions of these things are dynamic…So, every year, I have sat on our merit review committee in the department, and every year the people who have websites put them back up again for consideration, even though we're supposed to be evaluating productivity in the prior year, because new things have happened with the website. It's a work-in-progress always, and so that's something that I think we still haven't figured out how to deal with.

Digital work and databases

Some scholars do empirical work that involves the creation of software programs to analyze musical scores and/or databases of marked-up materials for analysis. As the first scholar below explains, securing tenure prior to embarking on this research path avoided complications in how the work is evaluated. For the second, and junior, scholar below, there is still no assurance that this work will be viewed consistently in a positive manner.

> I included some of my Web activity when applying to some jobs, but not for others…I have to be careful. It might be considered inappropriate or who knows what people will say. For one job that I applied for, I definitely mentioned that and somebody on the committee, who was a programmer, was like, "Oh! So you're not going to be asking me to write all the programs for you? That's great!" Again, I'm grasping at straws. I have no idea if that will be seen as a positive thing in the tenure process.

> I guess I'm pretty unusual in creating databases…I'm not at all representative that way…Well, in my particular case, my empirical work was never an issue because I got tenure long ago, so it never really cropped up.

Publications in online-only outlets

The increasing competition for publication in the most prestigious university presses and flagship journals is driving the appearance of new online-only journals and other forms of electronic-only publication. While the high-level administrators we interviewed are aware that good work can come out in new venues, there are existing prejudices against electronic scholarship that stem from beliefs about competition, the quality of peer review, prestige, and tradition. Similar arguments were made against digital dissertations.

> I'm a pragmatist, which is to say that if an online format enables work to get published that is valuable and might not be published otherwise because, let's say, of the financial constraints on presses and libraries, then I would say let's encourage it. If it allows work to be published in a way, in formats—and this would be more interesting, I think—that wouldn't be possible in print publication, then I think it should be encouraged. But just because it happens to be a new medium, I don't see any reason to encourage or discourage it. It's just different. New doesn't necessarily mean better, in that sense, or worse…I think there is a set of unspoken prejudices that work against electronic publications…Here I'm just recording what I think are

> the impressions of most people in the field—when you see a C.V. that outlines publications, if you ask two people to compare these C.V.'s and one had books published by Princeton University Press, the University of Chicago Press, and Yale University Press, and the other one had http.www.\\, or whatever, the one that is going to look prestigious, more important, is the one that has the names of those academic presses on it. There's no doubt about that. There are other ways in which the quality of the material may become evident, but the answer is, yes, I think it does play a role, and it seems to work against electronic publication.
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> No one presumed that a new electronic journal was not peer reviewed. I think there might be a question about how strenuous the peer review is. But that's a question you might have about any new journal, so I think it was the newness rather than the electronic media that gave rise to some of those questions.
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> And then the journal will do the peer review process, which I think for journals does tend to work pretty well, whether they're electronic or not, I don't think makes any difference at all.
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> My first choice would certainly not be to publish online…There is still, in the field, the sense that most of what is online, not all by any means, is not looked at by anybody before—that it's not peer reviewed.
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> The other growing thing in our field is electronic journals, most of which claim to be peer reviewed. Some of the more important articles in Spanish are on this online *Sibetrans*, which is the Spanish Society for Ethnomusicology, so it's a peer-reviewed electronic journal, and again, our field still isn't ready. There's still skepticism of whether that should count as a real article or not. Some of it is being at a competitive institution. I have to temper this. I don't really know if other schools have the same snobbery where it's not just that you publish in a peer-reviewed journal but that you publish in the right peer-reviewed journal. So if I were applying here as a faculty member, to have a journal article in *Ethnomusicology* would count more than to have it in the *Latin American Music Review*, because that's the one that was heard of by most people. I've heard that it's the longevity of the journal. If it's 10 years old or less, it's worth much less than these long 30-plus-year journals. I know that's true in anthropology, for example, and it's a similar hiring committee so I am sure it's going to filter over into our discipline, if it hasn't already.
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> Academia is a very traditional field, people are reluctant to make changes, especially if they're afraid that it might jeopardize their chances for promotion or tenure…I don't think making a name has a great bearing on the means by which to publish, except that it certainly favors publication in the more traditional venues, so the journals and the academic presses that we're talking about. So in that sense, it does have a great bearing there, but nothing other than what you would expect…I think faculty still do resist newer publication outlets. I think part of the issue is that—and I'll speak only for the humanities and the arts—recognition is extraordinarily important. And that comes in part from the venues in which you publish. And there simply have not been electronic venues that have been able to establish the kind of prestige that print venues have had for quite a long time.

Developing standards for the evaluation of new scholarly genres, peer review

There are a small handful of tenure and promotion committees that seem to be interested in creating assessment criteria for online-only journals and other nontraditional Web-based publications. One institution created new criteria to judge nontraditional work, including considerations of the scholarly distinction of the venue, evidence of external academic evaluations (including prizes, peer review, and invited presentations), the anticipated audience,

and perhaps a technical assessment of its permanence. The quality of peer review is incredibly important to demonstrate.

> Some criteria to evaluate electronic publication formats would be a general assessment of the quality and the importance of the work published, because format is still an issue. I think some technical assessment would also have to be included. The permanence, however, that could be assessed of whatever material is put online…How stable an archive it is? How reliable an archive it is?…It was my best guess that these were the kind of sites that were going to stay up for a while. And my argument back to them was, "Well, fine, you also never know when a library is going to de-accession a book or when it's going to go out of print." But for the most part, in the world of research libraries there has been a degree of permanence in these collections, so that 20 years later you can go back and find the same thing. That's a real problem with online publication…The filtering system is an important one in the scholarly world, because it's a way of ensuring quality and ensuring that the important things get recognized…There's no reason there couldn't be peer review in electronic publication formats, and I gather there are some electronic publications that do peer review, but I don't know is that it's as well established as in the print media.
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> I never got the impression that the tenure and promotion committee cared much at all about the medium, whether it was print or electronic, but really cared about the question of peer review and access, the notion that something actually was disseminated to and would be respected by a community of researchers.

Drawing on scholars with expertise in new media to assess non-traditional genres is essential in both new and emerging disciplines. Additionally, when seeking credit for nonstandard publications, scholars need to take an active role in verbalizing the importance of their research, as well as the venue and medium within which it is published.

> Judging new media scholarship will be the job of the home discipline, with some input from the faculty at the new research center. That's the way it's arranged right now. But we'll have to see how all this evolves. It was thought to be important that these appointees have a home in a traditional department or school, and that it would be the responsibility of the department or school to handle their merits and their promotions.
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> It is, even within our own system, the responsibility of the candidate to inform the chair as thoroughly as possible about the venues in which his or her research appears, because the disciplines are so multifarious now that the chair really cannot hold on to all the stuff and be an expert to know that that journal is really important in that field. He can't, or she can't.
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> The case I'm thinking of is someone who's created a website…and that scholar wanted to know: would s/he get credit for it. So the department decided to have it peer reviewed by experts and to get all of those peer reviews in long before this scholar ever comes up for tenure and to have that as part of his/her portfolio. So that has been done, and we then drew up explicit guidelines for the kind of credit that will be given.

Despite the general aversion to new publishing models that may have not yet broken through the prestige ranks, the publishers we interviewed are interested in investing in technology. According to one publisher, a move toward online publication is inescapable, and will result in some scholars suffering in the short term until universities amend their tenure and promotion requirements:

> It's much more difficult to publish your dissertation, and much more difficult to publish music monographs in general. And so I think that the tenure system has to recognize that, and it also has to recognize that some of the best journals are now online-only…To move to online and better publication models, I'm afraid some academics are going to be sacrificed, in the way that there are going to be people who won't get tenure because they haven't done what used to be what one did, and, finally, universities are going to have to recognize, "Actually, we're shooting ourselves, we're losing the good people." And some smart university will start hiring those people and then the rest will catch on.

M1.3a Teaching and Service

As in other disciplines at the most competitive research institutions, teaching and service count for less than a sustained publication record in tenure decisions. Directing a center for musical research or managing data resources and/or sound archives are also activities that are perceived to detract from the research productivity of young scholars.

> Teaching and service are important but I would say that what you can get away with is minimal, at least at my institution.

Scholars in music theory, drawn from different institutions, emphasized rigorously "developing teaching techniques" as part of a possible route to tenure in that subfield, but this can be difficult to judge.

> They expect something in terms of teaching, research, and service, but probably research counts for quite a bit more than the others…You are supposed to specify one of the three areas as your area of excellence, and I think the statistics I've heard are that somewhere between 90 and 95 percent of everyone says that research is going to be their area of excellence. I think it's very hard to make a case for teaching as the area of excellence because you have to show that your teaching has had an international impact or something like that.

> So, the effectiveness of teaching, publication, and service to the community, those are now the three categories here. So for a music theorist it involves very good teaching, developing teaching techniques, and then writing a book and some articles.

Textbook writing is also perceived as "teaching" rather than scholarship, and thus is often considered to have less impact than research-based publication.

> And, yes, it's true that textbooks do help to earn tenure, but I would say it would be very difficult to get tenure here only doing textbooks…I have written a textbook and they are not viewed the same way here as books and articles. But I suspect that that is something specific to individual universities. It could be that if you have a few articles in a textbook it's okay, but usually a textbook is discouraged. In fact, there is a way now to build a project of a textbook into a sabbatical project, but you have to, I wouldn't say promise, but you have to be in negotiation with a publisher at the time.

> I hear, and people deny it, but I've also heard it confirmed that there's a point system. You get six points for a solid monograph, you get two points for a chapter in an edited book, one point for a journal article, maybe one-and-a-half points if it's the number one journal in your field, and other things. If you edit a whole book, an edited collection, you only get two points for that. Encyclopedia articles, textbooks are way down there, a half-point, one point, you barely get credit for that. How am I aware of it? I hear about it. It's ridiculous, I feel, from a scholastic point of view. If you write an incredible textbook that everyone is using, why

doesn't that get valued? That's the reality of the situation. We have to be more aware than our advisors are about this, because they're not applying for a job right now. They don't see what the competition is. When they applied for jobs there may have been only three people in this research area. Now there's 500 or whatever; there's serious competition now. Ph.D.'s are growing exponentially.

PART B. THE APPLIED FIELDS: MUSIC COMPOSITION AND PERFORMANCE

In composition and performance, publication takes the form of original musical pieces, the performance of pieces, and sound or video recordings. Many composers also write reflective articles based on their work. Researchers in electronic- or computer-assisted new music research also publish in conference proceedings, and may disseminate computer software and other protocols. A scholar's reputation and visibility in the field is an important criterion of success.

For those who are practicing artists, the methods and the modes of communication and dissemination are very, very different…The performing arts make use of the concert performance, the stage performance, and the performance event that is at once the new material that's being made, and the dissemination of that material. And there will be archived versions of the performance event that will remain subsequent to the event. Those could be video recordings. Those could be taped recordings. Those could be something on a CD. It could be put up on the Web.

Composition, of course, does communicate through scores and sound recordings. Whether you want to call it scholarship is a disputed question. But they do communicate. And advancement is measured by sound recordings, performances, commissions, and things like that…The composers are very much involved in new media. For example, one scholar has gotten a lot of commissions. He really is on top. He's one of the international stars of this whole new media and music thing.

M1.1b A Suite of Achievements Anchored by High-Impact Publication

The evaluation of scholarship produced by scholars with artistic careers, such as composers and performers, can be a challenge for tenure and promotion committees in research universities.

Well, the first question is whether you call it scholarship. Was Mozart a scholar? He wrote operas, he's a creator, and that's different, I think. That sort of creation, then, is judged pretty much the way an artist in the art practice department or a creative writing person in the English department would be judged—by their products, by their commissions, by their performances, by their publications. It's the same. I don't think that's so much of a problem as with the chorus director type, for instance. And so the scholarly communication in that field happens to a certain extent by journals, a journal like *Music Perception*, which comes out of the University of California Press, and then CDs, which are not performances. In other words, the artifact exists there…A film of an opera is an artifact. If you were an opera director, that would be a thing that you would produce as evidence of your creative activity. If it were a new opera and you had written this opera and you're a composer, you would produce that as evidence of your activity, too. So that's the way that stuff works.

I think, for many people on the tenure and promotion committee, first of all, dealing with the people who were already doing, and have been for some time, the non-traditional work—in other words, not books and monographs and articles—and that would be the people in the performing arts. That's always been a challenge to the people on the tenure and promotion committee, even before digital communications came into view. So how do you evaluate

> architectural drawings? How do you evaluate a musical performance? How do you evaluate a dance concert?…It's especially the people from the sciences that always seem to have much more trouble with how to evaluate those sorts of things, so the voice of the people from the humanities on those cases always had to be quite articulate.
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> In the humanities, I do think the book should be the gold standard for advancement. In the arts, it's far less clear. And that's exactly where we have some current issues, because if we are going to have on our faculty people whose primary area is performance…they're not, for the most part, writing a book. They may be making a new important recording…or whatever it might be.
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> You've raised this perennial problem of how do you evaluate, particularly our performers and artistic careers, within academia. Every university seems to have a kind of different answer to that on the surface. Underneath, they all seem to solve the problem, and that means that they confront their surface in ways that are a little inscrutable sometimes because it's done, but you don't know how it's done…So I'm on the advisory board in the music department. They do it completely differently. And my institution does it differently, too. So these are unique structural solutions, but I think the common thing is that question of "What is the text?," and the solutions all come to finding a way to reify that. And composers, yes, same thing.
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> This is my impression of the general academic community, who looks at an art practitioner and says, "How do you gain your admittance here? How do you hold standing here?" It's a big question mark that I see on a lot of people's faces, because it's obviously not the way that they hold standing. And there is a more generalized understanding about what it means to have a published book, and you know where you are in your career. You're not going to get tenure if you don't have the book. So what's the equivalent of that? So probably my history in the university is always about how the university makes the comparison between what it takes for an academic to receive tenure and what it takes for a creative artist to do so. So, there is a lot of gray in there.

Additionally, scholars working in the new interdisciplinary area of the "digital arts" further complicate the evaluation landscape in applied music.

> There's a flakiness factor that can seep in the digital arts. You have to ask yourself, where's the qualitative material for that particular field? And in the case of music composition, the artifact is an extremely important item. In the case of the digital arts, oftentimes, the artifact or the artwork is merely a small part of a much broader culture or critique. In that sense, music composition is still fairly old-fashioned, because it's saying, "What did you produce? We will assess it by certain qualitative criteria." And I think in the digital arts it's not like that. It's like, "I'm doing a combination of some sound and some visuals, and this program and that program." And you have these inter-art things, and you look at it and say, "Hmmm." We have this experience in music all the time. There's absolutely no interest in it. So scholars in the digital arts are really coming from a different perspective, and that gets interesting. What I love reading about the digital arts is, "Well, I loved your article on hybridization. That's something you don't ever think about over here." We're mainly thinking about this machine or that machine, and you guys are really dealing with the idea base and the whole critique and all these things that are connected that are very important for working with technologies. And you don't have a specific practice. The question I ask is, "Can you point to me the five pieces of the late 20th century digital arts that are the great pieces we have to know?" Well, I can point to you the music pieces that you need to know; these are hallmarks that just changed everything. But in the digital arts, there's just this wide landscape of different possibilities and this is good, and that's good, and this is good.

As a result, the two composer/scholars that follow below expressed their anxiety that the tenure and promotion system might not recognize the quality of their work, and their relief when it did.

> I'm in a school where the word "art" does not appear in the title of my school. Within that, I'm in a music department, which is thoroughly dominated by musicologists who do things like write books and give papers…It's hard to imagine anyone you talk to wouldn't express some issue about the pressures relating to how one circumscribes one's work and what counts and what doesn't. As an artist, I spend time working on solving problems while I sleep…And, as a result—I'm being completely far-fetched here—but you could argue that scrutinizing what kind of pillowcase I use is part of my research. My dean is not particularly interested in that. The point is that as an artist I'm doing this around the clock…But what I'm saying is I have certain kinds of paranoia and cynicisms about the whole system that are based on the concern that my institution is not going to have the wisdom to agree that what I do is important or that the concatenation of the things I do are meaningfully synergistic…This would be like your president or your dean saying, "Well, I didn't see your book at the airport bookstore."…Or your president or your dean is going to go to a party and hears, "How come your faculty has this person I've never heard of," this kind of thing…In fact, those fears have not come true…
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> I'm calling myself a researcher but it's not in a sense of the way that my colleagues would do research in psychology or something. That's a process of bona fide jury publications…Mine is totally creative research. So I have been able to both take advantage of the lack of understanding in the university of what a composer does and to have been the victim…But, it's worked quite well for me…I've sat on all different sides of the tenure and promotion system…and I always found it to be not only fair, but also severe, in a sense that it's not like, "Oh, you do music. You're fun. We'll let you be a professor of music." No, you have to show the stuff.

Yet, there are lasting concerns with the tenure and promotion process in applied music scholarship; namely, a lack of comparative indices and changing stylistic debates into what kind of composition counts for tenure:

> Number one, in contrast to what my dean suggested be my professional goal, I am not the world's most important composer of my generation internationally. Number two—and this is very important—no one is. And number three, in my field, artists don't think about each other like that. There is no consensus…I dream of a field like astrophysics where I imagine that somebody is number one, and everybody agrees that person is number one, and that somebody's number two, and somebody's like, "Hi, I'm number seven, so I couldn't be tenured at my institution, but I could be tenured at this tier two, whatever."…I imagine these other fields where people actually say, "Oh, that person wrote this most important book in the last decade or published the most paradigm-shifting paper in our field." That doesn't happen in music. And so the terror and the anxiety of trying to get tenure in music and specifically as an artist-practitioner…I really don't have any colleagues in the world doing the same kind of work…I am indeed, the greatest at what I do, but the problem is, I'm also the world's worst, because I'm the only one…I could compose pop music, I could compose Indian classical ragas, but stuff like that would not be seen as the composition that is desirable for tenure. So then you start to get into the genre and stylistic kinds of definitions about what could count, and then there are all sorts of other issues that reside on a very dynamic ground. It's constantly changing, which has to do with prestige and cachet and legitimacy and dignity and those kinds of issues. And that's different for every kind of school as well.

Visibility in the field: Commissions, reviews, reputation

Despite the ambiguity in judging creative forms, there are means in place to assess such work. Foremost is the tradition of review. The quality of a scholar is judged by many indicators, including commissions, peer regard, prizes, external invitations and appearances (noting the quality of the hosting musical group or institution), lectures, performance reviews, and guest lectures. Visibility in the field is imperative in the form of making a name and external reputation. Moreover, an individual is generally promoted on the basis of a whole body of work and the resulting prestige, rather than on individually judged pieces.

> If you're on the applied side, then review committees are looking for things like performances, and if you can get a performance at Carnegie Hall or reviews, newspaper reviews, produce CD recordings, professional recordings of some sort, and then a roster of performances. Where is it that you perform? Who is it you perform with? What's your repertoire? And then of course the composers are also in that boat as well on the applied side. How many commissions have you had? Have you had any orchestral commissions? What was the quality of the orchestra? What was the group that commissioned you to do that?
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> If you focus on composers and performers, you get into the issues of: How do you evaluate performance, which is something that I hear about from arts and humanities deans fairly often, it's "Well, we know how to evaluate the written word and publications, but how do you even capture, how do you preserve?" And one way you evaluate is how it gets reviewed by experts in the field.
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> The one case I looked at with a group of senior faculty in composition last year, I think we were all puzzled to figure out what to make of it…I guess in that case we looked at external honors, for example, commissions of work, which is not something that…I would think about in any of the standard humanities departments, but in music composition it seemed to be an indication of the stream.
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> How you do merit evaluations, between composers, history of music, and practitioners?… Someone who's really a practitioner, a performer, they're not going to be writing scholarly books…In music or dance, we get a few cases where we really have to evaluate on the performance—the venue, where are you being invited to perform? Is it local…or is it Carnegie Hall? Do you have CDs, are you being recorded? Reviews of your performances, so there actually are ways to evaluate that.
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> Composers are installed in universities. In America, it's the primary place for this kind of work. I'm not connected to any commercial imperatives. I don't have to have record sales or something to be recognized. I'm recognized on peer review and standing, which is not as clear. There's no committee that determines if I do good work. It's just a bunch of people in the field who say I do good work…I don't have to defend my work in writing, for example. I don't have to produce scholarly material in any shape or form that it is typical of the humanities…I would say from the perspective of me in the university, I'm illegitimate…The method is really about external recognition, how much people desire you. And the university ultimately decides you're of value if other people seem to think you're valuable…So, there is an academic persona—the teacher, the pedagogue—and then there's the artistic persona, which is an active artist in the world. I have to balance those two sides very carefully. If I'm too much in the university, then I will not progress here. The arts people who progress here are people who do art outside.

> There's absolutely no weight applied to what's called a dissertation. My dissertation was a piece of music and a written analysis of that piece of music. At the time, it was somewhat laughable, in the sense that the dissertation would have absolutely no effect on if I had a career in the field of music composition or not, but it was a requirement of the university…So we don't have the notion that there's this stunning piece of writing by so-and-so. We do have the notion that there's this stunning piece of *music* written by so-and-so, but you won't find it in isolation. There would be a whole body of work around it. There won't be just somebody with one stunning piece. It just doesn't happen in our field.

> I remember this really brilliant talk about the prestige in the field and what counts and what doesn't. The speaker converted the Indian monetary currency, the rupee, into different kinds of repus: a commission from IRCAM and Paris would be worth five repus, a commission from the New York Philharmonic would be worth seven repus and, for each important composer you name in your bio that you studied with, you get one repu, up to four, after which you lose one repu for each person you continue to name. The whole calculus worked out and I thought it was so brilliant. But it still sticks in my mind, because I would like to poll people in my field and ask, "Here's a list of 500 accolades. On a scale from one to ten, how important are these for tenure?" And then just to see if I can find whether the conservatories think this is important or the land-grant institutions think this is important or liberal arts colleges, etc…A lot of these things are also self-selecting…I had students who applied to jobs at all sorts of less competitive institutions last year, and the students were amazing and didn't even get an interview or didn't get a callback. And I called my colleagues at those universities, and they said, "I remember that guy, he was totally amazing, but it was clear he was this international superstar, he'd never want to stay here, so we didn't take a chance on him." And then other schools said, "What is this Darmstadt Festival thing?," which is the most prestigious thing in my field, or, "Where is his Marine Corps Marching Band Commission or his Music Educators National Conference piece for high-school flutists?," or something like that. There's no agreed pecking order of what's important.

Artistic scholars must be able to balance performance expertise with an ability to reflect on their work.

> And the kind of publication that this person's work would be evaluated on would be their artistic career…They may never have written an article of any kind and don't need to, as long as they're going to get the merits they need out of the domain of performance they have. Each performer has very particular specialties that they mine, and so that becomes that distinguishing character of this case. And then you get into the real nitty-gritty, which is how much does an artist talk about their work, as opposed to *do* their work? And usually that's not even a question because people love to talk about stuff, and they love to write catalogues, notes, and things like that. But occasionally you'll find a person who lives only inside their medium, and it has to stand on its own for them. And that's when you run into trouble…if there's not enough external activity, beyond their material…That's a fine point, but I find it's an interesting one, and one that you almost need to discuss with young faculty now.

Advancement in computer/electronic research: Conference proceedings and software

For composers specializing in new electronic/computer music research, scholarly products include not only performances and compositions, but also scientific articles or publications in conference proceedings detailing the composer's music-theoretical research. Many scholars in this area also produce software programs, which create new musical instruments or new protocols for musical performance, composition, or research practice. As the three main centers of new music (CNMAT, CCRMA, and IRCAM) include engineers, psychologists, computer

scientists, philosophers, musicians, and composers, each individual may prioritize different research products.

> If you're talking about computer music, the publication model that they're using is electrical engineering…Most of the action happens in conference proceedings, and it's all CD stuff. If you go to these conferences everybody gets their four-page proceedings article in the CD and that's what they claim on their C.V. They're not highly competitive. It's very easy to get published in computer music…People there are also much more applied-oriented…they want to create a piece of music, they want to create a piece of software…So they do these four-page proceedings articles that come out every year for the conference as a way of keeping their publication record up. But they're so alien from the rest of mainstream music scholarship; they're like a different department.

> I have to define myself a little bit as being kind of a mixed type of character. So I don't answer very well to the question of, "So what are you more, a musician or an engineer or scientist?"…The answer to all of that is, it's much more episodic and I'll be working for a certain period or project in one corner or another. But when it comes around to evaluating someone like me…colleagues in the music department may be a little more traditionally versed in terms of what counts. You'll often see discussion at the dean's level about, "Where's the book?" or that sort of thing. And the answer in my discipline has been, the essential ingredients of a steady stream of musical output, a complementary stream of theoretical work, and often attendant to that are applied efforts too, like software systems, or even as far as startup companies…and demos…All that gets evaluated by the individual who's trying to chalk up the merit points for the whole package…You have to gauge what's coming in first; you have to see what the nature of it is. If it's spread that's okay, as long as the depth and quality is there.

> We don't develop technologies just in order to have done it. The goal is that this scientific collaboration is then applied to concrete cases that interest people in society. The first use case, of course, is internal, because we have composers in residence who directly use the technologies developed by the researchers. Then there is another level of external users through a forum, and then other levels, like industry applications, end user applications, etc. So the goal all the time is to find concrete applications, and of course the kinds of researchers that find these applications are better evaluated internally than the ones that don't have applications at all. But on the other hand…sometimes in science you have new advances, discoveries, etc., that cannot immediately be applied in a given context, but maybe will be applied in 10 years, for instance. So we must also keep open space for investigation, for research with no immediate, concrete or commercial application. So you have to maintain a balance…between concrete or commercial applications and scientific dissemination in journals…You have to be recognized as part of the scientific community for your evaluation. And it's very important for people to get credit, which means that they have a sufficient number of publications in particular peer-reviewed journals and other outlets.

Visibility in the new music field: Music festivals, software demos

As for performers and composers, establishing and retaining an international reputation is crucial for those engaged in experimental music research and composition. In new electronic music, invitations to festivals, master classes, lectures, etc., are important both in terms of networking opportunities and as means by which to attract graduate students to study at one's home institution. Personal appearances are also an opportunity to conduct demonstrations of new technologies.

> I've made the presumption in terms of my C.V., which I don't know if it was an important factor or not, that it would be a good thing to show that other schools have invited me, and I've made a presence there, and that recruiting has taken place on that basis. So, people actually then apply to study to do graduate work with me, because they met me there or they heard about me…I'm making a name for myself…so it's been a project over these last years to get my name out there…That's just the way I feel, that as a way of getting more lines on your vita. There are also these things that are called electronic music festivals and…the networks are somehow a little bit bigger and more connected, so there's a little bit more excitement around that.
>
> So if you find somebody who really, really puts their work out in public through these personal appearance hands-on demos, that can be very good. I wouldn't recommend it as the only practice, but it should be counted. So you could say, I'm a little bit of a maverick thinker, maybe, compared to, say, a music historian. But I'm not alone, and I think that's the nature of this kind of subject…

One scholar and composer commented on the difficulty of balancing the scholarly aspects of work with a professional artistic career external to the institution.

> …I was trying to do all of those things while at the same time being almost unique among my colleagues in the music department in going out and doing international performances and keeping my name out there and composing pieces, which has been bread and butter in the research that I do…What I learned upon arriving at my new institution is that the demands of tenure are so acute that I don't actually have to be here. I don't have to have all these hours and minutes on campus. I'm supposed to be away. I'm supposed to be making my institution famous by showing my face at other schools and other festivals and other conferences, which I was already doing but now I do it even more. And so during my intake interview, the department chair told me that my job is, in seven years, to become the most important composer of my generation internationally, and that would be what I would need to do to, in a sense, assure everyone that I was tenure-able. And that was so amazingly daunting…After the chair saw all of the blood rush out of my face, s/he said, "But the other thing is, we don't hire people unless we think that they could actually possibly do it. This is actually a place where you can get tenure." And I'm still pinching myself but apparently…it can be done…So I'm outlining at least two dilemmas, one of which is an artistic/scholarly orientation toward multiple fields, which is tenuously seen as a good thing if you present it correctly, but could be held against you if it's not presented correctly…Most composers that I know also do other things. And so there is this constant concern that we're going to be seen as dilettantes in areas, and that we're dabblers, or we're doing tokenistic work in areas outside of the field that we're supposed to be responsible for and the one in which we're supposed to establish our mark…But creative artists tend to have interests that bifurcate and continue to split in all sorts of other directions. So my appointment would not have been possible had I been only a composer, and yet, paradoxically, I'm told that the requirements for tenure are to distinguish myself above and beyond all others in a narrowly defined field of composition.

M1.2b Teaching

Given the strong tradition of "master classes" in musical performance and composition, teaching is an important part of faculty work in artistic practice. Yet, as in the academic subfields of music, teaching holds less weight for earning tenure compared to other scholarly activities such as establishing one's name in the field.

> Now at my institution service is not listed. There are two components: one is teaching and the other is research. It's disputed by the provost, but it's commonly known that teaching counts as half only if it can be used against you. It counts as zero if it's really great. So, in other words, no one gets tenured on the basis of teaching.
>
> Artists and composers like to engage the dialogue and teach…and I'm not me unless I'm teaching and getting this flow going with students, where I learn so much in the process. If I were just to go outside the university and not have that, I wouldn't make the progress I do. It's kind of crucial.

PART C. ISSUES SPANNING ACADEMIC AND APPLIED FIELDS

M1.1c Skills Needed on the Job Market: Learning to be a "Renaissance Scholar"

There are a variety of institutional models for housing scholars across the musical subfields. Moreover, scholars at all career stages push forward the agenda of the field by introducing new research areas and specializations. The variance in scholarship and academic positions has consequences not only for tenure and promotion, but also for the hiring process as young scholars work to "spin" themselves to fit vacancies in different departments. Composers have to be theorists, ethnomusicologists must teach mainstream music history, and musicologists have to be up to date with the next new thing.

> Most jobs are mainstream jobs in music history and music theory…So, if you're an ethnomusicology student, the only courses you ever TA are ethnomusicology courses, which means that when it comes time to look for a job you have a harder time, because people often in these jobs are looking for someone who does 19th century music history. It would be nice if you also had a slight specialty in popular music and, by the way, can you conduct the glee club? Those things make it very difficult and they're highly specialized.

Trendy subfields

Interest in non-Western music and popular genres is increasing among scholars in musicology and music theory. Having expertise in so-called "trendy" music areas is attractive to some young scholars as a way to strengthen their resumes, though some music scholars warn against the dangers of following fads.

> These things seem to swing from one decade to another in a way, and I'm not sure I can really tell you what's going to be trendy in the future.
>
> Young scholars have to find where their heart is, and it might sound trite but that's where their treasure is. They should not do things that are trendy, because these trends change so quickly. For example, a lot of departments are on the popular music bandwagon and incorporating that into undergraduate courses. I'm not against it, I just don't have the identity with rock and roll and all of that…If rock and roll isn't your thing, don't go with it.
>
> Pop music scholarship is a rapidly expanding field. Most people who are getting jobs nowadays have at least that as part of their portfolio…In academic departments, the Harvards, the Yales, and the Princetons, they're looking for pop music scholarship as well.
>
> I think the thing that's going on now in academe is that people specializing in, let's say, Baroque opera musicology, there are not going to be too many jobs for people in this field,

> because the range of what departments want is increasing. There is a whole lot of interest in non-Western music and in popular genres, non-canonical genres, and departments simply can't afford to have specialists in every historical period. So I think really, there's not going to be that much demand for 17th century scholars, or 18th century scholars, or 19th. Maybe 20th.
>
> I also do a lot of recording work. I'm a recording engineer. One of my specialties, and I'm going that way, is music and technology…There are a few universities that are launching digital media initiatives and things like this, and they don't actually really know what they're looking for, but it has "digital" every sentence…Large research universities all do these cluster hires now. And so they create a whole new center. And one of the hip things in the last couple of years is digital media. So you get these very strange-looking job postings, because it's obvious they have no idea what they want at all. If it's digital and coming from music, they like that. So that is the angle I'm pushing my research toward, or my job talks or my conference papers and all that stuff.
>
> I've been pretty fortunate in that regard. I haven't had a lot of problems with papers being rejected or anything like that. I think maybe I'm fortunate in the area in which I work. I think maybe people who do more analytical work on really standard repertoire music might have a harder time getting published than someone who does more theoretical work of a kind that is currently in vogue, which might describe what I do…One pre-tenure scholar I know hasn't managed to put together a very good track record yet, partly because of the nature of the work s/he does. It's not quite what's in vogue right now.

Ultimately, as described by the graduate student below, it's important to keep a finger on the pulse of the field:

> I think part of academia is all about pendulums swinging and seeing where you are, and not getting hit by it. Today the same thing on your C.V. that could trigger a committee to put you to the side, in two years could be the thing that gets you on the short list. And so this is where, for us, the old-fashioned talking to lots of people behind the scenes, going to conferences and schmoozing up, gets us much more of a sense of the pulse and will help us in terms of how we position ourselves more than anything our faculty do in the classroom.

Particular difficulties in ethnomusicology

Ethnomusicology is often ascribed secondary status and, consequently, getting an academic job may be harder for graduate students in this music subfield. As one graduate student noted, musicology and ethnomusicology are separated by a "demilitarized zone" and, when seeking employment, ethnomusicologists must be able to explain and defend their work to traditional music scholars who may constitute part of the review committee.

> Even today my students go out and get jobs and they're treated offhandedly or treated as some kind of a minority thing, rather than equal partners in a music department, by the people who do the classical canon…I thought it was going to change, if you'd told me 20 years ago that there would still be this level of a problem that there is today, I would have been shocked. It's still there, the entrenched interests that find everything we do threatening. I shouldn't say it's all like that. There are a lot of inroads that have been made and a lot of broader recognition within disciplines. Even within the American Musicological Society, they have a dissertation fellowship they will actually give to people to do ethnomusicology topics. But in terms of the actual job stuff, a lot of stuff can still be difficult.

> You don't have access to people because this division is very strong…The hiring committee for prospective jobs may be musicologists, may be people from across that "demilitarized zone," so we have to also be able to communicate with them and have scholarly discourse with them, so we're in a potentially very tricky situation…
>
> I have a friend who was bemoaning the fact that s/he couldn't get a job…and I said, "Have you explained why your music is important?" My friend said, "I don't have to." And I replied, "Actually you do, to everyone, because even if you were lucky enough to walk into a department full of people who themselves are giant fans of your area of music, you would still need to explain why, then, they need to hire yet another person." So part of getting a job, it seems like, is "What is my fit in your department? What do I offer you that you don't have, and what do you offer me that will support me in future research endeavors?"

Ethnomusicology graduate students may also face stiff competition from scholars in other fields, such as English.

> Or you have someone who's getting a Ph.D. in English, but happens to write a discourse analysis of pop song lyrics, and suddenly feels like applying for ethnomusicology jobs. They can't even read music. They don't have any concept of the history of the discipline, but they have a musically themed thing, and, man, are they good writers and are they good literary critics. Of course they are. They're way better than we're ever going to be at picking apart the discourse under three words. We can't do that. We haven't spent six years doing that. And if you have a department that says, "Maybe a literary thing would be good," suddenly someone who spent their whole life trying to get an ethnomusicology thing happening is suddenly competing against someone who in the last year or two just put a music theme on the top, but who really is coming from a different angle. I'm glad that a variety of viewpoints come into the field. It's just a professional problem that we face.

The music scholars we interviewed mentioned several planned strategies to secure an academic position, including emphasizing teaching experience and interests.

> The conventional wisdom is it depends not only what kind of department you're applying to, music department or not, but what kind of school. If you're applying to a small liberal arts college, then even downplaying the research is good. And one of the things we face is sometimes they say, "Well, you're from a highly regarded institution. You don't even want to be here in Ohio, do you? And you're just using this as a stepping stone, aren't you?" And you have to say, "I swear I applied to a small liberal arts college on purpose. This is the teaching I want to do." So, then we would play up our teaching experience. But, if we apply to University of Texas, we have to downplay the teaching, because they don't care about that, and play up the research.

The super-specialization of research across music subfields means that younger scholars may be encouraged to gain expertise in a variety of specialties and research practices to enhance their portfolios. This seems particularly relevant to graduate students in ethnomusicology.

> At this research institution, they're unabashedly honest about this when we enter our program. "You have entered into the Ph.D. This is all about gearing you up to research and write your dissertation, and so that's what we want you to do. And then we're going to supplement with a ton of teaching because that's the other thing that you're going to have to do." And they make us teach Western music and non-Western music stuff, because they want us to be eligible to teach in a music department anywhere. And the head of the department says that straight out when you enter.

Graduate students in ethnomusicology complained that they are not prepared for the job market, nor are they taught how to write in traditional communication formats, something they felt could be remedied by substituting the term paper for formats akin to what is produced by scholars, namely journal and encyclopedia articles, book chapters, and so on. Despite a degree of confusion voiced by some younger scholars over what they consider to be ambiguous tenure requirements, we were told that mentoring is offered to graduate students to help them navigate the tenure process. These same students also mentioned that they felt their advisors were out of touch regarding what it takes to get a job. According to these students, early publishing is essential, and publication could take a variety of forms, including book reviews.

Musical composition and performance

Finally, we were told that music departments simply produce too many graduate students for too few university positions, especially in the applied fields of music.

> Most music institutions follow the sort of Juilliard, Eastman model, Indiana model; they want to produce orchestra musicians, people who can get professional jobs as musicians out there, and there are lots of students who in high school, the best thing they did was they played the flute. They played the flute better than anybody else in their high school. They really love music so they head off to a university in the music program, where there will be 25 other flute players, and it doesn't take very long after the first year, the second year that they realize, first of all, that they're not the best flute player in the program, wherever they happen to be, and that the number of professional flute jobs out there is minuscule. In a sense there's a big problem in disciplines with career paths, because the reason many departments are so big is that there's a huge demand by the students to do it. In some ways students are faculty members' ways of creating more faculty positions, rather than faculties providing career paths for students. Most students who graduate from the music program will not actually end up in a job in music. The exception to that is music education…So there is a bit of a kind of Ponzi scheme; it's much more popular as a student to take music than the output opportunities.

Many music composition graduate students will likely seek music theory teaching jobs due to a dearth of music composition positions.

> A very few students in composition will go on to be what you might call orchestral chamber music composers. So that accounts for a small, elite number of graduate students. Most of them will go on to teach traditional music skills that are part of the undergraduate curriculum in universities. It's oftentimes called "music theory." The problem there is that a lot of universities now just offer Ph.D.'s in music theory. So you're not a composer; you're just a theorist. That means that you publish papers in journals, and that's how you do a career. I think there are some big question marks with that…

As a result, several composer/scholars discussed the difficulty of constructing their self-identity as a composer alongside their scholarly identity of a researcher and teacher.

> One of the things that I specifically do, unlike most visiting composers in a standard "visiting composer talk," is I specifically try to outline the psychological and social dilemmas that I felt that I faced while I was a graduate student in constructing a self-identity as a composer, and secondarily as a researcher and as a teacher. And I do that specifically, purposefully, because I felt that it was missing in my graduate education. We'd have this parade of role models come through, and they were role models in the sense that they were doing interesting work,

> but they were not particularly helpful in actually revealing the stresses of getting to the point where they are in terms of the construction of their identity.

For students in musical composition who opt out of academia, a good working knowledge of music technology helps to secure a job in the field.

> If they don't go on to postdoc work of one sort or another, graduates in music composition go into the job market to compete for positions that are usually in music composition and technology. Most of the positions now being offered in music composition usually say, "We're looking for a composer who has extra skills like conducting an ensemble, directing an electronic music studio." So the composer is expected to have a kind of package of skills…They have to understand the field of computer music, they need to understand basic technology. Otherwise, there's absolutely no future in music composition.

2. CHALLENGES AND OPPORTUNITIES FOR DISSEMINATING RESEARCH: WHAT ARE YOUR CRITERIA FOR CHOOSING A MEDIUM?

Scholars in every music subfield prefer to publish with established university (or other relevant) presses and/or peer-reviewed journals characterized by prestige, a targeted audience for specific work, and the technical capabilities to accommodate musical notation systems. Specialized journals and broader interdisciplinary venues are often chosen alongside flagship music outlets. A variety of problems are perceived in the music publication system. These include a crisis within the academic subfields resulting from the disjunction between (1) stringent tenure and promotion requirements for high-impact books and print journal publications, (2) the limited number of presses and journals with recognized prestige, (3) a slow peer review process, and (4) the high costs of publication, which include securing permissions for copyrighted material and preparing camera-ready copy of musical examples. Many scholars noted a need for more journal outlets and lamented the inadequacy of print media to accommodate presentation of sound recordings, video, ethnomusicological notation systems, and/or high-quality detailed manuscripts and other archival data. Perhaps unsurprisingly, outlets enabling multimedia publication, such as peer-reviewed online-only journals, have been slow to emerge and are viewed as less prestigious by most scholars. In contrast, computer musicians and researchers have largely addressed these problems by creating self-publication systems to post multimedia work and to disseminate open-source software, tools, and other technologies. Yet aside from specially equipped performance halls, there are too few performance or publication venues capable of disseminating high-quality productions or recordings of new music and contemporary composition. The different publication systems in the academic and applied music subfields are discussed separately below.

PART A. ACADEMIC RESEARCH: MUSICOLOGY, MUSIC THEORY, ETHNOMUSICOLOGY

As part of a humanities field, scholarly research in music generally takes the shape of monograph publication, and/or single author articles in peer-reviewed journals. While some music theorists publish monographs, many lean toward the article as the primary form of archival publication. Academic music scholars seem to share common concerns regarding the state of peer review and the speed of the publication process; however, music theorists seem less affected by any perceived crisis in scholarly publication.

M2.1a Criteria for Choosing a Publication Outlet: Prestige, Peer Review, Audience, Speed

For archival publication in the academic subfields of music, there are select university presses and journals that signal the highest prestige and widest readership. The genres explored here include monograph and article publication, as well as critical editions and encyclopedic entries.

Monographs

When it comes to choosing a scholarly press to publish a monograph, scholars in musicology and music theory consider prestige, first and foremost.

> The principal issue, from a musicological standpoint, is status. There are lots of monographs that are published. My blood starts to boil when I get to this point. I think it happens in arts and humanities, maybe in other disciplines, but people like really excellent production, there's nothing greater for an author than to pick up this really wonderful thing with the purfling and the beautiful acid-free paper, to smell your book. There's a certain kind of cachet that really warms the hearts of arts and humanities scholars about the physical product. And the imprint is everything. So everybody wants to publish with Oxford University Press, and it shows. It shows because all you have to do is look at the costs of the books and the catalogs…Most of the music cognition research in monograph form is published by Oxford University Press, and they're expensive to buy. I don't know what the publishing costs are. When you go with Oxford University Press as an author what you're getting is terrific service. What you're getting is an editor who's going to phone you up and talk to you and schmooze with you and an editor whose name you know and is known in the field. Then when you drop by the conference in New York, you're going to meet the editor and the editor's going to take you out for a very nice dinner, that sort of thing. But it means that the book that you publish is going to cost 65 or 85 dollars and your students won't be able to afford to buy your book. And so when I wanted to publish my book, I actually went through publishers' catalogs and I tallied up the average cost of the book…and I found another university press that publishes these things relatively cheaply, even though they have a name…But the one thing you will find with this press is that they won't answer your email. You'll have to send them two or three emails and then after a week somebody will respond to you. There will be the acquisitions editor who acquires a book and then you'll be passed off through the whole chain of command and their assembly line. You will not have a relationship, you will not be coddled, and you will not feel like you're a god for having published with them. And for years I have discussed this with my colleagues and I said, "For God's sake don't publish with OUP." But they do because of the prestige and the status…

Hand in hand with prestige is the fit between a scholar's work and the mission of the press. Certain publishers focus on particular musical specializations, and are recognized as prestigious among fellow scholars in that research area. Key here is the press's expertise in working with particular musical notation systems.

> I would say that in looking for a press, it always makes good sense to find one that has interests that are consistent with whatever your topic is, and I think especially beginning faculty don't always realize that…I think it's true that the more prestigious the press, the better it is to publish there. That being said, I think there are some presses that don't have the glossiest names that are regarded among people who know as doing important work in certain fields, and only good work in certain fields. I wish there were more of that.
>
> You have to look for a good match, at least that's my own personal experience. Oxford University Press is very, very interested in 20th century materials…and so that's why, for me

> personally and for my work, that seems to be a good fit. Cambridge University Press is also a very prestigious publishing company, and I'm not personally exactly sure if that would be a good match for me, because they have published some technical things in the past, but I think Oxford is more interested and courageous in going with the analytical. When I was speaking with publishers at a conference recently, I spoke to someone from another university press, and that editor said, "Is this book going to be music theory?" I said, "Yes, yes, it's going to be music theory." S/he said, "Well, I don't know" and was very honest. So they're more interested in historical monographs. And so you just have to get the feel for where things fit. I have a colleague who's published with the University of California Press, and that seemed to work well. So, you have to really speak to the editor in great depth and know how they will promote the books, to know if your book fits in with the other books because then the marketing becomes easier.
>
> I went with the University of California Press because…why did I go with them? They wrote to me, I think. I forget why, but I guess someone heard about my book and inquired.

Journal articles

In the academic subfields of music, there is an extremely small pool of society-run journals or presses that signify both prestige and the broadest possible audience. They are, consequentially, highly selective.

> Part of the difficulty, also, is that the journals essentially have a monopoly…The three most important academic organizations of the United States for music are the American Musicological Society, which publishes *JAMS* (the *Journal of the American Musicological Society*), the Society for Ethnomusicology, which publishes *Ethnomusicology*, and the Society for Music Theory, which publishes *Music Theory Spectrum*. *Spectrum* is published twice a year. *Ethnomusicology* is published three times a year, and *JAMS* is published four times a year. This is very typical. You see that this particular issue has three articles. Now there are some book reviews at the end, but most commonly they're publishing in a typical issue three or possibly four articles, which means that, over the course of the entire year, the society is publishing 12 or 16 articles, or somewhere in that range…There are 3500 members of the American Musicological Society. Along with their subvention grants it means that they're probably publishing about 20 items a year. This is the premier publication, and by the way, this is the *only* publication produced by the American Musicological Society apart from the newsletter. This is the only publication provided by the Society for Ethnomusicology and so on. So there are probably on the order of about 10,000 music academics in Canada and the United States, and the total number of publications that's coming out…this is extremely difficult to get published in.

In addition to these three flagship journals, the *Journal of Musicology* (published by the University of California Press) and the *Journal of Music Theory* (published by the Yale University department of music) are also widely considered to be prestigious in musicology and music theory, respectively. As in political science, another low-paradigm field, there are different journal hierarchies in each music subfield. Examples of primary specialized journals include *Popular Music*, *Perspectives of New Music*, and *The Cambridge Opera Journal*. While the music scholars we interviewed noted that good work gets published in more audience-specific journals, they realize that they earn more institutional credit by being published in the most prestigious journals named above.

> It gets to the level of really a maniacal obsession with the quality of the journal. So you have to rank the qualities of the journals when you submit the case, and the publications are supposed to have been only in the top ranking journals, which is ridiculous because more interesting work might be done in journals that aren't so well known, and you would want to take that into account. But, generally, it's the blue-chip approach to everything, the blue-chip publishers, the journals should be blue-chip journals, and you see cases where other kinds of publications had to be minimized if not discounted. There may be different ways that journal prestige is measured, but the idea itself that that's crucial just strikes me as being ludicrous…I would be just as interested in somebody who wrote something that's really exciting and I wouldn't care which journal it's in if I thought this was first-rate work…But we're talking about institutional recognition versus individual reputation, which is a different matter altogether, of course.
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> There's a scholarly society for just about anyone who's ever written a book, it seems, sometimes. They're boutique. Many of them have some kind of journal or review. Again, very boutique. Those are mostly associated with or they're arms of the scholarly society. Then you have university press–published journals. There are very few commercially published journals in the field…
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> For publication in music theory, there are not a huge number of choices. There are a few fairly prestigious music theory journals that would tend to be most people's first choices if they think their work is good enough. And then there are a number of sort of second-tier ones that are reasonable options, also. I guess the first tier, I would say, probably *Music Theory Spectrum*, which is the journal of the Society for Music Theory. There is the *Journal of Music Theory*, which is an older one that has been around quite a bit longer than the society has, actually. Those are probably the premier American journals in music theory. There's one in England called *Music Analysis* that's very good. The second tier could include *Perspectives of New Music*, which is an odd title for a journal, it always sounds like the wrong preposition or something. You have a perspective *on* music, not *of*. Well, as the name suggests, they tend to limit themselves to articles about at least music of the last 100 years or so, but the journal still ends up being kind of an interesting grab bag of some very different things. And then there are a number of regional ones—there's a journal called *Theory and Practice*, which is actually the journal of the Music Theory Society of New York State, but they've published some good work. There are a few journals published by graduate student organizations, including one at Indiana, the *Indiana Theory Review*.

Audience

In addition to publishing in the flagship journals and writing for specialized target audiences, many academic music scholars also publish in a wider range of interdisciplinary journals to broaden the audience for their work. These outlets can include interdisciplinary history journals in musicology, area studies publications in ethnomusicology, or even a science journal in music theory.

> Articles sometimes have a wider circulation than books do in the sense that people not in the field might read them…For instance, I just got a copy of the *Journal of the American Musicological Society* and I saw an article on jazz that I think I might read but I don't think I'd pick up a book on jazz. I don't have the time. But sometimes if you have limited time and you want to know what's going on the field, you will read, cover to cover, an issue of a journal. So I think it's very good for people to appear in these top journals, and I think that's one way of becoming known in the field…For myself, I hardly think about it anymore, but I can tell you that, as a young scholar, my formula was: give a paper every year, write it up and publish it as an article so there was something coming out every year, and publish it in one of the main

journals, but once in a while hit an interdisciplinary journal because you do want to have some sort of larger community interested in your work and also you want to read more widely than your own small disciplines or small field.

There are a couple of flagship journals in ethnomusicology. Ethnomusicologists also publish in flagship journals in folklore or anthropology and those would all be considered top-notch locations. I think as well, ethnomusicologists publish in some area-related, geographic area, and journals such as Asian music or African music, that kind of a journal.

I publish, let's say, an article in a periodical that seems appropriate for it, and I will look certainly at the periodicals that I think will be most often read by my colleagues, not only in the United States, but abroad. So if I publish something, for example, in a smaller periodical abroad, I will ask for permission to publish it simultaneously in English, so that I know that more people will have access to it…

I've published an article in a music library journal…and I published it there because I wanted every music librarian in the world to know what was going on. You asked how do I choose where to publish? Well, that's how I chose. I could have published it anywhere I wanted to publish it, but I chose to publish it there because I wanted the music librarians to know that we were doing this.

I published one article in a scientific journal, which sort of fell into my lap. They accepted a music-related article by another author, and because of my previous work in the field, they invited me to write this "perspective" to put the other person's work in context for a general, scientifically literate reader who may not know very much about music theory. So my article wasn't really a research article, in a sense. It was more of a synoptic overview, trying to explain how the other author's work fits into the field.

Critical editions

Critical editions of a piece of music arrange a musical manuscript or score into musical parts for performance, and are very important for symphonies and opera houses around the world. As described previously, critical editions can be minor technical works, or lengthy, complex (and sometimes collaborative) scholarly products. Scholars at competitive research universities who produce critical editions also publish books and articles.

The equivalent to publishing images in art history in music is critical editions. If you go into the music library over here, you look up Shostakovich or something like that, and you will see 20 volumes of the collected works of Shostakovich, and they've all been typeset and so forth. So one of the big make-work projects in music history is critical editions. So pick your composer, Vivaldi or Chopin, whatever, there will be people who have gone meticulously through the handwritten notes and the manuscripts and the autographs and the proofs that were sent to the publisher in 1872 and all that stuff. They will go through and there will be different versions of this. There are two publishers, in particular, who are the classic publishers of critical editions. One is a publisher called Henle, and another is called Broude Brothers. These are the premier publishers of critical editions. These are massive projects that require several collaborations among a number of different authors or scholars who are all working on the same composer, and they put together these things and it often takes 10 or 20 years for the whole thing to happen.

I'm a music historian, and I do all kinds of things in music history. One thing I do is prepare and publish critical editions, major series that are put into print so scholars can use them everywhere, and that are also made available to performance houses throughout the world.

> Performance houses need to have printed musical parts or they can't perform these scores. The singers need to have printed vocal scores or they can't study them…I also, of course, write books and articles as well.

Grove/Encyclopedia entries

The *Grove Dictionary of Music and Musicians* is both the central resource of the field and another publication venue for scholars of music. Publication in *Grove* is an indicator of prestige, and many scholars are recognized for publishing reference articles there. This type of outlet is not, however, equivalent to publishing a journal article.

> As a scholar you're looking for obviously the most prestigious and widely read place…*Grove*, because it's an encyclopedia—it's not like they go looking for the most interesting new scholarship—and they need to ensure widespread coverage, like an update to the article on X, as well as need a new article on so-and-so. So it's not like journal publishers and book publishers, who are always trying to grab the hottest new subject, not quite in that position, with an encyclopedia. But *Grove* is looking for the very best people, definitely, to do the work.

> …Many articles in *Grove* really are written as a summary of the existing information on a topic. But there is also, particularly in early music…a lot of articles in *Grove* where information exists only in that article in *Grove*. It has not been published elsewhere. And so people will put their new research into the article in *Grove*, in a way that is not like most reference works. Now, they wouldn't commission an article from somebody who didn't work on that and expect them to go out and research it. But with anything *Grove* writes, they commission it from an expert, who often includes information that they haven't published anywhere else and they put it in their *Grove* article.

M2.2a Perceptions of the Publishing Environment

Peer review and editorial quality

There are differing views about editorial quality in traditional music scholarship. Given the nonprofit, society-run nature of the flagship journals in music, most editors are active scholars with heavy workloads. According to some scholars, these scholar-editors may lack the training, time, and resources necessary to edit a top-tier scholarly publication. One scholar also complained that one journal editor pushed through articles from all of his/her students. Although peer review is a prerequisite for publication in music, the quality of peer review is said to be uneven and in some cases declining, particularly in less prestigious outlets.

> I think the process as a whole tends to be about as fairly done as it could be at the top journal of music theory, *Spectrum*. I think everyone takes the peer review process seriously and we've had submissions that are well regarded, and are published.

> If you're asking, "Is peer review working?," well, we have a lot of peer review. I'm not sure that it's working, because I see stuff that comes out that is not edited. This is not ready for publication, it's just not thoroughly done. One aspect of it is good, another aspect is totally erroneous; they weren't aware of the research. I don't think peer review is working across the board, I would say. Probably at the journal *Ethnomusicology*, I would say peer review is working. None of the articles are bad there. None of them are like shameful or anything like that. There may be a little inaccuracy or something wrong, or maybe I disagree with it, I have plenty of things I can disagree with, but, still this is really well done, they have good

> standards. I can't say that about any other journal. It's hit or miss, and typically miss is my feeling. But that's my experience.
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> I think our journals could be run better than they are if we had people with the time and resources to do it in a better way. I hate to say that it's better with for-profit publishers in the sciences, but still, if you compare journals in music theory with various journals in physics and chemistry, there's certainly a real difference in production values. In the sciences, you have much larger journals with much larger circulations and much larger staff, including people specially trained to work with graphics and so on. But music journals are typically low-budget operations, run by professors in whatever time they have available, or even by graduate students. I think we suffer sometimes because the people who work on the journals are not always really trained to do it right, which leads to production problems. I really suffered that with an article I published last year: it actually had to be reprinted because there were so many mistakes in the graphics the first time they printed the article. It's hard to know exactly what went wrong, but I'm not the only person this sort of thing has happened to.

Academics are already stretched for time so it is difficult to solicit top reviewers in the field. The problem of locating peer reviewers is compounded by the rapid growth of many musical subfields, particularly ethnomusicology and music theory, as well as the highly varied and distributed nature of research in these areas. It can be difficult to locate and compel quality reviews for small and emerging research areas or find unbiased reviewers on topics of scholarly contention. As one ethnomusicologist points out, this makes it difficult for peer review to perform the traditional function of "making the work better."

> I think peer review has mostly deteriorated in the last 10 years. In one respect, it's deteriorated. More and more people feel they don't have the time to do peer reviews, so it's more and more difficult to find reviewers. And that's meant that the review opinions are not as good as they used to be. So, essentially when you're seeking people to do peer reviews, you're forced to go lower and lower and lower on your list of top possible reviewers.
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> You must have heard this from other people, but there are problems with the peer review process, too…I would say that the kind of problems that we have with peer review, first of all, it's difficult sometimes to twist people's arms into doing peer review because there's no acknowledgment for it. You put a lot of activity into this, a lot of effort, and there's no acknowledgement anywhere for it. So that's the first issue. The second issue is that often, especially in blind peer review, people don't necessarily behave as ladies and gentlemen when they write these things. The worst thing about being an editor in a journal is having to smooth over the ruffled feathers of authors who have received really outrageous reviews that should have used much more temperate language. Then often people will be sort of hypercritical. There will be disagreements about particular ideas. A classic example in music history would be Tchaikovsky commits suicide, and you'll find people will think that absolutely there's no question he committed suicide, and people think absolutely there's no question he didn't. So you have trouble publishing anything along these lines because all you need is one person from the other side and they think these are completely bogus arguments. One of the troubles that I have with publishing…and it's probably because there are so few venues, is that then any little criticism…It's like grant applications to the NIH; one little misplaced comment, and you're out, just because there's so much competition.
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> There was a situation that I heard about where someone wrote a book, and then they were asked who would be the right person to peer review their own book. It goes against the idea of the anonymous peer review. It's like, "Hmmm, who would I like? My mom?" But, again, the field is so diverse, and that diversity is part of its beauty and its greatness. There is so much

> interesting stuff, and so many unexpected places, but it's having a hard time adjusting to its growing in size. It's just exploding in size and there are not enough people to review. *Ethnomusicology* is reviewing books that were published in 2000 and 2001 in this year's journal. There is that much of a backlog. There's a pile of several hundred books at the office.

The exception is the *Grove Dictionary of Music and Musicians*, which is professionally edited by staff at Oxford University Press. *Grove* also draws heavily on external peer review and editorship from active scholars. At the *Grove*, the editorial process is very important: "Every single thing that goes into *Grove Music Online* is vetted and edited and considered. So that's what makes it *Grove.*"

Speed

Both musicologists and ethnomusicologists may engage in years, or even decades, of research prior to publishing scholarly monographs. (Indeed, two of our senior music scholars asked for the gift of more time.) This is due to the lengthy periods of archival research or fieldwork required of many musicologists and ethnomusicologists, respectively. The research and publication process may be faster for some music theorists and other scholars who work with easily accessible musical scores.

> It takes time to publish. If it's a graduate student I think you have to add at least a year onto their Ph.D. timeline, from other humanities disciplines, maybe two, because it takes them a year to be in the field and then if they come back some of them still have data processing to do before they're ready to write so that might be six to 12 months there, and then they start the writing process. Some are faster and come in ready to roll right when they get back; they've been doing it all along in the field.

> Someone reads my article only when it comes out. So unlike the sciences, you're not likely to get scooped. If there's a 4-year delay, you're talking about stuff that happened 400 years ago, what's another four years? So you're unlikely to get scooped. There's not the same kind of time pressure that you're going to find in *Nature* or *Science* or something like that. But status is still the biggie.

Nevertheless, many of the music scholars we interviewed thought that the publication process takes far too long, in both journals and university presses. This delay seems to be due to issues of editorial quality described above, as well as the slow speed of the peer review process and the large publication backlog in the flagship journals.

> As a practical matter, some presses are much more efficiently run than others, and people can lose a lot of time waiting for reviews to happen in inefficiently run presses.

> It takes too long. In many arts and humanities journals, the official policy will be things like, "We intend to get back to you within three months," but despite the official policy it's often six months, and because they don't publish these dates there's no accountability for these things.

> Speed to publication varies a lot from one journal to another. *Spectrum* is actually pretty quick. From acceptance to publication tends to be a year or less with *Spectrum*. The *Journal of Music Theory* has been a lot slower in recent years. In fact, they're even slow on their actual publication dates. They're still publishing the 2005 issues right now, which I think is relatively unheard of in some fields. So I don't know, I think that just comes down to the people who are doing it and whether they have adequate time and resources.

Long lag times can be particularly problematic for younger scholars in musicology and ethnomusicology who have to produce publications prior to tenure reviews.

> An article takes two years, probably, from the time the research starts. It depends on the journal. Sometimes it takes three months to get an article read, peer reviewed; it might take six months to get a book peer reviewed. Then of course from that point there may be changes, and once those are made, still further time until the book or the article is actually published. I think speed is a concern. I think it's hard for graduate students who need a publication to go on the job market. I think it becomes a concern for faculty before they have tenure, as they're coming up for tenure, because they have to plan so far ahead in order to make those deadlines and there are not many chances for missteps along the way.

> Speed to publication is very much a problem. I was lucky in that…I had some time in my first job to basically start the revision process and really move the ideas that I had presented in the dissertation forward in a new direction before I took this position here. But I had colleagues for whom this was their first job and six years doesn't look like such a long time if you haven't got a book in the pipeline yet, because it can take…I can't even remember how long it took for my initial reviews to come back when I first submitted to the press, but it was a long time, maybe nine months or a year, just for the manuscript to be reviewed. And then finally it was accepted and now I have to start my revision process, and that went through multiple iterations as well. And then of course…well, you know the routine. So, yes, time to publish is an issue…One of my colleagues just barely got tenure, even though s/he's now got this wonderful 700-page book. But because of the time to publish, the book was not yet out when his/her review was happening.

> The other thing is the turnaround time is terrible…Two to three years is a common turnaround time, but it's hard to tell. Because I also do work in psychology, one of the nice things about psychology journals is that they typically publish the date at which the manuscript was received, the date at which it was accepted, and the date of course when it was published. So this is also useful for, especially for young faculty, because it takes so long to get through that whole process if you're in your tenure review, the last thing you want is pulling your hair out asking "when is this going to appear"…It took six years for my first article to appear.

Speeding up the publication process

New communication technologies, namely email, are warmly embraced by editors and scholars alike for speeding up parts of the publication and peer review process.

> The burden of the current peer review process for editors is time. You send something out for peer review, and people will promise you a review in X number of weeks, and you're X times three and it's still not…that's a great burden. It's a time burden. The communication burden of it is not so great. I think the ability to circulate, certainly, short pieces, the review of essays—I'm not talking about whole books—or the prospectus or abstract, sample chapters of books—all that online works very well. That's been made much easier, I would say. If I didn't mention that in some of the answers, I should say that the submission process, the process of the initial review, reviewing a prospectus, reviewing a sample chapter, all that online is much, much less cumbersome than putting things in envelopes and mailing them out, manuscripts in boxes.

M2.3a Crisis in Scholarly Publishing: Getting Quality Scholarship into Print

Although prestige is important for scholars choosing university presses and journal outlets for publication, there is a limited number of such outlets and an expanding number of scholars working in the field.

Monograph publication

Many university presses are reducing their titles in the humanities. While leading scholars at the most competitive institutions are still publishing work without problems, pre-tenure scholars are facing an increasingly competitive publishing environment.

> Part of my view is that these are changes that are taking place around us, and faculty are in the position of adapting to whatever kinds of social and technological changes in the media that are happening. It's a long process. In publishing, I think there is a crisis…I think that it is mostly the case for our faculty that they get their work published, but I still think there's a crisis. And I think there are other ways in which it manifests itself. I think outside of my institution, it's a very different picture. The University of California Press, about five years ago, announced that it was no longer going to publish in the field of literary criticism. Okay, that tells you something: it's not a viable field for this press…So that's one measure of a crisis, certainly…But the crisis is also related to shifts of interests in various fields, and shifts in what's perceived to be exciting and sexy and new and hot topics and all that. So there are a lot of different faces to this crisis…If you made a survey of university presses in the humanities, it would be interesting then to look at how many manuscripts are submitted at the presses each year and how many manuscripts are accepted and published. You would find it's tremendously, tremendously competitive. More and more presses are screening out projects before they even look at manuscripts…It's gotten much, much tougher over the last 10 years, let's say.

> I mostly heard from some very angry faculty members about the press' discontinuation of publication in various fields, and I think the perception was, "Oh, they've decided to go for the coffee table books and abandon serious scholarship." There is an effort, I know, on the part of the press now to involve some leading figures in the humanities and advise them on how to go at this juncture…I agree that something has to give, between needing a book for tenure and the university presses being incapable of publishing that much. I think it's going to give last at the best places…because I think our people are going to continue to be the ones who can land the contract, at least a few months at any rate, before it's time for tenure…And that will reinforce the perception in places like ours, that they're maintaining standards and the lesser places are letting them go, and so on and so on and so on.

> I never thought that anything really good would not be published. I never had that feeling from any of the people I knew. I know one scholar who is having trouble getting a book published, but it's a particular kind of book and might not actually be a book. It might really be a series of essays and it doesn't feel like a book. And yet my colleague needs a book for a promotion, so maybe s/he tried to make it into a book, that kind of thing…I wrote book proposals, but I didn't try to get a contract until my books were done. I knew that I would get them.

Advice given to pre-tenure scholars about how to publish their dissertation work is symptomatic of the changing environment for monographic publication. Extensive revision, as well as the addition of new material in many cases, is increasingly required to turn a dissertation into a book.

> You don't precisely publish your dissertation. But publication of research based on your dissertation or even just simply a substantial revision of your dissertation, which is basically what mine is, then that places it in a different category. The University of Chicago Press is generally recognized as the top academic press in our discipline. And they state as a matter of policy that they don't publish dissertations, but they do…If you send them your big black book and say can we publish this, they're going to say no and they'll send it back. But if you're doing a substantial revision, maybe you've done some follow-up research, you're completely reorganizing, you're reanalyzing or whatever you might be doing in a revision process, then they certainly have published examples of those. They ended up not publishing mine but I found another press that was comparable in that regard. I don't think that they will just publish a dissertation as such.
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> Another issue is that I have friends who are music books editors at prestigious university presses. It used to be to get tenure, you had to publish a book. So what a lot of people did was finish their dissertation, fix the typos, send it off to a publisher, and presto, they had a book. Publishers absolutely will not publish a dissertation anymore. It's out of the question…I happened to be standing there when a scholar spoke to a music books publisher at a conference. This scholar described the dissertation, the approach s/he was taking—it's a very modern and very forward-looking, very interesting dissertation, looking at this performer from lots of different angles and using both traditional kind of archival research and also modern ways of thinking about performance and gender and all the buzzwords. This scholar had all the bases covered. And the publisher said, "Well, I can see that you might write a book on this person, but we won't want the chapter on the history and maybe you could add a chapter just comparing her to Madonna. And then, if you could make it shorter and…" Essentially what the editor was talking about was completely different. It really would have taken this person several years beyond dissertation to recast this, where the scholar should be moving on to the next thing. S/he doesn't want her whole life on this one performer. So, it's really this: A dissertation really does lay out the groundwork on something, and university presses don't want that, they want it short, they want it interesting, but not necessarily so heavily scholarly.

Some established scholars did not perceive the increasing difficulty of publishing dissertations as a problem. Instead of spending time reshaping the dissertation into a book immediately, many advisors suggest that their students mine their dissertations for articles to develop the topic before writing the book. As one senior musicologist stated, "I really believe in articles. They lead to a book. They make you ready."

> I think that it's actually a rather healthy thing not to go publishing everybody's dissertation, because I really do think that very few dissertations are worth it. And I think it's very healthy for people to write a dissertation and move on.
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> If you're going to publish your dissertation, that's a completely different thing from publishing a new work or a newly rethought version of your dissertation. One is easier, and if those are not being published now I applaud that, the kind of "turn your dissertation into a book without alteration," I just don't think that should count…I'd rather see people publishing a few articles from their dissertation and rethinking their dissertation and maybe expanding it or contracting it, doing something to it that shows that they're maturing intellectually.
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> Now, I do know that there are places that require you to have a certain number of actual publications. It certainly is the case that it is harder to get a beginner's monograph published today than it used to be.

New models for monographic publication: open access and on-demand publication

Few music scholars spoke about economic models for new publication outlets.

> There are some basic facts about the human body, including the human arms and eyes, that mean when a book is important we're probably going to want a book, and there is publishing on demand, and there are some very interesting options out there in the world, but we're not going to be probably really reading books online. It's very taxing. So that's the kind of key limitation…The young generation of scholars that is used to reading everything online is going to mean an interesting change in disciplines, not just in modes of research and dissemination, but actually the nature of the disciplines, it seems to me.
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> Some publishers put earlier published books into electronic reprints. Of course, that's happening around us. That's not something we're doing.

When asked about open access publication, one dean thought author-pays could risk promoting "vanity publications."

> I think what I would be saying would have to be put in brackets, because I know so little about it. But at first blush, I would say that open access might be a workable model. With the author-pays model, it seems to me that the primary risk would be that everything could be a form of vanity press. So whoever is able to pay or pay the most would have the best chance of publishing. How would you guard against that? Whereas, open access, I take it, doesn't in and of itself explain how the costs of publishing would be borne. There are some costs associated with publishing even though it's open to everyone. So who's going to pay that? Not the reader…but someone, grants…
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> Somebody has to act as the editor who's responsible, and that's a personnel issue, and then somebody has to be that person. Those are some of the issues with open access.

On-demand publication may be an easier adaptation for university presses, but it might negatively affect image quality.

> Monographs have changed with technology less so, except inasmuch as it's opened up the possibility for on-demand publication, and so that you don't have quite the problem that you used to have of how many of these things are we going to stock…I know, as an editor for a series at a prestigious university press, basically, that they keep those things in print largely that way, in plain covers, and somebody asks for a copy…Usually what happens is you'll get an initial print run of 400, 450, or something like that, and then when that's exhausted it will be on demand. I don't know exactly what print runs at the university press will do on things like this, because all the expense is in the upfront handling of it. I think that there's some problem about the quality…if you're going to use color illustrations it doesn't work or something like that. That's a problem for humanities monographs, and they try to balance that off by larger-appeal publications. I know the press will do cookbooks and wine books or state history or something like that.

Article publication: Online-only journals

Several scholars complained about a glut of books and the need for a greater emphasis on articles instead of books. Given the highly selective nature of the top journals in music, the slow speed of the peer review process, and the increased pressure on young scholars to publish articles in lieu of (or in addition to) books, there has been a proliferation of new journals in the

past ten years. Some of these new journals are online-only, which enables scholars to better integrate sound recordings, video, manuscripts, and other systems of musical notation with text. In addition, there are some disparate experiments in new electronic journals to encourage peer-to-peer commenting. Yet, the existence of new journals seems only to strengthen the prestige and selectivity of the top print outlets. The peer-reviewed *Music Theory Online* (published by the Society for Music Theory) is perhaps the sole online journal afforded respect similar to other print journals in music theory (this impression is not universal), but this may be due to the fact that music theory is already an article-oriented field. The few online-only journals that have been successful have focused on establishing a reputable editorial board and attracting high-quality authors.

> We do have now some purely electronic journals that work fine, I think. They're new…there's the *Journal of Seventeenth-Century Music* that is the standard place if you're working on that area. I bet that's only been around for 12 years or so, that's just a guess. It's online-only…In a case like that the journal's perception and prestige depends a lot on the editorial board and the people who publish in it. It's an offshoot of the Society for Seventeenth Century Music and they just decided, "We're going to an online journal," and that's what they did, and it does work and it belongs to the Society. The interesting question is how they managed to get that up. Obviously what happens is there are one or two people that know how to do this and say, "Okay, we're going to do it."…You would think if you set up a good editorial board and a good peer review system, that that should be accepted. And I think in the instances we have, the *Journal of Musicology* is a relatively new one that is definitely accepted as top in our field. And then the *Journal of Seventeenth-Century Music*, which is electronic-only. The *Journal of Musicology* is hard-copy…Most of the electronic journals are going to be new, in any case, because most of the hard-copy journals are owned by private people or by societies.
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> We have one online journal in music theory; it's called *Music Theory Online*. It is also sponsored by the Society for Music Theory. They seem to be doing a nice job. There's a lot of nice flexibility in that medium, they put out an issue whenever one is ready to go and they don't necessarily have a fixed schedule but they manage to put out several issues a year, it seems. I had one article published in there and I like it. I think there are some questions about how it is regarded, whether an article in *Music Theory Online* counts for as much toward tenure, for example, as an article in print, but I think it's moving up and getting close, anyway, in the level of prestige…That moving up may be due to the fact that there have been a number of fairly important papers published there in the last couple of years, and that's something that has gotten a lot of attention and has been a little bit controversial and attracted a lot of discussion. And of course they have an even quicker turnaround time than the fastest of the print journals, probably.
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> The Society for Music Theory does have something called *Music Theory Online*, and it's deprecating. People want to publish in *Spectrum*; they don't want to publish in *Music Theory Online*.
>
> New forms of publication do not hold the same value as standard forms, but I think that's mostly a reflection of people's opinion of them rather than of anything inherent about them. I think there's no inherent reason why a document published online needs to be inferior to the same document published on paper. The opinion of the document published online is that for some reason it hasn't met the standards that are in place in academic publishing in journals and by presses. It's generally known and assumed that competition to get a manuscript published at presses is very fierce, so built into that process is the understanding that the things that get published are the very best. It's not just that there's peer review, but there's intense competition. I think it's perceived that the competition for publishing online is not

> nearly as stiff, and that while there may be peer review built into some of these venues, there are others where there's not peer review. It's also a medium that doesn't seem to have some of the same constraints and pressures that print publishing does. So, I think people sense, somehow, the competition is not as tough. And I think that's one of the reasons why people think it's not as great an achievement.

From the editorial perspective, a musicologist relayed the story of the founding of a new online journal in music that is scholar-run, cheap, open access, and peer reviewed:

> I wish the AMS would start up about half a dozen more electronic journals…It's really a great opportunity if we can do that…The new technology really does give us some great opportunities, but what we need is some good leadership…The obvious solution is electronic publishing, because it's very cheap…The first problem with a new journal, though, is that the principal indexing service in music is called Music Index…and their policy is they don't index anything on the Web…which is the kiss of death. People can't find it as long as it's not cited in any of the indexing services.

M2.4a Affordances and Capabilities of Publication Models: Musical Media

The presentation of research in academic music often includes complex musical notation systems (including music manuscripts, scores, and ethnographic notation), and these may form crucial components of a scholar's argument. These musical examples can be represented in a variety of ways in archival publication. First, the music example can be embedded in the text as a printed score. Once photocopied reproductions, scores can now be embedded in published text cleanly or shown as an appendix thanks to encoding programs such as Finale or Sibelius. Second, the original musical manuscript, written in the composer's hand, can be included in the text as a high-quality image, as with archival materials in history. Third, some monographs come with CDs tucked in their back covers. Although flagship journal and book outlets design their physical shape to accommodate musical notation, the great irony is that paper publications generally cannot offer the advantages in this area that digital publication would.

> With music, you've got an artifact that is not purely text; I'm talking about scores, the way it's notated. There is, of course, the physical music example, which would be the printed score embedded in the article, which you would you access just the way you would access a painting in an art history article. Scores can be encoded now into things like Finale or Sibelius that give you very true…It used to be that you had to do scores like photographing a map, but it's no longer true. So it's less a problem than you might think.

> The capability of a publisher to work with particular media does affect my choice of publisher. Correct, and I didn't mean to avoid mentioning one of my publishers…they do editions of music and they're international. And this was a very good venue for me to publish a manuscript. So the thing I'm doing is going to be done by them, because they're not a publisher of monographs but of manuscripts.

> I had this problem with my most recent book where the facsimiles are in black and white and you really can't see the layers of the ink and sometimes it's crucial.

> Yeah, I publish a lot of graphics. In a sense, I guess I do take that into consideration when choosing a publication outlet, although one would hope that, with relatively conventional kinds of graphics, that any journal ought to be able to handle them.

> One of the conventions in our writing is about: how do you describe in layman's terms enough of what this sounds like, so if someone's never heard it, they'll know enough in music technical terms if they want to take it to the next level? So, one of our challenges is to transcribe the music into a notation system, enough so that anyone can decipher it. That's the difference between when non-musicians write about music and when musicologists or ethnomusicologists write about music, is that we know how to add in the sounds…From other areas, the apologies come, "I just want you to know, I know nothing about music." But, imagine if I said, "I'm going to write about the history of Panama, but since I'm not a historian there will be no dates here. I'm sorry."…Or a physicist who says, "Actually, I don't really know anything about mechanics, but I'm going to tell you all about…" It's very strange.

One music theorist explains the evolution of publication models for presenting manuscripts and other visual media over the course of a career:

> For those musical examples in my first book, we took photographs of manuscripts and then I sent them to the press and they put them in the book. The second book was a facsimile edition of manuscripts from the archive. That was done with Ektachrome prints. And now, a book that I hope will be out in a few months…is going to be very unique in that it involved the digital photography of manuscripts from the archive. Now the archive said, in addition to printing these manuscripts, they wanted a CD. And so for me this represents something very, very unique…So when this book comes out, it will have a CD, as well as the printed material. Then a book I'm working on right now…I'm speaking with the Oxford University Press…and their idea is to make the transcriptions of the manuscripts available on a website. I had asked, "How about a DVD?" and they said, "Let me go one step further and have it available as a blended book." I'm mentioning these four books because they represent a progression toward technology. I haven't even submitted the proposal yet…but of all the publishers I spoke with, Oxford had the most forward-looking idea as to how to make this material available.

Audio and video

There is increasing interest among many (though not all) of the music scholars we interviewed in including not only scores, but also audio or video clips in written work. This is particularly important for scholars working with performance. To this end, some monographs come with CDs or DVDs tucked in their back covers. Additionally, online versions of print journals may link to audio examples via scholarly society websites or online repositories (e.g., the *Journal of the Royal Musical Association*). Some scholars, particularly those in ethnomusicology, cited new publication models as the ideal way to present this work in a more "integrated" manner.

> …then there's sound and the actual doing of sound examples, which is actually not very difficult. And a lot of journals and monographs are now doing musical examples and sound examples. Music examples are embedded in the publication as manuscripts or scores. The sound examples come as CDs; with monographs, you sometimes get a little CD slipped in the back. The *Journal of the Royal Musical Association* now allows you to access sound examples online, too. Most of these things are available online…Permissions, of course, are a problem, but they are a problem everywhere…Art history has always had this wonderful advantage, that they cannot only put the painting there—sculpture is a little bit more problematic—but they can put the detail there. Music can't do that, well, now it can. You can access sound examples by going to the website. And so examples were much less effective, and I think still are. It's quite rare, even very highly polished professionals will not claim that they can really hear the score by looking at it. They can access it and they have a pretty good idea what it's going to sound like, but the actual sound of it…and composers are like this, too…they need a

performance to figure out, "Oh, I shouldn't have done that." So the whole example system, until you actually get actual sound examples, is not nearly as effective as it is for art.

It's one of the things that I think musicologists are going to be kicking themselves for in another 10 or 20 years. They're going to say, "How on earth did we ever do musical scholarship without musical examples, without sound examples?" And the Web is so beautifully set up for this, it's so music-friendly.

Integration of audio in publication might be something I consider, eventually, for my current project. I can't really imagine it right now, but I think I might want that.

…the live performance of ancient music, you can immediately get something that writing it down will never manage, and even going to a conference…and talking about what you're doing and playing what you know it must have been like, isn't going to be remotely like hearing a musician who's done this all his or her life, and so I think there was a gradual convergence. There is actually now an attempt by musicologists to be playing these things and bringing them alive, just as there's more staging of these plays with use of music and so on.

Unique needs of ethnomusicology

Ethnomusicologists have always had difficulty communicating their unique research data (which have been traditionally captured in video and audio) to a field driven in the main by musical scores and facsimiles of manuscripts. Like archaeology, much ethnographic data are dynamic in content and comparatively little ends up in the final monographic publication. Scholars in ethnomusicology overwhelmingly called for a move to online multimedia publication as the only way to present a complete and integrated picture of their research. As one senior scholar noted, "being able to physically contextualize the musicians, instruments, and venues remains crucial for the Western understanding of remote cultures." Some authors create their own websites with video and audio materials to supplement print publication, or in hypertext format, but these supplementary materials are not peer reviewed.

We get a lot of books and articles that are hard to then use later…If you say, "I was in the village for nine months and these are the things that I saw," even if I don't like the analysis you've drawn from it, I can use that. I'm finding all these sociological studies from the '30s and '40s in Turkey. It's the only data where anyone has said anything about where they were, when they were there, and, "This is what I saw with my own eyes." Well, maybe you analyzed it wrong, but I can use that data, and it's very useful to me. And in ethnomusicology now, our focus is so much on theorizing what we've done, sometimes the publications come out and they don't have the data that might end up being more useful in the long run.

We have our particular problem in trying to communicate the medium we're working with, and that's been a challenge to ethnomusicologists for a long time. We're constrained by the printed page…There's less experimentation with audio/video embedding in terms of peer-reviewed outlets that I know of. Certainly people are putting up their own webpages and embedding video and audio in those, but I don't know of an example that's peer reviewed in ethnomusicology at this point.

Ultimately, doing a hypertext format: I could actually be talking about a recording, and, wow, you could click a button and hear what it is I'm actually writing about, rather than having to go and find the CD that probably got lost in the library copy and popping it in and trying to find the track and I don't know if it's the right track…

Sharing this kind of data openly, however, presents ethical issues, which should be dealt with on a case-by-case basis with considerations of the research subjects and history in mind. One ethnomusicologist who chose this route was motivated by the need to digitize and preserve the research data, have easy and unified access to this material for teaching purposes, and reach a wider audience (specifically individuals from the country where the research was conducted). The website was made possible via the university's hiring of a website designer, and took place after the material was out of copyright. As this scholar notes, it is difficult to locate such websites:

> No, I don't know how the website is used. This is the interesting trend for the whole thing. So everybody that I've mentioned this site to, looks it up and says, "What a great website, I'll use it in teaching." But the problem is I thought that the website is this big open thing and everybody will know about it. Well, nobody knows about your website, because there's no way to advertise the website. You don't get a flier in the mail like you do from a press saying here's a great website. The reviews help, the reviews are now in journals, so some people would have loved this review. Whether they will follow up and actually check out the website I don't know, but that's the rub, is that you can't find it…there's no way that a general audience, even ethnomusicologists, will know this exists, because you have to search it in Google, and if you're not looking under the precise genre of music, you won't find it. There's no way you can search websites of ethnomusicology that I might be interested in, or that might be useful for teaching. There's no way to do this now. So this thing has not reached the audience it should because I know from personal experience that all the people that find it really think it's neat, and they use it, but it goes by word of mouth.

Publishers in the subfield are transitioning slowly toward new models by offering Web-based companions alongside print publication. While these models carry the additional benefit of enabling international colleagues to easily access their work, important issues remain regarding sound quality and sustainability.

> The publishers are in transition, in terms of their practice for publishing multimedia. So Oxford University Press, in 2000, had CDs in the back. Now Oxford has moved to where they don't put CDs in the back, but the music is available online and you get access to it when you buy the book. So that shift has been made. Now, there are some problems with that but there are also problems with the CD in the back. First of all, the CD in the back gets lost, it gets stolen, it gets whatever, and CDs will no longer be playable. On the other hand, they put this thing online, you lose a little sound quality, first of all, which is actually rather important to us, but which gets completely overlooked, because MP3s are not as good as CDs. How long will they be streaming that website? I have no idea. But that's where that is now, and it's logical for them to do that, but it's a shift. So we're dependent on what publishers say they can do and can't do in these terms, and everybody's in that transitional state. The university press where I also publish…they're transitioning to that, they haven't quite gotten to where Oxford is yet on that, but they're going to move in that direction because it's logical. But as I say, you can only follow the logic of the moment, and you can only do what publishers will do.
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> People are clamoring for audio and video embedding in publications, and certainly the journal *Ethnomusicology*, for example, has a website where people can sometimes post the sound examples that go with the article. The publisher who handles the print is not really equipped to build the right kind of websites, so the professional association maintains that website and there's a good chance that as standards change and formats change, some of those will be lost. It's not really preserved in the way we think that digital sound and video should be preserved, so it's not a professional standard that's applied yet to the adjunct sound and video recording. And that's true of many university publishers as well. They don't have the financing in general to put up the kind of website they need to. They also depend on the authors to

> even build the webpage for them. One of them admitted that the other day. The good news is that a couple of presses, IU Press, Temple, and Kent State have recently gotten a grant from Mellon to explore linking the prints with the other media. I think that's productive for them to explore and hopefully something will come from that.
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> Certainly it's standard in the field of ethnomusicology—not required, but very common—for people to include some sort of illustrated material with the text of the publication, increasingly. The most common way that's happened is for a CD to be inserted into the book jacket or perhaps a multimedia CD or DVD these days. Our university press has argued against it for several reasons, including the fact that when the books are placed in academic libraries very typically the illustrative material is taken out of the book jacket and put wherever the library keeps that format. They're separated, and then the book remains on the shelves and so you're asking the user then to go to two different places in the library to put things together…And so to make a long story short, they convinced some authors to develop accompanying websites, but they quickly realized that they lacked the infrastructure and staff and expertise to do this. So everyone recognized after the fact, actually, that while it wasn't really a failure, it wasn't nearly as successful as everyone would have liked. It was pretty basic. That said, a number of people have been exposed to the work through bumping into my pages, including some immigrant performers in the United States. So it certainly had some payoff. I am certainly very attracted to the idea of a publication outlet in which—this is one of the things that attracted me to multimedia in the first place—everything can be in one place, that is the text, even archival or any other sort of documents you might have used in the research, video examples, audio examples, photographs, in one sort of multimedia publication is certainly of interest to me. I've heard of the EVIA Digital Archive as well, and that's leaning in that direction and I find that exciting.

M2.5a Music Economy: Securing Permissions of Copyrighted Material

In *Art History and Its Publications in the Electronic Age,* Ballon and Westermann cite the importance of high-quality images in the presentation of art-historical research, and the limitations posed by copyright law, publication costs, and existing publication models for the publication of art-historical research.[96] The field of academic music scholarship can be seen as undergoing a similar crisis—what we refer to as a crisis in the "Musical Economy" (after Ballon and Westermann's definition of the "Image Economy" in art history). There is no charge to the author for journal publication in most traditional music scholarship. There are, however, two other expensive aspects of the publication process in academic music considered to be impediments to scholarship. First, scholars are personally responsible for securing permissions to use licensed content (such as sound, video, or lyrics) in presentation or publication. Publishers generate large revenues from licensing fees for copyrighted works, and may act strategically to extend their copyright on particular manuscripts or recordings. Some of the creative work produced by scholars and composers—notably compositions, scores, and critical editions—remains in copyright for over 70 years. Second, as in history, archaeology, and other image-heavy fields, many scholars must pay to support the cost of preparing an image-rich monograph for publication.

> One thing I know is a problem in these areas, when the book and the visual combine, getting permissions and arranging for plates or illustrations that are absolutely necessary to the

[96] Ballon, Hilary, and Mariet Westermann. 2006. *Art History and Its Publications in the Electronic Age*. Connexions website: Rice University Press, Council on Library and Information Resources (CLIR), September 20. http://cnx.org/content/col10376/1.1/.

course of research and presentation is becoming increasingly difficult. You may need to pay big bucks. It also is just an enormous job to secure permissions for everything that you want permissions for, and it usually falls to the lot of the faculty member to spend his or her time doing this, which is absolutely ridiculous…One of the things that I'm still not completely clear on is how book deals that do require those kinds of dollars are structured, so that as a high-level administrator I'm not getting a lot of subvention requests, because I'm not, but that may well change as time goes on.

The only time we grapple with copyright is if we want to reproduce anything. We have the right to cite anything we want to cite. For works in the public domain, we can cite anything we want to cite. What we can't do is reproduce a manuscript without permission. And, of course, that's a problem. But if the ogres won't let you reproduce, you don't reproduce. You leave them. I know there have been some problems with 20th-century music. My work is on 19th-century music, so I haven't had a problem in that way. But, for example, for a long time while one of Verdi's operas was still in copyright, Verdi's widow refused to give anyone the permission to finish the third act, and you had to wait until it got out of copyright when she died, and then all of a sudden it became possible. The same thing happened with Puccini's *Turandot*. Puccini died before he finished the last act. The publishing house recording, actually before the work went out of copyright, commissioned a new completion from a contemporary composer, Luciano Berio, who is a wonderful composer, and no one's ever told me this, but I have no doubt that one of the reasons they did so was to keep their copyright in the work for another 70 years or whatever it is now.

One thing that is sometimes a big problem if you're dealing with music written the last 100 years or so would be copyright. If you tend to publish something you have to work through that…I want to say yes, this has impeded my publication of something; although I'm not sure I can think of any really definite examples. I have had to pay fees a couple of times, and I guess maybe in a way it's sort of at the back of my mind in avoiding working on certain kinds of repertoire. There are probably some composers whose music I wouldn't really be able to write about adequately in a journal without including extensive examples, and I wouldn't be able to do that. Anything before about 1920 or so is fair game, I think…There are stories about Stravinsky, who revised many of his early works later in life, and the revisions often don't amount to much at all, and the conjecture is that he did that in order to get a new copyright on it.

The major problem in our discipline is permissions and licensing fees, which have drastically reduced what we can do, drastically over my career. It used to be that you didn't even think about licensing when I started, and then if you asked people to license they were rather generous, and now we just can't license almost anything. This concerns sound or video or even quotations of song lyrics. You cannot quote more than two lines of a song lyric. Two lines! How can you explain a song's text if you can only excerpt two lines legally? Any more than that they will charge you, and they will say, "We want $5,000." And you'll say "I can't afford it, it's a nonprofit," and they say, "Tough, and if you violate this, I will kill you." That's what they all do now because they handed this all over to lawyers. It used to be these things ran out of companies or owners, who understood that you were actually doing them a favor by publicizing their work or whatnot, and now it is all led by lawyers and they all are ready to kill you. So we drastically reduce everything now, and it's really limited what we can actually do in a scholarly way.

Permissions are something that the scholar has to pay for, and that's another thing, alongside page charges for publication. That would be true in music, too, because if you cite musical examples, if it's in copyright or if you're going to do sound examples, God, that's a huge problem…because then you're citing a contemporary score or anything that's in copyright, it's not going to last forever. Then you have to pay the publisher of the score, Universal or

> whoever it is. If it's a sound thing you have to pay EMI or whoever it is, and that can get very, very dicey and very, very expensive. So often in our field what happens is the choice of example that you use if it's a sound example will depend on who you have to pay for it and how much you have to pay. That is a problem with scholarly communication, but it's a problem of the whole copyright system, as Larry Lessig would say. This is just coming up right now, again. If you're doing pop music scholarship, I mean, it's a big problem.

The time needed to secure copyright was also noted by one music scholar as an added delay in publication:

> My CD publication actually came out several years after it was finished. Because of copyright issues and various things it took a while to come out…That's something that my work in this regard resulted in a publication that came out, really after CDs had already seen their heyday, but again, it should have come out in the '90s, it just took a few years to get it all put out.

Production costs and publication subventions

Preparing visual images, music examples, or manuscripts for monograph publication is also very expensive, though these costs have diminished slightly since photographs have replaced engravings. Though some presses or journal publishers will set musical notation for authors, many require camera-ready copy of graphics that include musical notation.

> These costs are a function of a bunch of things. So there are the typesetting costs, which are quite substantial, and that's usually what people will say. Although now there are now these electronic methods of doing this, and often now these editors are saying, "You're the Editor-in-Chief of the project. You're going to be responsible for camera-ready copy."

> A lot of people won't publish score or manuscript examples. It used to be really expensive, now I don't think it's so expensive. My recent book doesn't have anywhere near as much music. The expense wasn't for the copyright because it was all my own transcriptions; it was for the printing, because when I published my first book, it was all engraved and was very pricey. Now it's just computerized and photographed…With my recent book, what cost me was permission for the facsimiles, but the music examples themselves, once the copyist was paid, a page of music doesn't cost any more to print than a page of text.

While some universities or scholarly societies offer limited subventions to support securing and preparing images for publication, there are not enough grants to meet demand.

> Sometimes the societies, the disciplines, will pay for page charges by the publisher, or they will subsidize the publications. Say a publisher says, "Okay, I'll publish this book but I want $10,000 to do it." The disciplines will give grants for that, but in my experience of music and in art history, they will not give grants for permissions…In one case, the dean came up with money. So, it is the university that's being called upon to do this. And I think that's probably the way it's going to go…The press wanted money to subsidize them for the publication, that's one thing.

> Preparing manuscripts for inclusion in a monograph requires subvention, and I'm happy to say that my university has supported my work with publishers. It's always competitive to apply for these things. And subvention is very important for scholars…The grant goes to the publisher. In the case of this book that I'm writing now, my university gave me a grant of $13,000 to have the manuscripts photographed digitally, and I didn't see that money. It went right to the archives…This was just black-and-white sketches. It's a lot of money, especially given the

> weakness of the American dollar and the fact that the two archives were abroad…So then I had to put in a little bit of money myself. This was to prepare something for publication…My university has been so generous in its support of my work…I would say it's unusual for a university to provide financial subventions for publishing manuscripts, although if you're at a research university, at least you would have the chance to apply for something, but it's not taken for granted.
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> I had to pay for the copyrights of the facsimiles and the copying of the music…I don't think I got a subvention. My research funds paid, but if you don't happen to have a job or even if you're a junior faculty, you're not going to have huge research funds. I think there are university subventions and AMS, and I think that's about it. I don't think they're sufficient, I think we could use some more.
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> There have not been any subventions for publication through my department. In one case, when I published a book chapter, the editors had obtained from the Society for Music Theory (SMT) what they call a subvention grant to cover that and various other expenses associated with putting together the book. So that one was covered, but I had to pay a couple of others myself…There's not much funding for publication in music theory in general. The SMT grant is about the only thing that comes to mind.
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> Some institutions may offer some funds but that depends on the institution, and how generous an institution might be. Luckily it's getting a little better, they used to be quite stingy; they now have actually a small publication assistance grant that a few faculty can get to help them get something out. That's new and that's nice. But they have limits.

Finally, high preparation costs for scholarly work in music, particularly critical editions, mean that many of those costs are transferred to the customer through higher book and journal pricing. For scholars cited below, this creates a crisis akin to the serials crisis in the sciences, wherein publishers are benefiting from the continued resale of scholarly material and scores through copyright laws, and scholars' inability to access costly material (particularly online) is preventing good scholarship from happening. Scholarly societies may be best positioned to challenge the publishers, although that will require author support for new publishing models.

> The production costs are so great that the only places that can afford to buy critical editions are libraries. So if you want the complete works of Shostakovich you're out of luck, unless you're willing to take $8,000 out of your own pocket and pay for it…You just simply can't afford these volumes, they're so expensive. So the publishers are the ones making all the money on all of this…Universities are paying for the research twice, they're paying for it when they pay the scholars' salaries, and then they pay for it all over again when they give the research to a publisher who sells it back to the university…So in the meantime, people will pay thousands and thousands and thousands of dollars to somebody who had nothing to do with the production of it…I just think it is unconscionable that this is happening, and there is no reason why it shouldn't all be done on the Web. Now, the problem is status…This is where we need organizations like the AMS…It has the imprint of the good housekeeping seal of approval for musicology…

PART B. APPLIED RESEARCH: NEW MUSIC AND ELECTRONIC MUSIC COMPOSITION

The vehicles and criteria for publication are less homogeneous and established in the applied musical subfields of composition, performance, and new electronic and computer research in music. Scholars in these areas produce and "publish" a range of material, including scholarly articles, performances, musical recordings, musical scores, new instruments (generally

disseminated as software or computer code), communication protocols, and other tools and technologies to advance work in the subfield. Most scholars regularly publish in two or more outlets simultaneously. For example, contemporary composers may disseminate MP3s of their work, publish scholarly articles about personal work or related work in the field, and may also distribute code or software demos (if these were created in their compositional process or are needed for successful recreation of the work).

M2.1b Text Publications: Prestige, Selectivity, Peer Review, Audience

English-language, peer-reviewed journals are the most prestigious text outlets for publishing scholarly work in applied music. As in the academic music fields, there is a hierarchy of international journals in particular subfields (e.g., new music, computer science, perception). It can be difficult, however, to locate relevant publication outlets for interdisciplinary work. In these cases, scholars generally choose to publish in the peer-reviewed conference proceedings of specialized, prestigious meetings, such as the International Computer Music Conference, in order to target particular audiences and make their work widely available. (Many conference proceedings are available and searchable online.) As in other fields, scholars may choose unconventional journals to publish specific pieces of work relevant to a different audience. For example, some scholars choose neuroscience journals for work involving fMRI experiments, computer science journals for work involving software programming, or *Science* for new think pieces in music theory or cognition.

> There are explicit criteria from our evaluation committees, and of course the most interesting ones are peer-reviewed international journals. This really is the goal, to publish in these journals. But, in some areas, specifically in science and technology, there are not always great outlets and sometimes we have to publish in international conferences proceedings, which are also peer reviewed. So, your first priority is peer-reviewed journals, and second, peer-reviewed international conferences.

> If I were to have an article in *Perspectives of New Music*, which has been considered for some time to be one of the main journals for composers to write scholarly articles, my work would suddenly be dignified in a way that it wouldn't be if I were publishing in *Leonardo*, which is a respectable magazine, but in a specifically visual-arts sort of context. I've had an article published in a lesser-known but probably much more venerable, respected journal, which is the *New Music and Aesthetics of the 21st Century*…All of this should be seen through the fact that I'm not actually required to or necessarily supposed to publish text-based articles. I'm just mentioning that within that area I probably get more points for *New Music and Aesthetics of the 21st Century* or *Perspectives of New Music*, and even *Leonardo*, than I would, say, *Keyboard Magazine*. There's a scholarly/non-scholarly sort of thing there, too. For example, a journal on popular music studies might be very, very scholarly, but is not in the area specifically of composition.

> I think that it's more a question of the prestige of each publication, and so I definitely think refereed journals count for more than conference proceedings, although they are also refereed…Everything I'm seeing here is conference proceedings and refereed journals…There are a lot of people who just put their research on a website somewhere, but it's not really a publication in the sense of something you'd put on your résumé. It's funny because we are completely pushing the envelope in communication in the musical realm, but in terms of conveying our findings and so forth, I haven't really been aware of too many ways that people are experimenting.

> Most of my publications have been in the International Computer Music Conference (ICMC), so conference proceedings…Another really important conference is the New Interfaces for Musical Expression, this so-called NIME conference, which is specifically focused on the computer-based musical instrument line of research that I was talking about. Then there are smaller, one-off conferences…This is a paper that was published by the Audio Engineering Society…they call it a convention. It's a conference, but they don't have conference proceedings, which is the weird thing. What they have is what they call preprints, but there never is a proceedings that gets printed. It's all available online, so to us it doesn't matter. As long as you can type the name of the thing into a search engine and get to the text, it's all the same in terms of using the stuff. The Audio Engineering Society is a more prestigious venue than the run-of-the-mill conference.
>
> There are some interdisciplinary places for publication, like the yearly ISMIR (The International Society for Music Information Retrieval), DAFX (Digital Audio Effects), ICMC (International Computer Music Conference), but it's true that these outlets are not specialized…And what we try to do is that we implement interdisciplinary coordination in our internal organization, but each researcher has to be integrated in his community and be recognized in his community. This is essential for one's scientific career.
>
> There is one side of this sharing that I think remains pretty traditional: articles and theses or books. A lot of people still publish their finalized articles. There are a few respected journals that everybody refers to in order to see what's going on. And, as I said, whenever a composer writes an article, usually it's not really about the composition itself. It usually is a little more on the technical side of the realization of the composition. So whenever things go toward the technical side it's easier to fit a composer's article in a regular computer music magazine. It's usually a little more complicated when you want to discuss your composition itself, in terms of the process of creation or creativity and stuff like that. Sometimes these topics don't fit very well in other journals, although there are a few journals that are geared toward that kind of discussion about the process of composition itself, how one composes. This can be a little more subjective.

M2.2b Affordances and Capabilities of Publication Models: Software and New Technologies

While scholars in new music composition and research publish in traditional scholarly outlets such as journals (which are articles *about* the technology), they also create many scholarly products (such as new tools or technologies *themselves*) that cannot be accommodated by traditional publication formats. Because technology in new music research is changing rapidly, and many of these scholarly products are dynamic and regularly updated, traditional publishers cannot offer the necessary dissemination infrastructure to keep up with technical requirements of evolving scholarly products.

> We also need to associate music technologies and associated materials with all new music published. But the problem is that these become obsolete quickly, and publishers will not expend time and money to continually update these resources. In sum, the large publishing houses of classical music have not adapted to new technological advances in music, and so we have to fill the gap. The work I've done based on concert presentations demonstrates that the dissemination of new music calls publication into question. It's impossible to work with traditional publishers. They simply can't work around open access models. And, from our point of view, this is necessary in order to preserve the software and support documents along with the audio or written publications that we produce.

We worry about copyright, of course. But this is exactly the same discussion that we should have with the publisher, because unfortunately publishers don't have any consciousness of technology. We simply want to disseminate our work, and we need a real-time way to deal with contemporary scores and compositions. Of course, we'd rather go through a publisher; it's much better to receive royalties for the score and the software, and then the record producer would provide the technical requirements to make the piece, exactly as when you do a string quartet. You do a string quartet; now we have a string quartet with electronics. Why does it have to be different? We have not had success in bringing publishers around to accommodate new technologies. It's quite difficult. Also the difficult thing is that the technology is changing all the time, so we have to upgrade from one model to another one. And it costs a lot of time and money, and in my mind this work of upgrading should be shared with the publisher—and, if that was possible, we'd even share the royalties or let them go entirely.

In the absence of official publication outlets, many of these researchers and composers have spent endless hours creating their own Web-based dissemination outlets, which allow them to reach potential users and keep track of updates or releases of new versions of tools and technologies. There are some indicators that scholars in new music research may be more inclined to experiment with dynamic publication models. As one composer noted of a colleague in music signal processing, "…this became all-consuming, so s/he's actually doing more with online publication systems at this point than with signal processing. S/he's enjoying it; it's a new life."

When you develop technologies, you must also propose ways of disseminating the technology, not only articles about the technology. Of course we are also faced with this problem here, which is with which vectors can you disseminate that technology? And we have a sort of online forum. It's something we created that is based on registration, not sale. You come to a community and you register on the database, where you get all the software and updates within a given period of all the software developed here. This mainly concerns tools that are either too advanced for being available in shops as products, so it's more experimental tools. We disseminate them this way to professional users like musicians, artists, researchers, teachers, etc. The tools are disseminated in quite a finalized way, in the form of applications, in the form of modules of a given functionality, etc. So this is one aspect. And we address many professional users.

All of that still falls into this category of expanding the continuum. If you take any musical parameter—I just used time as an example—and you say, "Well, what is the traditional way of organizing time? And what ways of time are suggested or capable when we add a technology component. How does it change?" That doesn't really help you in terms of how things get communicated, but it does completely change the notion of what it means to be published, because the publication of a composer is no longer in a physical printed score. It can't be represented in any way, because there are too many components. The only way that this can actually have a history now is that you have to build systems that are capable of skipping and jumping to future platforms. So here we've created a very elaborate support system, which is Web-based, which would allow someone who's interested in performing or presenting some of this kind of work to come to get the recent version of the software…

There are a few things that we just published ourselves. There's one conference that we put on that we call a conference proceedings, because it was. And then there are a couple of things that we've just published by putting them on our website. There's this communications protocol. It's a protocol for communication among computers, sound synthesizers, and other multimedia devices. It's just a way for various elements of one of these music systems to talk to each other. So if you're using one computer to do one thing and one computer to do another thing, and you need to get them to exchange information, that's a classic use of Open

> Sound Control. This is a technology that CNMAT developed, and then decided to try to promulgate as a standard, and that has actually, I think, to a large extent succeeded, and people are using it all over the world. So one of the things that would be called a publication is the specification for this standard, which is just self-published electronically. It's just basically a webpage written by a researcher that says, "This is how this piece of technology works, and if you want to implement this protocol here's what you have to do."

Open source

Given the commercial value of some of these software programs, tools, and technologies, the scholars we interviewed do consider copyright. While some believe in open-source dissemination of all software and other materials, others may restrict particular technologies with patent potential or potential commercial applications.

> If you're asking me personally, I'm more open-source and just letting it all go, because I'm in the university. Everything really belongs to the university in a certain sense, and so I feel like I've already received what I need to receive and this should just be free. I've never come across a case where I see someone using something that I've been a part of in a way that they're trying to take credit for. I haven't experienced that, so maybe my tune would change if I saw that, but I don't think so. I think that there's just too much of this material, especially in terms of the software, that is really not original. No one is doing purely original work. It's all based on several steps and several pieces of history that no one individual can put together anymore…And, for example, there are some profitable patents that come out of music and technology, like the FM Synthesis patent that John Chowning took out when he was at Stanford University. There's absolutely no commercial potential in my musical composition work. I'm the quintessential non-commercial explorer of musical materials. Basically, I try to find ways to give my music away.

> The creation of open-source software is fairly general, actually. I can cite examples where that comes into play for the three centers. I wouldn't say open source software is the driving focus for any of those things. It's a nice side effect. And particularly as you see stuff moving out of the lab and into commercial circles, the dissemination of, let's say, finished results, increases like gangbusters. You can work all you want in a kind of lab context, and a cadre of people will know what you're doing and maybe use it in their musical production. When it wants to really hit the road, though, and become ubiquitous, in this current day and age, it's only through commercialization that that happens, as far as I can tell. Open source is great, but my experience has been it's particularly great for builders and inventors and designers, but less likely to be adopted by at all users. It's good for innovators and inventors, people who need to have the ability to recombine and customize stuff. And particularly they'll be building tools or new approaches, which are the *avant-garde* beyond where the current practices in the commercial world are. So locked up projects, commercial software, that kind of thing, tends to hinder, obviously, the rate of innovation. This is a huge argument in favor of public domain software. There are always public domain projects, and it's not particular to our lab, anyway. The way we work is that everything is public domain and talked about and taught, no matter how new and recent, and no matter what the team is that's working on it. So if it's a joint industry-academia team, we go to great lengths to keep that flow open and there will be IT agreements, which might sort of earn the contributing industry a facilitated access, the "first on the block" type thing, but not exclusive generally.

> Copyright and authorship is an interesting question, and we have tried many things concerning open-source code dissemination. We have also been disappointed in some aspects. For instance, we understood that in generic computer functionalities, like websites, for instance, it's understandable that many people would be skilled to participate in a collective

development effort. Whereas in our kind of technologies, it's much more focused and requires many more specific skills. We would disseminate our new technologies, but we were the only ones to develop them, and so these technologies were not accessible to everybody. We understood that, and now we are much more selective in the way we disseminate technology. Generally we do that for general-purpose functionalities, like library functions. For instance, we have a library that works with Max/MSP software, which enables application developers to implement sophisticated features based on this library. It's more a library for building the applications for the developers. So this is disseminated as open-source code. But we don't disseminate finalized applications that do, for instance, sophisticated audio processing functions, because there will be no other people who could understand the code and edit it. It would be more in a competitive situation with commercial products, and also for industry production, for instance. We make a distinction between finalized features and general-purpose libraries. And so these general-purpose features are disseminated as open-source code when we can, whereas specific features that require maybe higher skills are not disseminated that way.

M2.3b Sound Recordings and Live Performance

The end goal of computer and electronic-assisted research in music is in the creation of new horizons for musical composition and performance. While software and other technical contributions are important components to support new composition and performance, the physical performance or recording itself is an incredibly important scholarly product.

> In new electronic music, the computer program…is essentially the document. But it also has a manifestation in sound that can be recorded on a CD in a conventional way.

> I would say that our publishing is when you have a piece finished and then you have it performed in a public concert, which could be in my own university, locally, or in a festival somewhere else or in another country. This is how our research circulates…And the other way would be sharing your research or music by CD, for example, distributing MP3s or FLACs. I personally think that CDs are pretty much becoming obsolete, not yet but almost, and I think that, in my field, more people will get to know each other's music primarily over the Internet.

Once the traditional form of publishing applied work, the CD album may increasingly be giving way to the single track, or MP3, posted on a composer or performer's personal website. This move has changed the nature of the quantum of output in musical composition and performance.

> The CD era is an interesting vanishing moment…It's really happened in about three years… Gone. That's changed the granularity of what an album is. It used to be a CD album, a certain length chopped up into one big piece with movements, or a bunch of tunes. Nowadays you traffic in tunes, single units. And those are shared via download. That happened so fast, it's amazing.

> I think we might still stick to the album idea for a while, just because it's not just about the physical album or the CD, it's also a proposal from the artist. So if I do an album, even if I only release it online, the idea of having those 10 tracks or 15 tracks together is also to convey some larger message. It's like a composition itself, in a way. Each track is a piece by itself, but my packaging of the 10 or 15 pieces in the same group to which I can give a name and maybe a few pictures and maybe some liner notes and stuff like that, this is a composition in itself, in a way. So I think people may still like to do this for some time. I don't know how much it's going to still exist, but I think it's going to exist as much as people are

> creative in conceptualizing their "album." And even if it's online-only, the way you promote it can be: "Do not download only track two, download all of them because there's something important about the fact that they are together." But other than these creative approaches on this idea, I think the tendency is really to have one track, one piece, and then you get isolated things. At least now that's what I think is going to happen for a while; you'll go just for the one that you want.

Limitations in sound quality

While new technologies enable performers and composers to disseminate their theoretical, software, and technical work in new ways, there are few specially equipped outlets able to effectively "publish" sound recordings and performances. This is due to the highly specialized nature of contemporary computer/electronic composition and performance, and the lag of scalable listening technologies.

> Single units are shared via download—so that's how you do it. That happened so fast, it's amazing. The iPod has had a huge effect, but prior to the iPod, and parallel to it too, it's just been PCs and people having network access. And so, you either do it through peer-to-peer, above- or below-board, and you tend to do it in compressed audio formats, which is really disappointing. It changes the quality of the music. There's a funny thing about audio quality, it actually becomes part of the sound. So there are instances now of people taking kids from the MP3 generation and saying, "Okay, what do you prefer, this version or this version?" And you play them that uncompressed original, and they prefer the MP3 compressed version, which has changed. For some things it'd be really hard to know the difference, and the listening environment is huge. So if you're in your car or you're walking around there's so much other sound that you might not notice it. I feel like I have cotton in my ears, basically, that's the main thing. There's some detail missing. I don't know…We very rarely reflect on what's being left behind in our enthusiasm for new technologies, or the conversation will happen and the decision is trumped by someone with access and breadth. So the high-quality stuff is still there. The idea of compression is an artifact that comes from the fact that networks aren't up to the job, at least in this country, versus Korea, Japan, the Netherlands, Germany, etc. It's getting better everywhere, but there are some countries that have this broad-scale high-speed Internet access…and we're a little hamstrung in this country. Actually we're not looking very good comparatively…I'm doing a lot right now with using the networks for real-time music making. Real-time means like rehearsing a concert production on stage. It works really, really well if the collaborating parties are at universities, and you're part of Internet2, which is this wonderful resource that we've got.
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> Once a piece is done, it's not difficult to disseminate. Well, for example, there's one limitation that might be worth mentioning. When you listen online, because of the nature of the technology set-up—everybody usually has a computer hooked to two loudspeakers—it's a two-channel version, you have the left and right channel, and that's it. But what's been going on a lot in this field is that people are doing pieces that are surround sound, you could say. There are more than two channels. The standard surround sound that you have in a home theater is 5.1, which is five channels plus the subwoofer with the bass. But, in my field, people are doing a lot of stuff, for example, with eight channels or 16 channels, which really doesn't exist in any regular household. And over the Internet, if you put eight channels for someone to download, it's not going to help because you download the eight channels and you cannot do anything. For example, this piece that you heard is actually four channels, not two. So you heard a reduced version of the piece, not reduced in terms of time or content, but in terms of the space, because ideally you should be in a room with two speakers in front of you and two speakers in the back, because there are elements in the piece that are composed to take advantage of this spatialization of the sound. So, this is the problem nowadays: many people

> compose pieces like that—"multi-channel," it's called—but the only places where you can play are in special concert halls that have the multi-channel speakers set up. In the United States, it's much more common: you can find a lot of places in universities or even normal concert halls, in big cities, that have this kind of set-up, and can do this kind of concert, but it's really not everywhere…If I go to South America with an eight-channel tape piece, there are probably only one or two places where I can play it, and it's probably not going to be easy to schedule a concert or anything. So, this is one of the other limitations in terms of technology of this kind of music.

3. HOW DO YOU SHARE YOUR WORK WITH OTHER SCHOLARS AND KEEP UP TO DATE IN A FIELD?

Sharing practices in music vary by subfield and the personality of individual scholars. By and large, scholars in the academic subfields of music rely on informal networks to share work-in-progress and data. These same informal networks play a role in the wider, formal sharing that takes place at conferences. In the applied music subfields, sharing is largely done through conferences, festivals, and in-person appearances, as well as the maintenance of personal and center websites for the dissemination of preprints, recordings, software, and other technologies. While listservs and blogs are used widely by academic and applied music scholars to keep up to date with trends in the field, there is little evidence of sharing work-in-progress via these mechanisms, or via social networks. Similarly, although young scholars expressed interest in exploring new technologies for creating scholarly communities (e.g., sharing of data, resources, or ideas), many adopt the conventions of their subfield and academic mentors when sharing their own work-in-progress.

PART A. THE ACADEMIC FIELDS: MUSICOLOGY, MUSIC THEORY, ETHNOMUSICOLOGY

Informal networks are the most important way that scholars share work-in-progress. The formal sharing of ideas is largely based around the conference model, which serves as an important venue for staking a claim and raising the visibility of one's work. Conferences also provide formal and informal opportunities for scholars to meet face to face with members of their informal networks, as well as make new connections. Although they are seldom used to share work-in-progress (e.g., research ideas or working papers), new technologies for scholarly communication, such as personal websites, listservs, and blogs, enable scholars to keep up to date in the field to varying degrees.

M3.1a The Importance of Informal Networks

Most musicologists, music theorists, and ethnomusicologists use email to send polished drafts of work-in-progress to specific, trusted colleagues for feedback prior to submitting their work for publication. As one ethnomusicologist noted, early sharing in academic music is "selective sharing." Email is also the predominant means for discussing research data or ideas "in incubation" with close colleagues.

> How much sharing goes on? I don't know. It really is so individual, and it depends how much sharing you like and whether you go after sharing, if you're one of those people who's on lots of lists or whether you're one of those people who tends not to do that. It's a personal thing. I think the possibilities for sharing are just enormous now…I share selectively. And people come

to me because I'm senior and people come to me and say, "I'm doing this, do you have some ideas for this?" Or, if I need to know something I will ask people more selectively, but I don't go into group sharing in a big way. I think it's partly the stage that you're at and it's partly temperamental, but the possibilities are really so large now.

In my current project, where everybody needs everybody else and everything is interdependent, we have one person or two people working on each source, so I think everyone wants the input of anyone who wants to give it. So I didn't particularly want that in my most recent book. I didn't want to share my observations. I really didn't want to share it until it was ready, until it was out. Not that anyone would use it, would steal it, but I just wanted to wait until I was sure about my conclusions. I had people reading individual sections of my stuff just to respond to it, but…we do that among ourselves, we read each other's drafts of things…Mostly my former students—I send my stuff to them, they send their stuff to me. There are very few older colleagues anymore, but the few that I have I still send my stuff and read their stuff. But it's on a very personal level.

I've just not had time, when doing research, to get terribly experimental about it and to communicate with people. So I have ideas about what might be neat, but I haven't got a lot of experience. I've used very traditional means of doing that, such as giving conference papers, which always helps me network with other people who are doing similar work and we certainly collaborate in sharing ideas over email, if you can call communicating on email traditional, but I guess I just did…For example, an article I've got in the pipeline right now, I shared with a colleague who's an expert in that theoretical area, to get his feedback before submitting the final version. I'll certainly do that kind of thing. I guess the stage at which I share typically does vary…It's more common for me to do what I just described, which is, once I've got a pretty solid draft of something that I feel pretty good about, that if it was published in that form, I'd say, okay, I'd be all right with that. Then I will share it with mentors or people whose work I respect and see if they might share their ideas and feedback with me.

We very often will send materials to other scholars, generally by email. We often do that. People who work in the same field as we do will send something off and say, "Do you have any ideas? Do you want to read it?" and they'll send it back or with comments, etc.

Of course, people do share, just in the same sense the philosophers have for decades. They send around drafts or they give papers for discussion and criticism by their colleagues before they finally then say, "Okay, I've got this in the shape that I want it. Now I'll send it off to…" whatever journal.

When I was writing my first book, each time I would finish a chapter I would send it to a very trusted expert colleague, and then s/he would read it and get back to me. But, we're talking now in the late '90s. And nowadays if something like that would come up, I would just send an email attachment. And then one of the editors at the press I publish with understands my work and so sometimes I will share things with that editor.

There are informal discussions of a sort that I think have definitely been improved by the advent of things like email. Just the other day, a colleague emailed me with a couple of questions, if I could think of a few musical examples of some particular phenomenon that he was working with. That's a sort of discussion that probably wouldn't even have happened before the days of email. I don't think he probably would have bothered to pick up the phone and call me with a question like that.

On a personal level, if I have a question about a particular manuscript that I know that another scholar has studied, I would just send them an email.

> I do a lot of emailing with some of my peers who live in other states…that part of technology for the informal networking and the sharing is very important in everyday stuff. I spend at least an hour a day on email, between reading and writing.

Even among graduate students, some early sharing takes place among one's dissertation committee or peers.

> Those informal chats or the sharing of chapters, even things like emailing other dissertation committee members an early thing of your chapter and getting some feedback right in the Word document with the tracked changes, it's really helpful. I share work at my institution with my friends, because we trust each other very much.

As in history, graduate students in ethnomusicology use instant messaging or Internet phone services to communicate with and support each other while in the field.

> When I was in the field, I spent a lot of time on Skype and Gmail chatting with some of the other ethnomusicologists in the field, about how to approach field research. We were helping each other out.

Establishing informal networks

Scholars in ethnomusicology and musicology mentioned intergenerational models of research exchange within departments. This kind of sharing is described as "mentoring" and "keeping up to date," but can be fruitful for both the junior and senior scholars involved.

> One thing that I do a lot of is I read my junior colleagues' work. That's not really sharing but that's the kind of, I guess, mentoring. That is a little bit, actually, like keeping up to date. For example, there's all this stuff in performance studies, which is just not something I know anything about, but I'm reading my younger colleague's work in later opera. I don't know anything much about the specific research topic, but my colleague is writing about it, I'm reading that stuff, and I'm getting a lot out of it. So that's more like intergenerational interaction.

> I helped my advisor with editing a book that's coming out, and my advisor helped me with my article, so we get along, but it's not collaborating on the work that we're doing together.

> We don't really have necessarily one advisor in the music department. We work very closely with all the ethnomusicologists and they get along really well. It's an amazing resource, because they have such different research interests, points of view, and they are different ages as well. We have one of the most important scholars of ethnomusicology in our department, as well as a much younger and sort of politically charged musicologist.

> Generally, it's the faculty that suggests things to the graduate students, not the other way around. If a graduate student finds something I don't know about, I'm very happy—I'll go look it up right away—but it doesn't happen very often.

M3.2a Widening the Circle: Conferences, Seminars, Meetings

Annual meetings hosted by the main scholarly societies are the most important form of formal in-progress scholarly communication across all academic music subfields. This may have to do with the lag time to publication in musicology, music theory, and ethnomusicology, as discussed

previously, and lack of a formal working paper culture. Given the relative small size of the academic subfields, conferences promote a dynamic atmosphere of scholarly exchange and are an important face-to-face setting for scholars to engage with their informal networks.

> There are eight distinct societies representing the different areas of musical scholarship, so the American Musicological Society, the Society for Music Theory, the Society for Ethnomusicology—those are all American societies. The Music Library Association, which is also an American society. I always leave one out, I have to count. The Royal Musical Association, which is the British version of the AMS, the International Association of Music Libraries, which is the international body of librarians, the International Musicological Society, and the International Council for Traditional Music, which is the International Ethnomusicology Organization. So musicology, music theory, ethnomusicology, and libraries are each represented by two organizations, except for theory, which only has one.

> Conferences play an enormously important role. That's where, first of all, we meet each other, we talk to one another, we get to know each other personally. And in music, unlike in literature for example, people actually go to hear papers. It's not the MLA [Modern Language Association], where people don't hear each other's papers. We go and hear papers. We discuss them. We sometimes have fistfights. We take it very seriously. I'm thinking about the American Musicological Society right now. It's a real place where serious musicological work gets done every single year…because these are smaller groups. At an AMS meeting, there will be 1,500 people, whereas, at an MLA, there will be 35,000. Well, if you've got 35,000, it's very hard to get around, even if you're one of the big shots. If you have 1,500, you're more likely to know, say, 700 people there.

> I don't really do a lot of sharing until at least the time of the first colloquium talk or conference paper or something like that. I tend to like to have something reasonably presentable before I show it to anyone…Sure, there are things like posting on SMT Talk [the Society for Music Theory listserv] and informal emails with people from time to time, but for the most part just about everybody in our department goes to the Society for Music Theory conference every year; it's expected that we will.

Presenting at society conferences is highly competitive, given the limited number of paper slots. Although one senior musicologist thought that there were not enough venues of this nature to present one's work, another noted that the combination of specialized and field-based conferences provide sufficient diversity and opportunity.

> Scholars can present every other year at the AMS. That's okay. So then in the odd year you go to the 17th century society or one of the…there are a lot of conferences abroad that are pretty regular, every other year. There are plenty of conferences…We have chapter meetings; we have conferences at various institutions. I don't know who would feel that there are not enough venues…American music has a number of forums and meetings…

> It's not just journals where we have these problems about high selectivity…the same thing happens with the scholarly societies. They reject three-quarters of the proposals that they receive for the annual conference…and so they have a bylaw that states that if you get to present in 2008 you can't do it in 2009…Conferences are very well attended. People like to schmooze…Of course the vast majority are people who show up for the conference but are not presenting. So that's also a problem because…I spent time on senior university committees, where we looked at productivity between departments…Typically they look at scholarly productivity principally: the number of publications, but also conference presentations. Then what happens is the arts look…very, very, very unproductive, and as a consequence of that,

> the funding of these departments suffer. The music department would probably be a little more competitive if we looked more productive.

Stage of career and conference attendance

Graduate students and pre-tenure scholars, in particular, view conferences as an important way to make their work known among a wide audience.

> Presenting at the Society for Ethnomusicology…it's spreading our research around, first and foremost…And then being on part of panels at the Society for Ethnomusicology that are not necessarily area-studies-related. One of my papers was just a panel about a transnational topic, so on the same panel with my work was three other people's work on three different countries. So the idea is that different audiences will get to know my work.

> …just getting to know people by going to conferences and trying to present your work there, certainly that is something that I've urged our graduate students to do because we do have a number of regional conferences and graduate student–sponsored conferences at which they certainly can be presenting their work. Some of them really are eager to jump in and others are somewhat reluctant. I think some people find it intimidating even if they're not presenting a paper, just going to the conference. That's something that maybe we could somehow do a better job of getting them over, because that shouldn't be an unpleasant experience.

One scholar felt that conference involvement may drop off after tenure, although prolific senior scholars are conference mainstays:

> We have a big problem in music…The problem is after people get promoted to associate professor, there's a huge drop-off in scholarly productivity. People really take tenure seriously, they go for it, and then once they get tenure there is a really serious problem maintaining research productivity. I'd say that's especially true in the Society for Music Theory…and in music cognition. I'd love to do the statistics about this one day, but it seems to me that the conferences are full of assistant professors and then a handful of the true believers, the full professors who continue to be productive…There's a hole-in-the-middle effect that happens in music…

Faculty mentoring at conferences also seems to vary. Some scholars take it upon themselves to introduce students and younger colleagues to other scholars at conferences, but this is not universal. The Society for Music Theory has a program of "conference guides" to shepherd young scholars and pair them with older colleagues.

> The Society for Music Theory does something nice at the conferences. They have a conference guide's program or something like that, and so experienced people can sign up to be conference guides and graduate students can sign up to be guided. So basically they'll pair you with someone for the duration of the conference and you can go around and listen to papers together and have lunch with them a couple of times. I haven't actually been involved in it myself but I have heard good things about it.

> If you want people to think of you, you have to make personal connections. My advisor's not someone who drags you around conferences and introduces you to everyone. Other people have advisors who do that. My advisor takes off with his/her buddies and parties, which is what s/he should do.

Although conferences promote thought-provoking scholarly exchange, one ethnomusicologist complained about the absence of critical debate:

> I was yelled at by a senior scholar for asking too controversial a question. What is the point of coming to conferences and sharing work if we're not supposed to critique? We heard stories back in the day of Alan Merriam duking it out with Alan Lomax about their methodologies. Isn't that why we come together once a year? But, in fact, it's not for many people. It's just to be seen, or you're just supposed to pat me on the back because I went to the field and came back, or because I just showed you a pretty instrument…It's to my benefit if someone creates good research because now I get something to use in my classroom, or it inspires me to think a different way…some of the best innovations in musicology happened because somebody made a giant blunder, because it inspired all these other scholars to start writing about why that's wrong.

Because of the highly competitive nature of conference papers, graduate students and less experienced scholars may require mentoring, particularly in abstract writing.

> There's an art to writing the 200-word abstract, and at other institutions, they have workshops on that. It would be the easiest thing to institute here.

> It seems to me that one of the problems is that these young people don't really know how to write abstracts, they have to learn how to do that, and that involves a lot of mentoring…I look at the abstracts of my students. I don't always do it successfully; they don't always get accepted. AMS is very competitive, but you never know with them. I helped two students this year, one of them got it and one of them didn't. I don't know what it depends on.

The role of conferences in sustaining informal research networks

As several musicologists and music theorists pointed out, the main society conferences provide important formal and informal forums for more specialized research groups to connect. Young scholars in ethnomusicology also pointed out that senior scholars or directors of programs in the field sponsor conferences, or ask to organize panels, in order to get added exposure.

> Mass emails are sent and then people respond, or we end up seeing each other at unexpected places, running into each other, so three people make a group if you happen to meet somewhere. It happens at AMS, for example. Last year at AMS we had a little study group meeting of the scholars in my research area one afternoon. We only invited the people who were going to be there anyway, but it ended up being 15 people and it was a good opportunity. And I think that kind of thing can happen when people happen to be at the same place at the same time, but you need to kind of find out about it in advance.

> There is a small but pretty active community of mathematical music theory these days. There is a new *Journal of Mathematics and Music* that seems to be making a go of it. There are, I guess, a few dozen people who tend to go to all the same conferences and conference sessions that I do, and we keep up with each other's work pretty closely. Actually, within the last few years the American Mathematical Society, which is a much larger organization than the Society for Music Theory, has sponsored a few special sessions on mathematical techniques in musical analysis, as I think they call their sessions. And that's something new for them, but I'm happy to see it because it attracts the attention of other people who have the necessary mathematical background to do this kind of work.

Specialized and interdisciplinary conferences

Smaller, specialized, interdisciplinary conferences can be an important way to unite scholars from various fields concerned with common themes.

> I was invited to participate in a two-day conference on opera and society…being forced to think about how my book relates to opera and society, I think, enhanced my way of thinking so much. Even hearing people talking about opera from eras they had nothing to do with greatly enriched me. And I was warned it was an interdisciplinary conference, so I had to really work to make sure my paper wasn't too technical because there would be people who wouldn't necessarily be able to deal with the technical issues…but it all came together very nicely.

Similarly, membership in specialized research groups and attending regular meetings are important activities for maintaining contact. More funding for similar conferences would be welcome.

> My study group has a conference at least once a year, in some place or other…They'll always be held in conjunction with a performance, so there's a reason for people to want to go…it is an encouragement, because some people really want to come for that…The funding of conferences is probably something that is important, that is, of keeping a group of similarly interested scholars together. That kind of getting together, I think, needs more funding.

Teleconferences

Disparate experiments with teleconferences are a means to broaden access and participation among scholars in the field. One ethnomusicologist spoke of this as a necessary step in order to include colleagues around the world and "decolonize" the field:

> I'll tell you an interesting thing we're doing right now in ethnomusicology. The convention site is going to be at a US university and there's going to be live conferencing with scholars from other countries at the meetings. So the society is doing a couple of things. One is they've applied for small grants from the Asian Cultural Council to bring scholars from Indonesia and China, and they're looking also for money from Africa to bring some scholars from there as well. Secondly, they're also going to have a live hook-up with those countries…so that those people can sit in for the discussion in the sessions. And that's never been done before in ethnomusicology. This is important, because at the Hawaii meeting, which was '06, the general theme was decolonizing ethnomusicology and how it shouldn't be thought of as just a Western elitist hegemonic discipline. They are going to be opening it up more in various ways, which actually has been going on for a long time, but they made a point of it in Hawaii. So this is that kind of a step, which is to say that if you can't afford the airfare, maybe you can get to a place where there's equipment where you could sit in on this session, at least a step in that direction…The technology allows an open session rather than just a closed set of papers, because the conference is a forum that way, or an exchange, or a town hall, or whatever you call those electronic meeting things. And that hasn't been done before in the society…

Our senior scholars in musicology, however, did not find such technologies useful, arguing that physical presence is the "life of the conference." As in other fields, face-to-face interaction is an essential component of sharing.

> Teleconferences are not for me; that's for somebody younger. I cannot envision that. I'm sure that would work, but I like physical interaction. I'm sure it can be done long-distance, and

> certainly I communicate with these colleagues of mine on an almost daily basis. We have Skype and we have whatever else, but I don't think that there's a substitute for interaction, multiple voices simultaneously including physical presence. I just don't think that that's going to be obsolete.
>
> I was involved with a conference last year where they simultaneously made it available for everybody. I don't find it particularly useful. I never do it. I consider that the point of those conferences, really, is not just to hear the papers, but to be able to talk about them, to discuss them, to have friends around, to have people you can have a meal with and have a conversation about what's going on. That's what gives life to the conference.

Internal meetings/seminars

Departmental and research center seminars are also an important way for faculty to present new research and get feedback.

> Of course, often you do present work in some form at conferences before publication. We have an active colloquium series here, and often faculty are presenting various things there. Apart from that I don't think there's much in the way of formal ways that we share our work.

Publishing vs. giving papers: Concerns of poaching

From the user point of view, one music theorist noted that conference handouts and other materials are a helpful means to consume scholarly work-in-progress and are treated as scholarly publications.

> One thing we do a lot of in music theory is at conferences we tend to distribute handouts at conference presentations. I'll probably include copies of all of those, also, as a record of the outside activity in my tenure portfolio…I find them really helpful to hang onto and I have a couple of file drawers full of old conference handoutsD from various things that I've attended and occasionally I find myself thinking, "Now what did he say there?" referring back to something and pulling out the handout to see.

Although no scholars could report stories of work being poached, many were aware (to some degree) of the possibility. As another music theorist pointed out, this system of handouts or circulars works very well if your work is accepted for inclusion in the conference proceedings, but raises concerns of poaching if not accepted:

> Right now I'm getting ready to propose something for a conference; you go through the proposal process. And I find myself providing a second thought, "Should I really put this unique work out there before I publish it?" It's not the idea that I think somebody would publish or steal my example, but would figure out my insight on something and then maybe claim it as their own, or once you look at something and then maybe beat me to the conclusion…I have not experienced it myself, but there's always the fear that it could happen…I don't know of any horror stories…I was very happy to have the conference venue, and then to have my work in the proceedings, because then it allows me to claim a certain amount of turf for what I'm doing…If it's published in my name, I'm happy with it. If for any reason I'm turned down, who knows with the seven or eight people reading the proposals, what will happen to my work. I would trust 90 percent of them, but I can think of someone who might like to see what I'm doing. I think you get the message.

The smaller the subfield or research area, the less poaching appears to be a problem. Again, personality plays an important role in scholars' habits of sharing openly at conferences and other meetings.

> I don't see people keeping their in-progress work close to their chest. Not very much. Maybe a little bit of it, but it's not something that I really worry a lot about, and I haven't heard too many stories of people who think that their ideas have been stolen in our field. It probably has something to do with the fact that it's a small field. The Society for Music Theory has only about a thousand members, so a lot of us know each other, and word would get around pretty fast if someone did something like that.
>
> There obviously are fields and individuals who are much less trustful, that is people who are concerned that if they make something available, someone else will steal it. I presume this happens but, frankly, I don't know of very many cases, and most of the people that I deal with are perfectly happy to share their materials because they know that, basically, we are a pretty honest bunch. And we are small and we know each other, so that if someone gets the reputation of not being honest, let me tell you, it's not a good thing.

M3.3a Open/Public Sharing: Websites, Working Papers, Pre/Postprints

As noted above, most scholars circulate work-in-progress by email to specific colleagues within a small circle of trust. Some researchers may post working papers, preprints, or postprints to personal or research center websites, but this is not widespread practice. This practice is more common among composers and other applied music scholars.

> I personally don't tend to post preprints or drafts, some people do. One of my colleagues has on his website a number of papers in various stages of polish, and sometimes he sends them to me for comments of various kinds. I think maybe that varies from person to person more than it does from discipline to discipline.
>
> We do have a virtual space here…that is theoretically a space for the sharing of white papers and works-in-progress and that sort of thing and I think some people on campus are doing that…Now I'm realizing that I'm not sure how much of that has actually taken place, and I'm assuming it has…Preprints, no. It sounds interesting…This is the kind of thing that I've been assuming that people were going to use our virtual space for, but again, I haven't seen it and I haven't participated in it myself.
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> We actually have on our website an area for articles and written work for people who want to make something widely available, and that doesn't mean only stuff that hasn't been published before. For example, articles that appear in *festschriften* are very unlikely to be read by very many people, so we put them online if we think they're important for our work, and people then have access that way…I've never done up my personal website. Other people do it. People put their own writings on them, etc. I've never done it. I do have this website from the research center, and I have put some of my writings that are not easily available on that
>
> I do think it's more common for people who were composers and performers to dedicate having websites where they might also link their C.V. Also, faculty generally are given their own webpage at institutions, so some faculty take that opportunity. The most that they do is put a copy of their C.V. up so you can see what they've published. Some actually have taken the time to put on papers or links to samples of their students' work.

Several music scholars with elaborate websites were younger, described as "up to date," and/or had experience in programming or Web development.

> I was a Web developer before I came back to music, so that was partly the reason for my developed personal webpage, just to have it.

Personal website trolling is used by some of the scholars we interviewed (without patterns of age, career stage, or subfield) to keep up to date with the work of others in their field, but this practice is not widespread.

> When I'm interested in visiting a website I would go to a university website. For example, I was just looking for someone at another university, and I was pretty sure he taught there, so I went to the university page and got his bio, but there's nothing more than probably the bio that you've found about me.

> No, I don't follow personal websites. It's too hard for me because my computer…I just don't have the adequate connections. And I don't really care; I don't want to do that.

> I don't have a personal website. And I pretty rarely look at anyone else's involving anything that is connected with my research in any way. There are certainly a number of useful music theory websites out there; there are things that I refer students to sometimes, actually, but not really anything that I use in my own research that I can think of.

M3.4a Data Sharing

Academic music scholars create and use a plethora of resource types. Overall, sharing data is not the norm in music; most data only see the light of day in publication. Musicologists and music theorists who work with archival materials tend to follow the history model of data sharing, in that archival materials are not theirs to share and scholars seldom share archival notes or intermediary interpretations. For scholars who use archival manuscripts and readily accessible musical scores and sound recordings, access to resources is managed by professional archivists, librarians, and publishers, and may be heavily limited by copyright restrictions. Like historians, scholars in musicology may archive their notes, facsimiles, and images in little "personal archives," sometimes with an eye to using facsimiles of primary resources in teaching or collaborative work.

> My archival data will come out in the book, or in the case, if I go with Oxford University Press, they will have them on the website, my analysis, as well as the manuscript, I hope…For the most part, I hope these will be published. But as far as putting it up out there for the whole world to see, I would rather wait until it's published.

> Musicologists…tend to choose to do lifetime projects. Let me give you a story as an example. A scholar who will remain nameless…took all the archival writings produced by a composer and used them to construct a chronology of his life…This scholar…goes to the archive on sabbatical, where they have a holding of a number of these documents, and then, as you might expect, encountered another scholar who was also interested in them…who happened to see this deep, thick, day-by-day chronicle of his life that our scholar had assembled…Then an hour or two later, there was a part of the chronology printout that had gone missing, and then one thing leads to another and our scholar found, "There it is, underneath these papers that you have over there," and had caught this other scholar red-handed stealing this stuff. The first part of this is the horror of how immoral this person is, but that's not the message that I

take home. The message that I take home is that that chronology has still not been published…

I don't circulate notes, photographs, or research data. That's not the way I work. I think I will probably circulate things when I'm doing my next critical edition. I think I'll probably want to circulate that because it's collaborative, but my own stuff I never did…I haven't circulated sound files, but people do. I'm working on a project now, a collaborative edition where I'm going to have to do that…Although my study group just started, we plan to have a database with sources, and everybody's collection on microfilms and whatever else is going to be on this database. So we're going to be able to share our materials, a lot of the stuff we can scan and just put on…I'm going to have a repository for whatever materials people will send, and mostly primary sources and scores, but eventually work that people are engaged in…That's going to be an ongoing repository of people's materials so that we can just share all the primary sources. I don't think that anyone will be possessive about their primary sources.

Digital databases of primary research materials

Data preservation and storage are mostly covered by scholars' personal funding, and there are few institutional arrangements in place. Scholars mentioned a number of recent small-scale, scholar-led projects to compile and share databases of scores and archival materials around the work of particular composers, schools, or genres. Many of these projects are funded by the NEH and the Andrew W. Mellon Foundation. Another case in point is the Petrucci Music Library of the International Music Score Library Project (IMSLP.org), a collaborative wiki-based music score library with the goal of making all musical scores in the public domain available freely online. Publishers and high-level administrators recognize the importance of such projects, but are concerned with their economic models and sustainability. One high-level administrator described an inter-university partnership to share resources and emphasize different institutional strengths. As in biology, however, one publisher observed, "It takes money to keep things online," and publishers may be best positioned to support the scholarly work of building databases by charging a subscription fee to pay for the costs of its sustainability.

I'm not much of a thinker about the future perfect, but there are a number of projects that seem to be important. Philip Gossett is working right now on an online database called *OperaCat*. It's a catalog of all the manuscripts, letters, music, all the material that has ever been sold in auction or dealer catalogs of the works of Rossini, Bellini, Donizetti, Verdi, and Puccini. And this is a database that already has some 4,000 items and will have 10,000 before they're done. I believe it will be made available through the University of Chicago library website, and it will be absolutely free. He's using his Mellon grant to do this. I really think this is a very useful tool, because there are many, many things that come out in catalogs that nobody knows about because, of course, these are materials that most people don't look at. But it turns out there's an enormous amount of material out there…My sense is most people are very enthusiastic about this project. They would like to have it for a lot more composers…

Some scholars have been encoding music for years, and they have put up websites with lots of music. Walter Hewlett also has this group at Stanford's Center for Computer Research in the Humanities (CCRH) that produces all these scores beautifully…They put all their materials on the Web for free…There's a lot of junk on the Web. You can get Mozart piano sonatas on the Web that somebody has entered in a midi keyboard and it's full of mistakes. This is exactly what musicologists will tell you, they say, "Web schmeb, that's just full of junk." And then you say, "What about the CCRH stuff? Well, that's beautifully done. It's beautifully

produced." And, of course, the center has had to encode the music from 19th-century sources whose copyrights have lapsed.

New digitization projects are quite expensive…but with Mellon and the National Endowment for Humanities, there is money available to get the projects done. The problem that we're running into across the board is the sustainability issue. Everyone loves a project, but they then expect the institution to somehow sustain it when it's over, and/or set up something like a licensing fee or something for people to use it. But many people expect Internet materials to be free…So we're at a real crossroads in terms of figuring out who's going to pay…When you have something as large as JSTOR you can figure out the fee-for-service. When you have smaller entities, it's a little more difficult to figure out how to market them, and academics aren't used to thinking about marketing. There's a sense that scholarship is a public good. Some of our professional associations are exploring to what extent that could be added on as a membership benefit. But I think we're also being cautious, having seen some of the pushback in the American Anthropological Association about these issues. They've now gone with Blackwell…and one project in our field also been approached by commercial publishers. The downside is that the publisher would take the project over for a couple of years…and the scholars would lose control of some of the aspects of it. But the upside is the publisher would bundle it with other music products…But, then again, I hear some of our librarians starting to say, "Wait a minute, we're really getting socked for a lot of money for all these databases," and if you're dealing with something like ethnomusicology, that may not be a priority for a library.

There's a collection of images of music manuscripts online, out of a British university, and it's a well-funded project. There are also several sound preservation projects being funded, including one at the University of Southampton. I believe that *Grove* has an arrangement with them. They're using some *Grove* data and they hope to be able to make *Grove*'s works list much more searchable and accessible and also tie-able to sound. So there are individual little projects all over the place, and being funded, and one of my great frustrations and ambitions is to find a way to harness all of that together. Academics are very interested in using online materials in their research process, and one of the ways I know that is that scholars are building their own databases for the important things. So there's somebody in a university somewhere entering every madrigal ever composed into a database and his funding is going to run out and that thing's going to fall by the wayside. And I think we need to find those things and figure out how they could be kept going.

Data sharing in ethnomusicology

The issue of data sharing is to some extent more complicated for ethnomusicologists, who spend years generating original data via fieldwork (and the musical examples they collect are not subject to the same copyright restrictions as "published" music). Although the degree of data sharing is related to individual personality, the impetus is still on publishing first to establish primacy and claim turf. While some scholars see data sharing as a moral imperative of sorts, others prefer to keep their data close to their chest until they have exhausted its potential for publication.

I have heard a couple stories where there are people who say, "I have this country."…Are you kidding me? So there's a myth of somehow, "I have this territory."…I think all across academia you've got that continuum of people who are very generous with their knowledge and those who are very territorial, and I think until you get tenure it's really hard for some people to feel generous because they're scared. It's fear. I personally don't want to work anywhere where people would want me to do crazy things like put down somebody else's

> research because it's just like mine, but other people have different ideas…There are two people I know who are in my country of research right now doing research. I've shared everything I have. I try to email them, say, "How are you doing? Anything I can do?" I shared my contacts. Because, honestly, it makes my work better if they go see the same people and say the same thing. And I have to get on it so I can publish first, but I'm actually happy if they publish second, third; great, we can finally have a panel.
>
> One would hope that scholars would be happy to share their data for the archive to work. People worry about sharing the raw data of their research. This is really odd given that, well, I'm just making assumptions here, but in the sciences there's this notion of replication, right? So if you don't have access to some of the raw data of someone's experiment, let's say, then there's no way for you to then replicate it yourself…And of course the other side to that coin is people are worried about others effectively scooping them before they've mined their own data for all the publications they want to get out of it. All these things are impediments to people archiving material and making it accessible to others. These are realities in our field as well, definitely…I am happy to share and I recognize that there are warts and everything in my material, but I am a pretty strong believer in the preservation of this material that people have been willing to share with us. I think we owe it to the communities where we record, at least, to make sure that this material is going to stay available into the future, because you don't know what kind of value it's going to have in the future for those communities or for researchers. I've not deposited everything that I've done yet into either the traditional music archive or EVIA, but the lion's share of it, and I will deposit it all…One field project, for example, is still not deposited…I just haven't had the time, haven't gotten around to it.

There have been some moves to openly share ethnomusicological data, including depositing data into archives of traditional music. One initiative for the evaluation of data in music that was mentioned was the Indiana University's EVIA, the Online Digital Archive of Traditional Music. This project, funded by the Andrew W. Mellon Foundation, prioritizes the scholarly annotation and peer review of video data using a software program called the Annotator's Workbench (developed in a collaboration between programmers and ethnomusicologists), with the aim of creating a dependable archive for scholarly re-use. In order to encourage scholars to share, curate, and archive their data (vs. the general tradition of not-sharing in the field), the EVIA Project has provided guidelines for deans at other institutions about why this work should be considered as part of a contributor's tenure dossier. The real challenge, as with all archives, is to become self-sustaining, likely through some kind of licensing agreement with the university.

> Annotator's Workbench was developed for researchers to use in analyzing video after the fact…But last summer my colleague took Annotator's Workbench into the field, uploaded the recordings immediately after taking them, and did the annotation with consultants in the field. So that considerably changed the amount of time that it would take. Now this would still be subjected to peer review, but the point is that this is sort of like a scientist uploading his notes and sharing them with the world. Maybe we'll get to this point where we won't have to wait until a finished article comes out, but have these annotated notes that would be there for other people to search, to compare, to check when they're reading new publications. This sharing is pretty novel and this is actually only in a very incipient stage, so I can't tell you whether it will take off or be adopted. We do have people very anxious to test the interface and use it in the field. Whether they'll actually share it with others we don't know yet for sure.
>
> Oddly enough, we have an ambivalent attitude toward sound recordings made by others, that I think has extended into the video age as well. There's this sense that if you weren't there in the field, doing research yourself, and producing these recorded documents, then what can you really do with them? But, for pedagogical purposes, everybody uses this stuff and

> everybody wants it, and I don't think there's any question that EVIA is going to meet a need in that regard…It remains to be seen the extent to which people will use each other's collections and publications in EVIA. EVIA is Web-based and is defining the 10-hour annotated collections of each scholar to be a publication, so it's going through a peer review process, etc. So it is a multimedia publication…Since we're right on the cusp of that, it's a little early for me to tell the extent to which people are going to (A) recognize this as a viable and legitimate form of publication in the field, and then (B) use it for research purposes in the same way they use books put out by the various publication houses or articles in *Ethnomusicology* or what have you. I'm not sure, and we won't know until it gets out there.

> To begin with, there's raw data, but as we know, even when one makes a videotape you're still encoding it in certain ways, you've made certain decisions. But in this EVIA Project, they are not only trying to preserve raw data—that's one aspect of it—but they are also trying to take highly annotated video and have it available for other scholars to peruse and study. The process of creating that annotated video is a highly peer-reviewed process. It is peer reviewed twice: once before people's materials are accepted to become part of the archive, and a second time after people prepare their annotations. Funding from the Mellon Foundation provides fellowships so that people can come and spend two weeks in a summer workshop doing that work…So it's different in a number of respects. It's going to provide multimedia information that we didn't have before, but can be adjunct or stand alone, and it's involving a collaborative process, but it has a peer review aspect to it.

As one ethnomusicologist pointed out, the relatively widespread use of information technology in many places around the world is an important enabler for international collaborative data curation and sharing.

> I was abroad this summer, doing research. There was little electricity, little running water…and yet at the universities in the country they have very advanced IT set up. Students were sitting at computer clusters working, carrying their thumb drives around campus, printing their papers out. All the faculty offices were linked into the Internet, although they had to use generators for electricity. So I think that information technology is an extremely high priority in many of these countries. I know in Eastern Europe I've been told by some of my colleagues that at a time when they couldn't physically get out they used computers to sort of jump over the physical barriers they faced. So they're quite sophisticated in that regard…In some countries in Europe, for example, there's a lot of state investment in things like digitizing video of very high quality. So when we work with them, we're much further along in terms of metadata work, and they are interested in what we're doing, but they are very, very accomplished in the technical quality. If we can link those two then we've got some really interesting projects together.

Data preservation in ethnomusicology

Sustainability of different archival sound and video media is a large concern. As one scholar pointed out, digitizing analog video is not a neutral operation, but can actually change the "aura" or nature of earlier film. Another scholar worried about his website and what would happen to it after his departure. Although the curation and reuse of ethnomusicological materials is growing in the field, important issues remain about preserving these media.

> The big issue in preservation in ethnomusicology is to set the standards in terms of our video, so that we're not just preserving an okay copy but we're trying to really have the highest standards of preservation, and that requires considerable effort and expense and tracking of all kinds of technical metadata. There's a digital library project at Indiana University called

Sound Directions, which is funded by the NEH, which is doing that for digital sound. But these are areas in which there haven't been standards, widely accepted standards.

I have on my shelf several media that I can't even use, the players are all gone…I just spent a huge amount of time transferring VHS tapes to DVDs, and I know that that's going to be a joke five years from now because the DVD players will be gone. And I have to do it right now, I have no choice, or I can't use this stuff. For example, I just spent half an hour this morning over in the media office trying to fix a VHS tape that I really need…so the technician figured out a way to fix it and put it on the DVD, which took a bunch of man-hours. Multiply that by thousands or hundreds of thousands of VHS, 8mm videotape, Hi8 videotapes, and many DV videos, not to mention my old reel-to-reel, which survived much better than any of these new media. But it's an endless receding horizon, with a speed-up factor, which means that there will be much less data available around probably 10, 20, 50 years now, than there was 10 years ago…because they won't be able to pick up that much data and move it around, whereas the stupid books will be still on the shelf…It's a hopeless quest…I can't transmit all the stuff I have because I don't have the time to transfer it all to another medium, so lots of it is going to get thrown out and lost.

It's stating the obvious to say that taking advantage of the potential of electronic and digital media for ethnomusicology is going to require a lot more money than I see floating around right now, and so I'm not sure quite how that will happen. For me, it really starts with preservation, and that's something that is not discussed frequently enough at all. In our YouTube world, everybody just wants to make everything accessible all the time. This is great…but so much attention has to be paid to preservation, because if you don't preserve the stuff there's nothing to create access to, and the preservation issues alone are enormous and require a huge amount of funding, which is not yet forthcoming.

I think the problem with YouTube is probably that these things will drop off YouTube, and I haven't yet figured out if there's any way to preserve stuff that you see on YouTube…Can you actually preserve these things, these clips?…Otherwise, it's gone. That's a problem. So you have to scan it all the time and you can't depend on it. It's not like a book or a periodical that is going to be there.

M3.5a New Technologies for Sharing

Aside from the use of email to circulate work in informal networks, sophisticated new technologies do not appear to be changing scholars' patterns of scholarly communication and consumption of work-in-progress. While some graduate students and younger scholars are thinking about new technologies and Web 2.0 tools as arenas for scholarly communication, most scholars use such venues for keeping up to date, not sharing work-in-progress.

Our field is just very backwards…There are almost no good ethnomusicology websites anywhere. There's nothing. The Society has a typical website that has a few things, and there are a couple of graduate students who have blogged a little bit. I blog and I've been really linked to a lot of people because I'm one of the first ones. I'm on Tribe and MySpace and the ethnomusicology list, and stuff like that. It's very, very empty, very few people are doing this. So, it seems to be only some of the younger students, before they learn better.

I think people certainly engage a *Grove* article in the way that they engage scholarly research, in that they will write an article and say, "The article in *Grove* says this and I disagree." So, *Grove* does get engaged as a piece of scholarship in that way. But I've heard that the whole question of making *Grove*, in a sense, more interactive is one that still appears to be under consideration…I think that's my sense of scholarship, in general, that people prefer peer-

> reviewed, final publication outlets. And if you do want to engage someone, if you disagree with something you read, whether it's in *Grove* or a peer-reviewed article, you write in your own article and you take issue in your own words. There's a chat list where people debate topics, but, I think, in general, you read something and then you get a publication of your own by taking issue with it.

According to one musicologist, the preference for conference and informally based networking (as well as print publication) may be due to the public popularity of music in general. The fear of being "inundated" with amateur requests and submissions can deter historical music scholars from establishing a strong Web presence.

> Here's the problem now: We start moving into music and the Internet, so we're going to get a lot of resistance from historical musicologists about anything on the Internet. The reason why is that everybody has an opinion about music in the same way that everybody has an opinion about film. So if you're trying to do serious scholarship and you start putting stuff on film out there on the Web, what you're going to get is a ton of crap. So I'm sure the serious film scholars, for example, have a real reluctance…If you start a listserv on film or music, what you're going to get is 300 million opinions, unlike what may happen in astrophysics or chemistry. There are tons and tons of blogs out there, and lots of listservs out there, especially about popular music and so on. I wouldn't want to be a popular music and culture person, because you've got so much crap to go through.

Listservs

The majority of academic music scholars keep up to date in the field in rather traditional ways, and many follow listservs in their particular subfields or research specializations. The most common listservs belong to scholarly societies, such as the Society for Music Theory or the Society for Ethnomusicology, and are generally for members only. There are large numbers of passive readers on most listservs, and active users generally ask questions about possible projects, research ideas, or manuscripts, but do not share detailed research-in-progress.

> People will use the listserv if they're looking for an unusual recording of a performance that they know exists and they can't find it, or some of the people who work on music before 1900, if they can't find a certain document that's referred to in a footnote or something. But it's mostly for really unique and obscure questions…Well, every once in a while somebody does share a large body of work, but then you say to yourself, "Oh, the poor guy or the poor girl, they must have had trouble getting it accepted for publication." There has been somebody who has done something like that. We're still a little bit traditional that way.

> In the case of the one paper in *Music Theory Online* that I can think of, it elicited a number of written responses that were published in the next issue. And sometimes SMT Talk fills up with comments about something like that…I subscribe to them and tend to read them quickly when they come in. I wouldn't say they really form a major part of my work, but on the other hand it's another way to stay connected.

> There are also electronic listservs that if you are a member of the Society of Ethnomusicology you can be on. And what I witnessed is very few people are actually able to share real research. Every once in a while somebody will say, "Hey, I just published this article," or "What do you all think of this issue because I'm writing on it?," and the same six people answer. There are all of these passive readers now. It's on their radar. So I think some people are more or less dedicated to doing it that way.

> There are many ways to keep up to date. First of all, people will send you email messages. There's a list for ethnomusicologists, and then people reference stuff and they tell you what's coming out or people put up queries saying I'm interested in doing a study in this, do you have ideas, and some people actually write you back with ideas, and if you read all that you get ideas yourself. So there are Internet lists…There's the Society of Ethnomusicology listserv. In ethnomusicology there aren't that many, but then there are specialized things. Sometimes I drop out of the lists because they get boring and tedious and a few people hog the list all the time that I'm not interested in, and that can happen, too.

As one musicologist and music theorist described, some people are reluctant even to use listservs to ask small questions, due to personal preferences for protecting turf and conservativism in keeping one's research topic close to the chest.

> We do have an online publication in the Society for Music Theory called *Music Theory Online*. That's more for reviews of books and responses, but there's an SMT announce and an SMT talk. So if, for example, I want to know if anyone else has an opinion on something or if there's something in a manuscript that I just can't crack open or can't find the answer, I could put a message up that way. I don't know if I'd be inclined to do it because, I don't know, I think I'm somebody who likes to solve my initial questions on my own, before publishing. So it isn't as open a communication with me as perhaps it should be, because people do tend to safeguard what they're working on. Like in history…It's turfdom. It's the fear of something being appropriated by someone else.

In contrast to the larger society-run listservs, smaller, topic-specific listservs may foster more community engagement and scholarly communication. One scholar wished more specialized research networks would support this genre of communication.

> There's a list called Dance Cult, which is for electronic dance music, and it's generating some very interesting stuff, and scholars really are critiquing each other's work and creating good stuff and doing ethnography on there, and pooling, trying to find out…maybe there's a scholar in Australia that's curious if the same thing is going on in Canada. And people are very, very helpful. It's a small community, though. There are only 130 people on that list, of which maybe 25 are pretty active, which is a really high percentage for a list. I find that useful. I wish there was something like that for my area of music, or some of the other fields I was in. I thought of starting it, but then some of the people are provincial and petty and I don't know if they would go for that. Who knows? Our field is strange.

Blogs

According to the music scholars we interviewed, blogs are not commonly followed or maintained in any of the musical subfields. One senior musicologist told us that there are some excellent music blogs, including those written by music critics at news outlets like the *New York Times*; however, blogs are primarily considered to be recreational activities, rather than scholarly products. Blogging is often perceived as a generational issue, and the young scholars we interviewed do seem more likely to keep a blog, although generally blogging is sporadic or for personal reasons.

> I have some friends who keep blogs, so I read them because they're my friends. That's the only reason why I consult them. Or I will occasionally pick something up from the *New York Times* website, which is how I keep up with American news when I'm doing research abroad. And occasionally they have references to blogs and I will go look at them. I get *The New*

> *Republic* materials online, and occasionally they, too, will give something from a blog and I will go look at it. But I don't regularly read blogs. There are supposed to be some excellent music blogs. One that is particularly well spoken of is the one that Alex Ross from the *New Yorker* has used. It's very well known, and people like his blog. Brian Dickie at Chicago Opera Theatre in Chicago has a blog, which I occasionally look at to see what Brian is thinking these days. There's a woman by the name of Marion Rosenberg, who is a critic and a musician, and she has a blog which I think she calls "Vilaine Fille" and I've looked at that occasionally. There is a woman who I don't know at all in Milan who calls herself "Opera Chic," and she reports on what goes on in Milan—very funny. So she's fun to read and I will occasionally go over and read it, but I don't read it on a regular basis.
>
> I don't use blogs, but it's starting to come in. I know people that do run blogs, and so that could be interesting or useful. I don't know I just don't have much patience for it, the kind of chattiness, self-centeredness, and public posing that people will do in something that's supposedly informal. I could do one, but I'm just not that generation or that type…There's the 24-hour-day problem, too, and how much time do I want to spend on that…
>
> Oh, I don't do blogs. But you've got to speak to younger people who are more into this, it's so far behind what I feel comfortable doing…You can waste your entire life looking at people's blogs, and you have to have some standards. How do you judge what the hell is on a blog? People can put whatever they want on a blog. I really think that there has to be some sort of a filter, at least personally. I don't want to open myself up to all that. People do research on Google now, and that's not my idea of research. Students do that. I would not encourage my students to use blogs for research, I just wouldn't. If they read the *New York Times* and read *JAMS*, they'll be okay.
>
> I think that most scholars would not engage in blogging or anything like that. They would say why would you put your idea out there because it takes so long to get published? You're just seeding the idea for all the other scholars. It may just simply slip their mind that they read or thought about this some four years ago or whatever, and it will end up in their article. People do become proprietary about ideas.
>
> I don't blog, although a friend of mine in the music department created a chat page for a music seminar, and put me on their chat page, because they were doing something that I was interested in. So I did get involved a little bit that way. Is that what blogging is?

Ethnomusicology blogging

More than other subfields, scholars in ethnomusicology seem to be interested in blogs as a technology for public communication. Indeed, some blog from the field, although this appears to be a marginal activity.

> My involvement in multimedia…happened before the wiki phenomenon really got up and running. I see great potential there for sure, as I do with blogs for that matter, which is another thing I haven't really done a whole lot with yet and is really just starting to happen in our field. There are a number of ethnomusicologists publishing blogs and experiments with blogs as notes from the field. I think that has great potential but there are also some dangers and pitfalls there…I'm aware of just a few ethnomusicologists doing blogs on the Web. They're open to anybody. From my experience with them so far, which admittedly is very limited, it doesn't seem like they are getting consumed by other scholars a whole lot. Again, if you build it will they come, but it's not clear yet if it's going to happen. I can say for sure it's going to happen with my students, the people who are in graduate school right now. They are just so familiar with and naturally inclined toward communicating in these kinds of ways, that I'd be

> very surprised if in five years when they are all assistant professors of whatever someplace, that they're not using these tools…I'm kind of in the middle zone. I grew up before computers took over everything, and my older colleagues, some of them are getting involved in this stuff but fewer of them. I'll just tell you this. There's a newsletter for the ethnomusicology website that has published a couple of brief excerpts from blogs. This is definitely in the air right now in our field, but the extent to which are people actually doing it is a little bit unclear to me.
>
> In terms of taking the idea of reciprocal ethnography to a new stage using new technologies…imagine if you could create a blog, in which all of the people who you're doing research with—who are spread across the country—could participate. So, you could run your initial analyses by the people you're doing research with and get feedback from them, and then you could have virtual conversations about this. I think there could be a point, maybe a little bit further down the line toward publication, where you could extend this to conversations with other researchers. I'd really like to see something like that. I'm very much thinking about concentric circles as I talk about this. There's a point where I reach out to a large concentric circle of like-minded colleagues in ethnomusicology, "What do you think about these ideas?" before it sort of goes out to the biggest circle.

PART B. THE APPLIED FIELDS: COMPOSITION, PERFORMANCE, ELECTRONIC/COMPUTER MUSIC

In contrast to the dearth of formal sharing in the academic subfields of music, scholars in computer and electronic music appear to have more of a sharing culture for in-progress work. This is undoubtedly due, in part, to the close-knit, collaborative nature of research in this area; the field itself is one big informal network.

> There's a triumvirate now. It started with IRCAM over in Paris, the Pierre Boulez operation, and CCRMA down on Stanford, and then CNMAT at Berkeley. And CNMAT agreed to specialize in software, and they specialize in hardware down there, and then the three basically share people and send people around.

As in the academic music subfields, email is the preferred form of soliciting feedback or communicating research questions for applied music scholars. In-person appearances at conferences, festivals, and other internal and external events are an important way of sharing work-in-progress. Personal websites are also an extremely important way of sharing and keeping up to date with publications, recordings, and other materials created by colleagues. Sophisticated Web-based support mechanisms in centers of new music research function to both organize scholarly collaboration and facilitate the sharing of data and work-in-progress. While some scholars belong to dynamic listservs, such as the Auditory Mailing List, there is no evidence of social networking or blogging activities as a means of scholarly communication in the applied subfields beyond what was described previously.

M3.1b Widening the Circle: Conferences, Festivals, Lectures, Internal Seminars

As discussed previously, in-person appearances are essential for establishing visibility in the field. These include performances at international festivals, invited lectures or master classes, and giving demonstrations of new technologies under development. Similarly, in-person appearances are also an important way to communicate and share work-in-progress. Foremost among these are attendance and presentation at key conferences in the research area, including the Society for Electric Acoustic Music and the International Computer Music Conference. As the composer below describes, appearances at conferences are important networking opportunities,

and attendance and awards can result in invited performances, master classes, and enhanced reputation.

> One of the ways that I communicate with other people on a regular basis is through conferences and festivals of music that happen all over the world. They are reviewed, some of them are blind reviews and some of them are not, but you submit things to these things, and then you get accepted, and then you go. They're basically composed of paper sessions and concerts, and run over the course of anywhere from three days to a week. One I've done a lot with is the Society for Electric Acoustic Music in the United States. Then there's the ICMC, the International Computer Music Conference, that's actually part of the ICMA, International Computer Music Association. Those are two big annual conferences, one national and one international. So I have the equivalent of peers who are doing electronic music…at some of these places…That's actually one way that I've gotten a lot of performances and there's been a lot of networking there. So, I go to one of these things, I have a piece played, people go back and then they want to invite me to do a piece back at their institution. And then somehow I got a reputation of being great at master classes and giving lectures and stuff, so people have me in residence for three-day stints.

Given the importance of specialized conferences to share and communicate new work in electronic and computer-assisted music research and composition, two complaints were expressed about the existing venues. One scholar lamented the lack of a comprehensive creative meeting for composers, while another noted that most meeting venues have insufficient technical capabilities and no way to teleconference for scholars unable to attend.

> My discipline does not have a similar really comprehensive meeting that linguistics does, their Summer Linguistics Institute. I'm sincerely jealous. Linguistics does this every two years now and they have a large number of invited experts, they attract this huge body of graduate students, everybody lives together for a month, doing all kinds of different things. Can you imagine? That's just such an enormous impact.

> There is something else that we really need and that does not exist, at least in the standard tools, and that is technical tools for conferences. When you do a scientific conference, you generally use a PowerPoint presentation, with additionally another medium, like we'll have sound files as extra. But we don't have an integrated tool for managing the recorded video of the speaker or slides synchronized to the video, and maybe also a link between our presentation and the textual article or its references, etc. I have seen experimental tools that do that, and we really need that because we cannot attend all the conferences, and there will probably be an effort to do this in the field.

Festivals

As with conferences, electronic music festivals are important networking and sharing opportunities. As one researcher and composer pointed out, the "portability" of computer and electronic pieces make them especially conducive for travel to festivals.

> I have a lot of friends in the electronic music community, and all of them are not just the electronic music community; they go back and then they write their orchestra pieces in their own hometowns, but we get together and we see each other quite a bit through these festivals that often focus on electronic music, but not exclusively.

> Expressed a different way, it's much easier, surprisingly, to make an eight-channel tape piece in this massive surround sound thing and bring it to a festival where you need no rehearsal

time because it's all frontloaded because the festival has committed to have it and set up a major eight-channel sound system. You go there with your sound files and you get a performance. Now, if you write an octet for eight musicians, you're talking about thousands of dollars to pay for performance fees, countless hours of rehearsals, space considerations, etc. So, as a result, acoustic performances are just much harder, and orchestra is really, really difficult.

External seminars, lectures, master classes, demonstrations

Performers and composers in new music also follow the traditional applied music scholarship practice of visiting other institutions to give lectures, lead colloquia, or conduct demonstrations or master classes.

I've given some fifty or so lectures at "peer institutions," which is a very funny term. What is a "peer institution?" But I've given presentations to all sorts of other institutions, and to graduate composers, which are like composition colloquia. So that's one of the gigs that we do: we move around and we go to other schools and we talk to their communities.

During the year there are a lot of external seminars…For example, next June during the Agora Festival, there will be a symposium on expressivity in voice and speaking. There will be a general public presentation and then a more scientific presentation with invited speakers from the field. We also travel to various other countries and give both theoretical lectures, as well as presentations to showcase the applied work. It certainly is difficult, sometimes we have to just be theoretical and just give a lecture, but it's better when we can blend the lecture with the demonstration. The most important sharing that takes place is external. Of course we have the website but it's not enough. We have the publications, but the best is to have this kind of open symposium.

Internal seminars and demonstrations

In tandem with external lectures and seminars, many centers of electronic and computer music research also hold regular internal seminars for the researchers, composers, and performers in residence. The presence of funders or visiting scholars may provide an additional occasion for an internal seminar and demonstration of work-in-progress. Centers of new music research simply seem to have a more open and collaborative mentality than traditional academic departments; as one scholar described a visit, "I love that place. Everyone is speaking French and drinking wine in the afternoon. It's very nice…very Bacchanalian."

Then we have a monthly seminar, where our researchers present their work to the composers and performers in residence.

In terms of research that we're doing that we haven't actually published in a more traditional thing, the main way that we do that is people come and they physically visit the building. So a lot of times it will be an old friend of someone who works here or someone from another center who's coming, who happens to be in town because they're giving a talk or something on their own. They'll just get a tour through the building and directly talk to the researchers, and you have some piece of hardware that someone's building, which, of course, is the impetus for the discussion about it. A lot of times we do demos for people here. A lot of times we will set up a demo, especially if we're doing some kind of sponsored research or we have funding through a grant or something and the people who are writing the checks will come for a site visit, and we'll have prepared a demonstration of something we've been working on. So we do a lot of small group communication of "hot off the presses" kind of research.

M3.2b Public/Open Sharing: Websites and Other Web-Based Mechanisms

Scholars in applied music commonly use personal and research center websites to share publications or polished work-in-progress, including preprints, recordings, and software. For example, IRCAM has a centralized, searchable repository for publications. Additionally, in France, the Centre National de la Recherche Scientifique (CNRS), the national research organization, has an open access archive of publications named HAL, akin to PubMed, where IRCAM scholars deposit additional preprints of their work for public dissemination when permitted by copyright. Other scholars or centers for musical research seem to post and share work on an *ad hoc* basis, or on a personal webpage.

Personal, professional websites

Composers and performers commonly use sophisticated personal websites to disseminate written work, MP3s, podcasts, video recordings, and supporting material. This is related to the importance of visibility in establishing scholarly reputation. Some composers and performers may use MySpace as a surrogate for maintaining a professional website, or contribute musical scores to IMSLP.org. Correspondingly, composers themselves browse personal websites to keep up to date with each other's recent work.

> I have my list of publications online…That's the big link on my webpage there.

> You could expect that composers will have a personal professional website. If you want to know about a composer, the two main things that you would expect to find there are the composer's scores and, hopefully, MP3s or other recordings of his music. So personal websites are what I look for first when I'm looking online about a composer. And, of course, there's stuff like MySpace, which is not considered standard at all in academia, but you can find a lot of composers who prefer not to maintain a website in the traditional sense. These composers may have all their stuff hosted in a service like My Space, for example…However, I think many people still stick to traditional ways of keeping up to date, like looking into new books that were released or new articles in journals and magazines. I look a lot for people's websites, their online presence. And sometimes I find out more about people through websites than reading about them in a normal book.

> In the artistic domain having a well-developed website is absolutely essential. So, as far as composers or performers, if you didn't have that kind of contact you'd be lost in the ether; that's for sure…I also encounter people who might not have well-developed websites, or might have very minimal stuff…and it tends to be generational. The younger folks are going to have decent and much better than my representation, and older folks less often—sometimes just a bio on a department webpage. That might be all you see…And so now I enter into website apology mode, because I don't really do much with learning how to do websites, and I had about two days to redo my website over holiday break last winter, and it's a mess. It's interesting, because I feel like it's just incrementally better than it used to be, but it would require an insane amount of work for me to do it to the level like a younger colleague does it, or to do it to the level that I'd be satisfied…I don't have anybody to help me with it, and I probably wouldn't want to put somebody through that. I should be doing it. It's just a question of time. Because I tend to like to, as far as my software, I like to understand what I'm doing. And everything about how you do these online things, as they get more and more useful, they also get under the hood a little more and more tricky, and so designing that stuff obviously there are lots of ways to do it…So, there's this huge industry of 500,000 Web developers out there, and how are you going to do something at the level that's common practice, good

> practice? Well, either you go out and get somebody else or you spend the time. And I'm just confessing now that I know I need to.

Frustrated with the inability of senior colleagues to keep their personal websites up to date, one young composer spoke longingly of "some sort of Facebook for researchers" that could be used to search for scholars doing work in particular areas. Indeed, another scholar and composer noted that some sort of amalgam of a home page and preprint server would be welcome "if it takes some of the burden off of me reinventing my webpage to be spiffy."

> I realize that many composers and colleagues in the field…because it's not too easy to maintain your own website if you have one. In order to keep everything neat, they may pay someone or they may do it by themselves if they have a lot of time and experience. Some people just don't have websites, and I know that they are doing a lot of stuff. For example, one scholar is an excellent computer musician and programmer, so you'd think that s/he would have an excellent presence online, but this scholar has a very crappy website. And I know that because this scholar is doing so much music and research, s/he doesn't have time to keep a website. So his/her website is a simple page with a few messy links pointing to some publications, but I can never trust if it's updated or anything, which is a pity, because I'm sure this person is doing a lot of stuff and I would like to have more access to what s/he's doing right now, like yesterday. So the thing that I thought…I don't even know if it exists; if it exists I would love to know…is some sort of Facebook for researchers. If there was some kind of Facebook service for researchers, in academia, where people could have a more or less standardized page that you don't have to maintain but it's there ready for you to input your recent, "I'm writing a paper about this. It should be ready in three months," or, "I just found this book." Then you put a link there, for yourself to remember but also others could access it. And if I'm looking, let's say, for scholars researching ear training methods, I could just type in "ear training methods" and the system would give me the 15 top researchers, and I could see their pages and see what books they recommend, what articles they have published, etc. I don't know. So, many people use Facebook today to keep up with their family and friends, with various bits of information going out to everyone at the same time, and so I think that this would be a good system to have for research. I don't know if people would use it, but an ideal situation would be if everybody got into it and you had everybody doing updates without having the trouble of maintaining your own website.

Other Web-based mechanisms for sharing work-in-progress

The sophisticated Web-based support systems in the publication of scholarly materials at IRCAM, CNMAT, and CCRMA play an important role and some of the materials produced and "published" through these venues are open source. But even here, the music scholars we interviewed draw a distinction between the kind of work that can be shared with close colleagues, and that shared with a broader public. "Open" has a variety of meanings, and there are often different levels of access with various security measures or "gentlemen's agreements" determining who in a restricted or public network has access. Again, small and tightly knit communities tend to engage in more open sharing.

> We are very open to sharing. Absolutely. In the rapid and free dissemination phase, from the get-go everything's open. And internally—this is important to know this, actually—we run a central service, which is a file system, that has hundreds of user accounts on it, and everybody can see everybody by default. If somebody really wanted to change that in order to have a lock on a project, they could implement protection, but that would be kind of odd. Nobody's going to sit there and call them on it, but the default is the usual, and you know

somebody's working on something, even without asking, you usually can read what they're doing. Obviously, that doesn't work for the administrative stuff, so a few things have locks on them. But that's not as particular to our lab. I think we've always had a tradition coming through…and maybe you've bumped into this, but it begins back in the artificial intelligence lab cultures of MIT and Stanford being these kind of hyper-egalitarian, libertarian mindsets where if somebody put a lock on something, that was like a challenge. Just physically if you try to put a door lock in, there will be 10 copies of a key the next day. That was the old days, right? This has changed a little bit now because as those mainframe computer cultures switched to distributive processing and PCs, and fewer and fewer labs maintain a central services file system. So, ours has that built-in sharing structure to it because it is central, but if you're in a lab where everybody is in charge of their own file system and there's no direct coupling there, then there's a physical act that means you have to somehow trade data. So you may not be there unless somebody goes to the trouble of posting it in a public way, like on the Web or something. Whereas in our case, literally I can look at the directories of somebody else; all the machines see all the accounts…Outside the lab is the boundary, actually. There's this department-sized boundary, which is semi-permeable when you open it to somebody on the outside, but somebody has to enable that. And then everything else that happens, though, is in the mode that causes somebody to publicly post something in a world-readable way on the Web, and that raises the questions of is it altruistic, is it forced by advancement reasons, or what's going on?

There are always public domain projects, and it's not particular to our lab, anyway. The way we work is that everything is public domain and talked about and taught, no matter how new and recent, and no matter what the team is that's working on it. So if it's a joint industry-academia team, we go to great lengths to keep that flow open and there will be IT agreements, which might earn the contributing industry a facilitated access, kind of the first-on-the-block type thing, but not exclusive generally. That's changed over the years. What's really particularly important here is just the no secrets policy. In a small lab, that's so key. On the other hand, it means that there's a community that has a lot of respect internally for colleagues. Everything is visible, but you don't go snarfing it up and patenting it…Like a gentlemen's agreement, I think it's self-regulating in that sense. Nobody signs anything.

In terms of sharing work-in-progress, there's a lot of software that we have available for download through our website that, a lot of times, somebody will find a bug in something, they'll send an email, it will get forwarded to the person who knows how to fix the problem, and usually he/she will fix it and put a new version up on our website. And that's a thing that we share with the public. I consider that a form of communication.

Researchers in new music and electronics have talked about the urgent need to establish data standards or protocols in the field in order to share and disseminate work, not to mention preservation.

Some parts of a piece are mere experiments that will happen and then be over, but other elements may find a longer existence in other pieces or for other composers. One of our priorities as a research center in new and computer music is to promote the generic, rather than having one composer, one piece, one technology. We need to emphasize common standards, which can apply to several aesthetics and several composers. And then we don't all the time need to invent new instruments, new techniques, *ad infinitum*. No, we try to build on and make use of each other's work—common objects among different and unique composers. If there is not this generic aspect, we cannot work. This is also key to sharing and disseminating the work, because if you look at the history of electronics, you can see that there were some very inventive pieces that were simply impossible to redo because they are too closely bound to the owner, the composer, or to the very first player. We can say at the

> same time that it's impossible to do John Cage again, it was bound to him. But while we want to preserve the aura and importance of unique, singular compositions, we try at least to have the piece's foundation built upon some common aspect, methodology, or way of working.

M3.3b Data Sharing

As in biology, computationally minded researchers in music spoke of the need for shared databases of sounds that could be searched, mined, collectively annotated, and computationally analyzed to extract information. Scholars in computational musicology who create databases of sounds or other data seem happy to openly share these after publication on personal websites or privately upon request.

> I encode the database and then people will find out about it or they'll ask me for it…In the old days, I'd send them floppies and things, or email them to them, but now the nice thing is you can just stick it on the Web and they download it.

> One problem that people are really interested in, in addition to the "finding the beat" question, is marking when notes occur in musical recordings. It's called onset detection. And, again, I think there are going to be databases of sounds that people have found onsets for by hand and they're sharing them so other people can calibrate their own software using them and so on. I don't know exactly what that's going to look like, but it would nice if there's a Web interface to it and people could contribute their own materials and people could add annotations to other people's things or comments about the quality of…"I don't really agree that there's a note at this time in this one. I think it was earlier." So, I think that's coming, and it's going to be very helpful for people doing that kind of research.

> Well, one thing that I see is a lot of work on computer analysis of sound material, where people have recordings of something, and you want the computer to tell you what genre of music is it or what's the tempo of the beat of the music. People do a lot of similar stuff with speech, and speech has always been much more funded than music. So in a lot of ways, especially in terms of computer analysis of recorded sound, speech is leading the way. One of the ways that speech is leading the way is they have a lot of public databases of sound where there will be 1,000 hours of whatever, people conducting an interview in English that will be notated. Somebody will go through and transcribe it and mark where all the words begin or something like that, which will then be shared. So researchers who are developing software for dealing with these recordings can then know that they're using the same data as other people who are doing the same kind of research somewhere else. I think that in computer music, for this analysis of sound thing, there are going to be more and more shared databases of sound that have somehow been annotated or marked or processed by hand.

These databases could be a way to both preserve ethnomusicological data, as well as to make them available for other kinds of music research.

> I'm uploading some data…These are a bunch of field recordings that my collaborator and I made in another country. We were actually…just recording…various things that we saw just on the streets and performances. It's some audio. It's of some crappy video that we shot with just a little handheld digital camera, but a lot of audio recordings that we made that we intend, eventually, to catalog and archive and study and go back and refer to, both for just our own learning purposes but also possibly as a computational analysis project of…whatever. It's just a big database of field recordings of this music.

Data preservation in new music technology and composition

Issues of preservation are forefront in the minds of many of the new music and technology scholars we interviewed. As one described, "There are three decades of black holes, because material is disappearing quickly from the field. The Web components of our work are expiring." But, as another researcher pointed out, preservation cannot be the guiding principle because then composers and researchers will be afraid to experiment. There are some movements on behalf of research centers to maintain archives of computer music compositions and the technical specifications necessary to recreate them. As one scholar described, selecting which new music pieces should be preserved is a highly selective act of data curation.

> The problem is that we just walk on forward and leave no trail behind us. And, even now, we can see that some famous electroacoustic pieces are vanishing slowly but certainly. This disappearance is twofold: first the recording or artifact of the piece itself vanishes, and then there is a lack of precise descriptions or tools to re-create the piece. A piece that is not played is a piece that will vanish, just like a lot of opera from the 18th century; they vanished and we know nothing about them.
>
> But, we cannot worry about preservation or the long-term life of a composition from the very beginning of a piece's development because the composer won't take any risks and won't experiment with anything.
>
> We'd like to document at least 10 or 15 pieces a year, but we just can't do it…Then again, not all pieces will be played again, and not all of them should. Some are just "experiments" of sorts. When they are performed, we can tell by hearing them whether they will likely be replayed…And when we see that musicians are particularly interested in a certain piece, then we start to consider its preservation.
>
> IRCAM has Mustica, which is a database for technical specifications to recreate particular musical pieces. They've created over 500 new pieces since IRCAM began, but they've only been able to create precise descriptions of the piece for about 12. Their descriptions are very precise; they describe not only how to perform a piece with the actual tools, but also how to be true to the composer's idea down the road, when the tools may be totally different. But it's a huge job because the technology and the specifications are always changing.

4. HOW DO YOU COLLABORATE WITH OTHER SCHOLARS? AT WHAT STAGE OF RESEARCH?

Collaboration in music varies by subfield and according to the particular project being undertaken. Historical, theoretical, and ethnographic music research tends to be solitary in nature, and collaborations are often driven by informal networks. In contrast, research related to performance and music technology can be highly collaborative, and such collaborative work is often sustained by interdisciplinary research centers for new music and music technology. Scholars in all subfields may collaborate with individuals outside of academia to carry out particular projects, such as musical performances or recordings, or industrial technology transfer. In all cases, scholars note the lack of adequate standards in place to judge the individual contributions of authors in collaborative research. Email and face-to-face interaction remain important ways to generate and sustain collaborative work, while purpose-built websites facilitate data analysis and collaboration for larger research teams.

PART A: THE ACADEMIC FIELDS: MUSICOLOGY, MUSIC THEORY, ETHNOMUSICOLOGY

Collaborations in the academic music subfields tend to be small-scale and organized by common research interests. Some scholars complained that the general absence of support and encouragement for larger-scale collaborative research actively discourages "knowledge building."

M4.1a The Nature of Collaboration

Collaboration in musicology and music theory

The norm of the single author reigns among the humanities, and work in traditional musicology, music theory, and ethnomusicology is no exception. Music scholars nevertheless collaborate in a variety of ways, which often depend on individual personalities and the nature of the project. In musicology, collaborative work is particularly common in the production of critical editions of musical scores. Other collaborations in musicology and music theory can include coauthored textbooks, co-edited volumes, the occasional coauthored paper, or even interdisciplinary collaborations with scholars in other fields, as found in the study of music cognition. Music theorists report that collaboration is rare, which one scholar attributed to the small size of the subfield.

> The norms regarding collaboration depend on what you're talking about. Obviously, if you're talking about a monograph or an article, generally people do single-author work. In work that involves making critical editions or editing major series, you're collaborating with people all the time.
>
> People become very, very proprietary of their work in musicology. What I admire about the sciences is that people understand that research is a community effort in which the essence of the effort is dialogue, and you rely on one another to correct each other's mistakes. But what happens in the arts and humanities is that, first of all, we don't know how to collaborate. The exceptions in music are these critical editions. That's the only area in which people collaborate, because it's a division of labor, "You're going to do symphony number one, you're going to do symphony number two, I'm going to do the critical edition for symphony three," so we can divvy it up that way and it's not as though we're going to be stepping on each other's toes. But the image in arts and humanities is of a long-isolated ivory tower genius scholar who comes up, and after 20 years produces this great work of genius…That's what I've learned from the sciences, how to collaborate…I collaborate with other scholars, because they have something to offer that I don't have…And also I've realized that this is the best education for my students, to coauthor papers.
>
> Co-editorship is pretty common. I've actually been talking with a former student of mine about doing something together, and there are certain projects that lend themselves to collaboration. I don't know how this is going to pan out, but I think it's a good model.
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> I'm not sure exactly why we don't coauthor more. Again, it might be because music theory is small. It just doesn't seem to be the way that we are moving, for the most part…There are not as many joint publications in our field as there are in some others. I think most of our publications are single authored, but at the same time that doesn't mean that we're entirely solitary in our work.

Collaboration in ethnomusicology

Ethnomusicology is a multidisciplinary research area, in that scholars examine their research subject from multiple perspectives, including linguistic, anthropological, and musicological aspects. While multidisciplinary team-based fieldwork collaborations are more common in Europe, scholars observe that the American structure of higher education does not seem to support this model. Like the scholars above, ethnomusicologists who collaborate are motivated by personality and may be the "usual suspects."

> Many ethnomusicologists apply for individual grants to go to the field and do their research. They work with consultants from the field site where they are, but they typically do not collaborate with other ethnomusicologists on a project. Now there certainly are exceptions. This is unlike some of our European colleagues, who tend to work more in teams and groups. I'm not sure why that is. It just seems to be a pattern that has been developed in our research here in the States. If you look back to years ago, around the turn of the 20th century, expeditions went to Africa in groups and multidisciplinary teams. But it is much less the case these days. So data collecting tends to be individual.
>
> Coauthorship is not as common as you would think. I haven't done it very much in my career. I would definitely be in favor of it, but scholarship just tends to be very isolating in various kinds of ways. People do their own work and then maybe they meld it with other people's work. I've talked to the students about that, because, for example, I did a lot of fieldwork in the old days…where it was normal to have what they called a "complex expedition" with a linguist, an anthropologist, a historian, and an ethnomusicologist, and they would comb this valley and get all the stuff out of it, and then put out publications where there would be a comprehensive look at this valley. We just don't do this. Also, America is very oriented to the individual. It doesn't encourage people to collaborate. You just have your own work, and it's not like science where all the papers are multi-authored…That's why I say America does not have that team approach in the humanities, in comparison with the European model. Even in France I'd say it's the same, unless you have teams that will work on something for a long period of time, and maybe come together with publications, or Max Planck Institutes in Germany, for instance. We don't have any of those structures—the research institute, the academy of science models—it's just not American.
>
> If you look in the journals, you'd probably have to go two or three years to find a coauthored article. Every two or three years you might find one. It's a very, very small number. There's much more collaboration among Canadian scholars. I would say maybe 10 percent of the articles in Canadian ethnomusicology journals are written by two authors. But they're also the same two people.

Collaboration in multimedia work

As described above, much collaboration in the academic music subfields results from the nature of the project being undertaken. Scholars engaged in multimedia or creative work, spanning everything from the creation of CDs in ethnomusicology to opera in musicology, collaborate with wider circles of individuals, including performers, producers, and those responsible for the technical components of the work. In these cases, collaboration stems from the need for expertise and resources beyond any one scholar's capabilities.

> In the multimedia domain, I've been collaborating for many years, because you have to. Well, I guess you don't have to. I guess one person, if they had the rest of their lives, could

probably put all of these things together as well as have the time to develop all the modes of expertise you need, but in reality I think all of us have to collaborate. So that has involved collaboration with other ethnomusicologists, for example, on CD projects. And then, very importantly, there are the technical people whom one has to collaborate with to do these kinds of works. This has been extremely interesting, because I find that I develop technical ideas that I bounce off of them and they give me feedback; and they develop content ideas that they bounce off of me, and so things are not isolable in that sense. It can be really stimulating and interesting to see what happens when you cross disciplinary boundaries in the process of creating something for public consumption. But I've done not as much typical collaboration with other ethnomusicologists in the sense of coauthoring articles or books or anything of that sort. Collaboration is not typical in the field, though obviously scientists do this all the time. So the kinds of collaborations that we're seeing in multimedia are a bit unusual for us in the humanities.

There are scholars of music who are also involved in visual products beyond the score itself. For instance, for some scholars of opera, there's a visual product there, and they can be very much concerned about productions of these things and how they work, and working with what we would call directors. One of my colleagues used to work with theater and performance arts in opera productions.

M4.2a How Do Collaborations Arise and How Are They Sustained?

Many of the collaborations described by scholars, across the academic subfields, are born through informal discussions with colleagues in one's department or research network. Seen in this way, collaborations are often an extension of a scholar's existing informal network. Scholars who do collaborate cite the benefits of working with people with complementary skills and similar interests, or being driven to think in new ways. One ethnomusicologist described coauthorship as a "nice experiment."

I'm having conversations with one colleague right now, who works on the same genre of music as I do. We've talked about ways in which our interests intersect and the possibility of a collaborative venture where we might do a comparative study of two musical styles. That happens very informally with this person. We'll have lunch; we'll talk about these things, bat ideas around, or email here and there. That is happening, and I'm hoping that I'm going to be moving more in the direction of more collaborative research and maybe even coauthoring something with him, which would be a nice experiment for me.

I do have one paper that is a joint paper. It was quite a few years in the making. It goes back to someone who had an idea for a new application for the sorts of things that I was doing…I showed him some of my work, and he gave a conference paper extending some of these ideas in a different direction from any that I had thought of, and subsequently I did some things along those lines too, and we put our heads together and came up with this paper.

There is one scholar in the field who has written many books, and I always say to my friends that we would be good collaborators because he does one aspect of things and I always do the other, and we have similar interests. But I don't think either of us has time to collaborate, because we're so busy doing our own things…So, as far as teamwork in publishing goes, I have not done much of that, but I will be a member of a teaching team with scholars in two other departments. The course will be a collaboration, and it's great fun. I don't see all of us, though, publishing anything together because we're all specialists. But this opportunity to think in an interdisciplinary manner is going to be very refreshing.

Collaboration exists between advisors and graduate students in musicology, music theory, and ethnomusicology, but this is not universal. For one senior musicologist, involving pre-tenure colleagues in collaborations helps them to establish the contacts and connections that are important for a career.

> Collaboration usually takes place at a late stage in the research process. But then again, one of the things I like is having a student or a young colleague with me when I go to a library, because the dialogue over the material is extremely helpful, and so in that sense it would be very good to have that discussion at a very early stage…You really learn more by answering and asking questions with someone who is equally interested in this material. I've found that to be incredibly useful, mostly with my former students. I love it because I learn so much from them and they learn from me, but mostly I learn from them…I had a big project years ago…and now I have students who have gone way beyond what I've done and who are thinking of doing a collaborative publication on this. It would be great because now their work has stimulated me to think new thoughts. I think I'll enjoy that very much because as collaboration it makes you think harder…For example, there's all this stuff in a related area, which is just not something I know anything about, but I'm reading my younger colleague's work… my colleague is writing about it, and I'm getting a lot out of it. So that's more like intergenerational interaction…It's going to lead to collaboration because we're going to do a conference paper together…It will be good for my younger colleague because s/he doesn't have tenure yet. Although I'm not sure it will count, exactly, the kinds of contacts and context that we will establish will be very good and very useful for my colleague's career.
>
> Collaboration does happen…It's more like a mentor and mentee collaborating; it seems that's happening now and then…I collaborated with an older colleague on a textbook…It was great fun, and we go way back, so we always got along well…But I don't think collaboration happens so much in music theory, that I'm aware of…
>
> If young scholars are participating in this joint project, they're going to have a lot of contact with pretty much everybody who works in the area, and they establish a community and they'll get good letters from all these people, and they'll know what's going on, and there's a solidarity that you achieve when you're in a group project like this.

Funding and sustaining collaboration

Sustaining and publishing larger-scale collaborative work, particularly multimedia work, seems to receive little direct support. Private foundations, such as the Andrew W. Mellon Foundation, the NEH, and local institutional "pots" were mentioned as some of the few available sources of funding.

> I've done a lot of collaboration. I think it's nice, I think it's great. I think more of it should be done. It's a problem of institutional support and the funding to get people together. Scholars in the sciences are always able to get very large grants from NIH and NSF…but we just can't do it. There's nothing there…I've done edited anthologies. So you start with a conference, and you have to get the funding for a conference, but if you're lucky enough to get funding for a conference, then you can try to make an anthology out of that and make a book out of it. I've done that successfully and come out with some nice books. But it's a huge amount of work and of course you don't get any real support for any of it. You have to do it out of everybody's goodwill and find a publisher that's willing to do it.
>
> There is some money out there for development of and experimentation with technology. I guess I would say that I've been lucky here to get a local pot of money for that. Generally

> speaking, though, it's certainly difficult because obviously we can sit with our own computer anywhere we want and write a book, whereas the amount of collaboration and the different types of expertise that's involved, or that's required rather, for some kind of multimedia publication is of a completely different order and requires funding. We funded a CD that I did with a grant…But it's very complicated to coordinate all the people who need to collaborate on such a project and it requires a lot of money, mostly for staff—obviously for equipment and technology as well, but it's really largely staff.

M4.3a Judging Multiple Authorship

As in history, the guidelines for what counts as a scholarly publication seem relatively inflexible across the academic music subfields. While the value of multiple contributions to critical editions seems to be well established, the coauthorship of books or articles is less well received. Scholars report that institutional review committees want to see a scholar's individual contribution stand alone.

> I think it's also a matter of credit. In the humanities, you don't get credit, or you wouldn't get as much credit for a multi-authored work. "Well, how much of that did that person write?" is a question that a committee will ask. I think it's stupid and it's against knowledge-building, the way in which they understand it, and collaboration should be encouraged at every level. But if you're a junior person, they'll assume the senior person did all the work, or it'll become a question as to, "Well, how much weight should we give this because we don't know?" So the system works against collaboration at various levels.

> Some very senior scholars do collaborate. For instance, senior scholars will create a textbook and basically invite all of their former students or good buddies to participate. One scholar did a few co-written articles that are excellent. Another person in the field did this innovative thing where s/he invited three different scholars who were specialists to write chapters, but it was this scholar's book. Even then, as the book was praised as one of the most influential ethnomusicology books, the author actually got flak during the tenure process for whether that counted as fully writing a book. So, even if people like it, they think there's something wrong with it. I think that's the legacy of being part of humanities where you create a monograph and it looks like this.

M4.4a Mechanisms for Collaboration

Generally, email and face-to-face interaction are the dominant modes of orchestrating collaboration and coauthorship across the academic music subfields. As one scholar notes, this allows preservation of a "private space" for the personal thought process. Scholars are aware of wikis, Skype, and other newer technologies. While no music scholars mentioned using these in collaborations, some ethnomusicologists (of various ages) mentioned interest in their potential use in future projects.

> I think we'll talk a lot. We were just together at a conference; we could have a conference on the subject and interact there.

> We interact via Internet and email. That's how we communicate. People write to me. I write back to them. We go back and forth. Occasionally, we try to get together, particularly toward the end of a project. When you're shaking hands with someone or sharing a glass of wine, you can get to agreements about things that maybe online you found a little harder. But there's no doubt that the electronic medium helps a great deal in allowing free interactions between

> scholars…I know about wikis, but I do not use them. I'm behind the times. There may be newer ways of getting back and forth. I know that I have many friends who have a program that allows them to see each other and to make calls from their computer. I don't do any of that. And that hasn't yet crossed my screen.
>
> Interaction was pretty much by email. I don't believe I've ever spoken with my collaborator on the phone, to tell the truth. But we exchanged messages by email and we each more or less wrote half the paper and sent the pieces to each other, and then I did the work of pounding it into one paper instead of two…I didn't use tracked changes, actually. I think it's because I did enough reshaping that it ended up being pretty different from the version that my collaborator had written, and I think s/he was comfortable with that. But, yes, certainly in some cases tracking changes would be useful. One thing that is kind of nice about using email is that we managed to do that using up very little paper, because we really were not printing out many copies and sending them back and forth through the mail.
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> In terms of the collaborations that I've been involved in, even producing multimedia products, there's a great deal of communication that happens through the multiple iterations of something. But we haven't used typical communication tools beyond email. We haven't created wikis and we haven't used blogs. I think there's great potential for it. There remains a time and a place in our work, for me personally, that I want to guard as a private space. I write differently when I know I'm writing just for myself, and also there are things that I'll want to write about in my field research process, in my ethnographic process, that I know I don't want others to see for political reasons or because it makes somebody look bad. But then there also reaches a point where I think that new tools for collaboration, like a blog, for example, could be extremely productive.
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> I've never used wikis, blogs, or social networking tools to write collaboratively. I suppose one could, but no, I've never done that. I haven't done that much collaborative writing, although I am involved in a project now that has just received approval to work collaboratively to put out a new edition…where that might actually be a useful idea. I would suggest, if we get this approved, that we find some kind of new technological way of keeping in touch and exchanging things. That would be a nice thing to do.

PART B. APPLIED RESEARCH: NEW MUSIC AND ELECTRONIC MUSIC COMPOSITION

Music technology and new musical composition is a dynamic research area driven by interdisciplinary collaboration.

M4.1b The Nature of Collaboration

In contrast to traditional conceptions of musical composition, the burgeoning field of computer music and music technology provides new opportunities for interaction among individuals or teams of researchers with very different backgrounds, including musicians, composers, technicians, engineers, computer scientists, psychologists, visual artists, musicologists, and ethnomusicologists. Here, scholars from various fields are united by a common interest in pushing the boundaries of music-making.

> If we were to call computer music a discipline…it's an interdisciplinary world to start with. Literally, from the get-go, it involved a number of disciplines. If you look back 50 years to the first moment where someone used a computer to generate music, 1957, they were doing computer science, psychoacoustics, musical acoustics, music theory, and, with one missing component, even the first "bleep" would have been less, and absolutely the first actual piece

> of music would have been way less. So that was the germ. This happened at Bell Laboratories, which was the most amazing place for this kind of thing. And that mix never really stopped. Those are the core, or sub-parts, of what you'd call computer music…Today, what you used to call computer music 50 or 40 years ago is now much broader, because now every person working in the field has some sort of technical and digital chops to bring to bear, and they do it in different ways…
>
> The ability of technology to allow you to work and collaborate in new ways is all really germane. The old romantic notion of the composer as a singular creator doing the great work that becomes a model for others to emulate…I think that's completely been overturned by our information age. Now, when I do work that involves serious technological components, it's collaborative work. At the end of the day, there are many people responsible for it…We're lowering the status of the role of the composer in favor of a group of people who have a certain goal in mind.
>
> Sharing and collaboration is key to what we all do. It really is…because computer music is inherently interdisciplinary. So there's the technical side and the artistic side and people coming out with different theoretical approaches, and because it's at the intersection of disciplines it naturally leads to collaboration between people from different disciplines. Also, psychology is really important. We have a big connection with psychology in terms of music perception and cognition, which ties into a lot of things that are more purely psychological. So, for that reason, I think collaboration is especially important, but certainly not uniquely important in the field.
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> In this area, collaboration wouldn't be rare, but for music historians, for some reason, it's pretty rare…In this emerging field, we have engineers, psychologists, and musicians…Some researchers are trained as psychologists. There's a tremendous amount of collaborative work there.
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> At the core of the center, there are the musicians, the performers, who we need to be research subjects for all these experiments. For example, if you are working on a piece, like the traditional études composed by Chopin or Liszt to push the limits of the player, the composer, and the instrument, you can substitute the place of the instrument with a piece of software. And even classically trained musicians are quite keen to work with us. Even though classical musicians don't have any familiarity with this kind of contemporary experimentation, they rise to the challenge, and they enjoy seeing the relationship of their own virtuosity with the versatility of the software.

Collaborative composition

Musical performance can be independent or highly collaborative, depending on whether a scholar is performing alone or with a larger group, such as an orchestra. Traditionally, musical composition, as an applied artistic activity, is solitary and relies upon the mystique of the lone creator. In contrast, improvisation is a more collaborative activity, which, as demonstrated below, can form the basis of collaborative composition. Collaborative composition can involve extensive physical co-presence and interaction.

> In science and pretty much everywhere else, a lot of people do research in collaboration, and you have books or articles written by two or three or more people. That just doesn't happen in composition because there's this whole historical tradition that the composer is the one person who does his or her piece, and there are very few people collaborating to make a piece where they are both authors. This is very rare. And I think it's a problem, because in terms of

> available resources and opportunities, everybody expects the one-composer model. There are not many outlets where a piece composed by three people would be accepted or understood, for historical reasons. But I think collaboration is a very interesting field that can be still explored. I myself have tried this a couple of times with colleagues in the past. Improvising together is a lot more common, so if I record a composition with myself and other friends…and we have a few takes and we have one that we think is the final one, we could call that our collective improvisational result. But when it comes to more strict composition, like really notating a score or making a piece that is not improvised but where every step is decided in advance, that's where practically no one is collaborating.
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> I tried to collaboratively compose a piece with a colleague, and it was a very interesting experience. It started as improvisation, but then we went through the process of really composing through the whole piece together…So we had to sit down and discuss every step of its creation and decide on the aesthetics of the whole thing, the main ideas and secondary ideas, everything down to details of sound design. This can be a painful process for a composer because, in a way, there's a little too much ego involved sometimes…You have to find a common ground, but some people would say this is very limiting or can result in a composition that is neither the best of one composer nor the best of the other. But I do think, depending on the interaction of the people involved, that you can have exciting new things that could not be done otherwise…I'd like to do it again. It was interesting as a research experience in composition for me…because you are no longer the solitary composer doing your stuff on your desk, but you pretty much have to get involved in discussing all the issues, and that requires a lot of verbal discussion and trying to put into words exactly why you think this sound is better and not the other. So you have to develop terminology, or make use of terminology from other fields, and try to express exactly what you mean. Yeah, it's really different. Because there's some subjectivity involved, it's like two people trying to reach an agreement about a delicate subject. But it was a lot of fun, and we were happy with the result.

M4.2b How Do Collaborations Arise and How Are They Sustained?

The independent research center is the central model that unites scholars from different disciplinary fields in collaborative work. Indeed, these centers may function more as "cultural units" than as research centers, given a unifying interest in bringing engineering, science, and technology to bear on music and musical creation. A wide variety of research is carried out in these centers, and scholars interested in "new media" and the "digital arts" may find support for this work here instead of in more traditionally defined academic departments. In some cases, composers and performers help to define particular research questions and work with individuals with analytical, engineering, and software skills to solve them.

> These centers have both researchers and engineers, including Ph.D. students. Of course, there are much bigger labs in other fields, but in the music technology field there are generally people isolated in universities, particularly in music departments. And centers are incredibly unique, in that they include so many people with the goal of both performing research and also hosting composers for producing works…For instance, there can be researchers linked to specialized scientific communities—acoustic communities, signal processing communities, computer science communities…as well as the humanities and social sciences, like musicology, sociology, psychology, etc. Each represents a given field of knowledge, and, of course, the researchers have to be recognized and be among the best possible researchers in this given field. They can also represent each community in interdisciplinary projects.

One of the areas of research that I am very interested in is computer-based musical instruments…What will occur is that at a very early stage in my research questions, it's going to surpass my ability to answer, and that's where the researcher comes in. So that's the coordination point for someone in the sciences—computer science or engineering—to come in and help me work on the problem. I help define the problem, I help keep it focused on a musical issue, and then someone who has very high-level software skills helps me solve the problem. That's the collaboration. That's what we do. We try to explore healthy ways to collaborate between art and science…There might be a computer science Ph.D. who's working on a computer science problem that's connected to music. There's also Ph.D. work from psychology and engineering. And there could be a research director who would also assist with some special project. People in statistics getting Ph.D.'s could be involved because they might come up with some method that offers some way of analyzing the music using new statistical methods…

A center is not a university, it is not a laboratory, it is not a company or a production team, but it is all of these things, and this plurality of direction is the richness of these centers…They have a lot of Ph.D. students…and it's very interesting to see a traditional Ph.D. researcher in a science or computer field collaborate with a composer and collaboratively build a composition and carry out a research project…I will give a simple example to show the interaction among a researcher, composer, and musical system. A Ph.D. researcher might collaborate with a composer who is investigating particular aspects of the musical performance, and the researcher may find and develop tools to help the composer. So together they can find a solution.

I've only coauthored one scientific article…But the way that happened was that I had a colleague from a center who was very much involved in the field of music cognition. And I was coming from my own experience in composition…In scientific terms, I was coming from a practical use of those concepts in my compositions. This friend was also doing some research in related topics, and so, after a few conversations, we figured out that there was something we could try to write together, combining my experience and his/her experience. And the result was that paper, which was actually presented in a conference, which was this attempt to try to find these intersections.

A lot of universities are interested in these interdisciplinary collaborations, so there are a lot of centers being formed on media arts and interactivity, and around art and technology issues. So I would be comfortable in that interdisciplinary environment as much as in a music department, and possibly even more on the computer science side. I really come from both backgrounds, so I'm comfortable in a technical environment, as well as in a music department. In a lot of music departments, there's this gulf between the people who are doing technology stuff and the people who are Beethoven-oriented. So, in some places, the music department would be less of a place for me to do my kind of work than other kinds of centers.

The composers are very much involved in new media through the interaction of the research center…which itself branches out through the whole new media initiative that involves art practice. So the whole coordination of music and visuals is very much a part of it now.

Because of the birth and advent of the digital arts initiatives and centers for new media, I think a lot of the universities are losing ladder-rank faculty in the area of music composition to the thing called the digital arts, which is the university's current attempt to try to solve the problem of "How does our practice integrate new work in the university situation?" The digital arts are inter-arts, by definition, and this is very attractive to the university systems. Because of our unique center, we're able to train a number of our graduate students who take a degree in composition to be prepared to move into media arts…I think that "new media" is new enough that the jury's out on what to do with it and what it all means. As I said, it's very

> attractive because it's interdisciplinary; it doesn't carry any of the baggage like a traditional music department or a music composition faculty would normally have. It starts with a very open landscape. It's almost a play space for trying to decide how to build a field, or what fields might come of it. It seems to be almost that "play" is a big part of the digital arts right now…But, for example, at this institution, practice has been really devalued in that area. It's really much more about critical thinking and theory.
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> It's the very early days, and media studies is pretty new here…I think this is going to be absolutely fascinating for many people, including people in the humanities, for as long as things continue to change as rapidly as they have been. What's not clear to me is how organized into a discipline it's going to turn out to be, and how successfully it's going to be able to reach all the way from humanities to engineering and back. That's a neat idea, but I don't know whether it's going to work, so we'll see…Not a lot of thought was given to how we were going to support these things. All you have to do is say you want to be involved, and you're involved. There's a very dedicated core of people.

Sustaining extra-center collaborations

In many cases, scholars in music technology foster connections locally and internationally with other centers for new musical research, artist communities, and even cultural institutions. These collaborative relationships help scholars to enhance the possibilities for experimentation and the dissemination of ongoing research.

> To me, it is key for the center to have a strong connection with several artists and local arts institutions. And this strong relationship can be transformed into original creations. Sometimes we can feel that there is a lot of hybridization in the field, a real mixture between several disciplines, and we can study all of these aspects on site. For example, we worked recently with some visual artists…on the visual and sonar aspects of perception.
>
> Economically, some collaborative research is supported by international projects, whose idea is to build permanent connections among several research centers, which can be spread out around the continent. And the idea is to have long distance courses or lectures or whatever, and then maybe to build a piece in several places. But the physical meeting is still quite important.

Some research centers also maintain partnerships with private industry, something that provides important funding and equipment for their work. This is particularly the case concerning the development of new audio technologies for mass-market production.

> The idea of the center is not commerce or to be a business, but rather to experiment and do new things for the field of music…But we also have relationships with some private companies in industry. Our mission is not to produce mass-oriented products, but private companies can easily do this once we develop the initial technology. We license them, in a way, to produce these tools for us. It's like an "insider perspective" on the research process. We are not developing for the industry, but from our research they can develop products by themselves. We need to have a mixed economy between public subventions and private funds, and we have this relationship with many different companies, including those in telecommunications and transportation. So this is another part of the center. It's not the essential side, but it's a part. And 50 and 60 percent of our research budget is funded by these kinds of contracts, of which international contracts are a huge part.

> The question is, "Are we in the position of setting up an agenda for music research?" Actually, we don't pretend to do that. We have a number of research directions that we periodically renew, in exchange with other centers for new music and audio technologies and also with composers, and we make choices according to our means. So of course it's a mass of work, of research, but I think that the field is developing quite fast now—there are many actors, not only in universities, but also in companies, and so we are one actor among many. Particularly in the industry, there is a lot of work on research in audio technologies, for instance.

M4.3b Judging Multiple Authorship

Given the traditionally sole-authored nature of musical creation, the attribution of credit for collaborative work in music technology poses questions for which there are no easy answers.

> I'm doubtful about communities in the artistic field. I think there are several communities among researchers, and among administrators, but in the artistic field, I think sometimes the artist feels uncomfortable about this idea. But I think this is changing. In these centers for new music, we mix everyone. In some of our courses, we have very young composers, and they have strong contacts with visual artists, video artists, choreographers, and so on, so they have this idea of a community of interests. So, I don't know if the center is a reinvention of the *atelier*, like we had in the Renaissance—several people working toward common aims—but sometimes it reminds me of this, because you have the composer, the researchers, the sound engineers, the sound producer/manager, and the musicologist, all working on a common project. But the signature is the composer's. Maybe in the next 50 years the notion of authorship will change, this idea will evolve, and then there will be not one but three or four signatures. Then issues of ownership and credit will be problems for the next generation.

> The idea of ownership in this domain is a little difficult…Whose project is it? Is it the composer who's doing the music for it? Is it the developer of the software? Who gets the ownership? And what if someone else comes along and says, "I like this little piece, but it's a little part of what you've done, so I'm going to extract it from that, and then I'm going to make a new world." Who gets credit then? So it's confusing.

Collaborations in new music and computer technology also require different classes of researchers and technical personnel. The key to collaborations in such circumstances is developing a common language, as well as helping individual researchers to play to their strengths. Questions remain as to how the contributions of technical or computer experts are valued in scholarly communication.

> We have staff here working as programmer-analysts, so officially they're on the software side of things from the university's point of view. That's a different track. There's no possibility of tenure and not really much possibility of promotion.

> When you manage a collaborative lab, you have to find balances. Some people are better at specific theoretical developments, while others are better at finalized application development. What is important is the global balance, that the global work satisfies all kinds of needs, including the need to promote relationships with particular disciplines in the sciences, the needs and unique goals of our institution, the need to generate external resources through industrial application, etc. So, the way I see it, there are many different people with different skills, and I have to find a balance among all that. And I will not force, for instance, a given researcher who is very good in theory and concepts to make an application. The better organizational model is if this person works in his or her field, and then we have another person more invested in the final application, for instance.

M4.4b Mechanisms for Collaboration

As in more traditional fields, email and face-to-face interaction remain standard mechanisms for collaborative discussions in music technology. Some scholars mentioned the use of Skype or other virtual conferencing tools in the interim, but emphasized the importance of physical meetings.

> Mechanisms for collaborating pose a problem, because we have a high turnover, and when people move on to other places, what happens to their work? And while there are many new communication technologies, the best way to work is to have a physical meeting. This is extremely clear. From time to time we have to have this physical meeting. Then in the meantime we can have exchange by mail or by video or whatever.

> Actually, last week was my first time using Skype just to do this conference call, because we're all geographically separated doing research, attending conferences, and on vacation. So I won't be able to collaborate with them in person until about a month from now when they get home. But, obviously we use Skype for phone calls, but much more often it's email.

Varied tools for varied tasks

The tools used in collaboration can vary widely depending on the nature of the research project and the number of collaborators involved. While face-to-face interaction is important for some research, Web-based platforms play an important role in data and content management for larger collaborations or scholars who are not co-present. These tools can be tailored for the needs of individual researchers, specific research projects, or the management of collaborative work at the research center as a whole. As one scholar described, the websites at many research centers are built on the "collaborative development of content model." Several scholars also mentioned the use of listservs, blogs, or wikis to organize collaborators' updates and contributions to particular projects. Yet, as one scholar points out below, there is no "perfect tool for communication," which can result in using different tools to organize different components of the research process.

> With one collaboration, we were pretty much sitting together in a room with eight loudspeakers surrounding us, each one with a laptop…The first step was to improvise together in the same room, each one with his/her own system, recording everything that we were doing…Then we went through all the recordings…and that's where the main collaboration happened, because we basically put all of our options out on the table, metaphorically speaking, and sorted through them thinking about what sounded best…We'd each go home and listen at home, and think a little more. And the next day or two days later we'd meet again in the studio and do another session, sitting together there and going through the whole thing. That's pretty much we how did it. After a few of these intensive sessions of doing this stuff, like four, we finally got to the end of the piece and we agreed, "Okay, this is the final shape of it."

> If I'm working on a piece for musicians who are elsewhere, I tend now to just do everything as PDFs of scores or sound components that I post online, and I say, "Hey, go download from this URL and send me feedback"…And the musicians will email back about musical stuff…Generally we post documents and either have exchanges in email or exchanges in writable documents. It might be catch-as-catch-can. But when it's a more targeted research project, you'll have these project listservs with people giving feedback and posting updates. And that starts looking again like the whole open-source model, where you have lots of

> collaborating cooks all over the planet. It's pretty important…For instance, I had a summer project last year that involved collaborators around the world, and we implemented a blog. It was the first time I really used one for a project, and it was extremely useful. We were also sharing documents through this website, which integrated the blogs…so you always knew where to go look for things. And we did a lot of phone conferencing, so you could just bring things up on this website for reference as you spoke. It felt a lot like what happens in industry these days…That was at this project level, but it was also happening at a center-wide level too, with our internal organizational system. So that's continued with user documents and things like that.
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> We should differentiate the tools used for collaborative research projects and the tools for technology transfer. We are involved in collaborative projects at the regional level, at the national level, and at the international level. In each project, there is an agenda with scheduled rules of partnership, their choice of these quite common ways of organization of research, with deliverables, etc. And so we usually use tools like wikis, periodic meetings, etc. The wiki is a means…for contributing at any level, and so it breaks the barriers in the research hierarchy. So I think it's a good tool for notarizing contributions, but it's true that it's not appropriate for everything we do. For instance, just a few minutes ago, I was communicating with a colleague who was asking me about some big data sets, and this would not be possible at all with these kinds of tools. So we also use specific project activity sites, where we post the data, for instance. And it's true that we don't have the perfect tools for communication. We use some tools for some aspects, and other tools for other aspects, but we don't have integrated tools for managing all the kinds of communications between people in a given project.
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> We have a website here based on a technology for the collaborative authoring and organization of Web content. It's kind of like a wiki, but more powerful and more complicated and difficult to configure. There will be parts of this site that people can add to or can add comments to. And it's also controlled by permissions, so there'll be some areas that are only for people within the center here. There's a lot of enthusiasm for this particular technology among some of the people around here. A lot of needs just weren't getting met by our old website, mainly needing to have more community involvement of, say, graduate students…On our old site we had some pages about facility use that staff people would write, and then they would grow out of date, and eventually people would just know to not even bother looking at that page because it's wrong. But what we need is for people to be able to edit collaboratively and say, "Oh, I figured out how to solve such and such a problem," or, "On such and such a day this piece of equipment is broken, so I sent it to be repaired." So needing to have more people involved in keeping the content up to date was the overriding thing. Our website also has much better integration with email mailing lists and permissions, and different people having different roles and determining what they can access and what they can edit, and more powerful searching capabilities and ways of organizing content that relates to various topics, and letting people navigate with that kind of a system.

Version control software is invaluable for work involving software or other open-source material, and is often built into these Web-based platforms for data sharing.

> In terms of private collaboration, there are a lot of face-to-face meetings, there are a lot of emails, and there's a lot of use of revision control technology. This is nice because if we're working on a document together or there's a big collection of documents, I can pick one thing and edit it and then somebody else can be working on another part of it and they can do an update, and then they receive my changes into their copy of the thing. I really like that technology for mediating this collaborative work. Originally it was designed for source code and for software, but it's great for papers that you're writing together or even for sound files

> that you're sharing for research. It works for collaborating because it will keep things in synchronization as different people work on them, and it will keep track of the history of who changed what when. You print a little comment when you commit your change so people can see why you made the change. So I really like that technology for that kind of communication.

Coauthoring papers

One scholar noted that useful tools for the collaborative authoring and editing of final articles or papers are lacking. Although word processing software with tracked changes is functional, this scholar would like more sophisticated software tools for collaborative authorship and collaborative reference management.

> When you collaborate on a common project, you have to elaborate common deliverables in the form of a document. So, generally, you have an editor who centralizes the text, and he does that almost manually, by copying and pasting the various contributions into the reference document. And I have seen demonstrations of tools designed for that, with technologies of text management in which every contributor just has to put his text in the right place and then the final document can be edited. There are tools derived from Gmail, for instance. These tools are generally developed by researchers in a really experimental way, and we don't yet have tools that we can buy that are finalized to do this kind of collective elaboration of a document. I think the best feature we have in standard tools is the tracked changes tool in Word. We cannot really go further with existing tools, and we need to have that.
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> When you want to publish papers, every researcher has to manage his or her own documentation database, generally with minimal means or with specific software programs. But at least in our situation, we don't have an integrative tool that manages all these references and documents for all researchers. We have an institutional repository…but, as of now, it only works for articles and any kind of documentation published by the researchers in the lab, not external references. When we publish an article, you have to manage by hand most of the external references, but we also need to share these references, so that when we publish we will already have all that ready. So this is a kind of tool we are missing, and we actually lose a lot of time when writing an article because of this kind of issue.

5. WHAT DO YOU NEED TO CONDUCT YOUR RESEARCH?

Although the previous chapters address the academic and applied subfields of music separately, such a clear division is not necessary here. Scholars across subfields rely on many of the same resources and face similar obstacles in doing their work. Taken together, scholars engage in mixed practices and draw on a variety of primary and secondary sources, conceptual tools, and computer technologies.

M5.1 What Do Scholars Do in Their Research? How Is What They Do Changing or Not?

Data collection in music draws from a variety of sources, including musical manuscripts, published scores, live performance, and sound recordings. Some scholars also consult libraries, archives, or museums for documentation on the history of musical instruments, sounds, communities, and music-making practices. Although digitization efforts in many of these areas are increasing scholarly access to primary and secondary sources, travel to physical archives or research sites remains an important part of data collection for scholars doing historical or ethnographic research. In the applied subfields, new computer technologies are expanding the

range of music-making by creating new musical instruments, compositional systems, and performance environments. Interdisciplinary analytical techniques, such as those drawn from cognitive studies and mathematics, are paving the way for the future of music analysis.

Musical scores and manuscripts

The close study of musical scores is an important part of the research process in musicology, music theory, and composition. Scholars engaged in historical work consult the original manuscripts of a piece of music as sketched in the composer's hand. These manuscripts are located in archives around the world, and travel to these archives remains an important part of research. Some archives permit cameras or scanning devices, but others limit scholars to the use of a pencil and music paper for note taking. Scholars interested in a more theoretical analysis of music use published musical scores, which can be found in music libraries and critical editions. Scholars can draw upon all of these resources in combination for certain projects in musicology and music theory.

> I had this burning desire to learn more about the creative process of a particular composer and how s/he sketched out musical compositions. That led me during my first sabbatical to the archive overseas…I've been back there at least a dozen times…It's pure and simple. The manuscripts that I write about are in the archive…If I needed something, they wouldn't make a copy of it and send it to me unless I had a publication contract. But before I could get a publication contract I had to study the material, so I was there for several months last year studying the manuscripts. It's like a dialogue with the manuscripts. And when the publication contract is assured, then you choose what you want to put in the book and they'll give it to you. I also spend time analyzing the published scores for the sketches that I transcribe and study. That's how I go about my work, but that's not the way everybody in music theory works. I go about it more like a historian would, because music historians are more inclined to study sketches. So in a way I bridge both fields.

> I use manuscripts. I use books. I use articles. I use printed editions of music. Much of this is found in collections all over the world. I've got to locate it, and I've got to figure out what to deal with. When libraries have good online catalogs, it helps. Not all of them do. Sometimes you have to write letters and then you can wait up to a year before someone responds, if they respond.

> I don't have data in the sense of experimental data or anything like that. That all comes out of my head the way it would for a mathematician or something. But there are musical scores that I need to consult…In a lot of cases, my work tends to be more theoretical than analytical. That is, it mostly deals with some abstract theoretical description of the way music works, more than looking at particular pieces of music to find out specifically how they work. So the musical examples that I use tend to be fairly short for illustrative purposes, and they often come from pretty standard repertoire pieces that are not hard to find. I may already own scores myself or it's easy enough to find them in the library. In most cases it's probably not that critical that I get the best available edition. I just need to have some edition that shows the notes of these measures, so it's not a big problem.

Digital versus analog scores

As in history, some archival and library music resources are being digitized and made available online. Online access to musical scores can take a variety of forms, and all are cited as valuable for increasing access to archival and reference material. First, and most commonly, libraries or

archives digitize archival manuscripts or printed critical editions of published scores. Second, score digitization projects provide access to marked-up versions of scores that are compatible with software for music analysis, such as Humdrum. Third, scholars such as John Rink have created interactive critical editions that include the original manuscript sources they draw from. As described below, these online editions allow scholars to compare the variance from different sources and provide "information in a way that no printed edition has ever made possible."

> Now that many libraries are beginning—and it really is just the beginning—to put some of their sources on the Internet, in reproductions, you now have access to materials that before you would have had much more difficulty having access to. This is still not nearly as widespread as it needs to be. Some libraries are advanced and some are not nearly as advanced, but it's lovely to have some of this material available in ways that it wasn't before…I would like to have more original sources available in online reproductions, digitally…I would like most libraries to have digitized most of their collections. It's never going to happen. It's too expensive. It's too much stuff. But that's what really would serve me better. If I didn't have to go and order microfilms at enormous prices from different places all over the world, but could have them right on my computer and could compare manuscript A with manuscript B by just clicking on one and then clicking on the other, that would be a lot easier.
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> John Rink has this database for Chopin, in which you can call up any of the many different publications of every single work and compare them easily with the original sources. For a scholar, that's a wonderful thing. This is very important because nobody can figure out how to publish a responsible Chopin edition, because Chopin sent the music to different publishers around the same time in order to get around copyright restrictions, so there is no easily available access to all of the material that goes into any individual piece. The online work of John Rink may help that, ultimately. And this is different from what the University of Chicago has done, which is to put the actual printed editions themselves online. It's probably the largest collection of Chopin editions in the world. But it's one thing to have access to an entire composition in a printed version. It's another to have access through a critical edition that makes available the variances from other sources and actually develops a database that is useable, not for someone who wants to compare every note of every piece, but for someone who wants to work on that piece or play it, and wants to know what the alternatives are…The online database or edition makes it possible to get that information in a way that no printed edition has ever made possible.

While online scores and digital reproductions are "much better than nothing," and very helpful for quick consultations, they do not replace the use of analog sources. Historical scholars still need to "touch and feel" handwritten manuscripts. Other scholars find printed critical editions and scores easier to manipulate than digitized versions, particularly for performance. Still other scholars simply prefer the convenience of browsing through scores in the library and "discovering" unknown composers.

> I always accessed archival data by going to the place, but now you can get a lot of manuscripts and things online…That's a pity in a way because when you go to a place to look at the resources, you find other things that you didn't know to look for, by scanning the shelves, ordering a few extra things, or just poking around the archive…Also, there are absolutely dimensions of the manuscripts not visible with scores online…You can't examine the ink color or tell whether something made a hole in the paper because it was first or second…When I spent almost three days with a manuscript at the archive, I found stuff that no one had seen before…because they didn't look at the foliation, the ink color, or other features. Even if it is beautifully photographed digitally, you still don't have the whole thing in your hands, so you can't see the gathering structure or the binding…For example, there was a

section of the manuscript that was inserted and two pages were exactly the same, but I wouldn't have been able to see that if I hadn't been able to keep my finger in it…And there are other things, like you need to see what's on the back of things and the front of things and you're just not as…I don't know. It's a completely different and much more thrilling experience to be in the presence of this thing…So, having access to a virtual archive is a lot better than nothing, but it's not a substitute.

A digitized copy isn't sufficient, because there are many things that we need to see about a manuscript that simply do not appear in reproductions, however it's reproduced. It just doesn't appear. You need to see, for example, the structure of a manuscript. You cannot see that online…We all know about this problem of insufficient resources. Nonetheless, as far as anyone whom I know is concerned, online access will never replace the book. We want books. We want things we can easily relate to…For example, I have used online versions of printed editions on many occasions. It means I don't have to carry volumes with me everywhere…But as soon as I can, I print them out so I can switch the pages without having to go click, click, click 10 times, and make notes in the margin. I know you can do that in Acrobat, but it is certainly not easy to use…Also, no music performer can use online scores because they're not parts, they're scores. And even if the parts were put online, if you tried to print out 100 pages of them, you'd have a mess. So as a scholarly tool, digital versions are remarkably helpful. As a practical tool for performance, they have much less to recommend them…So I don't think any of us feel that the one will replace the other.

In terms of my research there really isn't much up there on the Web. I guess I just love going abroad, so I don't mind finding an excuse to go. But maybe that's not the right answer to the question. There is this problem with recent music, that you have to respect the rights of the people who own it…I always feel I'm a guest in the house when I'm at the archive. They have certain policies and procedures, and you abide by them because you have the great privilege of looking at these manuscripts…

When I search for pieces, first I look for composers' names that I am close to. For example, let's say I'm doing a saxophone piece, so I look for 10 different composers first, and then I see if they happen to have a saxophone piece. The other approach is to look for all the saxophone pieces that the library has, and then I browse through composers' names. These approaches are both unfair to unknown composers, because I'm skipping over them just because I don't know them. When I do have time, I like to go to the library in person…When I'm there, I'm always picking up the neighboring scores on the stacks and taking a look at the first few pages to see if it would be interesting to me. So if that could happen online, to be able to browse unknown composers…There are some published catalogs of pieces for saxophone, but what's more useful is to just ask colleagues, "What saxophone pieces do you find interesting?" and then look for them. I think it happens more in this informal way. The catalogs, in general, don't say much in terms of helping me to decide. I think seeing the score is really what makes me decide, seeing the first page or two is more telling than reading the two-line description of the compilation of the catalog. I really prefer to go to the library and browse around.

Ethnographic fieldwork

In contrast to research that is based on the study of handwritten or printed musical scores, live musical performance in its cultural context is an important aspect of research in ethnomusicology. Here, ethnographic fieldwork is the prime component of data collection, which can include a variety of media such as field notes, interview data, audio and video recordings, and photographs. Young scholars are trained to be ethnomusicologists "by doing it," and while

the Internet and local resources are helpful ways to reach target populations, they do not replace fieldwork abroad at some institutions.

> In ethnomusicology, ethnography is something that's important to us, qualitative research where we generally work face-to-face with our informants. And in earlier years many researchers worked in places other than their home countries, so there was a lot of travel to other parts of the world. That's perhaps not as true today, particularly because many communities around the world are now moving to the US, so people can find multiple sites for their research, even involving people from the countries where they originally started their studies…In terms of the data that we end up with, we certainly are multimedia. We end up with field notes, transcripts, musical sound transcription, audio recordings, video recordings, still photos, and all of that data and analytical material is what we would like to include in presenting our research…Visualization technologies are something we've done less of. I have a colleague who works in that area, and some others are interested in it, but we're not expert in that compared to other fields.
>
> In our early stages we still have to prove our chops. We must go live in a different country for at least a year and speak a different language…I knew someone who did fieldwork in his/her native country. This scholar knew all about the country, had been there enough, and there's actually no reason to live there year round if you're not making constant trips to see and talk to the musicians…But it's the myth that somehow you've got to live there to learn something that you wouldn't learn otherwise…
>
> Internet research has become very important. Lots of my students do Internet research, and I teach it now when I do methodology: what it's good for, what you can do with searches and talking to people online, etc. That's become a really big part of our field in the last few years. You can tap into big networks of people that you could never have possibly communicated with, on international and domestic levels. You can study stuff that you couldn't before because you could never locate all the black metal enthusiasts in the world, but now you can and they might live in 12 countries. And so that's something that researchers can do that was previously absolutely impossible…That will never replace fieldwork. Internet research is a different kind of ethnography, and it's not a complete ethnography because you have no idea whom you're talking to and you can only assess what they're saying in a partial way, so it would be much better if there were actual people you could talk to. But using that as a base, you can extract a population of informants from it that you could then do qualitative work with. That's very, very helpful.

Transcribing field data

Data collection in ethnomusicology has changed rapidly with new technology, becoming increasingly multimedia, including the use of video. Students depend on departmental resources for tools and software necessary to transcribe and analyze their data.

> Technology has changed our work, certainly in terms of recording in the field. I invited musicians…and they played while I put my little mini-disk recorder there. Then I came back and transferred that to a CD and transcribed that. We type the words and write the notes into Western musical notation. There are different software programs that are needed. We still have a reel-to-reel tape player somewhere because that's how it used to be done.
>
> I have hours of interviews that I need to transcribe. There's great software now. I don't know if it's any easier than an old tape machine with a foot pedal, but having everything on my laptop, right here, is pretty amazing—all my recordings, all my interviews, translations of my

> interviews, and all my journal articles…That makes certain kinds of things possible that weren't possible, say, to some older colleagues when they were doing their work.

Sound and video archives

The availability of music in recorded form has been transformative for many scholars, but much work has not been recorded (such as work by unknown composers). Sound clips are generally accessed through CDs or fee-based sound archives (such as recording label Naxos Online), either through personal purchases or library subscriptions. The availability of video clips from musical performances, such as opera, is becoming the "bread and butter" of many scholars' work in some areas. Sound recordings are also used by some composers to gather musical examples of particular orchestrations.

> I spent my whole life analyzing music from the page, and suddenly everything's being recorded, which is great. Of course, you still need to actually see the manuscript, but instead of musicologists working on music they never heard, now you can play the manuscripts, put them on a computer, and notate them immediately. I think that's made a huge difference, the idea of being able to copy music into a digital form and then circulate it and talk about it and think about it and listen to it…I understand a lot of the stuff much better than I would have if I hadn't actually heard it…When you hear a piece you can write about it better…Also, if you have recordings, you're more likely to notice similarities or differences between pieces. I had some recordings and I suddenly realized that there were two scores that had the same piece in them, which I wouldn't have necessarily recognized by looking at 20 scores. You just don't remember music that way.

> I use Naxos Online a lot, particularly since it became more easily accessible through the music library's online catalog. You can listen to everything there, so I don't have to buy CDs anymore…So if I want to remember a little fragment of a piece that I'm studying, instead of going to the library I just log into the library website and stream the music instantly. That's very useful; I use it all the time…For one article I wrote, I needed good examples of uses of a particular instrument, so I went to the music library to get CDs of as much stuff as possible…I was looking for a few composers, and when I'd find one of them I'd end up finding other composers that I didn't know of around or in the same CD if it was a compilation. I also found references in articles, like if someone is analyzing a given piece, the article will give references to other pieces or the names of related composers. So that is cross-referencing. And of course we have to listen to everything.

> I use sound archives of music all the time. When I do PowerPoint presentations, there's always a sound clip to elaborate on what the manuscripts are about…I access sound clips in two ways. Sometimes I own the CDs, and then other times I go to some of the resources we can access digitally at my institution, like Naxos…We have a lot of classical things.

Ethnomusicology and world music recordings

Recordings have always played an important role in ethnomusicology, where there is an emphasis on musical performance as text. It is common for scholars to purchase CDs or access sound recordings through world music archives or via interlibrary loan. Although there are few comprehensive online resources, scholars can increasingly access video recordings of world music online, either through scholar-produced websites (which are reviewed in society journals as well as in the *Journal of the Music Library Association*) or YouTube. YouTube is cited as a

wonderful resource for scholars of all ages, but it is not an annotated scholarly archive, has low video quality, and does not substitute for traditional fieldwork.

> I actually do a lot of purchasing stuff from local music stores and Amazon…We kind of all have our own little mini libraries to ourselves…YouTube is something that we use a lot in class. Sometimes you're trying to describe a particular instrument and there are very few examples available, but some tourist will actually upload a video. Or even better is when people upload their own performances.

> I use websites, like Mark Slobin's website on music in the Afghan North. There are a lot of really good websites popping up in my field now. They get reviewed now in our journals, so I can see, "Oh, there's a website on this kind of music," and I can check it out and it's pretty good. And that's likely to stay up there for a while…Also, in our field, YouTube has been just absolutely explosive in its helpfulness…there's a video of everything you ever wanted to see. It's a phenomenal resource for those of us who do performance-based work. So I just type a particular instrument or a particular genre of music, and it turns up. You can spend all day browsing through YouTube videos…It's a terrific, broad research data source. These are largely performances that you don't know about, that you wouldn't be able to find, that aren't on CDs, that aren't on videos, and they're just out there because somebody felt like making it available…I'll use it if I want an example of something to see what that looks like. If I want to see if there's anything up there that I might be interested in, I just browse…It's like being able to do fieldwork in some vast archive that's got everything there. That's amazing.

> I use YouTube for research. I use it to find recordings I can't find anywhere else. I'm giving a little secret here, but if you wanted to do an ethnography of dance styles in country X, the only place you need to go is YouTube because the locals are so passionate about taking little videos and putting them up. You can see 130 regional versions of a single dance on YouTube…It's amazing, and that's really the only archive. Ethnomusicology, for all the millions of dollars in the NEH grants, has not managed to produce any kind of usable archive of any music for dance…YouTube would be the only way to do an ethnography of traditional dances in this country, period. But it's not going to happen for a Ph.D. dissertation if you want to get published. Or, over 60 percent of your work would need to be the founding of a new critical methodology. Then you would be hired as a critical methodologist rather than for the actual work that you have done.

> I certainly hear that some ethnomusicologists are using these YouTube and new media outlets. Our view is that the quality is generally very poor. The clips are very short, generally, and the documentation is fairly nonexistent. Now if you happen to find an example, maybe you can fill in some of the documentation. But I think in terms of the scholarly value, I would say it's a stopgap measure. I don't see it as the end product for an academic institution, but certainly I hear a lot of people say they're using them in class examples.

For scholars attempting to resurrect ancient musical traditions, such as ancient Greek music, more accurate performances are required, and sharing is needed between individuals trained in those traditions and Western scholars.

> What can we reconstruct about the sound of ancient music? We've known theoretically what those instruments were made of and bits and pieces of them survive, but nobody's actually bothered to rebuild one until very recently. Stefan Hagel, an Austrian scholar, has built a couple of Aulos pipes…and if you click on his site he's got little bits of himself playing different tiny scraps of ancient Greek music on synthesizer and blowing the Aulos. But there needs to be further sharing between these theoretical reconstructions of how ancient instruments and systems of tuning worked, and the various types of contemporary Middle Eastern and North

> African music that still use very similar instruments…The efforts of Western scholars to play surviving music sound incredibly wooden…they're still playing it with a Western mentality of time and intonation and style of singing. But if you listen to any music from the Middle East, Egypt, Turkey, or even Greece, and you look at the history of the instrumentation from very ancient times all the way through contemporary West Africa, African-American singing styles and guitar playing are much closer to authentically recreating this music. So we need people trained in those traditions to play and get comfortable with the ancient instruments.

New technologies for musical composition/performance

New music uses electronic and computer technology to create musical instruments, compositional tools, and performance environments. Using new technologies to alter the capabilities of instruments, voice, or music production creates what one scholar described as "a space for research and experimentation." Research in this area can also result in new technologies or protocols for the dissemination of sound (such as wave field synthesis), software for computer-assisted composition (such as the program OMax), or new models for interactivity in performance using artificial intelligence. Although many musical composers still work traditionally, using pen and paper, others tap into new tools and technologies in this area.

> Composers don't think of themselves as electronic or acoustic. That's like saying, "I'm a woodwind composer but not a string composer." We have all these tools available to us. I have a computer available to me, I've got a violin available to me, and I have an oboe…There's a constant evolution of all sorts of new tools…20th-century composers, such as Luigi Russolo or George Antheil, brought in new sounds to musical performance, like a telephone ringing or airplane propellers. There's no difference between these and traditional instruments…they are all available sounds…Some people have trained long and hard and have become virtuosi with these tools. A lot of people compose hybrid pieces using electronic and acoustic instruments simultaneously, and that's part of our field…Now the computer also allows for new kinds of control and musical communication on stage, and there's work with artificial intelligence on the ideas of information systems and algorithms that would generate things…Moreover, electronics are a huge and central part of the actual project of composition, whether it's tape pieces, pieces of electronic controllers, or even synchronization things…So for me the electronic stuff is a tool.

> In the last 50 years, there have been many pieces using technology to question the conventional idea of voice, like someone singing a melody. I think that compositional space was created because people had been using computers and changing the sound of the voice in recording. A hundred years ago, nobody would have thought about that because there was basically no other use of the voice in music besides singing. And now you can find pieces, for example, where you record a voice and then you change the voice so that it is almost recognizable but is also slowed down in time, or you change the order of the syllables so it's not singing anymore. It's still a human voice, but it's different than in traditional music. So that creates that space for research.

> In my mind, contemporary music is no different than other musical forms. The technology component is just about tapping into and gaining access to the continuum of materials that is already a part of normal music composition. It's about extending ranges of things…For instance, let's say that I want my musicians to be spread out across a football field, but in different times. How can I coordinate them all? Well, I'm going to need wireless systems, I'm going to need to be able to communicate to them, because I can't stick a band director up on a big podium with a big stick and say, "Do it this way." One reason band music is so boring is because it's very limited. You have to be really like Sousa; it has to sound a certain way,

> because a single person can only coordinate so much. There are other possible ways of dealing with organizing space with the addition of technology and computer-assisted systems.
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> What counts as "musical research" is different for every scholar and composer. But the relationship among music, technology, and science is divided into several research areas. One is the analysis and synthesis of sound, including ways to re-synthesize sound using mathematical models to describe or predict its behavior…Another field concerns processes of interactivity, the idea that technology, in real time, can follow and respond to the action of a performer or group of performers. It has a lot to do with artificial intelligence, because it's interested in how to anticipate the tempo, a changing of mood or of color, etc…Another research area is the study of acoustics and models of diffusion beyond simply directional loudspeakers. Now people are delving into wave field synthesis, which is a new way to diffuse sound into space…IRCAM did an experiment where they created a wall of loudspeakers, and when you walked across the space it felt like the sound was coming to you and moving with you. There are also some experiments going on with this in the concert situation, but it's still very much in development. Another research area is computer-assisted composition for music, where the computer supports a composer as he structures his piece. In that area, there's a new program called OMax, where you can have an interaction between a written score and a performer's improvisation.

Although computer-assisted musical composition and research often depends on expensive and sophisticated technology, this may become more scalable with time.

> The scalability of new musical technologies will depend on the ability and speed of private industry, which will also decrease their cost…For example, I remember performing a famous piece in computer music several years ago…and the technology was so huge that you could only see the giant computer. But when we performed it recently, you couldn't even see the technology. There were two little laptops…So I think that technology is always very obtrusive when first developed, but then you just completely integrate it. And this gradual miniaturization, which is also evident in nanotechnology, is of course the direction of progress.

Networked performance

Networked performance is a radically new development for conducting research and experimentation into the performance environment. In development for roughly two to three years, led by researchers at Stanford's CCRMA, networked performance functions as a research platform by changing interactions among musicians and limiting visual cues. Performers or groups of performers are physically isolated from each other, often in different geographic locations, and improvise or perform guided by animated scores (rather than a visible conductor). Often referred to as "jam" or "improvised music," networked performance is marked by high sound quality, the need for high bandwidth, and, occasionally, a lower-quality video link. In the absence of visual cues, it presents a "strange and unique research situation."

> Networked performance is a recent thing that's happened only for the last two years, and Stanford's CCRMA is really at the center of this, and that is getting people together over long, long distances, performing together through the Internet. They've got this thing down now. It's just unbelievably amazing…The latency is down to almost nothing. It really feels like you're in the room right next to each other, so you can play together. There are video uplinks where people can see each other, and these animated scores keeping them in synchronicity together, and all sorts of stuff going on with computers talking back and forth. It's quite elaborate…This has strong implications about what's going to happen to the field in terms of getting people together physically…This is high bandwidth; there's no degradation. This is not

> MP3. There's no compression that I know of. It's really high-end audio, and it's like you're in the same room with the other musicians. But it also causes all sorts of problems socially, and there are interesting issues that come with it.
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> I've done some networked performance…Sometimes, there's a real audience at one of the sites, and other people are playing in a rehearsal room, for example…In one performance, we could see the audience, but it was just a simple webcam to catch a glimpse of the space, not a high-definition camera. The main point of developing the software for networked performance is to enable a very high quality of sound being transmitted, so they are trying to surpass CD quality. We have left and right channels multiplied by eight or 10 times. The visual element is much less important…So in these concerts that I've done, people were playing real instruments, like the piano or contrabass, but were also playing electronic instruments, like from a laptop. And we were really testing the limits of the network, how much sound could be sent both ways while preserving good quality, and what kind of musical interaction happens without visual cues…It's interesting, as research itself, to deal with musicians who are far away, and to only deal with their sound and not really see them. Of course, you are also listening when you improvise in the same room with musicians, but you also get a lot of visual cues, such as faces and gestures. Removing that from the equation changes a lot of the way you play, and that's very interesting as part of the research itself.
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> A lot of us doing networked performance come from jazz backgrounds. And the crossover into experimental music is a pretty strong practice for the last 40 or 50 years now. So all of a sudden you've thrown all that into this kind of bizarre distributed stage, where it's hard to tell what the stage is anymore…Next weekend, there's a concert with several musicians onstage in one place, with fancy computer graphics as part of the performance, and another group of musicians in another place…and audiences in other locations. We've been doing these kinds of performances on various scales, from duos with an audience in two places, to…a four-way performance with audiences in four places, and a lot of improvised music, where people have joined into the ensemble and after about six or seven musicians I can't tell who and where they are. It's a really funny displaced thing. But the music can be really good, despite all that…There's some practicing, and then there's a kind of musical common practice in improvisation.
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> This is the first technology to move sound back and forth over the network. One could imagine a composer saying, "Let's compose a piece for musicians here and there," and it would have a fully notated score with musicians on both sides reading from the score and being very precise. I think that will happen in the near future, but it's still an experimental field so it will probably just involve improvisation at the beginning…By its nature, improvisation is happening in real time, so it's well-suited to testing and developing the research. Also, improvisers are usually more tuned into these problems of playing with other people and having to react instantly to stimuli and sonic events and things like that…which is not true all the time for musicians who only read from scores.

As the technology improves, it may become a new performance venue or the basis for increasingly public music-making, as with building on software platforms like Apple's Garage Band or Second Life to integrate amateur performance across distances.

> Technologies for networked performance are still in the beginning, so there are some limitations, which is natural. For example, first of all, it used to work only in universities where you have Internet2, really strong broadband connections. It's not going to work very well if you're trying to connect from your home connection or something like that. This is normal for now, but I really would hope, and I think many of us would expect, that in the future, as bandwidth becomes less of a problem and more people have access to better connections,

> people would not need to be hosted by a university to have access to the connection necessary to do that. So you could ideally have a decent connection from your house to your friend's house, and more people could use the software to play at home or create their own connection with other people in the world through making music. So for now, the full power of the software is restricted to the research institution's Internet. The software still needs people with a very specialized knowledge of the system in order to make it work, and hopefully with time it will become a better user interface so that more people will understand how it works and be able to connect, without really having to open a command line and tweak the code itself. In terms of making it more widespread, I think these are two current limitations that hopefully with time will be overcome.

New directions in music analysis

Musical research is becoming more and more interdisciplinary, and may require younger scholars to expand their skill sets with training in mathematics, cognitive science, semiotics, and linguistics. Innovative research areas, like music and mathematics, are often driven by younger scholars in the field.

> Music theory is becoming more and more interdisciplinary. The Society for Music Theory was created, I think, 30 years ago, because we felt we didn't have a place in the musicology society where things would be heavily analytical. So we have that now, and we still have analytical topics, but the base seems to be broadening to include more history, and also to include philosophy and semiotics, as I mentioned before. It's interesting the way this has gone. So there's a strong core of theoretical analysis but it's also becoming more interdisciplinary and more mathematical.

> It's very hard to tell where the field is going. Over the last 15 years, we've had a very strong so-called new musicology, which was heavily influenced by literary theory…Suddenly issues that have been of concern mostly to literary scholars working on very serious texts are working their way into popular fields as well. There's a certain amount of cross-pollination that's working well, and that's important.

> The project of music cognition and brain science related to composition is a branching field. It's absolutely looming at this point…The field is typically called music cognition these days, and it's related to older research in music psychology and hearing studies. In 1999, researchers began analyzing music listening and cognition with fMRI. But now, some people are talking about the simulating side of things. The technology is nowhere near ready for that yet, so I'm not going to mess with that for a while.

Search and discovery for secondary literature

Scholars in music engage in "mixed practices" for the search and discovery of secondary literature, combining electronic searches, library browsing, and journal subscriptions. The growth of online access to journals and reference tools has been a huge boon in the field. JSTOR and other journal indexing sites are the main sources for full-text journal articles, and RILM (Répertoire International de Littérature Musicale) is used by many to access bibliographies of relevant work. Many scholars also subscribe to the main society journals and non-music journals related to their research areas. Listservs or e-newsletters linked to scholarly societies, research centers, or interdisciplinary topics of interest are another common way for music researchers to stay abreast of new publications in a particular area. Google Scholar was mentioned twice, but was used sparingly— mainly when scholars want to see if they missed anything in these other

search routes. In small but growing fields like ethnomusicology, the growth of online access to literature has raised the bar for scholars, who are now expected to keep up to date with work in more areas. According to one ethnomusicologist, "I scour anything remotely related to anything I might write about."

> I use JSTOR. When I'm doing research I'll go to RILM, which I like…RILM is good but it's not really up to date. You just read one article and it sends you to other articles…I use the bibliographies of various articles that come out. I also read articles in non-musicological sources, like Renaissance Quarterly…I read a lot of bibliographies…I'm talking a big game. I do what I can, but it's very hard to keep up…The trouble is the more work you have to do, the less you have time to read around…I also read a few journals. I subscribe to the *Journal of the American Musicological Society* (*JAMS*) and to the International Musicological Society journal (IMS), *Acta Musicologica*, and also the *Cambridge Opera Journal* and the *Journal of Musicology*, as well as a smaller journal that specializes in the area of music I study. I think that's more or less it.
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> First off, ethnomusicology is a pretty small discipline. We tend to notice what everybody does; it's not like we're swamped with vast numbers of journals. There are very few journals. There are very few important book series. A lot of stuff can escape your attention because the field has multiplied, but pretty much you know what's going on…And of course now the Internet has made so many things incredibly easier, searching and finding data and scholars. And you can actually read the work without leaving your desk. That's incredibly valuable…If you're interested in a scholar you can just follow that person's work so easily now without trying to figure out how to get a bibliography together. Then if you read Google Scholar you can see where things have been cited and you can do a great deal of browsing if you're in the mood…This just wasn't possible before…But, because I'm old, I love going to the "new book" bookshelf at the library, and this is still one of my favorite things…I take things off the shelf that I've heard about or that I'm curious about. I still use that very, very old option and I think the library should keep it.
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> It is clear that for the reading of articles, being able to have access to JSTOR is a remarkable resource. I am abroad right now, and I have access to JSTOR through my home university. It means that I don't have to bring any periodical literature with me. It's all available through the Web. That is utterly wonderful…I go, first of all, to JSTOR, but if there are others that have periodicals that JSTOR doesn't have, or for years it doesn't have, obviously I'd use whatever seems to be available. It doesn't make any difference; once the university has subscribed to these, they're available to me.

Reference information

Additionally, the *Grove Dictionary of Music and Musicians* (with a seventh edition online) is the premier and comprehensive encyclopedic resource for the field. The *Grove* was born as a "community project for the musicology and music theory community," and continues to maintain a very close relationship with music scholars and scholarly societies. Other specialized reference databases include IRCAM's Brahms in the area of contemporary music.

> I also use the *Grove Dictionary of Music and Musicians*, which is another big reference source for musicians in general. And it's huge. Its paper format is a 20-volume reference thing with long articles, in dictionary form with entries. If you want to know something about 12-tone music you go there and you find a 10-page article, usually very good articles, giving you not only information but all the bibliographies and everything. Now you can just check that online. So that's another thing that I use almost all the time.

> I'm getting much more online now, because when you're doing searches it's easier. I am actually thinking at the computer now. I couldn't live without my laptop. So even though I own this 23-volume *Grove Dictionary of Music and Musicians*, I now find it easier to go online to find what I'm looking for because it's updated, whereas the hard copy that I have at home would not have the revisions that the online version would have.
>
> Research tools are where computerized stuff is wonderful. It's a problem for libraries only in the sense that where we used to buy the *Grove Dictionary of Music and Musicians* and put it on the shelf, now we buy it every year. So it's expensive, but you can update it. And you can search it.
>
> IRCAM has a database, a very good one, called Brahms, and normally if you go to Google or whatever, and you just put a name of a composer who worked mostly after the Second World War, you will immediately get this Brahms database, which provides a biography, a bibliography, a text, and so on. This is a very important database.

Wikipedia and Google may also be used sparingly by some scholars for quick information searches.

> I'll use Google occasionally. If I'm writing something and there's suddenly a very obscure reference to a person or a place, I'll go to Google and I'll put it in and see what comes up. And, sure, I'll use it that way, and then I try to be very careful about what I'm using. For example, I used Google the other day, not to look for scholarly material, but to look basically for an anecdote. And I found it handily. It was no trouble at all. I could have done it in the library, but I happened to be in a place where I was right in front of a computer, so I did it that way.
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> Sometimes I do go to Wikipedia—for example, to find quick information that I just want to remember, like the name of a guy or something like that, although I don't really use it as any sort of reference for anything, just when I'm in the middle of something and I have to have quick access to that thing.

One composer noted, however, that there is no complete online source for orchestration information.

> In the regular composing situation you are usually alone in your room composing, but you need quick access to three things: recordings of other pieces, scores of those pieces, and basic information on instrumentation and orchestration. If you're writing for an orchestra, say, and you need the specific technique for the harp, you don't know it by heart so you have to go to the library and pick out the book about the harp or the orchestration book, which has the chapter on the harp, and then you check it out…It's easy to do, but it's bad for your composition if you have to stop everything you're doing to go to the library and come back, because sometimes you are in the middle of resolving that measure, and you are writing those notes, and all you need is a quick piece of information because you want to continue your stream of thought. But since everything is becoming so easy to access nowadays, it would be great for composers to have all this online…There are a few websites that do something like this already, but they're not ideal. For example, there's an orchestra in Vienna that has an instrumental library, and for each instrument they have some pictures and an explanation that you can trust…but it's still not complete and not very substantial.

Print versus electronic

Scholars expressed mixed reactions about the reliance on electronic literature. On one hand, scholars noted that it enables ease of access and ease of writing. On the other, JSTOR itself is not exhaustive, and so scholars need to maintain their "research digging" skills. Other scholars simply prefer the convenience of a paper journal and writing in the margins.

> I'd like to be able to rely on JSTOR, but it's so inconvenient because you just can't read around in the same way…I like writing notes to myself in the margin—that's how I remember things—and it's a little harder to do on JSTOR…I love carrying an issue with me on the train or on the plane…For instance, I just got a copy of the *Journal of the American Musicological Society* and I saw an article on jazz that I think I might read, but I don't think I'd pick up a book on jazz. I don't have the time. But sometimes if you have limited time and you want to know what's going on the field, you will read, cover to cover, an issue of a journal.

> I use things like JSTOR all the time. We have a very good library right downstairs from my office, so that's awfully convenient. But JSTOR is easier if you're looking for a journal article that's on JSTOR. I don't even have to get out of my chair to find it. Actually, strangely enough, sometimes the hardest things to find are the recent journal articles. If they're not on JSTOR yet, maybe they're supposed to be on the current periodical shelves in the library, but maybe somebody else has taken it off to some other place to look at it or something, or then there's a brief period of time when they're at the bindery, in between the current periodical shelves and the bound volumes, and they don't show up on JSTOR for another couple of years. Every now and then those are the things that I have the hardest time finding, and I have to hunt down a colleague who subscribes to the journal or something.

> *Computer Music Journal* is a big journal. In fact, there's our library of it right there on the shelf. It's really handy. First of all, I actually just enjoy physically reading the book while I'm at lunch. I don't really like reading papers on the computer screen very much. And I like being able to scribble notes on the margins, spill my food on it, and so on. Partly that goes back to the days before it was all available online, and we've never had the courage to just throw them all out and trust in the Internet.

> The librarians are divided both among themselves and even within the individual. On one hand, their students and their faculty and everybody's going online and so they need online resources, and it's great that they're updated. On the other hand, there's still fear that it's not tangible—what happens if we decide not to do it anymore? And they've been paying every year for this thing that's gone. If you pay for a book, you own it forever…I know a librarian who, every time *Grove Online* made a correction, was printing out the page and putting it in a notebook on a shelf in the library. And I don't think this librarian was alone…So I think that's a confidence factor that is going to change very rapidly over the next two years, as people get used to it.

> My actual writing is always on the computer. I think I've gotten away from printing lots of things out—I probably did more of that a few years ago than I do now. I try to just read things electronically when possible…Sometimes I have big mountains of papers around me, and I don't especially like it. It's nice if you can flip from one to the other on the screen.

M5.2 What Do Scholars Need? How Are These Needs Being Met or Not?

Scholars across music called for wider access to musical materials, which involves issues of funding, infrastructure, and technological support. The growth of applications for technology in

musical analysis and composition has led to a need for the training of young scholars in these areas. In sum, much of what scholars need to support their work is related to issues of funding.

Funding

Scholars in traditional music fields repeatedly described being desperately under-funded, especially given their needs and desires to move forward into the digital and multimedia age. Students often teach or take fellowships to support their work. Digital projects or collaborative initiatives such as multimedia websites are often supported by individual grants, which do not provide sustainable support.

> I don't think ethnomusicology is particularly so well funded. Maybe it's unfair to compare yourself with the sciences. Even if you look at other humanities and arts, I would probably argue we are under-funded. Mellon has obviously funded the EVIA Digital Archive and so ethnomusicology has attracted foundations, and certainly it is on the map with regard to the federal funding agencies, like the NEH, and it gets that sort of money from time to time. But relative to the field's needs, I think especially as we're moving into this digital and multimedia age, I would say we're pretty substantially under-funded and that is a major obstacle for keeping us from being able to move forward into promising directions.

> Funding is very weak for us because ethnomusicology is not a science, whereas anthropology at some levels is a science. So, for example, the National Science Foundation will fund anthropology but not ethnomusicology. We have no really serious sources of funding, so it's very hard to get fellowships for students or for junior faculty to do fieldwork, especially if it's domestic fieldwork in the United States—there's almost no way you can fund that…And there are only a handful of postdoctoral researcher positions in the whole country. There are no research institutes where you can be on staff and do your work, outside of a few people at the Library of Congress and the Smithsonian. We are very badly under-funded in terms of the research we do…Some institutions may offer some funds, but that all depends on how generous institutions might be…There's very little stable funding in the humanities and the arts, let's face it. Social sciences and sciences get the money. That's the hierarchical system that we live in…If you can just say "quantitative" maybe you can get the money for it.

> Arts people don't get grants. You don't get your journal subscriptions on your grant income or something like that; people have to pay for this. My situation is probably very typical. I get a few hundred a year from the department for faculty improvement or whatever, but that has to pay for all of my conference expenses, everything. Anything else comes out of pocket…There's just no money for faculty development.

The danger, for one musicologist, is that limited funding may discourage innovative scholarship.

> There is a tendency now more and more in graduate schools to provide full funding for graduate students. This is a double-edged sword. It's a wonderful thing on one level for those who come. It means you have many, many fewer students coming than you once had, and that means that you better be good at guessing who is going to be successful. I don't know this yet, because this is fairly new, but it may actually create a more conservative body of young scholars because departments may be less willing to spend one of their few full-tuition five-year fellowships with a big stipend for somebody who is doing more innovative work. I find that a worry.

But not everyone is complaining, and scholars engaged in traditional or non-field-based research may require less funding for their work.

> Music theory is not really a heavily funded discipline. I don't think I can say that this will change anytime soon. In a sense it's not really a very expensive discipline in which to work, either. Well, I guess some people in music theory do analysis of a sort that requires them to travel to locate a composer's original manuscript or something, like a sketch study. So that can be more expensive, but those who do more abstract theoretical work are basically just sitting around and thinking, so it's not very expensive research.
>
> Musicology is funded, I think…there are a lot of postdoctoral research positions around, and they're really great. There are also foundations around the world that support work in particular research areas. It's very competitive, but I don't think it's too competitive. I think if you really need a grant and if you really deserve a grant, you will get it. There's a limit to how many scholars a field can support, or should support. It shouldn't support every Tom, Dick, and Harry…I encourage people to exploit the various libraries around. For instance, I encourage people to apply for fellowships at the Beinecke Library because you can get a lot done in a library like that, and they have avenues for publication internally and it's very prestigious. There's also the Newberry Library and the Library of Congress…These are places that give scholarships to young scholars to do a specific project, but you can utilize your time for whatever kind of research you want. It feels good to be working in an environment like that.

Access to resources: A PubMed for music?

Libraries and published material are an incredibly important resource in music, and more scores online is a dream for most scholars. As in biology, some scholars in music are interested in mining large amounts of data and being able to search and retrieve items across many different domains. Some publishers are thinking about meeting these needs by establishing partnerships with other publishing entities to form hyperlinked resources integrating musical scores and sound, secondary literature, and reference material. The key, for one publisher, is to retain the "scholarly apparatus" around these materials. An outstanding dream for many scholars is searchable sound.

> Faculty are wanting to be able to mine large amounts of data and find things, and be able to retrieve across all kinds of domains. That's a huge issue: we can put all the stuff in there, but what can we get out of it?…We work with our metadata librarian, and certainly we try to make accessing the material as simple as possible. But it doesn't offer specialized capabilities, for instance, for some of the scholars I know who take large amounts of literature and are looking for metaphors or something like that.
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> For instance, with the launch of Oxford Music online, OUP has partnered with Alexander Street Press, which has the online Classical Music Library, which is a big sound database. People who subscribe to both *Grove Music Online* and the Classical Music Library will be able to go back and forth between them. They also have a partnership with RILM…And I think, really, this is where things are going. Different organizations will specialize in different things…but it can all be hooked up so that end users just go online and jump around and get their sound and their scores and their *Grove* articles and their bibliographic information, and it's all connected. Libraries are also developing technologies for bringing resources together. For example, *Grove* articles appear in some library catalogs now, so if you type "Beethoven" into your library catalog, the Beethoven article in *Grove* will come up as one of your hits…Online resources are a major part of the scholar's toolkit, but this technology is changing so fast that a publisher could invest a lot of money in getting sheet music up online, only to turn around and find out that Google has every music score in the world and all we have to do is link to them…The possibilities are endless. On good days I find that exciting, but on bad days I just want to

> crawl back in bed. I would really like every entry in the list of works in a composer's *Grove* article to link to a score of the work, a sound example of the work, a facsimile of the original manuscript of that work, images of the composers…Really, it could go on and on…Music catalogs online are another thing being talked about, like catalogs of composers, or the catalog of Beethoven's works. Those are so clearly famous that those belong online, and when somebody finds a new piece, they can add it in…Publishers are constantly looking for new ways to do that gradually.
>
> For composition, I need to have examples of pieces with certain characteristics, but there's no readily available catalog of pieces, and the description of a score in a library catalog varies a lot. Usually they give the level of difficulty for the player and some reference information on the composer and when the piece was premiered, but that's only of marginal interest to me as a composer…I really need to either to hear the piece or see the score, which is almost like hearing it…But describing pieces in words is very difficult. What would you say, "This piece begins with a thick texture made by the strings," and then what? It doesn't make much sense…What would be useful—and this is really far-fetched—is to be able to take a five-second excerpt of something and Google that excerpt, not in words, but in the sound, and it would find all the pieces that sound like that. This would be fantastic. There are people researching music information retrieval now, but they're starting with very simple things, like programming software to recognize a tune that someone is whistling…But to move from there to a full orchestral performance, with many voices and different instruments going on, I think it will take 50 or 100 years or more…It would also be great for locating work by unknown composers, because then you're going directly to the sound without the score as an intermediary. That would be amazing.

Training and support for the use of new tools and resources

Scholars also called for university help with digital infrastructure, particularly for the creation, migration, preservation, publication, and storage of audiovisual work. Currently this is paid for by grants or out of a faculty member's research budget. Universities able to attract up-and-coming music scholars cite the creation of such infrastructure as important in their retention.

> There are a lot of different ways in which arts and humanities need a lot more tech stuff and tech support…It's an area that we've really got to pull our socks up on…What's more salient for me are the tools issues. We need a completely different kind of service base and help with digitizing and the stuff on film, etc. We just have a lot of needs of this kind that have been neglected forever, and what do we do about it and how do we keep a funding source going for upgrades and so on?
>
> I think our digital humanities initiatives have been really a result of the kind of infrastructure that's been put in place here. We have free massive storage for as much data as anybody wants or needs…We've built a very robust infrastructure that supports all of this activity…Every faculty member gets a new desktop machine every few years…That's just part of the utilities in the house. I hear that from a lot of colleagues in other places, you get one computer when you start and then you have to fight for anything after that. But I'm not sure that new faculty always know about all this when they're recruited, because some of the department chairs that are recruiting aren't all that aware of it.

Age and technology use

According to young and old scholars alike, the younger the student, the more technologically aware they are, meaning that they have familiarity with music notation software, digital music

forms, and other tools. Many senior faculty enlist graduate students or others to help them convert music clips into digital form. Two young scholars in ethnomusicology were particularly frustrated with their field's understanding of technology.

> It probably is true that the younger ones tend to be more technologically aware at the beginning. I guess I'm somewhere in the middle on that scale, just in terms of familiarity with music notation software and graphic software, and various other things that might be convenient to use from time to time. I don't know.
>
> The better students are the better students. I've got one student who is really motivated, and he has great software. I don't even know all the software that they have now, but there is terrific software for sorting the data that you get, for figuring out how to make kinds of bins and cross references. That part of the work is really good because he finds that the software helps him to think of new topics or think of new ideas in the work. And I've never heard of this software because I'm a little slow in knowing about all those things, but students who are interested, inquisitive, and sharp are great.
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> I don't copy music into digital form for my research, but I hire people to do it for me. I simply don't have the time to do that…I don't know quite how to, but I'll get someone to help me. Graduate students know how to do it.
>
> I pay someone to find and convert music clips for me to save me time, because I'm not so adept technologically, but I love to have the benefits of it.
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> When I began, it was really high tech for the time, using video and using field recorders, and people were lugging up tons of equipment, and all of the early manuals of being an ethnomusicologist focused on the technology aspects. Now it's regressed back to the point where people often barely know how to use a computer, and it's really strange. In the 2004 president's address to the Society of Ethnomusicology in our journal, the focus was on this amazing tool he discovered: "If all ethnomusicologists used it, it would transform the discipline. It's called PowerPoint." I'm not kidding…It was really scary…It will take a while for everyone to get up to speed. There's a split; you've got real extremes. Some really are cutting edge. In fact, the book that won the society prize last year was all about digital cultures, and it was a dual-edited, multi-authored book edited by Tom Porcello and Paul Greene titled *Wired for Sound*. So that was, first of all, a major thing in terms of the topic that won, but also the fact that it was a multi-authored edited volume.
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> Technology scares some of the older faculty who really are still used to mimeograph machines, or scared that it might render them obsolete…I feel like I'm technologically savvy to a point, but I don't have time to seek out all of the newest stuff. And I know that in 10 years…the entering class is just going to blow us away…I feel like I'm behind when I hear about the people who have the GPS locator with their cell phones to locate their friends on Facebook and I'm thinking, I guess I'm a Luddite here!

Training in new music technology

Research centers for new music and music technology provide important tools and training for scholars interested in exploring applications of technology for music analysis. These centers work to establish protocols for audio data exchange, training and certification courses in computer music technology, and the organization and dissemination of pedagogical materials. While some scholars in ethnomusicology and musicology see contemporary music as tangential to their

research interests, as two professors described, music technology "broadens our imagination" and "expands the field of music" as a whole.

> We have an electronic music lab in the department. It's a computer lab, and attached to each computer is a keyboard, so some of the composers do their projects in there. And then there are classes in music technology…It's been really good for the department. All of our music education students take at least one course in technology.
>
> When I came here several years ago, I'd say something like 75 percent of my students were doing at least some electronics. Now 100 percent of young musicians out there do at least some electronics. I almost have never heard of such a thing as a composer who does zero electronics in the young generation.

6. TO WHAT DEGREE DO YOU OR YOUR COLLEAGUES ENGAGE WITH THE PUBLIC? HOW? WHY OR WHY NOT?

Music scholars play a distinctly public role by informing and framing musical consumption and performance and they have unique means for doing so in each of the academic and applied subfields. Public engagement across music can take a variety of forms, ranging from educational outreach and media interaction, to writing annotations or liner notes for performances or recordings. Some scholars may engage directly in musical performance themselves, either through involvement in productions, composing pieces for performance, or by performing themselves (particularly in ethnomusicology or new music). In new music technology, many researchers also make tools or software products in development available for public consumption. Although public outreach in music is less contested than in other humanities fields, pre-tenure scholars are often discouraged by their more established counterparts from excessively focusing their efforts on public engagement, and scholars across subfields are wary of "diluting" academic work with amateur musical ideas and practice.

M6.1 Why and How Do Scholars Engage with the Public?

Many subfields of music are inherently public given their emphasis on performance or musical production. Music scholars, however, engage particularly with specific "taste" communities sharing their interest in certain genres. In general, scholars envisioned two types of audience for their work: the performers and music professionals who consult their scholarship in order to inform their practice, and the general public who consumes musical performance as entertainment or for general knowledge. Because some musical performance requires extensive production and infrastructure, particularly in opera or new music composition, public engagement can also be enabled and sustained by scholars' work with public cultural institutions.

Musicology and music theory

In musicology and music theory, many scholars' public engagement is driven by enthusiasm for their research. For others, a sense of obligation dictates that "it's just the right thing to do." Musicologists mentioned numerous forms of public engagement, including giving pre-performance lectures, writing program notes for performances, giving interviews to reporters, writing for local or national publications (such as the *New York Times*, the *New York Review of*

Books, and *The New Republic*), and engaging in educational outreach at the K-12 level. Scholars in the area of music perception or cognition may discuss their work in popular scientific outlets, such as the *New Scientist*. Local university institutes for the arts and humanities were also described as "a nice vehicle to communicate with the world." Although one administrator mentioned the possibility of podcasting, new media venues were not seen as a major form of public engagement. In general, music theorists who study internal musical structures may have less of a public presence than scholars studying famous composers or pieces, since their work resonates less with a wider audience.

> Well, of course…giving free concerts, lectures, we all do that sort of thing here at the university. And when I was away on sabbatical they needed someone to write an article for a local theater, so I did that…So when called upon, we all do what we can.

> I'm engaged with the public all the time. I'm constantly talking at performances and working with performance venues and companies. I also write for some national newspapers and publications. So I'm interested in engaging beyond the scholarly community. But I don't do it via the Net. I do it via publishing or lecturing.

> I don't think music theory is really a field that has much of a public presence. When I tell people I'm a music theorist they tend to say, "What's that?"…We would have the most visibility, for instance, when we are occasionally asked to give a short lecture before a performance, to say something about the piece that will be performed, or to write program notes for a concert or liner notes for a CD. These are all pretty small things from our point of view, but they may actually be the things that we do that have the most public visibility.

> I work in a public institution, so I'm at the public trough…There's no overt encouragement, I just think that it's the right thing to do.

> *Grove* certainly engages with the music scholarship community, but, traditionally, when *Grove* was a print-only work, it appeared in public libraries and was used by educated generalists. The *Grove* online still sells widely in public libraries. And one of the things they're doing with the new *Oxford Music Online* is putting a couple of shorter music reference works alongside *Grove*, like *The Oxford Companion to Music*, to allow shorter and more generalist access, so somebody might take the jump from the more generalist article to the *Grove* article. *Grove*'s core audience is the community of music scholars, but secondarily, and importantly, the larger community of people who love music.

Scholars with an emphasis on performance genres, such as opera, may apply their work in support of new productions. As one scholar observed, however, it can be difficult to find space locally for large or elaborate productions.

> Some scholars engage extensively with the public. For instance, Ellen Rosand at Yale University is collaborating with a librettist on an opera that the Metropolitan Opera is staging…I believe she is putting together music by Handel, Vivaldi, and others to go with this libretto. It's going to be in the genre and style of baroque opera…She's also launched a baroque opera company at Yale, which is quite interesting in terms of interaction with the public.

> I also work with performers, which means that I actually coach them and prepare ornamentation for them, and work with theatres to produce productions that I'm involved with, but I wouldn't call that scholarly material. It is the application of the work that I do, and it is done on a case-by-base basis.

> Finding a space to perform large productions is a real problem. In fact, we're producing a performance in a local community center. It's going to be fine, but we can barely get proper video equipment in there to photograph it…Regardless, it's going to be great.

Why not?

As in history, the potential downside of public engagement in musicology is "watering down" musical scholarship for public consumption. One scholar attributed the general absence of a public Web presence in musicology to a conscious effort to avoid contributions by amateur music historians to scholarly debates. Similarly, a musicologist warned of the dangers of journalistic misrepresentation. Although senior faculty encouraged young scholars to engage with the public, "if they have something to say and they feel comfortable with it," they also noted that engagement is a much safer proposition after tenure.

> If you talk to a traditional historical musicologist about the Web, they really don't want to have anything to do with it. It's also the reason why, unlike physics and chemistry and areas that require highly specialized knowledge, you see very few serious music journals in electronic format. The last thing the AMS needs for *JAMS* [the *Journal of the American Musicological Society*] is for every amateur music historian and everybody who has any idea about music to send in articles. Fortunately they don't know that *JAMS* exists because it's a paper journal. The last thing *JAMS* wants is to be inundated with 100,000 submissions a year by people who don't know what they're talking about. They've already got too many people who *do* know what they're talking about. So a Web presence is a huge invitation to get spammed…

> There are some difficulties in dealing with journalists, and they can get you into trouble. The nuanced things that you say never get nuanced, so you end up looking like a fool to your colleagues when they read what the journalist has written…One of the pieces of advice I'll give to anybody is, if a journalist calls, find out what they're writing about and make up an excuse to phone them back in 10 minutes. Then, sit and think for 10 minutes about what you can say and what you can't say, because they may twist the words around."…I realize that journalists are in a particular business and that they need to write things that are going to be compelling and interesting…But when you've had these experiences and you read the front page, you start thinking, "How much of this is completely made up?" So you have to balance these concerns when you decide to give a comment.

> Blogging or public lectures are a foolish thing to do if you're looking for tenure. Nothing else is important until you get tenure.

Ethnomusicology

Among musical subfields, ethnomusicology in particular seems to emphasize public engagement in its effort to preserve, sustain, and raise cultural awareness of world music traditions. Public engagement can take the form of compiling CDs of world music for public consumption (from previously recorded music or personal research recordings) , participating in outreach activities in affiliation with departments of area studies, giving radio or public television interviews, and delivering talks at local libraries. Like musicologists, many ethnomusicologists engage in performance-related activities, such as K-12 music workshops or local concerts. Unlike musicologists who coach performers or produce performances, however, many

ethnomusicologists are themselves professional performers of the musical instruments and traditions they study.

> Ethnomusicology in general has made huge strides in public recognition. Journalists and the broader public…know the word. Even the *New York Times* knows the word "ethnomusicologist." Before, if people asked, "What do you do?" and I said, "I'm an ethnomusicologist," they'd look at me blankly. Now they look at me and say, "Oh, you mean world music." The broader public knows what we do much more than before. We've made a lot of inroads in all kinds of ways, through public education and media, etc. That's all very good and that'll continue because we're the good face of multiculturalism, internationalism, and conflict resolution, for example…because it's all music. So we always have that role of the good mediator. Music is not controversial, in the way bilingual education is. You can do this with music and get away with it, whereas they'll ban bilingual education in the classroom…Music is a bridge, which gives us many social opportunities all the time.
>
> We do public engagement in all kinds of ways, including appearing in the media. So we might be interviewed on NPR or in the newspaper, or on public TV, which happens a lot to musicologists. If something comes up in this realm, they do turn to us, they now know that ethnomusicologists exist and where you can find them. That's one way to have public outreach. Another is to go out and give talks at libraries. I've been asked to talk at libraries or other venues.

Scholars in ethnomusicology take particular pride in their relationship with the people and cultures they study. Some ethnomusicologists described the potential of research websites and blogging to reach their publics in a more productive way.

> For example, I recently established a wonderful correspondence with a young man who lives in the area where I did my fieldwork. I could never have met this guy otherwise. He knows some English, and he writes me saying, "I read your website, it's so exciting that the music that I grew up with is on your website," and he now corresponds with me. I sent him a camera and he sends me material that I put on the website…It's great. I am so excited, because that's exactly what I would like to happen. But I couldn't find him, he had to find me. It was obviously serendipity how he found me.
>
> Public engagement is really important, and this goes back to one of the great potentials of blogging for us. Blogging is potentially a place where we could really engage a broader public in a really productive way.

New music technology and composition

Much of the public engagement in new music technology and contemporary composition takes place by disseminating software for public consumption via institutional or personal websites. Some center websites feature social forums inviting user commentary regarding questions or bugs in software releases. These tools and technologies generally target professional and amateur composers and performers, although some centers also make simplified versions of such tools available for music education. Centers of new music research may also have industry partnerships for technology transfer, although one scholar called for a better system to advertise new technologies to commercial companies. (Indeed, several scholars mentioned the precedent set by Stanford professor John Chowning's profitable FM Synthesis patent.)

> We have a content-based website and access depends on your permissions. There's a general public downloads page with all of our software and tools that are available. If you're an internal user with special permissions, then you have access to more material that isn't yet released.
>
> There are a lot of projects that maintain a public face as works-in-progress on our website. You can see the latest developments and the updates and discussions, and we might even invite public commentary through blogs or listservs.
>
> Our commercial relations and interest in producing things for mass consumption are secondary to our main mission, which is to develop and give tools to people working in artistic fields. For example, IRCAM created the software Max/MSP, which is now used by pop musicians, famous choreographers, and many others…The software on our website is mainly geared for composers, musicians, or performers for use in their creative work. We do have a help forum or hotline of sorts, and if you log on you can get alerts to new software or the latest versions. This caters to a community of software users and creators and has a very open-source mentality. Some software is open source and some is not, because we think the forum and organized registration and communication is still important.
>
> We have a broad user-audience target. Generally we develop simplified versions of the tools we make for professionals with more limited features, for instance, in the context of music education in high schools. We develop simple tools to download with specific areas in mind, such as education.
>
> We have a lot of software available for download through our website where, many times, somebody will find a bug, they'll send an email, it will get forwarded to the person who knows how to fix the problem, and usually they will fix it and put a new version up on our website. And that's a thing that we share with the public. I consider that a form of communication.
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> We also have the issue of how to address companies and industry for technology transfer. And for that, we have to first publish the state of our available technologies, so that our partners understand what we have available, and then provide a way to distribute the technology to them. This is an issue of software development, how to package the technology in a form suitable for the industry's needs…Something we have started to think about is creating databases of available technology in different labs, or some sort of standardized way to advertise technologies in development that companies may not know about, by describing the features, having a keyword search, providing examples of the capabilities, etc. This kind of database exists in private companies, but it's not yet broadly available in the scientific community…The goal is to advertise our technologies to private partners.

As one contemporary composer pointed out, many outside of the field are reluctant to term the online sharing of software and tools as truly "public," because it only reaches a small community. Live performances—on site, in concert halls, or networked online—are an important form of more general public engagement, and may occasionally perform a public outreach function at universities in recruiting new music students. (Some scholars lamented, however, that many of the technologies supporting new musical performance are limited to specialized venues.) Other efforts to reach new audiences for contemporary music include internal or external seminars open to the public, partnerships with museums or centers for contemporary art, collaborations with regional symphonies and musical ensembles, teaching undergraduate courses in music technology, and launching experimental sound projects in public spaces.

> Yes, there's a huge public engagement with music, but the criticism that comes back is, "Your public is just a small ingrained group of people with the same interests. So, really, there is no public. You made it up." This is one perspective on how people might view it, because there's no category for this contemporary music. Who's listening to this? Where is this music done? Well, in the United States, it's primarily a university nurtured phenomenon. There just aren't that many venues that do what I call "new music."
>
> There is still a gap between the experience of performing in venues with excellent facilities and other venues where everything is complicated and difficult. And, to me, there is a social aspect of what we are working on. I really want the technologies and compositions that we are building here to be able to tour and be performed in many different venues, not simply those with high-tech experimental facilities…They have to have a level of autonomy. This is one of the main lessons that Pierre Boulez taught at IRCAM: the institution must make its work available to all.
>
> A lot of networked Internet performances allow random people on the Internet—not at any of the physical locations where the performance is happening—to tune into the broadcast and listen to it like the radio, like listening in on a live concert from somewhere else.
>
> In terms of the publicity for performances, mainly we use email. Sometimes, for the old-fashioned physical concerts that we put on, we will send announcements to the local newspapers to put in the concert listings. Every so often we'll send out a direct mailing of postcards for a big event, or for an event that's in a large venue where we don't think there will be very many people. And in the local area, there are a lot of nice website calendars for different kinds of music where you can submit your events and they'll have music listings, whether it's music with an emphasis on improvisation, or new music, or music with technology…different kinds of foci.

Why not?

As in traditional musicology, one downside of public engagement in new music composition and technology is unwanted solicitation by "random" individuals.

> Every so often we get some random person who rings the doorbell and says, "I have this theory about music. I want to explain it to you guys." We're not very open to that…

SELECT RELEVANT LITERATURE AND LINKS

This is not meant to be an exhaustive bibliography; as a courtesy, we are providing some of the literature—scientific and popular—that we have collected over the last few years. Please see the main Relevant Literature section and various footnotes for additional citations.

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CHAPTER 8: POLITICAL SCIENCE CASE STUDY

CONTENTS

INTRODUCTION AND OVERVIEW OF THE FIELD

Political science is a multidisciplinary field characterized by scholarship that "leaks" into both humanistic and scientific perspectives and skills. There is a diverse array of subfields in political science, including American government and politics, area studies, comparative politics, formal theory and methodology, game theory, international relations, political behavior, political theory/philosophy, public law and jurisprudence, public organization, administration, and public policy, among others. One emerging interdisciplinary subfield is neuropolitics, where brain imaging technologies are used to examine individual political choice. The diversity of research in political science makes it a decentralized, low-paradigm field. Scholarship in political science is often divided by methodological orientation between theoretical and applied approaches; the latter can be further separated into qualitative and quantitative work (although these methodological divides are challenged by scholars who combine socio-historical qualitative analysis, ethnography, quantitative analysis, and/or formal modeling, such as that which occurs in international relations). Consequently, there can be tension among methodological approaches or subfields. It is not uncommon for faculty in large research universities to be affiliated with interdisciplinary research institutes or have joint appointments in schools of public policy, economics, and history.

As in economics, political science has seen a trend toward publishing journal articles and away from publishing books. The degree to which final publication is both book- and article-based depends largely on the work's qualitative or quantitative orientation and the argument length. Most flagship journals in the field are sponsored and run by scholarly societies or university presses. There appears to be no call within the field for open access journals, and although there are a few online-only journals, they lack the gravitas of their traditional print counterparts. Citation indices are used by many tenure and promotion committees as an indicator of an article's impact in the field, though it is not a sole mark of good scholarship, particularly since such metrics do not comprehensively capture import and visibility. While prestige and imprimatur are the most important considerations for publication, scholars also increase the visibility of their work by publishing in journals targeted at specialized audiences. Frustration with the slow speed of the peer review process has led to an emerging climate of sharing in-progress work, particularly through working papers, though this may be more prevalent among established scholars who already have reputations built through traditional publication mechanisms.

As a field, political science appears to generally welcome the sharing of information due to its focus on the often unpredictable unfolding of world events. The extent to which scholars share depends, in part, on personality and on the pace and nature of their particular subfield; scholars in policy or current affairs may value timeliness of information more than those with a historical or theoretical focus. Additionally, qualitative scholars may have a higher threshold for engaging informal networks for feedback on drafts compared to their quantitative counterparts, who are more likely to publicly share working papers. Society conferences and smaller research symposia are important venues, particularly for increasing the visibility of pre-tenure scholars' work, though fear of poaching can hinder participation in publishing conference papers.

Political scientists use a variety of sources to keep up to date in their research area. These include email and listservs (or similar subscription services), as well as resources such as JSTOR and Google Scholar. Most print journals in political science can also be accessed online. Scholars rely heavily on large databases, especially those concerning election results, public opinion data,

survey data, and census data. Political scientists amass their own data sets as well, some of which are made publicly available via institutional repositories or personal and journal websites. Materials required for the replication of results, such as data sets or back-end data and code, often accompany the text of the publication. Digitally innovative social scientists, including political methodologists, draw increasingly on various forms of computational analysis, including text and data mining, visualization, and GIS to analyze new and more diverse kinds of digital data that are derived from all manner of electronic media. Demand for more sophisticated tools and techniques to make sense of this growing mass of information will consequently increase throughout the social sciences (Berman and Brady 2005).[97]

Growth in the implementation of quantitative and mixed methodologies has led to a general increase in collaborative authorship across the field.[98] Scholars seem to use traditional mechanisms for collaboration, preferring to circulate documents via email, wikis, and other social media platforms. Overall, the field is relatively well funded compared to many other social sciences, and research is typically inexpensive to conduct, especially as expanded access to online information reduces the need for research travel. There is some evidence, however, that the increasing use of technology may increase research costs. Securing large amounts of external funding, however, is not considered necessary for advancing a scholar's career.

Like history, some topical areas in political science are relevant to government activities, policy, and public interest, and consultation work with government agencies, NGOs, and corporations is commonplace. There is a large component of public engagement in the field as a whole, particularly through the news media where academics can serve as political analysts or commentators, though this may be more common among scholars whose specialties have popular resonance. Excessive public engagement is discouraged for pre-tenure scholars since it falls outside the realm of traditional scholarship.

In sum, complaints concerning the slow publication process are widespread and particularly problematic in time-sensitive subfields. While there is demand for more specialized journals (following a proliferation of subfields), there is limited experimentation with open access or online-only journals. There is little evidence of a crisis in scholarly monograph publication at the most competitive institutions. Instead, scholars call for university presses to continue publishing scholarship across the spectrum of the field. Post-publication data sharing is common practice among quantitatively oriented political scientists, primarily to facilitate the replication of published results. Information and communication technologies have enabled the ability to harvest new kinds of data and increased access to diverse resources in the field. Although data repositories, including the Interuniversity Consortium for Political and Social Research (ICPSR) and the Harvard-MIT Data Center, play an important role in data preservation, there is demand for more specialized institutional repositories, such as polling archives. For those scholars who depend on archives outside of the US and the EU, there is tangible concern about the selectivity of what gets archived and the continued need to travel to physical sites to get an accurate assessment of a given cultural and political situation.

[97] See Goodchild (2007) on sensors and King (2009) on new software and methods to enable reading a million blogs.
[98] The American Political Science Association established a working group to address this topic (Chandra *et al.* 2006).

1. REQUIREMENTS FOR TENURE AND PROMOTION: WHAT ARE THE QUALITIES OF A SUCCESSFUL SCHOLAR?

Tenure and promotion in political science require high-impact, peer-reviewed publications. While the criteria for judging quality scholarship can be vague, department chairs and review committees generally look at journal titles or imprimatur, citation indices, and a scholar's visibility in the field as judged by external letters. Growing methodological differences in the field (between theoretical, qualitative, quantitative, and mixed methods) can create tension around the establishment of a common practice of evaluation (i.e., between the value of books versus articles) in any given department. Overall, there is little movement away from books and articles as the main scholarly products of the field. Though uncommon in tenure cases at competitive institutions, various forms of electronic scholarship are judged by their degree of peer review and the perceived prestige of the publication. Data curation, consulting, and other non-peer-reviewed activities may be valuable contributions by senior scholars, but count for little in tenure and promotion without a strong, traditional publication record.

P1.1 A Suite of Achievements Anchored by High-Impact Publication

The "vague" nature of judging scholarship: Quantity vs. quality

The unwritten criteria for advancement for scholars at all career stages are generally understood to be a combination of a stellar publication record and original contributions to the field. Because of the exceedingly diverse nature of political science, scholars acknowledged that requirements for advancement can be particularly opaque and varied across subfields, departments, and institutions. For those in monograph-based subfields, one (or increasingly two) book(s) is expected in order to achieve tenure. Article-based subfields (such as methodology, political economy, some quantitative and theoretical work, and parts of American politics) require a body of 6-page to 30-page articles, a significant number of which should be published in top peer-reviewed journals. There are no absolute standards, however; as one high-level administrator explained, "Quantity and quality are sometimes a tradeoff."

> It is deliberately vague at most institutions, and is vaguer (nominally) the higher the institution is ranked. And I think there's a certain logic to it, but it's not a comfortable logic for the people who are subject to it…The institution wants you to work hard and be productive on some dimension that's considered valuable…In the social sciences and humanities, it's not obvious that we're producing something that has immediate value. An engineer bangs on things and makes a better metal or improves the conductivity of electricity, or whatever. And we think deep thoughts that maybe some day, somewhere, will matter. But this is the game we're all playing and we need to have some metric by which to evaluate performance so that we can keep some people and encourage people to work hard and so on. If you knew exactly what you needed to do to get tenure, then you might have an easier time. As an untenured faculty, you might be a little bit more comfortable psychologically, so I think it would be better in that regard. But there are two problems with that. One is: you might nominally meet the criteria but not really have achieved—you might have just gotten lucky to publish in some high-profile journals, got a book accepted, something like that. But really, people don't think about these things; they read the articles and don't think they're very good. The other possibility is that people work to the task. It's just like the debate about testing and standards in primary and secondary education. Once you have rules about what's good and what's not,

people are going to meet those expectations and then stop. A vague threshold means that you can't be sure you've crossed it until after the fact, so you work past the threshold.

I tell students that when you write a paper, you have to answer the question: Whose mind do you want to change about what? And when junior scholars first become academics, they just desperately want some italics on their C.V., like a journal or a book, or something where they got past an editorial review process. And it's true they have to do that, otherwise they're not going to influence anybody. But the real goal is beyond that. It's not just getting things accepted. The real goal is to figure out how to make a difference, how to make a contribution. Just getting past an editor where you've demonstrated that you did something smart, that's okay, that's good, but that's not really what it's about.

Tenure standards are notoriously in the eye of the beholder. At the private research universities that I'm most familiar with, the tenure standards have to do with quality and impact on the field. The quantifiable aspect of it is generally thought to be less important, but there has to be a certain pile of publications there. It used to be that you had to have at least a book or maybe two. Nowadays there are, in political science, subfields or approaches that are not oriented toward book publication but are more oriented to article publication. So there's no particular rule of thumb about how many books and articles that you need, but sometimes the tenure standard is articulated in terms of one major project, often emerging from your dissertation, plus being very far along on a second major project, which, again, could be a second book or it could be a set of related articles.

Quantity is always an ambiguous concept. We usually say that candidates for promotion and tenure should have enough to show sustained productivity, should have something that shows originality or potential impact on the field, and should aim their work at the best possible places—for a book, a high-level university press; for articles, the most selective journals.

It will vary. It's some combination of quantity and quality, measured in terms of journal publications, and there's a hierarchy of journal publications. It's very explicit and steep in political science…The *American Political Science Review* accepts about four percent of the papers that are submitted, and getting a publication in that is considered the pinnacle of journal publication, not that all the articles that are accepted are great and many of the ones that aren't are also extremely good, and arguably better on occasion…So just below, the next step down would be the big disciplinary journals that are dominated by American politics: the *American Journal of Political Science*, and the *Journal of Politics*. And those are very highly regarded by American politics people. Basically, at a top-25 department, if you haven't published in one of those or published a good book, you're very unlikely to get tenure.

If, by "scholarly communication," you mean publication, there are the monographs and articles published in both refereed and non-refereed journals. If, by "scholarly communication," you also mean more informal settings or even formal settings that encompass scholarly communications, but don't necessarily entail publication, then, of course, giving papers at conferences and at annual conventions of scholarly societies of all sorts, both within political science and within the other disciplines of the social sciences, is also standard fare. That's within political science…In article-based subfields, depending upon the quality of the articles and the ambitiousness of the articles, to get tenure it could be anywhere from six to 12 to 15 articles. I've seen people get tenure with six articles, but three of the six were in the most-difficult-to-break-into peer-reviewed journals, and the most cited articles in the field, that kind of thing…The difference between whether you're manipulating in your article a pre-existing database or whether you're building that database yourself, which can take years, you've got to go gather the data. So there are those tradeoffs.

> At all the major universities, faculty must either publish 10 to 20 articles, of which a number must be in highly prestigious journals that are well known—the *American Political Science Review*, the *Economic Review*, the *American Economic Review,* or *Econometrica*—or they must publish a book with a prestigious press (e.g., Princeton, Harvard, Yale, Chicago, Cambridge, Oxford) and a number of articles. In either case, the work must have made a mark on the field as revealed through citation rates and the opinion of peers.
>
> I would not say there are a number of publications certainly on a per-year basis. I would say if somebody in the department was not going to publish anything in two or three years, the department head's going to say, "What's going on, what can we do to help?"
>
> Essentially I'm completing another book project. My tenure will essentially turn on that book project. That wouldn't necessarily be the case for the typical person in the department. But having said that, this is still true: no one will ever give you a concrete checklist, because, ultimately, it's a qualitative judgment as well as a quantitative judgment.

Clearer criteria at less competitive institutions

The "Big 10" in political science is a robust group of institutions that generally compare their advancement criteria against each other to guarantee robustness and consistent judgment of high-impact publication.

> The Big 10 in political science is a fairly strong group. Michigan is—depending on whom you ask—a number one, two, or three department in political science; so they kind of set the standard. And Northwestern is private, and then we have a couple of Big 10 programs that aren't so strong. But it's a strong comparison group…We use those comparison statistics from other institutions to gauge how we've been doing over time, and you can see big changes in the department and its publication rates and so on over time. So I think the dean uses that, in particular, for comparing departments and saying, "You're doing the right thing/you're not doing the right thing." Knowing that that is there at the dean's level, it trickles down to us, but we aren't counting publications.

In contrast to their vague criteria for judging scholarship, less competitive institutions may issue more rule-based or "contractual" guidelines about the clear publication requirements for tenure and promotion.

> It depends where you're going to get tenure…I think this institution is sort of different. At least the goal here is that you're supposed to be the best person that there is, not that you've just done the stuff that you have to do. In most places, there's some kind of rule of productivity…you write a book and seven articles…you do your job and that will get you tenure, if it's pretty good. And, of course, teaching and seeing students and contributing to the university and maybe the community. And it's a little bit more career path–ish.
>
> For some public research universities, sometimes they will issue a formal policy that says for tenure: "You need to have six articles in the following ten journals"…that sort of thing. And they actually treat it almost as a contract, that if you get a certain number of articles in those journals, then you get tenure. But those policies are offered generally more as guidelines than contracts.
>
> The people who really work at the review process, and do it honestly, read articles. The others sit and count the number of articles you've published in whatever peer-reviewed journal, and it does make a difference.

Raising the bar?

One department chair thought the criteria for tenure and promotion had remained somewhat consistent over time, but others suggested that the bar has been slowly raised, though this may be institution-specific.

> I think—at least my impression at a major research university—it hasn't changed much in terms of the overall requirement.

> Well, the expectations are that faculty in political science will have a record of ongoing productivity from the time they start. Now, it may take a while to get things out, to get things into the shape that younger faculty want to see, but essentially there's an expectation that they'll start getting their work out soon. And, in fact, when we hire junior faculty, we look for people who already have something written or at least submitted. So, over time, it seems to be pretty clear that the expectations have gone up for new Ph.D.'s – they should have things that are ready to be published, if not already out, as they search for their first academic job.

What is judged: Book vs. article

The degree to which articles are accepted in place of a book for tenure and promotion has increased over the last decade due to the increase in mathematical modeling and other quantitative methods among particular subfields. This divergent publication structure is reflective of the diversity of the discipline overall, but, as the following quotes demonstrate, it also raises tensions about how different methodological approaches are valued in the field and the future structure of the Ph.D. dissertation.

> Political science is a good discipline and begs the question in relation to where young scholars choose to publish, because one large section of our department, really, is humanist in a way—traditional political philosophy, they do more historical studies, and then the gamut runs all the way up to people who do formal mathematical models or people who don't do formal modeling but do statistical studies of various kinds of behavior. Our discipline, our department, is divided over how much you need to have a book, and how much credit you will give for a number of very good and serious articles. It still tends to be the general view of our department that you've got to see the book and then there is also the view that you've got to see the second book as well, which makes it really very tough. There are a number of members of our department who think that articles are just as good and should be weighed the same way, but there is something about the sustained argument of a book, etc., etc. But if someone is doing major articles, that's good as well, which puts us closer to economics and closer to the natural sciences.

> …A scholar is judged on his or her merits. One of the problems in departments like political science is that we cover such a range of styles and topics. One of the things I like about my discipline is that we have managed to stay together as a discipline better than some other fields. We don't really hate each other as much as do people in comparative literature or other fields, where there really are passions with one approach or another. But I get worried that it's beginning to fester between the formal modelers who do economic-type analysis in political science, and the historians. And so it is a problem that affects the whole nature of scholarly communication because different people think that different things are what should be communicated.

> Ours is a department that still has a strong interest in book-like manuscripts and big ideas and major projects. That was certainly the case in the past. There was a heavy bias in that favor.

Now I think that's changed and there are quite a few people here who are coming up both those routes—both the book route and the article route—and so I don't think there's any uniform single standard. And part of that is because political science, unlike a lot of disciplines, is really a combination of a lot of different disciplines. And that's both its strength and its weakness. We have people who really are sociologists, historians, methodologists, statisticians, or area specialists and, really, the only thing that truly unites us is that everyone's talking about politics and political institutions in one way or another. So it's not like some of the more traditional hard sciences or engineering where there's a very, very clear pattern and path that everyone, essentially, is following and checking off things on a checklist. Because we come at this from so many different angles, I think it's really hard for me to give you a uniform sense of what that standard is.

There's been a considerable…almost a melding in one direction of political science publication standards, attitudes, and practices, moving closer to the economics side. It used to be almost inconceivable that one could get tenure in a major political science department without having a book, and that's no longer inconceivable for people who do formal modeling in particular. For people who do more qualitative historical work in terms of methodology, the standards are different, and this is a separate problem. This is not a publishing or an academic communication problem. It's an intellectual problem in that some methodologies are seen as "high-tech" and others are seen as "low-tech," and, for those who do low-tech methodologies, in other words, historiography, they have to publish a lot more in order to prove that with low-tech methodologies we can still do stuff of value. I don't think that's a communications issue. It's a mindset issue. But it bears on the communications question in the sense that it's sometimes referred to as "hard" and "soft," and I get very insulted when people say that, or when people say, "These people do methods and these people do case studies or history." Guess what, guys? That's a method. Qualitative methodology is as much about methodology as is quantitative; methodology isn't just numbers. But there are different publication standards, and they tend to be more book-oriented than article-oriented, and thus, the book question comes up again…There are very few research projects in my field done with modeling that would require a book to communicate them…You don't need a book…In fact, a PowerPoint slide deck would be the best way to communicate it.

The emphasis in more quantitatively oriented political science is peer review, with much more emphasis on journals than just books. One book every few years is not seen necessarily to be as good as a continuing stream of journal publications in this particular atmosphere.

There are a few subfields in political science that look more and more like economics—game theory, in particular—and papers are more important than books. And so in the last decade, we'll hire and we'll recommend tenure to the department for people who haven't published any books, which was unheard of a decade and a half ago. Unheard of. But now the norm is similar to economics, and indeed, the people who work in politics who are hired by us, who are game theorists, actually have their doctorates in economics, and, if they're entry-level, their dissertation will be three papers—that's common now in economics, rather than a book-length manuscript arguing something. And we will hire people like that. If somebody came to us 15 years ago and said, "This is my dissertation," three papers, they would've been laughed at…But that's only in the game-theoretic modeling, mathematical modeling subfields of political science.

The pushing of the envelope in recent years has been things like dissertations that consist of three very loosely related papers, rather than an integrated book-like dissertation, which then, of course, has implications down the line for what the person's tenure file looks like…So, if you do a dissertation that's three papers that are stapled together rather than conceptually tightly integrated, then you wind up with three journal articles out of that project, rather than a book. That means that people have to accept the possibility of a no-book tenure standard,

which is pretty normal in American politics and it's pretty normal in any of the approaches to politics that are heavily math-oriented, either deductive, formal theory, or statistical work. But for people who do case studies or narrative theory or comparison, the presumption is that there's something fishy if you haven't published at least one book.

We also have in our department a split over whether a dissertation can really be three separate papers or has to be a single, coherent thing. I'm in the middle by nature. I'm one of the great supporters in our department of our requirement that you can't be a good political scientist unless you've read Plato and Aristotle and Machiavelli. Even though I can't pin down exactly how they've used them, the way I can pin down exactly how we would use various statistical techniques, I really do believe that you should have that kind of a humanist background. Not all my colleagues on the quantitative side agree with that; that's one of our big debates. I'm also a pluralist and I think a good book is a good book, but a good series of articles is also good. So I'm one of those wishy-washy people in between. I am sort of in the middle, though I am open to all the changes that are coming along.

The same sorts of methodological divides are reflected in public law, so there are people who are very interested in formal modeling and game theory. There's a small but growing trend in my field, in that there are people who are continuing to try to do more traditional behavioral, quantitative work. I don't see a whole lot of change, because this is an odd subfield and it just depends. With different departments, you would see it aligning itself with different subfields depending on the interest. So if this were more quantitative, we'd probably be much more tightly aligned with the Americanists and the methodologists. In some departments, we would be very tightly aligned with political theory and some departments it might be aligned with comparative politics. And so I guess the answer would be: That's probably how change would evolve, is that that marriage would dissolve and a different marriage would develop in a different department. And also because you're talking about a tiny subfield…In most places, it is a bastard child of American politics or of political theory. And in that case, it's going to tend to follow the trends in those subfields.

Given that different scholars and departments value different methods and subfields, tenure candidates often need to appeal to political scientists across the board.

In departmental votes, in most departments, you have to get the American end to go along with you; otherwise, you don't get the super-majority you need in order to get the dean to say, "Yes, we should keep this person and so on." So, basically, you have to be appealing to the Americanists.

To some extent you need to let people know that you're a decent colleague and you have good judgment. I think that this matters more than we commonly realize. They're making what could be a lifetime commitment to you, and they want to know that you will help steer the ship and have decent judgment, will be a useful person to have around, and stuff like that. Partially my feeling about that is formed by the fact that I had a very close friend and colleague who had a fantastic publication record but got denied tenure because, in a nutshell, his colleagues hated him. It's very amorphous and subject to abuse, but, by the same token, that matters. And it's not making everybody happy with you. My sense is that it's okay to disagree with your senior colleagues, but their feathers aren't ruffled by being disagreed with. Disrespectful is one thing, but if you have a rationale for what you say, everybody wants to hear a good way to do things. I think it matters a lot. In this field, trust across subfields is very important, and a sense that somebody is intelligent and has good judgment across subfields is very important. As a social scientist, I'm trying to find the principle. But I would suppose that in fields that are more multifaceted or diverse and disparate, it would be more important to have these kinds of considerations.

Younger scholars leading a shift to more quantitative work?

Some scholars saw the emergence of quantitative, article-oriented work as partly due to a generation gap. Subsequently, younger departments may promote quantitative work more actively than older, established departments.

> There's a divide in political science right now; it's essentially methodological, between people who mostly consider themselves social scientists and pursue the subject matter through rigorous methodology statistics, maybe not always statistical analysis but they're friendly to research design and so on, and another group, who are more humanistic in their approach, more qualitative, more interpretative. There is a generational component to this, because the majority of political scientists 40 years ago were qualitative, and now the majority of the younger faculty tend to have some quantitative skills early, and understand how to talk to those people. So there are generational changes happening, but like any generational change, because of the hierarchy of academia, there's a disproportionate representation of qualitativists at the top of the food chain, senior faculty at major universities who were tenured 30 years ago or whatever. So there's basically a divide now between what you could call book departments, which are dominated or have a strong contingent of qualitative research, and article departments, which tend to be dominated by quantitativists. And you can almost look at the age of the university, when it was founded, and it will tell you whether it's a book department or an article department.

> In political science…the book route was a more traditional route, and so older and more established departments in political science probably still have that preference and much younger departments that have been more captivated by the more quantitative work probably don't. But I would say there are some established and old-time departments that have shifted into more of a journal orientation. So I don't think it's strictly a matter of establishment. I would say if you think about the top 10 or 15 departments, most of the very, very best departments, it [publication] really breaks down by subfield.

> There is a flat mid-career structure right now in the field. The old guard has been at the top for a while, longer than the previous old guard. So it's not clear who's going to take the place of the old guard when they're done. It's not as clear as it was when the current old guard was young. There's a very strong crop of assistant professors at this point. The associate professor crop is somewhat in more flux…with regards to the impact they're going to have, the impact they've had.

Mixed methods as wave of future?

One professor and high-level administrator predicted that mixed methods research in political science will bridge the methodological gap in the field, as well as the book/article gap in what is judged for tenure and promotion.

> More and more people are doing mixed methods, where their work will have some kind of theory, sometimes formal or sometimes verbal. Their work will have some kind of statistical analysis of a data set that covers lots of countries or lots of years, but then will also have some kind of narrative discussion, either case studies or historical background or context that makes sense of the statistics or tries to move the statistics in the direction of showing the causal mechanisms that work in historical process tracing.[99] And you can do mixed methods in an article, but often mixed methods appear in book format where there will be a stats chapter

[99] For information on process training as a method in case-study research, see: http://www.polisci.wisc.edu/~kritzer/teaching/ps816/ProcessTracing.htm

> or two, and then two or three case-study or historical chapters, along with the theory and the contextualizing, introduction, and conclusion. And, personally, I think this is the wave of the future, because causal inference from only stats or only narrative has severe limitations that you can partially overcome by using mixed methods that use both approaches to shore up the weak points and the inference strategy of the other. Mixed methods people tend to be people who do all sorts of publications and all sorts of presenting of their work. They'll generally do an integrated dissertation. They will turn it into a book. They will chop up the dissertation project into a few articles, one of which is usually the core statistical chapter of the dissertation, but others of which may be a case study or policy-relevant overview article drawn for the project.

Two scholars illustrate this bridge-building work across subfields.

> I study comparative politics and international relations, and methods. Research Methods is my third field. And within comparative politics and international relations, I study comparative political economy, which is very much related to international political economy, which is why I straddle these two main fields…We have people who only do comparative politics and people who only do international relations, but I guess I'm in the camp where you cannot look at domestic development without looking at international development and vice versa. And in terms of even being within that camp, there are methodological and ideological paradigms. And so, I'm in the camp that thinks, "Okay, international developments and domestic developments need to be examined together." But even within that camp, there are obviously methodological divides and analytical divides.

> I study war, peace, and international institutions. And so, I'm pretty much a mainstream international relations scholar…I use formal and quantitative methods. What we find is that almost all the stuff that's been published in the last 2,000 years gets part of the story pretty well, but then gives up on trying to integrate all the other parts because it's too complicated…We can represent it mathematically in a very rigorous kind of logic game, a "for instance." And then we can derive implications of our arguments and then go check those statistically. And, just like mapping icebergs, we only get to see a little bit of what's going on, and we try to make good use of the information we have to check to see which theory is right and which theory maybe isn't. And that's why we want theories, because if we could see the whole thing we wouldn't need to have theory.

Perspectives from pre-tenure scholars

The vague expectations about the advancement process can lead to a lack of focus for some new faculty, who employ various strategies for publication and rely on senior colleagues to direct them in the process. The lack of clarity faced by some pre-tenure faculty is exacerbated in emerging subfields of political science. Given the confluence of these factors, many senior faculty agree that advising younger faculty is essential.

> It's a bifurcated field in that the discursive narrative side of political science is based on writing books. You need to write a book at a top press that gets good reviews by top scholars in order to get tenure. Within the article side of the discipline…you need to have a number of top-tier journal articles that ideally seem significant sometime after they're published. There's no hard and fast number necessarily in terms of how many you need. It should be anywhere from a handful to a lot, but they need to add up to a signature statement of your own, about how to think about some topic in your field. This is where senior scholars in your field can have a little bit of influence and are helpful in the process, in the sense of explaining what something means and why it's important because, even if something gets placed in a top

> journal, it doesn't necessarily add up to a lot. But, on the other hand, people usually come up for tenure before you can really judge any long-term significance. So, generally speaking, if you get a bunch of stuff in top-tier journals, and it adds up to something coherent that's kind of a signature statement of your own, then you'll be in good shape.
>
> What I tell younger scholars is that the difference between not getting tenure and getting tenure wherever you are is like jumping between two buildings that are two feet apart. You could do it, but you don't want to miss. And so start early and keep at it. Almost nobody gets tenure by waiting five years and then handing in three books. There's a lot of stuff to learn, and it's not only the amount that you learn and the amount that you publish, but also basically its influence.
>
> It is up to the chair of the department to make clear to new hires what the expectations are for getting tenure, because people don't come in and read a booklet that tells them that. So they have to be told. But, after all, if you start a career in academia at the assistant professor level, you would have to be unusually oblivious not to be asking the question: "What do I have to do in order to get tenure here?"

As illustrated by the quote below, some scholars understand and appreciate that the tenure and promotion process can contribute to good scholarship, but also that it can hamper creativity and innovation among scholars at the most competitive institutions.

> We're a knowledge industry, we're supposed to come up with new ideas or better ideas about how things work. And yet we organize ourselves in a way that discourages people from being innovative. We tenure people after a while, and give them lifetime protection at their jobs. Well, the alternative is the prospect of being hanged; it's not everybody's cup of tea. But if you're going to give reasons, I'm perfectly willing to take this tradeoff. I get paid a lot more than my colleagues do in other countries. And, in return, I had to spend eight years of my life not knowing whether I'd be employed or not. I'm not saying that I'd volunteer for that system all the time, but, in fact, a lot of European academics who are very competitive come to the US because they feel like they're more productive here. I don't think they want to live in the US per se*,* they just like the system better. Any institution tends to create structures that protect the people who get to make the decisions, and protect that institution from harm, from the vagaries of life, from challenges, whatever. Business does this, government does this, academia does this. And, to remain creative, you have to fight it, and if you look at where interesting things are happening, it is not at the places with the most prestigious names, with the biggest budgets or anything like that. It's on the periphery, where people want to get ahead and want to matter, but don't currently. That's where creativity happens. So, I love academia, I love the institution I work for, but we are not promoting creativity, we're stifling it…The only people who benefit from tenure are people who shouldn't be tenured. It's true. The people who you really want to have in your university, whom you'd love to tenure, are people who love the job, who work hard at it, who interact with their students, they're excited about research, and do good work, and guess what? You're going to fire them and they'll get a job somewhere else if you don't keep them. The ones that really need protection from maybe not being kept are the ones who aren't doing much.

Other indicators: Citation indices

Citation counts hold some weight in the review process, and this has been growing in importance in recent years, according to many of the scholars we interviewed. In particular, citation counts are used by chairs and review committees to quickly measure the impact of any given publication on the field. The agreement among high-level administrators seems to be that while

citation counts are not perfect indicators of quality, they are one of the better mechanisms for doing some filtering. Citation counts only provide a piece of the overall picture, however, so reviewers generally read through a scholar's publications, and consider how the publication was cited and by whom.

> It matters what the impact is. You could have done all those things—published 10 to 20 articles, or published a book with a bunch of other articles, or even two books—but if there are not citations that support the fact that it's been consulted…And we—not always, but often—go to the citation index. So there's a way that the modern scholarly communication stuff has made a difference…it can be an important argument. I went and looked and this article has 100 citations, which would be a goodly number of citations for an article, especially for a junior scholar. Even 50 could be quite persuasive and 30 might be persuasive. But if you go and you find this has been cited once, you might say, "Well, that's not too good." And if every article had that quality and there were 20 of them, that every one had been cited once, I think most people would say that's not very impressive. So citations matter, and then, of course, the standard opinions of peers…But I think the thing that's changed is some of the citation stuff that nobody would have done 20 years ago or 30 years ago.
>
> …Citations are good measurements. I think they are important. Are they the only thing you look at? Obviously, you have to read the stuff…It may have been cited 30 times, but if it's sheer nonsense, that's not so good. But, on the other hand, if you read it and you think it's pretty good, and, in addition, you have 30 citations, I think it's hard to argue the scholar hasn't made some kind of an impact. You'd go and look maybe at who was citing the scholar and that can often get a little footnote that says…"here are some of the people citing this work," and these are the major figures in the field. Clearly, this article has had an impact. I think zero citations are a worrisome thing, or small number of citations. It's more about citations.
>
> Using citation indices is a pretty quick method of figuring out what's going on. It's crude, but there isn't anything better that would go across a large number of works quickly…The modal number of citations that an article gets in political science is probably zero. Most articles probably are never cited even once. And so you have to be in that group that not only gets cited, but that gets used and changes people's minds about something.
>
> We do citation counts now, we track publication rates, and we have a list of 10 or 15 journals that we look at…So there's been a big emphasis recently in this department.

Limitations of citation counts

There are some criticisms about the limitations of citation counts; scholars are aware that important work may not make an impact until many years after its publication.

> Citation counts are a standard part of any tenure case, but it's not a necessary condition to have high citation counts just because it still could be something that takes time. The idea life-cycle could mean that you write and publish an excellent paper in year five, six, or seven of your clock, it comes out, it has an impact, and maybe it'll be two or three years before people can reflect that in new research. So the citation counts may not start to rack up until after you have to come up for tenure. Tenure clocks are very short, basically. That's a very short period of time to prove things. So people look at citation counts, without a doubt, but it's not a necessary condition to have a high citation count. If you can have an evaluation by senior scholars that says, "This is good stuff, it's going to have an impact," and they explain why, then that can substitute for high citation counts.

> Google Scholar is hopelessly out-of-date all the time. It's terribly out-of-date. I only know of it in my area. I think it's true in political science in general…and it's very partial in its coverage. I haven't looked at it in some time, in part because I think it's so unreliable. The citation count in Google Scholar is probably half to two-thirds of the actual citation count of that paper…That's a published paper, but just in terms of tracking citations to your work in general.
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> Or maybe it doesn't get read when it's written but gets read several years later, "Oh, interesting, let's go back…" Sometimes this happens, where you write something that is rejected at that time, and then seven or eight years later, people start making exactly that argument, and then somebody says, "Hey, wait a minute, this argument was already made in 1997." And then it gets picked up. Something I did that came out in the 1990s has had that kind of an impact. Nobody took it seriously. It was completely rejected when it came out, and now people are paying attention to it and citing it now, over 10 years later.
>
> Admittedly, Mendel would not have many citations for 50 years, and that would've been a mistake not to tenure him…because he lived in obscurity and published an article and nobody quite noticed it. Fifty years later, it was rediscovered and it turned out it was about modern genetics, and it's actually the most brilliant article I've ever read, and I actually read it because I wanted to see what he had done. It was astonishing. And the guy used statistics and his laboratory or field research. It's amazing.

As one professor noted, if universities put too much emphasis on citation counts, faculty will respond by producing particular types of work, which may be detrimental to scholarship as a whole:

> There are some universities, particularly where the American politics field is very strong, where people are starting to adopt semi-formal point systems of publication and citations as promotion criteria. If we ever do this, I know exactly how to play that game…You don't have to be a genius to figure this out…I'll just write a piece tomorrow saying that some lobby controls US foreign policy. Stephen Walt and John Mearsheimer just wrote this piece…it is not a piece of academic scholarship by any stretch of the imagination. They've blown their careers out of the water in terms of the academic world, but they've also got a seven-figure book contract, if that's what you want…But, if it becomes a citation thing, I know how to do that. So does everybody else.

In relation to the impact factor, one established scholar points out that while it is certainly a tool in the evaluator's kit, the impact factor is also a "fairly brute weapon," and may not capture the nuances of journal publication.

> Everyone looks at impact factors to some extent. The problem is that an impact factor is a fairly brute weapon. It's a great thing; it's better to have it than not to have it. A journal that has a high impact factor may have a high impact factor for reasons that are not relevant to my choice. It may be reaching an audience that I don't want to reach.

Visibility in the field

External letters

Establishing oneself as a known entity in the field of political science is often tied directly to the advancement process through reliance on letters by external reviewers. Ultimately, nothing is more important than high-impact publications in building reputation, but scholars can also make

a name through conference and seminar attendance and by disseminating working papers and preprints.

> Everybody who's been around long enough to get tenure has a brand. Basically, when they send for outside letters to ask, "Should this person be tenured at our university?," one of the most damning things that a senior person can say is, "I've never heard of this person." So essentially you're trying to establish that credential, those brands.
>
> The external letters will have a huge effect on what a tenure committee is able to sell, the case it's able to present, to its department. Political science is an incredibly diverse field, much more so than a field like economics, which essentially has a common model of behavior and they all build up from that. In political science, we have nothing near that, which people think is a problem…But it does mean that when a tenure committee presents a case, they're talking to people who can't necessarily make an informed evaluation of the scholar's work themselves, so the external letters are people who are not your colleagues, who may not have the same personal stake in shepherding your case, but who have a big effect on what a tenure committee is able to sell…I've never been in a tenure meeting, so how would I know for sure? But this is what I hear.
>
> …You've got to let people know what you do, because a disaster is when tenure letter writers get your stuff and they're like, "What does this guy do?" You get these people that write 30 tenure letters a year, they're not going to take three weeks of their winter vacation to pore over my stuff. They've got to know very quickly how to classify what I do so they can spend basically a day on it. That they might do. But weeks they won't do. So if I prime them by posting work-in-progress once ideas are fleshed out on my website, presenting it at conferences, etc., it makes it a lot easier.

Conferences and scholarly societies

Conferences can be an important way to make your work known and network with senior scholars.

> I think conferences are important in two ways: They're important for personal intellectual development, and they're important professionally because the tenure decision is such a qualitative judgment, of course. A lot of the decision is going to turn on external review and external letters, and so getting to know people in the profession, getting to have the chance to have a conversation with them so that they really understand you and your work, just from a purely instrumental perspective, is a useful thing. I think you can get carried away with it. You can go to too many of these things. And it depends, again, on the subfield. My subfield is a relatively small world, and so getting to know the people in that world becomes important.
>
> To get tenure, you need a great first book and progress toward a second. To get promoted to full professor you need a second great book. These are the things that make your reputation. There is, of course, the self-promotion that comes from going to conferences with some regularity and presenting papers that preview your coming work. But if you publish great books and they get reviewed as such, even if people can't picture what your face looks like, you'll have a reputation.
>
> There are many people in the profession who have made a reputation for themselves by playing the politics of professional associations. They go to every conference, they take on administrative roles. They're always giving papers even if the papers never get published…I know people in the profession who publish very little but have got big reputations because they're visible in the profession.

Working papers and preprints[100]

As with conference appearances, working papers are a helpful way for scholars to establish precedence and share their work-in-progress, but they count for little in lieu of published peer-reviewed articles.

> Conference presentations are a way to establish precedence. In that respect, a working paper "counts." Does it have value on your C.V. when you come up for tenure? Absolutely not. If it's not published, forget it. The citations to a working paper could count, but in terms of the centerpiece, the number one factor on a C.V. is published peer-reviewed articles. A working paper would not count. So it can help you establish precedence. It can't help you get the publication count up there.

> The importance of the status of the journal declines with your seniority. Once people know that you do good work, they may actually come to your webpage and read your papers, whether they're published or not. You still need to follow the money trail, though. You don't get paid because somebody reads your paper. You get paid because you get an outside offer, because institutions can make the case to the provost that this is somebody who's important.

> It would be odd to tenure somebody based upon preprints alone, very odd…It's conceivable. I can imagine something where you'd say, "This is so brilliant, we can't afford not to tenure this person." But that would be extremely odd if you really wondered why the brilliant article is not published somewhere.

As mentioned above, potential external letter-writers can be "primed" by posting working papers on personal websites. Online working papers can also be an important, indirect way for hiring or tenure committees to quickly assess a scholar's work.

> Probably the most common way that I'll use working papers is in hiring…We'll chat amongst ourselves and we'll get a list of 10 people that one or another of us thinks are interesting, but we may not have read their most recent work…Since we really don't know whether we want to hire these people, or even interview them, we certainly don't want to ask them for their paper. It's very convenient if they put their working papers up on their website so then we can anonymously visit their website and find out whether their work is interesting or not, and then decide, based on that, whether to invite them. That's something that we very frequently will use people's personal websites for.

One department head we interviewed felt that there were discrepancies in the way that female scholars in particular are advised with regard to scholarly dissemination:

> I don't think women, to this day, are mentored as well as men are on how to get their work out and recognized. I think men still get more and better mentoring, informally…New junior women just beginning their academic careers often have received less, or less detailed advice in graduate school about making their work known, seeking feedback from others in the field, putting their papers and publications up on their website, and so on. Since reputation is still such a crucial part of the evaluation process, other scholars must know about your work and your name…Representation of men and women is getting to a plateau; about 35 percent of the field is female, maybe 40 percent now. But, as in other fields, if you look at the senior ranks, the tenured ranks, there's still an imbalance.

[100] Although the scholars quoted below use different terms ("working paper" and "preprint"), both refer to the availability of pre-publication work posted on a scholar's website.

The importance of extramural funding

Tenure and promotion committees do not seem to weigh a scholar's grants heavily in the review process, although institutions can enjoy the indirect financial benefit of employing faculty whose research brings in money.

> Obtaining grants is a little bit helpful, but it's not like the natural sciences, where it's a requirement to even be able to do the work to get published. We don't have that issue. It's a very cheap field to fund…Grants: nice if you have it, but you can't take somebody with a weak publication record and say they're an awesome fundraiser, and say, "Well, then let's give him tenure." That would just never happen, for the same reason that a multimedia publication wouldn't count. That person hasn't gone through as rigorous of a standard on what the old guard thinks is important, so they wouldn't respect them.

> Institutions want, deeply, to be seen as having made good choices about whom they've kept and whom they didn't. It's very important, directly, because they want to make sure these people are productive and widely esteemed. But it's also very important, because the way that the federal government distributes resources, every time somebody gets a grant, they get to tack on additional overhead coverage, which is basically a function of the status of the institution. The more prestigious the institution, the more they can ask for in overhead. So it's very lucrative to be considered one of the top universities, and the way you get considered one of the top universities is to have other faculty at other institutions rate you highly in terms of the evaluations like *U.S. News and World Report* or National Science Foundation or whatever. So it really does come down to money.

P1.2 Evaluating Other Scholarly Genres

Scholars we interviewed suggested that the discipline, in general, lacks innovation in dissemination forms and that the tenure/promotion process generally rewards conservative publication behavior.

> Could new and emerging forms of scholarly publication substitute for books and articles in the review process? Definitely not, absolutely not. The senior faculty have got to look at the newly tenured faculty as having passed just as hard a standard as they passed, if not harder, actually, because it probably is harder to get a good idea published these days. I think the bar is going up. But in order to have the mutual respect that you need to make faculty governance work and to make a department function, you can't have one group of people that thinks another group of people doesn't have the chops that they have.

Online-only publications

Two department heads pointed out that few review cases mention articles in electronic-only journals, or other kinds of exclusively online publication. When confronted with work published in a non-traditional outlet, these chairs cite the degree of peer review as the criterion for judging their value.

> There are so few review cases in which there's even mention of online publication that it's sort of irrelevant. The only medium that is invoked as an issue is peer-reviewed versus not-peer-reviewed outlets.

> There is not a crisis in people being able to get into refereed journals or get their book manuscripts accepted by prestigious outlets. If this became a crisis and the Web was going to be viewed as a way of mitigating the crisis by expanding the options, I think people would say, "Okay, if you're going to put your stuff out on the Web, published on the Web by yourself, in order to get feedback, in order to make sure people understand you had the idea already, that's fine, that's your business, but it can't be the basis for getting tenure or promotion, because there has been no strict peer review process." That doesn't mean they should count for nothing, because then when you come up for promotion, whatever you contributed to those things will be evaluated by outside readers who are going to tell your department how good they think your scholarship is. I suspect that if a strict peer review process were set up for judging which things deserved to be published on the Web under a given imprimatur or not, that departments would accept that.
>
> Well, I think publishing in non-traditional outlets is tied back to the question of peer review and selectivity. Print journals are still the most highly regarded.

Data sets

Some scholars in political science create and publish data sets. Similar to the biological sciences, these efforts can earn a scholar increased visibility when other researchers use their data. Credit is only received for this work if a strong publication record based on the data accompanies it. Data curation and other data-sharing activities may be best left until after tenure.

> If somebody does a small tweak to an existing data set, that typically appears in whatever article they're writing on that project. If somebody has done a much more substantial data collection…a very new novel data set…the author will put that on a personal website and write what we would refer to as "an article of record," where s/he describes the data set, the coding procedures…and maybe a few preliminary findings to get people interested in it. It's like a roadmap to the data set. And there are now a couple of publication venues that are interested in publishing that kind of article…One is CMPS, *Conflict Management and Peace Science*, which is affiliated with somebody that's affiliated with the Correlates of War Project, and *International Interactions*. Now, if this new data set is accompanied by significant analysis and you're not just putting out the data, but it's the data and, "Here's this great new finding," then, with the emphasis being on the finding, that might appear in a top journal…Typically, people now have a section for data sets or "other publications" on their C.V., stuff that is not peer reviewed but is out there…And so I could imagine that if somebody who has a good case for tenure and developed this data and published articles and made the data available, then a tenure review letter from the outside world is going to say, "Professor X is well known because s/he created the data set of Green Headed Martians and other people started to use this data. Professor X has been responsive to comments about the questions and about the data set and has published five articles with these findings from it." So then the data set becomes one positive part of that record. As with a lot of things on a tenure record, it's multiplicative: A good data set alone is not going to substitute for a lack of publications. If you have the publications, then having this accessible data set is another bonus, it's a multiplier effect.
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> My understanding of the field is that they wouldn't get credit for creating data repositories. If you're tenured and you want to put together a huge data set, people will cite you over and over and over, that's great. That pays off far into the future, because they cite that data repeatedly. But to take several years…you just wouldn't get the payoff fast enough as an assistant professor.

> Publishing only data would be pretty hard, if you'd not published anything yet. But you certainly can do that, also, and that would get you a lot of credit if you've also done some other stuff.

One scholar pointed out that citation indices of scholarly output can cloud the value of different types of work:

> Thomson's ISI did a study three months before I came up for tenure, and ranked me pretty highly among authors in my subfield. And that, in addition to being a wonderful perk for my ego, was very important in terms of making me very marketable. I got a whole bunch of good offers that year. So you have to be careful about the citation indices because it's a statistic. It's going to tell you what it tells you and nothing more. It tells you how many people are citing your work and that could be because you're having a huge influence or it could mean that you're having a very marginal influence over a lot of things. Some of the things that are heavily cited are data sets, papers that present a new data set or updated data set and say, "Here's the data." And that's a valuable contribution, but it may not be the same contribution as a paper that's not cited as heavily but that changes people's thinking about how this process works.

Blogs

As we found in many other disciplines, writing blogs is generally off the radar of tenure and promotion committees in political science, and the production of blogs is not considered to be a scholarly activity by most faculty and administrators.

> I think a few people read them, but you're not going to get any credit in our discipline for blogging…our tenure committees won't care. That's fine if you want to do that in your spare time. There are a few public intellectual people in political science, but we're interested in scholarly publication. Now, if you can do scholarly publication and publish some op-eds or do some policy-relevant work someplace, that's fine. But just being well known for bickering on a blog or something is not going to benefit anybody.
>
> If they were to start taking successful politics blogs as a tenure consideration, that would be disastrous in terms of not just the direction of the field—my own personal taste about the field—but it would mean that the senior faculty would have done something qualitatively different from the junior faculty, and they wouldn't respect it as much. It's not clear that the sort of trust that you need to build a functioning faculty would continue to hold up in that case.
>
> I don't know that it hurts anybody because the people who it might hurt you with aren't aware you're blogging.

P1.3 Teaching and Service

As we found in other disciplines, service and teaching are part of a tenure and promotion case, but are a distant second to publication record when evaluating scholars at the most competitive institutions.

> It's the standard teaching, teaching/research, research/service…Some of those service activities are good and they raise somebody's visibility within the university community a little bit. Now, 15 public speaking appearances, though, are not going to substitute for two articles. It's clearly balance and, for us, the emphasis is publication.

Less competitive institutions may also place a higher emphasis on teaching or service, but this may be changing as they hold their faculty to higher publishing expectations.

> Tenure hasn't changed much in terms of the overall requirement—at least my impression at a major research university. There is a tremendous amount of stress on being a good teacher, being a good citizen, and all those things, which everybody talks about, but when you get down to making decisions, I think the highest proportion of discussion goes to publication, contributions to scholarship. Everybody talks the language of really having to worry about the undergraduates, but I think, unfortunately we downplay teaching…It happens in major departments, in all sorts of places. On the other hand, that has to be modified by the fact that there just aren't that many jobs in high-powered research institutions, and, therefore, lots and lots of our very good students go off to teach in places that have a greater stress on teaching. The confusion is that lots of places that are smaller, less prestigious, that really do want to focus on the students, have placed upon the jobs the same sets of pressures that go on at Harvard or Berkeley or the University of Chicago, in terms of publication. Publication still is a pressure placed upon people, even in places that are seriously pushing for teaching. So it's a funny market out there. I think most of my colleagues teach people to replace us, but the jobs they get are really very different from the jobs that one would get at a fancy research university. So there's a kind of disjunction between those various goals.

As in other fields, senior political scientists note the importance of sheltering pre-tenure faculty from an overabundance of service and teaching commitments early in their career.

> We look for evidence of effective and creative teaching. Here, too, sometimes it can take people a while to find their rhythm in a classroom, and so the question is essentially have they figured out how to communicate their expectations, how to be demanding and fair, but also responsive in the classroom? There are less lofty expectations for service, in the sense that we try to ask the junior faculty to do some things to help because we want them to work with other colleagues in the department, get them used to the idea that there will be service obligations throughout their career, but we try not to make those too onerous or time-consuming.

Although scholars are discouraged from innovating in digital publishing, they may be more inclined to innovate in areas that are not as heavily weighed in the advancement process, such as teaching, in part because students expect to see more technologies in the classroom.

> I can't say that I've seen much yet that makes use of media effectively. It may be just more complicated to produce and keep up to date. But, clearly, that's going to be an increasing part of our lives. I read all student evaluations of teaching, and over time more students say they want to see multimedia presentations, especially with video. There are higher expectations about the presentation of material in class. Many of us started out with…not even writing on the board, not even transparencies. And now if you go to class with only an outline in PowerPoint, without graphics or video, students can find it fairly dull.

Consulting

Traditionally, scholars in particular subfields of political science may engage in extra-academic practices of government or other consulting. This activity is less rewarded in tenure and promotion than it once was and, therefore, is generally practiced by senior scholars. As the second scholar below mentions, consulting can be a way to inform scholarship or teaching through data collection.

> The old style of being able to do some government consulting, to be able to write some chapters in edited volumes, and to be very well rewarded because of that, is no longer the model that holds true. And so now, I think as people become a little bit more senior, they do sometimes shift to doing a little bit more of that, but clearly the emphasis shifted very dramatically to publication and peer-reviewed outlets, university presses, and less emphasis on consulting kinds of activities.
>
> It's an interesting thing to do now and then, but it should be now and then, unless you're getting something from it…And so I was a consultant, and I got involved in these cases. And so that's sort of a public role. And that was really useful, because I got all this data, I brought it back, and my students used it. But if I was only doing that or I was on the road all the time for a year doing consulting, I'm sure I could make a lot of money doing it, but it wouldn't be very useful academically.

2. CHALLENGES AND OPPORTUNITIES FOR DISSEMINATING RESEARCH: WHAT ARE YOUR CRITERIA FOR CHOOSING A MEDIUM?

P2.1 Criteria for Choosing a Publication Outlet: Prestige, Peer Review, Audience, Speed

As described previously, political scientists produce books or articles depending on the specific publication culture of the subfield. Within subfields, publication practices are governed by considerations of prestige, peer review, audience, and, increasingly, speed.

> There are several different criteria…one is: What's the right format for disseminating an idea? Another is: What's the most efficient mechanism for people to receive ideas? A third is: What's a viable economic model? And those are separate questions…I've done articles, I've done books, and they are sorted on the basis of whether something feels like a book, as compared to whether something feels like an article. It's the natural length the argument wants to be. Sometimes people use articles as almost Picasso-like line drawings for a book, and that can be useful. Sometimes articles are just free-standing articles.

These criteria are most important for pre-tenure scholars who need to "brand" their work and build their reputation, while senior scholars may rely on more informal publication mechanisms (such as working papers) to disseminate their work to interested audiences. While the emphasis on peer review has led to a concern that some university press and journal editors have too much power, ultimately there is little evidence of a widespread crisis in scholarly publication in political science. There is also little experimentation with online-only journals or electronic publication. Instead, scholars are simply calling for more journals in specialized subfields and more guarantees that university presses will continue to publish work across the spectrum of the field.

> First and foremost, political scientists value final, archival publication in a prestigious, peer-reviewed outlet; most scholars in political science wish to publish books with the most prestigious presses and articles in the most prestigious journals.

Books

Prestigious university presses are the first choice for scholars publishing books in political science, primarily because of the rigor of their peer review process. Scholars may be able to

make a case that a lesser-known university press is the most prestigious outlet for niche subfields.

> There's also a hierarchy among the university presses, and that supposedly parallels the hierarchy among the universities that the presses represent…The lesser known presses…it's good to be published in them, but it's better to have publications in a better place.
>
> In terms of printed publication, university presses are considered top of the line, and then I think there's a range.
>
> As far as publishers are concerned, again, that's going to vary with the subfield, but Cambridge, Princeton, and then it's really…perhaps Chicago, perhaps Cornell. And here I'm sticking with university presses.
>
> University presses—prestigious university presses…If your book appears, let's say, from Southern Illinois Press, if there is such a thing, you'll have some explaining to do if that's your first book, as to why it's that press, rather than a more prestigious one. And the more prestigious one is not simply because of the prestige of status, but because of assumptions about the strictness of the peer review process. Now, it could be that in your particular subfield and that particular subject matter, Southern Illinois University Press has occupied a market niche, and is publishing the best stuff of anybody on that particular topic. But you would have to explain that.

Journals

The top journal spanning the discipline is the *American Political Science Review.* The *APSR* may not actually cover the diversity of political science, however, so scholars also aim to publish in the top journals of their particular subfield, such as *International Politics*, *American Politics*, *Comparative Politics*, or *Political Theory*. As a result, every subfield of political science may have different journal hierarchies, though these are generally consistent within a subfield. The majority of journals in political science are sponsored and run by scholarly societies or university presses.

> …the pinnacle is the *APSR*.
>
> We do know the *American Political Science Review* is the top journal and a publication there is going to be worth a lot. And then we have the second tier and then we have the third tier for specialty journals…Generally, we're very aware of that, and a few people would rank some of the journals a little bit differently, but I think we're in general agreement about top tier, second tier, and the third tier.
>
> Except for the *American Political Science Review*, which claims to cover the field, but doesn't, virtually everything in political science is subfield-specialized to a group of subfields. Some fields leak, so there are journals either in comparative politics or international politics, and some are strictly American politics…One is the *American Political Science Review* and the other is *World Politics*. There are a bunch of other journals, which are considered lesser journals. The *American Political Science Review* for decades has been captured by a certain brand of political science, which has made it irrelevant to over two-thirds of the discipline who don't even read it anymore. Now, at certain universities, where the people who are in that third of the discipline to which it's relevant dominate departments, the *American Political Science Review* is still where everybody bows down. My own department, that wouldn't be the case.

> There's also the distinction about where you publish, and certainly in political science, it's well known that there are the three, four best journals. Then there are the best journals in each of the various fields, and that's known.
>
> What journals count depends on the orientation and the status of the department. Of course, the top-tier journals are the general journals, like the *American Political Science Review*, or general journals at the top of one of the subfields of American, comparative, international relations, and theory would count more than lower-tier or more specialized journals. But for programs that value area studies or applied work, or who are a second-tier school, their list of journals that they value might be longer or somewhat different in nature.
>
> In political science the most reputable journals are the *American Political Science Review*…gee, there are so many journals for the different subfields, but *World Politics*, let's say, and *International Organization*, taking one that emphasizes American government, another that emphasizes comparative politics, and a third that emphasizes international relations. But if you spoke to someone in political theory or in methodology, they would probably have a different list. I would just say that, in general, in political science, those are three of the biggies.
>
> There are some journals that publish across the subfields of the discipline and that would be the *American Political Science Review,* which is the journal published at the American Political Science Association. That would be considered the premier venue. Then there are journals that have published specifically in international relations, specifically in American politics, specifically in comparative politics, specifically in political theory. And for the ones in international relations—*Journal of Conflict Resolution, International Organization, International Studies Quarterly*—obviously they will be considered the most prestigious, but they are the ones where I also find the articles I like reading. I don't know how correlated that is with prestige…Why do I think that *International Organization*, *Conflict Resolution*, and *International Studies Quarterly* are more interesting? I would say works of good quality are starting to appear in those journals. And if I have a good article, I prefer to send it there rather than to someone else. And I think that is how things build upon each other.
>
> Then there are journals in my field that are rather specialized. Everybody in that little world reads them, but nobody much else does, but they're pretty useful. And then beyond those, I guess the places I would opt for are the places that would be seen as the leading journals in the field.

Specialization and prestige only go so far.

> Impact factor is a great thing; it's better to have it than not to have it. A journal that has a high impact factor may have a high impact factor for reasons that are not relevant to my choice. It may be reaching an audience that I don't want to reach. Just to be clear, it's nice to publish in *Science* and it's nice to publish in the *Proceedings of the National Academy,* but if what I want to do is…reach sociologists or political scientists, they are still pretty low value publications. It would be way more significant to publish something in the *APSA* or in one of the other annals or something else, if I want to reach political scientists.

Prestige is important, but there is variability

Echoing some of the statements above, some faculty, including pre-tenure faculty, emphasized the need to balance high-prestige publications with a mix of publications spread widely across more specialized journals in order to reach a wider audience.

> Ideally I like to send stuff to a variety of places; you don't want it to all appear in the same place. There are slightly different readerships and you want to spread things out a little bit. You don't want to just have all your stuff appear in one journal, so that would be a marginal factor. Would I take my 10th *APSR* paper? Yes, I would. It's our flagship journal. You can't have too many of those. But in terms of your field journals, I would like to spread it around a little.
>
> It is certainly not the case, as a junior faculty member and since then, I never felt that I had to publish every single article at level X or in journal X. But you should have a mix of publications, some of which are top tier, some of which are probably more appropriate for a more specialized journal, so that you're establishing a reputation, both in the broader discipline of political science and among colleagues in your subfield.

Furthermore, one professor said that the high-prestige journals favored by tenure and promotion committees may not be the outlets preferred by funding bodies. Instead, organizations like the MacArthur Foundation or the Carnegie Endowment for International Peace favor more publicly visible publication outlets such as *Foreign Policy Magazine* or other online magazines of public or international affairs. Like the scholars cited directly above, this professor responds by publishing in several outlets simultaneously.

> I do a fair amount of fundraising, and I got a big grant from a large foundation and they couldn't give a damn if my students or I publish in *International Organization*, which is considered to be the leading academic journal in my field. Literally it's a disqualifying characteristic. So, we published an article in *Foreign Policy Magazine* and *Foreign Affairs*, that's what they want. Now we're trying to do essentially dual-purpose stuff. So, we have a piece we're working on now where one version will be in an online journal for international affairs and one version will go into the *American Political Science Review*. But that's not easy, and, for an assistant professor, I think it's almost impossible.

Scholars in political science must increasingly keep several stakeholders in mind when deciding how to publish their work, and pre-tenure scholars, in particular, must ensure that they are meeting tenure and promotion requirements.

> I keep drawing this triangle for anyone who will listen. Here's the assistant professor of political science today in the middle, here are the funding foundations, and here is the tenure and promotion committee, and here is the university press editor at the three points of the triangle. Okay? And this poor person, let's just call him Joe, Joe goes to the Ford Foundation, the MacArthur Foundation and says, "What do you guys want?" And these guys right now are saying, "We want demonstrable short-term impact on policy. We're not interested in basic research. You want to get a grant from us? I want to know who in Washington, D.C. is reading your work." Okay. Then Joe goes to the university press editor…who says, "I want a book that will sell. If the book will sell, then I will ask if it has scholarly merit. If the book won't sell, I'm not even interested." And finally, Joe goes to the tenure and promotion committee. They say, "Where is the peer-reviewed scholarly merit, individual path-breaking contribution?" And Joe is pulled in three different directions at once, and I don't know how he survives, frankly.
>
> Young scholars are really feeling the strain and stress…and a lot of established faculty who lived in the system don't understand just how intense this is right now…Assistant faculty members end up bouncing back and forth among the three corners of the triangle: funding bodies, presses, and review committees.

Age and prestige

Age plays a big role in publication behavior. Young scholars must first establish their reputation and the quality of their work by publishing in the top-tier journals before they can expect other scholars in the field to pay attention to their working papers and other non-peer-reviewed forms of dissemination.

> Before tenure, the primary concern that faculty should have and usually do have is the journal, the number—the proximate goal in publication is not so much to disseminate your ideas as it is to brand them as a quality product. At this point, when you're plugged into the community of people who are actually going to read your work, they're going to read it before it's published.
>
> If somebody already has a reputation and there is no sign that they are in middle age losing their faculties, their work continues to be stellar, you no longer worry about whether it's peer-reviewed or not, because you just know they're very, very good…At the earlier stages of a career, we encourage people to try to publish in the peer-reviewed outlets because that is a sign that it has gone through a rather rigorous process of evaluation.

Similarly, pre-tenure scholars are advised to pay particular attention to publishing with the most prestigious university presses, while post-tenure faculty can exercise more flexibility in choosing a lesser-known university press or a commercial press.

> When you're seeking tenure or seeking to build your public standing or professional standing in your field, you go through university presses because your peer reviewers have more confidence that this is a book meant for scholars based on scholarly standards, rather than a perhaps popularized version. That's probably an over-generalization, but those seeking tenure typically do go with university presses for that reason. They're more prestigious. Later in your career, when you're trying to reach a broader audience, or when you no longer care about having the imprimatur of a university press, you might go to Norton or Basic Books or Random House—if you're lucky enough to get a contract from them—in order to get your book out with a prestigious commercial press that will advertise it well and perhaps sell it well.

P2.2 Perceptions of the Publishing Environment

Peer review

Peer review is the coin of the realm. As described above, scholars must pass through the stringent peer review of the most prestigious journals and presses in order to be branded as quality researchers. The reason peer review is directly correlated to the prestige of a publication outlet is because many scholars depend on peer review as a distillation filter when deciding what to read. The most-read publications are, therefore, the most closely peer reviewed.

> I still think that, obviously, the coin of the realm is the peer-reviewed article because then we have some sense, imperfect though it may be, that it is not a piece of junk…It's gone through a process that you trust and that somebody's scrutinized it and there's nothing egregiously wrong with it, presumably.
>
> I certainly still believe, within my own field, in some kind of really good peer review. Otherwise, you don't know what to read. In my narrow field, a fairly high proportion of what I read in journals, I already know about within the narrow confines of the people working on the

same set of problems. But, even then, there are other things I don't find out about until they come out in journals, and I certainly can't sit back and read all the journals anyway.

If you want people to read your work and have access to it, start a blog and publish your thoughts online and it's there immediately and that's fine. The problem with doing that is twofold. One is: Who is going to come and see it unless they know about you? And the other is: How do we know if it's any good or not? We can invest the time and read it and study it and check things, but if we do that with everybody's work, we're going to waste a lot of time. The advantage that a journal has is the review process, which tells me that it's not obviously bad, by the time that the journal's interested in him.

You can't read everything…Peer review is another strategy…And the chances are, actually, that what you see in those other less selective journals has already been peer-reviewed and turned down, for better or worse. The problem is that you assume if it had been turned down there it's not worth reading, which of course may not be the case.

Other things are not going to change that will always make a difference. We will be trying to produce research that will pass the test of anonymous reviewers and it will be possible to be replicated, so you need the standard of transparency…You need to show your work to someone who doesn't know who you are and…I think peer review is important. I think it is. I think that academia might be slower with this model…But on the other hand, the goal of academia is to find the truth, and so that is what we are after and it takes time. And to be sure that we have the truth, then we need to be sure that our work is not just my truth, but is *the* truth, and therefore all these institutional elements that come with academia, peer/anonymous reviews and transparency, are what we need to follow in order to allow us to get closer to the truth, and so that's my story.

It's very common for tenure and promotion committees to just wave the flag of a peer-reviewed journal…and if it's not peer reviewed, you throw it out. If Einstein had written the theory of relativity on toilet paper, its quality wouldn't have been reduced. And there's a lot of junk published in prestige journals, or at least there's some junk published in prestige journals. *Science* published the Schatten article [which had to be rescinded]…I don't know what to call it, but it's academic religion, or snobbery. And most important I think it's an economizing…if you didn't have that device you'd be in a hell of a pickle…There's so much to digest, and so much of it is so highly specialized.[101]

The problem with open access repositories is, if that's the way you're distributing it, you don't get the support of knowing what's been peer reviewed. I find peer review to be, in a way, crucial for things that are not really what I'm basically working on right now. In other words, I still subscribe to three, maybe four, of the main political science journals. I know an article in there has at least been refereed, and it will be interesting. And so when I get it, I thumb through it, maybe I read one article and I read the abstracts of others. But at least it's a way in which I know of things that are not specifically in my domain, but that are interesting to me.

Editorial quality

By and large, there were few complaints about the editorial and peer review process, except for its slow speed (discussed below). As a pre-tenure scholar explains, the growing variance in the

[101] Holden, Constance. 2006. "Korean Stem Cell Scandal: Schatten: Pitt Panel Finds 'Misbehavior' but Not Misconduct." *Science* 311, 5763 (February 17): 928. doi:10.1126/science.311.5763.928. http://www.sciencemag.org/cgi/content/full/sci;311/5763/928

field of political science is causing some top journals to move from an editor model to an editorial board model in order to guarantee the content and quality of editorial judgments.

> The editorial process is in transition in political science because the old model in political science has been that one editor stands on top of the entire set of submissions a journal gets. It's very hard in this field. The *American Political Science Review* just went to an editorial board model, where they have people from different subfields in charge of submissions in that area. Another top journal, the *Journal of Politics*, is going to go in that direction in the near future. The *American Journal of Political Science*, which is number two out of the top three, has yet to go that way, and they may. Who knows if they will; they ought to. So the editorial process is different. The peer review process works pretty well. The editorial process can be a little bit trickier for that reason. So it's kind of in flux. You want to have an editor who has some judgment about a paper and an area. If the *American Journal of Political Science* editor does large-scale surveys and research on political behavior, and gets a submission on democratization in sub-Saharan Africa, how does the editor know how to judge it? Even the top journals in economics, which is far more unified than political science in terms of the underlying model, have been running on an editorial model for ages, this sort of editorial board…from their top journals, the *American Economic Review*, from the *Journal of Political Economy*, *Quarterly Journal*—they have one person who's kind of in charge of theory submissions, they have one person who's in charge of labor submissions. So, political science has only recently started to do this, and we need it at least as much as they do. On the other hand, you could say that that's part of what's kept a very disparate field coherent all this time, is to have one person's common judgment, so I can appreciate that. I think that's a strength of our field, but it does make it hard to know how to judge a publication.

One scholar complained that journal editors may act like "benevolent dictators," and favor certain scholarly perspectives for publication in their journals.

> This is a time that editors can make a big difference, and I'm on the editorial board of a journal, and the editor was trying to decide what to publish and what not to. And one of them had some mixed reviews but it was clearly very provocative, and the other one had three sort of vanilla, "Yeah, it's a contribution, it's okay." And he decided to publish the one that had some disagreement and was a little bit more provocative. And the other one, with space limitations, didn't make it to press. And I thought that was really interesting. That was the first time I had heard an editor say, "I'm going to overrule everybody's okay set of reviews."…I also know of other cases where journal editors were involved on one side of a debate and people trying to publish on the other side of the debate could never get published there. And, it was a journal where it would have been appropriate for much of the work! And I know a couple of those people were very frustrated and said, "I'm just not going to bother sending my stuff there, until the editor changes, because it's just not worth it at this point." So editors can be like benevolent dictators, or not.

Another scholar complained that editorial reliance on seeking increasing numbers of peer reviews has resulted in only the blandest scholarship being published by a top journal.

> The top journal in the subfield, *International Organization*—which I published in several times before I got tenure, and would never bother publishing in again after I got tenure because why go through that hell—changed their review process from two to three reviewers. And in a field where there's often a lot of controversy about what constitutes good work and bad work, as compared to some places where you know when you submit a paper whether it's going to be accepted or not…Anything that can get through three reviewers is probably not very interesting. Anything that is mildly provocative, and/or controversial, will never get through three reviewers. And so, the stuff that now appears in *International Organization* are articles

> that I find very useful for graduate seminar teaching, not useful for my research. I don't read *International Organization* to get new ideas. I used to…because I knew I was going to learn something. Now I look at it and I say, "Oh, that would be good for my syllabus." They've become more review articles.

In the next breath, this scholar called for an alternative scholarly publication to share more provocative work:

> My field could really use some kind of legitimate, validated publication that was about provocative, new, aggressive ideas on the edge of stuff that might be wrong but might be really interesting. We could really use that.

New models of peer review?

Despite criticism, peer review is considered a vital mechanism for judging the quality of published work, and some variant of peer review plays a central role in many of the alternative publication models mentioned by the scholars we interviewed. There are increasing pressures on the peer review process resulting from moves to speed up publication in political science.

> If we're talking about the social sciences, I don't assume that the format of the work is going to change, and, therefore, if we're simply talking about new forms, meaning available on the Web and perhaps only on the Web, I'm going to say there should be some variant of the current peer review process.

> Willinsky[102] had an elaborate model of how to do online publishing and build in what, in effect, would be peer review…It was quite an elaborate model. It was a kind of Wikipedia, self-review model. And he had some argument that was more reliable a measure of quality than anything you got from the actual journals. I have no idea what happened. He built the system, he built the argument, it was funded by somebody…I have no idea if anybody's ever picked it up. I'm sure he's published on it. And that was really innovative. It wasn't just another online journal.

Speed

The formal publication process can be very slow, taking up to two years for either books or journal articles. There is an increasing desire for quicker publication in certain subfields. Like economics, political science is on the fast side of research in the social sciences.

> You submit your paper, then you hear back from the first round of anonymous reviewers between three and four months, then usually you have some revisions the reviewers suggest. And then you can think about at least six months of work, and then it goes back. At that point, if the number of revisions was limited, it can come back very quickly. If it's more substantial, you can just wait another three months. At that point, more or less it's an up or down decision. There might be another round of advisements to make, but I think the editors are starting to cut down on that practice. And, if it's accepted, then it will be in print in one year.

> Until something actually appears on paper and in your mailbox, it could almost be two years. Probably, three months from the time you submit you would start to think you might hear

[102] For more information, see: Willinsky, John. 2009. "Toward the Design of an Open Monograph Press." *Journal of Electronic Publishing* 12, no. 1 (February). http://quod.lib.umich.edu/cgi/t/text/text-idx?c=jep;cc=jep;rgn=main;view=text;idno=3336451.0012.103

> something…and you might not bother the publisher until it's been four months or five months. Then you typically have a revise and resubmit and that might take you a couple of months. It goes back out for a couple more months. So it could be two years. Probably if it was accepted in the first round, it might be a year, might be a little bit more than that…but as long as two years is possible.

As a result, working papers and conference presentations play an increasingly important role in developing and circulating work prior to publication, but these vehicles do not replace final archival publication.

> We certainly do conferences. The typical thing is you work on an idea, you develop it, you present it at one or two conferences, and then you submit it for publication. Because we have to put in our proposals for conferences nine months ahead, sometimes the conference cycle doesn't work and so you just send it out. That's perfectly fine.

> The working paper counts for less in political science than in economics. I think part of the reason for the difference between this and economics is that, in economics, they are changing the scholarly practices to reflect the extreme lag time in publication. They're recognizing that it takes ridiculously long and they have to do things to deal with that. It's not that bad in political science. Lag times are not that bad, and by the same token, working papers don't count nearly as much.

While there is less of a rush to publication than, say, a field like molecular biology, scholars are nevertheless aware of the need to not sit on work for too long prior to publication.

> Book-oriented people take longer…whereas the people who do articles have things that are really right at the forefront of the discipline and the next good thing in that particular subarea. We don't look quite like molecular biology where there's this crazed notion that everybody knows what the problem is and everybody's working on it. But we have a bit of that.

> …A lot of people know that the frontier is roughly here, and, if they're pushing out on this piece of the frontier, they want to get it out pretty quickly. Again, it's not as dense a frontier as molecular biology, where my sense is there are—I'm exaggerating—five problems everybody's working on. That's not our situation. Luckily, we've got a lot more problems and we're not as focused as they are. So you don't typically have this problem they can have where a lab that's working on a problem is scooped by another lab. We don't have that. But it is true that if you don't get something out in a few years that somebody else might come along and do that. So there's enough pressure to get it, but not the frantic, crazed pressure.

> In terms of publishing results, I'm not curing cancer and I'm not in a race with somebody to blow up an atom. Speed is an issue in that you don't like stuff sitting around forever, but in terms of needing to get publication out quickly…there's not a particular premium on it.

Rapid publication is particularly important for scholars studying current events. Many subfields in political science require quick publication due to the rapidly shifting nature of politics and world affairs. The existing review process for most publications does not always accommodate these needs, and some scholars worry that their research might be usurped or rendered irrelevant at any moment by evolving current events.

> In political science, there's a premium on speed in many of the subfields on things that are current and up to date, because the political situation changes. This depends on the topic, of

> course—for example anything to do with elections and election rules, or issues related to international security…And the range of topics gets broader and more numerous every day.
>
> In political science, we worry that in real life the events are going to blow us out of the water…I published a book on a topical event…and toward the end, I had certain things in mind that were going to happen. I was always worried I'd wake up in the morning and I would open the *New York Times*, and it would all be shot down in one fell swoop, and I'd be back to the drawing board.
>
> On the one hand, I think it's really important to have things like journals where you have vetted information, and where people are not just thinking off the top of their heads, but they're actually doing a draft, it's getting reviewed, there's editorial judgment. And, obviously, that all takes time. But I think that, in comparison with the speed that you get with the Internet, the glacial process of reviewing and editing and vetting is like the horse and buggy as the rocket goes by, but it's an important value. And so when you ask, "Is there going to be a fundamental transformation?" one of the things that I worry about is that the horse and buggy will get passed by the rocket, but that the rocket will be of lower quality and will be the worse for it. I wish we could get the horse and buggy to go faster but maintain the same quality control.

Slow speed of the peer review process

As noted, article publication in political science can easily take one to two years, some of which is attributed to the slow process of peer review. The perception is that in some cases the lag time from submission to acceptance is increasing, although it still moves faster than in economics.

> I think that the instantaneous availability of all sorts of information and opinion is a huge development. But in terms of will we stop having print journals, and if we did, would that actually be a huge transformation? I don't know. One of the most annoying things for me is how long it takes regular journals to do their thing. And there is the problem that most political scientists don't really give a damn whether the information that they have is timely in terms of what's happening out there in the real world, because they're not as policy-oriented and they're not doing work that is directly related to contemporary political debates and issues. But for me that is important. It just drives me crazy: My paper is now almost two years old from the initial draft, and it's been sitting at the major journal in my subfield as part of the special issue and spinning its wheels for over a year, and yet my online version had 2,000 hits. And it's just driving me crazy that there's no formalized version of this out there when it's a timely topic.
>
> Speed is getting to be a little bit more of a problem, but I don't think of political science as having a big problem with this…Now, review times have been creeping up a little bit…getting longer. I had a paper that just came out in a top journal last summer and it took us nine months to get first-round reviews. Then it took us four months to get next-round reviews after we did the revision. That's not egregious by standards of some fields, but that's a significant amount of time…The closest comparison is to economics, where I think political science is far better. In economics, people can spend three years on one publication. They'll spend a year waiting to get first round reviews and they'll go through three rounds of review. At the top political science journals, that doesn't happen. You usually can count on getting first round reviews in—I think the median is—probably four months. You have a 90 percent chance of hearing within six months, and they usually won't take you through more than two rounds of review with external referees. You might have to send them three versions of the paper but, the third one, if they require it, will be in-house.

> Speed is not an issue for me. I think it might be for some other people, but the process that takes a long time is the review process.

One senior professor took a more positive stance about the lag in the peer review process and suggested using the downtime to be more productive.

> Some people get off track because they're just not productive enough. And, so that's an important threshold, where you really have to fundamentally change your life…A very large fraction of everything you do has to be productive, basically…Different people do it in different ways, but you certainly have to make sure that the idea that you have, if you have one, comes to fruition. So you do all the work necessary to figure out whether you're right…and write it up and show it to people and get feedback and prove it and send it out to journals. Some people make a mistake; they'll send an article out to a journal and wait for three months and not do anything. And then when it comes back six months later, they'll complain that it took a long time. But, sure it takes too long to review papers, but really the solution is just to increase the number of articles you send out, just keep writing them. And then if you have five out, then it doesn't matter so much if each one takes six months to be reviewed.

Editorial efforts to speed up peer review

Some suggested that the more prestigious journals in political science have worked to increase the turnaround time to publication, which has resulted in more pressure on editors and reviewers. This situation is exacerbated by the multiplication of journals in popular and speed-sensitive subfields. The increased need for speed in these subfields has led to difficulties in locating and ensuring the delivery of quality peer reviews in a timely manner.

> It actually started…maybe 10 years ago, when an editor of the *American Journal of Political Science* decided he was going to really reduce turnaround rates. And he got them down to just a few months. And then an arms race began in the field where everybody was expected to do that. And I actually think it's causing problems now because reviewers feel such pressure to get reviews done that they're refusing to do reviews and it's getting harder to find reviewers. It's also harder to find reviewers because we have too damned many journals. And so the requests are coming hot and heavy…But the point is that the pressure to speed up turnaround has now become such a norm that if an editor has more than, say, 10 or 15 percent of the manuscripts that have been there for more than six months, s/he's in trouble.

> It seems to be worse, since I've been in the field for a while. I think there are a couple of things going on. One is that all of us have more to do and there's more pressure to respond instantaneously to whatever it is. And so where I used to get maybe 12 to 15 manuscripts a year to review, I now get 30 to 50, not to mention proposal reviews and other things, and promotion and tenure reviews. So there's just more of that to do and then it means that any one reviewer is now more likely to either just not be able or respond or to just say no. I know journal editors who spend incredible amounts of time trying to keep their lists going to find people who will respond and who won't write the red herrings. And for the most part, I'd say that maybe 85 or 90 percent of the reviews that I've ever gotten have been constructive. Not as many have actually been on the mark in terms of people who knew what the topic was or knew what was going on. And there it depends on the editor to read through it and say, "Okay." And you depend on some other reviewers saying, "Yes, this works." And then you send back a response saying, "I looked at this point, and here are the responses." So I guess the bottom line is: I think the situation has gotten more difficult. There are more journals, there are more people in the field, everything is online, so it all piles up on you in the flash of

> an eye. And people are a little bit less responsible about providing reviews when they've agreed to do one…It's absolutely a problem for junior faculty.
>
> What has happened is that many journal editors in political science, of the most highly cited journals, have made it a point to respond quickly. When I've been on editorial boards, the editors talk about cutting turnaround time to a month or less. This is great. So I think there's been a bifurcation; some who are really working on it, and others who are now getting inundated with a backlog because they haven't figured out how to do things online. So there's more inequality in journal turnaround time. And for younger faculty who don't know which ones are going to be responding quickly, it can be a real sinkhole when a journal takes months to respond.

Posting preprints

Some journals may post preprints (pre-publication copies) once an article has been accepted for publication to appease the need for quicker time to print for scholars in particular subfields. This practice varies significantly by journal and subfield, with the less "online-savvy" journals taking considerably longer. Although some journals may permit scholars to make their preprints unofficially available on their personal websites (discussed further in the next section), there is still a reliance on final, archival publication for promotion purposes.

> Many journals put up prepublication copies of the papers they accept. So I had a paper that was out a good six to nine months on the journal's website before it ever technically appeared in the journal…The speed of posting preprints online depends very much on the journal and the subfield…I've had three papers come out in the last two years. The one in the most highly rated journal in the field took the shortest amount of time—nine months from submission to publication…It was terrific. Another article, the one posted pre-publication, got accepted, but then took months to be published. And a third paper submitted to a journal that doesn't use online submissions or pre-publication took about three years from submission to publication. It was painful.
>
> Some of the major journals now pre-publish the articles that they're going to publish as PDF files.

Working papers and other self-publishing online venues

The working paper increasingly allows scholars to share their work-in-progress in a timely manner. There are other forms as well. For example, one professor notes scholars of Eastern Europe resorted to the self-publication of online monographs to disseminate topical work at one time.

> From the mid-'80s to the mid-'90s, things were happening very rapidly in the Soviet Union and Eastern Europe. That encompassed the Gorbachev phenomenon and then the collapse of Communism in both Eastern Europe and the Soviet Union, and then Yeltsin. The Center for Slavic and East European Studies organized a lot of conferences, and many of those conferences resulted in conference proceedings, like books that they published themselves thanks to the Web and new technologies. And so they became a self-publication outfit, and were able to put out a dozen books or so within a couple of months. Had they been working with a publisher at the time, from start to finish it would have been more like a couple of years. And given that things were moving so rapidly in the world at the time, to have waited a couple of years for this to come out, it would have been a graveyard phenomenon. So many

> things would have changed by the time the book came out that people would no longer have been interested in it.

Similarly, in geography speed was single-handedly the most important criterion for publication for one scholar, and alternative online publication was preferred to the traditional print mechanisms for this reason.

> My feeling right now is that print media are less and less relevant. When I consider whether I'm going to participate in some publication effort, the speed of publication is one of the first things I consider and whether it's online or not. So the most recent book I did was designed to be online. It doesn't have a conventional publisher. There's print-on-demand, if you want it, but, primarily, the objective was to get the stuff online so that it's available immediately…I also published an article in a journal recently that broke a new record for me, which was that I had submitted a manuscript one evening before I left for home. The next morning I had a citation for my C.V. And that is my biggest concern right now. It's about speed and accessibility, because I think the traditional publication mechanisms are archaic. In the top journals of the field, the lag time is 18 months.

P2.3 A Crisis in Scholarly Communication?

Opinions about a crisis in scholarly communication varied between scholars who publish predominantly books and scholars who publish articles. As described above, the problems in journal publication relate to the proliferation of subfields (and therefore journals) in political science, the strain on editors to ensure timely and quality peer reviews in this environment, and the resulting tendencies toward publishing "conservative" scholarship. In contrast, scholars from the most competitive institutions were less likely to acknowledge a crisis in scholarly monograph publication. Some recognized problems with university presses cutting back on the fields they publish in, or favoring particular fashions or agendas, something related to the diminishing library budgets for obscure monographs.

> One university press gave up on political science a long time ago. They decided for reasons that may, in turn, now explain their financial crisis, to go with the more cultural-studies literature, which tends because of its jargon to speak to a more narrow audience. And they may have trouble selling a lot of those books now, which may partly explain their financial distress. But political science complained to this press some years ago about its apparent decision to no longer publish much mainstream political science. They would do the more postmodernist political theory, but not the more mainstream political science.
>
> And, of course, one of the big problems is there's no room in these presses…It used to be that there were maybe 1,100 or 900 sales of the obscure monograph to libraries around the country. It's now something like 250 copies. There's the cost of journals, etc., so the ability to get something out is greatly diminished.
>
> I hate to sound like a curmudgeon, but I don't see such a crisis here in the social sciences that I would need to change the reward system. But, if I were at a third-tier institution, I might. Or for that matter, if I were at a second-tier institution, I might. There are probably a lot of frustrated academics out there because we've got so many thousands of academics in this country, so many hundreds of thousands of academics. And if they're all living under a publish-or-perish kind of dictum, there must be large numbers among them who are quite frustrated about their ability to break into the peer-reviewed journals. But speaking only now for this competitive institution and our departments of social science, it's not a problem.

Given the emphasis on prestige in final archival publication in political science, key non-faculty university press editors play an important role in deciding what is published. One scholar noted the field's dependence upon these editors, and complained that universities are more and more often "outsourcing" tenure decisions.

> I just don't think we should let the publishers run our intellectual life. And I don't think we should let the publishers make decisions about tenure…I don't know about elsewhere, but if someone asked me who's the most important academic personnel person in international relations in the United States…I would say the most important person is the editor at this or that university press. And I don't think that's right…It's not that the university press editor is a bad person or anything, but the incentive structure is not the same as an academic personnel committee.

P2.4 Capabilities and Affordances of Electronic Publication

Among the scholars we interviewed in political science, there was little interest in using alternative publication models for disseminating research. This may be due to the fact that few perceived any crisis in the publishing environment, or the fact that political scientists are comfortable sharing in-progress communication via working papers. For some scholars, online publication would be the natural way to address any crisis in scholarly publication (*should* such a crisis emerge), but concerns about peer review remain paramount.

> There's no dearth of journals out there, and more journals are appearing every month. And there's no dearth of university presses willing to publish really good work. Just look at the list of Cambridge University Press in political science. It's a remarkably long list. The good work gets published, and we want the good work being done here to be published, and we don't really worry that it's not going to be. But, if a crisis set in, then the Web could be an outlet. For instance, I'd call it a crisis if university presses were starting to go under, or starting to be in such financial straits that they would publish only popularized works. We don't want our work to be popularized. When our assistant professors do their first big research project, we don't want a popularized version out. We want to be able to judge its evidentiary base solidly and its analytic depth. But if we face that kind of a crisis, then the Internet would be a savior, and we would simply have to devise a structure for peer review that would make people feel confident that this wasn't a place that was just what the Russians would call "samizdat," self-publication.

Discussions of electronic or online publication among scholars often confound issues of open access, prestige, and cost:

> I think lots of people are talking about electronic publishing, publishing in journals that come out basically electronically. That gets mixed up with the whole issue of open access, free journals versus Elsevier and all their journals, and that's a slightly different cut into the problem. But, sure, there's a lot of talk about electronic books. As you probably know, historians have been trying this a long time and really haven't come off as well as they had hoped, in part because I think people don't want to publish electronically or they certainly would rather not if they can get it into paper. Secondly, it's expensive to publish electronically. You think, "Oh you just press a button and there you've got an electronic publication," and that's just not true.

New fields, new journals, online-only journals, and breaking into the top tier

Given the diversity of subfields in political science and an emphasis on strict journal hierarchies in each, there appears to be a need for more specialized journals. Newer publications in political science have the potential to capture both audience and prestige if they fill a distinct niche, are sponsored by scholarly societies or prestigious scholars/departments, and are listed in the social science citation index.

> I think that in the social sciences, and certainly political science, you have less of a problem in breaking out of your standard journals…You've got only two journals that stand clearly above the rest…I'm not saying quality now, but reputation…And so, if you have just a couple of journals, and they are very narrowly defined in a field that is eclectic, and they don't cover the spectrum, they don't have the same psychological power that you'll find in, say biology. And so, there are relatively new journals that have a lot of people paying attention to them, and publishing in them is quite respectable, and nobody would downplay them, and they've come along in the last decade. They basically publish good stuff from good people, in the first few editions at least, and that gets them on the radar.
>
> I don't think any of the junior people would say there are too many journals. They want more outlets for their stuff to appear. But new journals don't have the reputation that our set of established—10 or 15—journals do…So we haven't had very many new publications. Our leading journals for both the American Political Science Association and the International Studies Association have both split and created sort of an offshoot journal that's a little bit more specialized, in the past couple of years. The International Studies Association now has one journal that is more scientific, theoretically oriented, and the other was titled *Foreign Policy* and has things that are still theoretical but more oriented toward the media and foreign policy concerns. Because that journal came from this leading association, it has some weight.
>
> And why was it that the case that *International Organization, Journal of Conflict Resolution,* or *International Studies Quarterly* became so important? Well, for *International Organization,* initially it had a niche, and the niche was international political economy and international institutions, and then they've had a series of editors that promoted that field and were working in international political economy. It was the place to be. And then it expanded to include work in international political economy and international organizations…For the *Journal of Conflict Resolution*, it was one of the great accomplishments of Professor Bruce Russett of Yale University, and was founded in the 1950s. And so initially that journal was devoted to quantitative analysis, all of international conflict and international security. And so it started as a niche and then that niche blossomed, so now it's a major point in the field.
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> One of the things that matters is that the journal should be listed in the political science citation index. There is a time lag so you start the journal, a certain number of articles per year should be cited, and then, after the time lag of a certain number of years, then the journal might be listed in the social science citation index. And then it would be, in a sense, a recognized field. But, of course, it should have anonymous reviews and all that, but then it's considered to be in the social science citation index. But if that doesn't happen, it above all hurts junior faculty.
>
> Unlike the hard sciences, this is not an area where there's going to be 5,000 publications a month. In the top journals in political science, there are *maybe* 25 articles a year that are directly relevant to my field. And that's actually a serious problem. There is a very big need for a specialized journal in this field and that's actually something I've been thinking about doing, but it's certainly not something I would do before tenure. Our articles tend to be 30 or 40 pages long, and it's not those overwhelming waves of publications as you would see in the

> hard sciences. A specialized journal is desperately, desperately needed, because most of the journals in political science try to be general, they try to cover the entire discipline. Electronic journal publication may be the route that this would have to go, so the closest is this electronic book review system that we have, and that's strictly electronic. But, it's a huge screaming deficit and as a result, sometimes people publish in highly specialized small publications, but there it's a real problem. But the upside is it's not hard to keep abreast of what's going on…Electronic publication may be the route that this would have to go.

Online-only journals and prestige

Many new journals consider online-only publication to be a convenient and cost-effective way to launch their journal and reach their target audience. Online-only publications, however, play a comparatively small role in disseminating work in political science at the moment.

> As far as I know, publications are important, especially for the top research universities, and publication in refereed journals. And they tend to be in printed publications. They have online forms, but, as far as I know, especially the top journals don't put stuff online until their printed version has been published. And there are a couple of reputable journals that are only online, but they tend to be very specific, so they're like subfields within subfields…Yeah, they're peer reviewed as well, but there are very, very few of them.
>
> You'll find a lot of things that journals are putting online so you don't have to get a hard copy of it…that's not really innovative. There are things like bepress putting out journals. I don't know how widely read they are.

One of the main reasons that online-only journals are marginal to political science is a perception that they lack prestige. Two scholars spoke of a new journal, *Quarterly Journal of Political Science*, at the time in its second year of publication. Though originally conceived as an online-only journal, the publication's founders opted for a print version to accommodate what they perceived as a hesitance by scholars toward e-only publications.

> There is one that just started. It's in its second year…It's called the *Quarterly Journal of Political Science*, which I believe is exclusively online, and it is unique among journals publishing American comparative politics in that it emphasizes formal modeling over theory.
>
> The online stuff hasn't taken off really well in political science. The most significant new journal in political science is the *Quarterly Journal of Political Science,* and when they were starting it, they toyed with the idea of doing online publishing only. Open access would be an absolute "no," just a definite "no." But they toyed with having online publication only and I think they got resounding feedback that this will not seem to have the same gravitas*,* so to speak, to the extent that the top-tier journal publications do. They got themselves in line with the publisher that says, "We have this idea, our field desperately needs this," as it certainly does. But we need to have paper publication, and so they're doing it. The useful development there is that the journal will publish a lot of stuff in an online appendix. So the journal maintains a website that has extra material, maybe an appendix, maybe a data set.

For the same reasons that young scholars are encouraged to publish in the high-prestige journals, they are also advised to avoid publishing exclusively in electronic journals prior to building their reputation.

> Electronic journals are still something that is rare within political science. People really want print publications. And when there are electronic publications, you really need to explain what

> it is and why is it there: why isn't this in *APSR?* Why is it in this place? This is something that actually I'm trying to figure out what to do with the project that I'm working on, because one particular publication from it clearly fits within a computer science journal explaining the particular model. Now, for me, I'm not worried about that, I'm promoted and all that. If I was a junior person, I would make very sure that that was not the only place I was going to publish this material, that I would tweak it and try to get a similar version in a political science disciplinary journal, as well as this artificial intelligence journal over here.
>
> I would feel more comfortable being published in an online journal that's reputable than having my book published online…But I think a lot of it has to do with disciplinary practice. Online journals are just not so widely used in my discipline. But you have to understand, I'm in a very conservative, antiquated discipline, to some extent…And obviously we have certain subfields or certain scholars who are more progressive. I'm just talking about the discipline and how it operates in terms of these old forms of communication or scholarly research and so forth…I don't think publishing in an online-only journal matters as much if it's a reputable one. Obviously, it's not going to be the same as being published in a refereed journal that's top of your subfield or top of the discipline. But I think it would have to be a reputable one…So, for example, a research center publishes an academic journal online. It used to be in printed form but now it's online. And the journal is pretty reputable. It's certainly not top of the field, but within its subfield, it's pretty reputable. And so that journal will be okay. You're not going to turn down that publication. But it's not going to be the same as being in a printed, refereed journal. And even then, if it's considered a top journal in the field, then even better.

Electronic monographs

For university presses thinking about transitioning into the digital age, some we interviewed warned of the need for a complete revolution.

> I think there's going to be a tremendous change in how things get published, who publishes…the one thing I know about the university presses…is that they're terrified. They don't know what's going to happen. They all are gingerly getting into electronic publication. The ones who got in too early get burned, the ones who get in too late will get burned, but no one knows what's early and what's late when you get in. I think that this is one of those cases where there really is a communications revolution.
>
> I remember very strongly a colleague saying that the real pressure for innovation would be not on the very, very top-rank university presses, because they were going to survive anyway, but on the second tier—the third tier would go away, but the second tier, not the Princetons, but the Columbias. They were the ones that had to be the innovators, and my colleague said the problem was making that happen…that s/he had a hard time convincing people to follow a very simple argument, which is to say, "Our job as a university press is not to publish books but to disseminate and vet scholarly research," and it was that simple. And that takes a mindshift for the people in that industry.

In the following quote, a scholar who turned to online publication to publish time-sensitive work notes its impact:

> Yes, I have used newer forms of communication and publication in my career. I was part of a project recently on area studies, on regional studies internationally, and how they've evolved in recent decades and what their future might be in scholarship…I contributed to that project a chapter, I coauthored a chapter on area studies. The first way in which that was published was through a university press–sponsored online publication, and it was peer-reviewed before it was accepted for online publication. We received monthly updates as to how many hits and

> how many downloads have taken place at our chapter of that online publication. And, subsequently, I don't remember when it was, one year or two years after it appeared online, the press then published it as a paper book, hard copy, as a book.

Open access/institutional repositories

When we asked about the possibilities of open access publication models in political science, some scholars responded by citing concerns about the lack of quality control.

> Open access movements do not play a visible role in political science; my impression is open access publications don't really have a big presence.

> If open access simply means anybody can put up whatever they want in some sort of a repository, then an individual wading into that has had no quality control exercise, and they don't know which are going to be the good articles and which are going to be the bad articles. So, unless there's a quality control that allows you the confidence that, when you go into that repository, all the articles have been deemed by your peers to be really solid and really good, then I think it's problematic. Because, on the Web, the major challenge is figuring out what information is worth paying attention to.

> [Some people in the field] say things like, "We should put the *American Political Science Review* online and just have it free to everybody." And people like me say, "Well, wait a minute. People pay fees right now to get that and that allows us to pay an editor who edits the journal. How are we going to pay for the content to be reviewed and guaranteed?" They respond, "Oh, we'll figure that out." These are not trivial problems.

> We don't have anything like PLoS, you know. We just don't…Maybe what you see in the publication and communications realm is a dependent variable of the subfield of international relations turning insular more than anything else. An inward-looking field won't be looking to publish its stuff broadly.

When asked about the author-pays publication model, scholars noted that page charges and publication fees are not common to the field and that cost for publication in the author-pays model could be prohibitive to younger scholars without large amounts of funding.

> We don't do page charges.

> What do you mean by pay, do they pay or do we pay?…The author? No, I've never heard of it… That's news to me…Can you maybe negotiate for a higher price and get your article in the journal?

> …I think the author-pays model would be very unfortunate in the social sciences and the humanities because, in contrast to the biological sciences, where the cost can be simply charged to your grant, which then becomes an equalizer—your personal ability to pay is not a determinant of whether you can get into a journal, which I think would be horrible. So, in the biological sciences, if they can charge it to a grant, and everybody who is good has grants regardless of their personal financial circumstances, that's one thing. In the social sciences and the humanities, with the exception of some pockets within the social sciences that get large grants, like economics, psychology, and some subfields of political science and sociology, it would be very unfortunate because then it would create a great burden on the younger faculty who have the least money and the highest need to break into the most visible and peer-reviewed journals.

Harvard's institutional repository

Some scholars mentioned Harvard's plans for a new open access institutional repository. Many political scientists had positive things to say about this move, although some administrators noted that pre-tenure scholars will likely be unwilling to do anything that jeopardizes their chance of publication in the top journals.

> Harvard's now putting up a repository and the university is trying to get an agreement from everybody that all the published articles and unpublished papers, but certainly the published articles from Harvard faculty, should be put up on an open access repository that anybody can get to. It turns out to some extent to be very complicated. There was a big battle about it, but they finally did it; the ability of anybody who wants to opt out is important. A requirement that people had to do it wouldn't work, just simply because, especially if you're a non-tenured faculty member and the *American Political Science Review* or one of the major journals is willing to publish it, but then says, "We won't publish it if you put it up for free." The cost is too great, and so people can opt out. So there still is that in-between setting, but most people just want to get it out there.

> It was a unanimous vote by the Faculty Senate, which at Harvard is the faculty. So everybody counts…not everybody, but whoever wants to come can come…It was a great turnout that day. It was unanimous. There wasn't a single vote against it…There are lots of potential issues that you could raise against the repository. And, so far as I know, all of them were raised. But I think everybody felt like it was time to give it a try, and it's going forward. So far, I don't think anything has blown up, or I don't think anything bad has happened, so…Harvard retains the right to the last unpublished version just before the published version. Although, scholars themselves may choose to keep the rights to the published version.

Tensions or opportunities around quantum of output

In comparison with fields in the sciences or humanities, scholars had few complaints about the accepted quantum of outputs in political science. If anything, they want more journals to publish their work in specialized areas. In contrast, some scholars discussed the difficulties of publishing images, data, and code in formal publication and the possibility of using new models to accommodate their needs. One scholar noted the benefits of online publication models that allow embedded content, but pointed out the problems with keeping the data updated, securing permissions for images to be included, and having the resources and training to create the publication.

> Multimedia publication would be terrific, but, once again, it's like setting up your own webpage. It's fun, but you need to make sure it's appropriate, check the copyright, include it and then update it, and I think it's probably more complicated in a field like political science, again, because of the changing emphases day to day…For us, the material really needs to be updated much more consistently, and that's a real cost…You could do it yourself but you have to find a student who can help you with all those other pieces that have to come together…Younger scholars do more multimedia publications, but I think they face the same issues, one of which is it still takes time. Google has heaven knows how many images online, but you still have to look through them, you still have to figure out the copyright issue. You still have to put all that together. Once again, even for younger scholars, what they put up today about the 2006 election is going to be outmoded in about another 12 and a half months. In some other cases overseas, the situation can change even more quickly. So, multimedia might be easier to manage for materials that change more slowly. But the reason students get

> into this field, that most of us get into it, is precisely because it's about how the world is changing.

Additionally, publishing code or data has also been a growing concern, particularly work done with GIS. Currently, scholars create ancillary websites to provide supplementary data to the book or articles, but a new publication model might be needed to address the complexities of the collaborative work in these areas. Image-heavy work in these areas can also be expensive.

> There's been a lot of interest in publishing the data or archiving the data. It's felt that the traditional publication mechanisms don't quite work in the sense that…we're very much an article-based discipline. And a lot of it is single-authored. But there would be concern, for example, that the actual procedures used would not be thought to be publishable and so need some other mechanism for being shared…But the publication process doesn't typically accommodate that. You'll find similar concerns in economics…I do fairly complex analysis…and what is publishable in that is the sort of methods, obviously, but the actual procedure, the code, the set of steps that I used…It's about publishing code or publishing data, publishing stuff that, in the tradition of academic publication, has been below the radar…What's missing is the link to the traditional academic publishing. That often occurs through ancillary websites, so one puts up a website to support the chapters of a book or the articles of a special issue of a journal…That's common practice now. I think a related concern is the black box issue, and this is something that science in general has to wrestle with. We're still living under a philosophy of science that is essentially about the individual investigator and a standard that says, "You shall publish in sufficient detail as to allow someone else to replicate." But that standard is unattainable these days. There are complex analytic codes that people use, or people are working in collaborations in which there's no way you can fully understand the details of what everyone has got. And GIS is a good case in point because much of the software that people used in the past has been developed by the commercial sector, and the documentation is also not up to that scientific standard…We really need to redraft the philosophy of science. We need to train students in a somewhat different approach that says that the black box or the gray box may, in some cases, be acceptable, and that the standard of publishing to the point where we can replicate everything about the analysis, perhaps, needs to be relaxed, because, in practice, we relax it all the time…just from complexity.

> I still deal with publishers who tell me that publishing in color is enormously expensive and then I have to pay extra…And even the traditional publishers know very well that they can do full color on every page without much extra expense…My textbook is in full color on every page. The publisher did balk at that. But I figured it's more about the business model of the publisher, because, in academic publishing, the production costs are very low, and most of the costs are absorbed by the salesman or operation. And, as a result, it's difficult to change the model.

3. HOW DO YOU SHARE YOUR WORK WITH OTHER SCHOLARS AND KEEP UP TO DATE IN A FIELD?

Sharing in political science occurs incrementally and largely depends on personality and subfield. Similar to economists, quantitatively oriented scholars are more inclined to share their well-developed scholarship in working paper form, as well as their data post-publication. In contrast, qualitative book-based scholars have a higher threshold for sharing their work in-progress. Research can be shared at multiple stages: initially, early drafts are circulated privately to a small network of colleagues, often by email. Conferences and seminars provide a more formal

mechanism for sharing work in early stages. Sharing is enhanced by technology, which maintains and reinforces existing informal networks, and some scholars post conference papers or polished working papers on websites to provide wider access and to elicit feedback. Post-publication sharing of data sets is common practice among quantitative political scientists, primarily to enable the replication of research by other scholars. Most scholars share such data sets openly but selectively, either posting data online (on personal or journal websites and repositories) or upon request. Some journal publishers and funders request that their grantees share data with the scholarly community. The use of blogs has not permeated the field to a large extent, and social networking sites for scholarly purposes were not noted to be important.

P3.1 The Importance of Informal Networks

Sharing in political science expands incrementally over the course of a project. Initial sharing generally concerns the polishing of ideas among a trusted network of personal contacts. Scholars expressed a sense of security in sharing early drafts of work with close colleagues, including former and current collaborators and students. The circle of informal sharing widens as work becomes more polished, across all subfields.

By eliciting feedback on early work, scholars can protect themselves from later criticism in more formal venues. Despite the advantages of the early sharing of work, the time necessary to circulate documents and elicit feedback can discourage early sharing by scholars who feel pressure to publish. Email is essential to informal sharing and allows the circulation of documents and feedback to have a more international scope.

> The papers that I'm working on, I share either with friends and close colleagues that I have established some kind of relationship with, either a relationship of reciprocity or people I've coauthored with or former students—people I've known well for a number of years. I'll very readily share drafts, even sometimes pretty lousy drafts, with those people if I think they'd be interested, but with the presumption that they're not going to forward it to the planet. I'll also share it with people whom I know only a little, but who are the top experts in the field, and who I really want to know what they think of this, especially if they have some expertise that's a bit different than what I know myself—and I want to have a reality check. With those people I usually wait until the paper is a third or fourth draft, where I'm thinking that it's fairly close to being able to send to a journal, then I'll send it out to them.

> There are informal channels to share work with friends and colleagues whose opinion I trust, and that's what I do, trying to get opinions from people I know whose judgment I trust. And presenting it at professional conferences—then I would have the opportunity to share the paper with people who are working on similar issues in the same area, so there would be feedback.

> I think sharing is largely through a fairly small network of personal contacts.

> I share a lot when I'm working on something and I want opinions. I just send out copies to people and say, "Could you read this and send me some comments?" My experience is that most people just don't do very much with it. But I still send them out because it protects me a little bit. If nothing else it means that they could have criticized me and they didn't. I think there's a fair amount of that. The issue for me often is time constraint. I'm often eager to get it off to a journal before I have the time to let it circulate for a year, because it takes a very long time to circulate it well. In other words, you don't just send it out and get things back in

> two weeks and then write it up for a journal. Things have to float for quite a while before you get enough feedback to make it worthwhile. But it's worth doing.
>
> I think that stuff still operates largely within personal networks, in part because—and, again, this may be a cultural and/or intellectual thing—my field has a relatively low tolerance for beta ideas…Sharing early is not *de rigueur…*My field still has the sense of, "If you show something to somebody, you better have it 95% right by now." That's not my personal style, I have to say…So I think people create fairly closed trusted networks of folks with whom they will share early-state stuff. And that might work, but sometimes it feels a little lonely.
>
> Nowadays, my fieldwork is traveling around the world giving talks, interviewing people when I'm there, getting a feel for the place, making contacts. Then when I want to write about the place, I'll draw on those contacts to get sources, to vet drafts, and to kick around ideas, sometimes via email, but sometimes when I'm actually in the place and just schmoozing with people. So that's not actually field research, but that's the way I do it given the nature of my work. Certainly technology, especially in the form of email, helps me keep abreast of that. And I also share drafts with people in the field.

Some scholars considered sharing part of a reciprocal process for keeping up to date. It is not uncommon for scholars to routinely exchange papers. Some scholars noted that although comments are welcome, they seldom expect feedback on papers they circulate.

> Honestly, the main way of keeping up to date is by keeping track of what other people who work in my area are doing. It's very much a personal network kind of a thing. I know almost everybody who works in this field. You basically get in a small enough field, and you're on a first-name basis with all of 20, 25 people, maybe 30…It's mostly national.
>
> So we've been working on something for about 16 months or so and we wrote a paper and I sent it around. I sent it to collaborators on campus, I sent it to people nationally whom I've met. I give talks from time to time on this question…and I've met people at workshops and they expressed interest...and I say, "I'm working on this paper, we're looking for comments, would you read it?" They always say yes, they usually don't read it, but that's okay. So it's a networking thing.

For some political scientists, departmental seminars are an important, informal way to share ideas and provide a forum in which scholars can familiarize themselves with their colleagues' work.

> We have seminars every day on every particular topic. Some of them are places where you can walk in. I present stuff that's in process to a bunch of graduate students and some of my colleagues, and it's clear that it's really in process. I feel comfortable with that, because I've got tenure so what can they do to me? It's understood that the discourse is of things in-progress and I get a lot of good feedback. Some people wouldn't even do it in that kind of a venue. I think it really depends upon how far along something is and what the nature is of the place where you discuss it.
>
> They have these brown bag lunches or seminars and so on, and everybody talks about what they do…In political science, I don't see people staking out a particular area and then holding it and keeping the information to themselves. Quite to the contrary.

Intergenerational exchange and sharing is common. Young scholars may circulate their early drafts of work, primarily among peers and advisors, though they may be reticent to do so.

> I know that some professors get their students—all the students whose committees that they sit on—together and form study groups and you read each other's work. And then, you send emails to each other. I know that when I communicate with my advisors, I do the same thing. I freely send all my work-in-progress. But I think there's an idea that this is the inner circle, this is my committee, I can trust them. There is safety. I know my committee members. As far as I know, they're not going to steal my ideas…I think that's another thing about political science or social sciences, but everything we do is supposed to be different from each other, so that you rarely see dissertations that are similar…So, in a way, that also lessens the possibility of stealing ideas. The fear is there—but I don't think it happens as much, at least not in the same university…I share among people who know my research well or with whom I have a socially established relationship. And if you're affiliated with any particular center on campus, then you email it out or post your in-progress research. For example, I'm having a practice job talk, and I had to circulate my writing sample…And I have to admit, I had more qualms about sending my chapter one through the mailing list of this research center on campus for my practice job talk, than actually mailing it to the different places I'm applying. But it's not a phobia about technology. I think it's more to do with these are people I know and how they might judge me.

Subfield differences

In addition, sharing depends on typical practice in each subfield, which can vary. Those in book-based subfields may be less willing to share in-progress work than their peers who publish in journals. Those scholars whose work is directly related to current events may also be less inclined to circulate their ideas.

> I think the balance is probably toward sharing, and there's, in fact, a norm, I'd say, for people who are working with especially large data sets and doing quantitative analysis. Many of those data are public access and so there's actually a premium on sharing because other people are using the data and you want to get feedback.

> I'm always nervous that I'm going to send out something that isn't finished. I work in a quantitative field, I do a lot of collaborative work. That's one of the big reasons to have collaborators, because you can send them stuff that you know isn't finished. I send it to people I know well but I wouldn't send out something that I was really uncertain about more generally.

> I think my subfield is very idiosyncratic because there's a real variation of people involved in it. But it certainly has a tradition of workshops and a lot of sharing…And sharing just varies. I think it also depends on the nature of the work for people. Some of the folks that do the more quantitative work in the field tend to work in teams and their networks are probably much tighter. The book writers tend to be more iconoclastic and lone wolves.

> I don't think it's just economics where sharing is prevalent. I think other fields run into it…And the people I know in political science, at least, are doing exactly the same thing. Political science is a complex field—so I hang out and interact with the people who do rational choice models of political behavior because some of my writing is in there. And they're just like economists. I suspect some of them were trained as economists, actually, and just drifted over to political science. So the methodologies are the same, the approach is the same, you wouldn't see any difference. Now, maybe if you talk to some of the political scientists who are country specialists and so on, it might be different…International relations scholars may have a different take.

The fear of being scooped did not seem prevalent in political science, and particularly not in international relations and quantitatively oriented subfields. In emerging interdisciplinary subfields, such as neuropolitics, it may be that work is so specialized or so far ahead of others that poaching is not a concern.

> In social science, in general, and political science, in particular, sharing is what people will do. They don't really husband their ideas…We don't do anything that has any commercial value, and so we don't have that particular incentive. And, in general, I think people share.

> Yes, we do share—in fact, I think to a surprising degree, on several levels. I know that in some areas of science people are very secretive and they don't tell anyone what they're doing until it's done, because they're afraid somebody else is going to come along. That's not a big issue in political science. I can speak specifically about the quantitative community.

P3.2 Widening the Circle: Conferences, Seminars, Workshops, Meetings

Conferences

As work becomes more refined, scholars present papers at professional national and international conferences hosted by scholarly societies. Feedback is solicited through this mechanism and networks are maintained and enlarged through face-to-face interaction with colleagues, usually within specialized subfields.

> So you go to a conference like the International Studies Association, there are 4,000 people there. It's not a conference; it's a gathering of 25 clans. It's a meeting that just happens to coincide for several different groups of people. The postmodernists all get together and chat and talk and compare notes, and the quantitativists all get together and the European political economists get together and the IPE [industrial political economy] people get together…You have clusters of people who interact intensely at the meetings. Then there are people who are on the periphery or have weak linkages to the group and you say "hello" to them and maybe chat for a few minutes, but you don't necessarily spend lunch talking about anything. And that's where you try out ideas before you invest a lot in them. That's where you find out, if you have an idea and you started working on it, somebody else gives you some suggestions for papers to read or literature that you haven't thought about. It's a very productive time.

> …I think conferences are more important in the learning process and the creative process of research. They're the catalysts and the raw material of having ideas, coming up with research, getting feedback, and so on. I like to go to conferences for a couple reasons. It gives me a hard deadline to get a paper done and so I have some tasks to work toward. I get some feedback from people, although most of the time, panels aren't that well attended unless it's full of very senior people. And the kinds of comments you get from a discussant are uneven, but you get some feedback. The main thing is, you get to go and talk with people who are doing the kind of work that you do, and you find out what they're doing. You talk to them. They're your community.

> The practice of presenting at professional conferences and giving talks at speaker series…I can think of many, many people who do that. It is important, because it is the judgment of people I trust. But, on the other hand, I think it is important to present the paper because then you have a chance to see the extent to which the people do not know exactly where you are coming from, but are working on that similar issue. Then they look at the paper and…that is important feedback, to understand whether the pitch is right. There have been a couple instances in which I got really good feedback and it helped me to improve the paper. While I

> would have been able to get to a better paper myself, maybe in six months, maybe we can get there together in 50 seconds, so that makes a difference because of the length of time.

One established scholar noted that a paper improved through feedback elicited at conferences, though it has still not been submitted for publication.

> I have a paper that I gave a conference three years ago, which has already got a life of its own and I'm embarrassed to say I haven't published it yet, but that's because I'm getting old and I'm a little slower than I used to be. I'm embarrassed. People really like it. It's won prizes. It's highly cited…It began as a conference paper…And then I've done about five or six different conferences and I keep trying to improve it. Partly, it's this "I'm going to improve it and make it perfect," and, partly, frankly, I just haven't gotten to getting the final thing out the door.

Age and conferences

For junior faculty, in particular, conferences are important venues for building networks, developing a reputation, and for eliciting feedback. Younger scholars may be more concerned about poaching than their established counterparts.

> I don't think very many people worry about being scooped in the sense of having somebody grab their findings and go with it…I have not ever seen poaching be an issue. The time that most of my students worry about it is with their dissertations because you go to a conference, and you see a title of somebody else's paper that sounds exactly like your project. And my experience has been, in every case, you go and you see what it is, and something is different about it. Yes, it has the word "mediation" in the title, but mediation could mean a hundred different things and so you don't have to worry…it's the buzzwords that people use. People have different databases that they're drawing on, different arguments that they're making and testing. Somebody else's approach to a problem could always be better or worse than what somebody has, but I certainly don't think that it's the case that I'm going to see your conference presentation, I'm going to go home, I'm going to write up something better, and I'm going to send it out. I do not know of cases where that has happened in my experience. It doesn't mean that it hasn't, of course, but I have not seen it.

> It's important to try to broaden the circle a little bit beyond just the narrowest constituency. Invitational conferences are great if you can get to them. A lot of them are *ad hoc,* one-time only things. That's a hard racket to crack. It took me five years, probably, before I got invited to any invitational conferences. You spend the first few years hocking your wares, so to speak, at the national association conferences, and hopefully start to develop a little bit of a network, establish yourself as an important enough player in your field that people think, "If I'm having a conference, I've got to have this guy there." That's a highly contingent kind of an enterprise. It's not easy to set out to do it, but somehow it happens…But on the other hand sometimes it doesn't happen for everybody.

> Conferences are how people get out and get their ideas put forth…It's obviously a step that the junior scholar has to take, but it's not how we evaluate them. Although, if I had a junior scholar and, had that scholar never gone to a professional conference, I would worry about that scholar. On the other hand, if they had never gone but they had 150 citations, I'm going to say, "Well, okay. Somehow, this is a person who has an impact even though they had never been to a conference in their life." But, of course, that's one way we all get our name out and about, get citations and peer recognition. It would be odd to have a scholar who wasn't going to two or three conferences, at least, a year…any scholar. It doesn't really taper off in political science or economics if you want to maintain your stature in a discipline. If you want to hibernate, then, of course, fine, but you need to continue to go to conferences.

Invitational workshops/seminars

Some senior faculty noted that the larger conferences were a waste of time for them, due to the uneven quality of presentations, poor organization, and lack of stringent peer review. A preference for intimate invitational workshops was expressed. These alternative conference models are more informal, specialized meetings that promote a stimulating atmosphere of scholarly exchange.

> The major association in political science has mushroomed. Since I've been in the field, the membership grew incredibly, and there's more of a premium on putting as many people as possible on the program. Lots of people sign up for the program and then don't show up. So conferences, in one sense, are getting less useful because it's unpredictable whether the panel will be there. For senior people, there's less of a payoff, partly because of that. For junior people, probably more so. And the conferences differ. There are some that are much more tightly organized…Our folks have a smaller program but it's much more focused. So this is a "must attend" for the people in the field.

> They've become less important to me, personally…I go to conferences sometimes and I think, "Wait a minute. I just got on a plane and flew to this one, in order to hear someone give a paper. I'd rather just read the paper." When people go to workshops, I'm more likely to go, and when they're organized by people outside of the university. I would rather just read the paper. I don't want to go and hear a seminar, a 20-minute talk on a paper I could read in a half an hour…We don't do as much of the intimate workshop venue as we should. It's almost as if sometimes I feel like my subfield has become a little too professionalized in the negative sense of that word.

> This one that I was just—it's an annual thing, it's a very informal conference…In fact, it's designed very differently. You're only supposed to send in a paper of no more than about 10 or 15 pages. It really was designed to be what are you currently working on, what are you thinking about, and just an exchange of ideas…They're very informal, very short, very speculative, but they've been tremendously useful to me.

> One of the things about social science, and political science is certainly one of them, is a lot of junk is presented as conference papers. In most cases, the papers are reviewed beforehand but that's not a serious review, and, in many cases, it's not reviewed at all. And some people always are going to give a paper at every conference, and then they'll spend a week trying to figure out what the hell it is they're going to say and it never sees the light of day in any more formal sense.

Conference proceedings

Papers can be circulated in advance at professional conferences, to enable speakers and moderators to familiarize themselves with the work in a session and to prepare discussion. Some conferences now request that attendees post their presented papers online after the conference as a part of conference proceedings. While some scholars see this as part of the process of soliciting feedback and connecting one's name to a particular research area, follow-through is uneven at best.

> The major professional conferences, now they require…that you give your paper to your discussant, to the chair, and to the other members of the panel. Then you also have to post it online, on the conference website…I think that practice has been going on now for about at

> least…seven or eight, nine years. If you present your paper to a speaker series in other universities, it depends…in another department, in other schools, again there would be a discussion and they would get the paper in advance.
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> We do not have proceedings in political science in the way they do in some of the sciences…Our conference proposal is two paragraphs: here's what I'd like to do. More and more conferences are asking people—and I don't think they can enforce this or haven't been able to enforce it yet—but they have a site where people are supposed to upload their papers so that other people can get them. I'm going to guess that 75 percent of the participants actually upload their papers…but it's certainly not 100 percent. It's not like proceedings…I can think of some very well-known people who, probably, I think their attitude would be, "I'm too busy to do this." And I can think of some other people whose work I would never want to read who would just say, "Oh, I don't need to do this because I'm better than that," and I don't want to read their stuff anyway.
>
> The biggest organization in the field lets presenters post their papers online, but often the authors don't upload them so accessing a given paper is kind of unpredictable. The association does not publish refereed proceedings, nothing like that.
>
> We don't have conference proceedings *per se*…We do have a practice now of posting things on the Web and some of the conferences will have set up an archive where you can go and call on the papers.
>
> Conference proceedings are how we share. We send out a manuscript for comment and post it.
>
> Mixed methods people are usually pretty strongly oriented toward political science, and so they go to the APSA or International Studies Association, and they'll present their work on an APSA panel and their paper will be on the APSA website.

Reading online conference papers, in addition to other scholarly output, enables scholars to keep up to date.

> If I'm working on a specific topic, I look to see if anybody's given a paper on that at one of the professional meetings.
>
> Reading, conferences, classes…Often, it's not keeping up to date; it's pushing things forward. In my own research, I'll need to figure something out, so I'll figure it out. In fact, I'm more up to date than anyone else at that point.

P3.3 Open/Public Sharing: Websites and Working papers

Preprints play little or no role in disseminating new work, though some of the scholars we interviewed used the terms "preprint" and "working paper" synonymously. As in economics, posting well-developed working papers on a personal website is common in most quantitative subfields; the papers are utilized by scholars to stay abreast of the most current scholarship. As one scholar described it, "There are very few articles published that I see for the first time as published articles."

> The working paper is something that is quite frequent in economics, in some subfields of political science, in demography, and it used to be that it would typically appear in paper form. Now I believe it appears more often online, and it becomes a mode of getting a first or

an early draft of an article out to a broader public, both in order to communicate findings and to get feedback. It tends to be more in the quantitative subfields. Although, occasionally, for example, an institute of governmental studies that publishes case studies or organizes conferences based upon qualitative case studies—they might put out working papers that are case studies based on more quantitative data.

We post papers on websites in political science more and more. It varies. It's probably less so in political theory and more so in political methodology and the more quantitative areas, but it's actually fairly true across the board. It started in political methodology with people who do quantitative political science research, but it has really expanded out more and more to the rest of the discipline…for international relations or politics, it would depend on who and whether it was a scholar who was journal-oriented or book-oriented.

I post working papers on my personal website generally. That's the extent of my technological innovation as such. Once an idea is fleshed out you need to stake your flag on it, although this is a huge field and there are so many different things to work on. I've been amazed at how often two different people wind up working on very similar stuff, without communicating with each other. There can be a little bit of an issue of priority. So that's one factor. You want to stake your flag—this is something that you have some claim on. By putting it out there, not only posting on my own website, but presenting it at conferences, this is all part of spreading the word about what you're doing, to let people know what you're up to…When you get a working paper out there it starts to get cited fairly quickly by other people who are writing working papers. They don't just cite it as a published paper. Probably half my citations—I don't keep that close track—are to working papers, things that I've written as drafts that are posted on a website, so other people who work on similar topics can see it and reflect it in their own research and that can sort of speed up the citation count process, basically.

You can have an influence without even having had your paper accepted yet…posting papers online so that people can access them can sometimes get people a pretty wide audience…People share work-in-progress in different ways. Sometimes people have a mailing list and send the copy out. But, I think, more and more, it's the posting on the website that's the most convenient and most useful.

People share a paper...publish it on the website…go to other people's website and download.

I certainly would make it a working paper and put it on the Web much earlier than submitting to a journal…There are certainly people who do everything, but it's not like some fields that I've worked in where you can't make it public until it's already been published.

There are people and scholars who have websites where they have their own working papers.

I visit people's websites, check them out from time to time, and make the rounds in a very idiosyncratic fashion. What's so-and-so up to, what have they done with that paper, stuff like that.

If I know that one of my colleagues at some other university is working on a topic, I will tend to just email them and ask, "What about this paper of yours that I heard of?" and ask them to send it to me. Sometimes they'll say, "Oh yeah, it's on my website." And so then I'll just get it that way.

I think lots of people put up their papers on their website, and that's publicly available once it's there. I think there's a lot of willingness to share…The problem is, if that's the way you're distributing it, you don't get the support of knowing what's been peer-reviewed.

The working paper model maintains and reinforces the importance of existing informal networks. Scholars often post a working paper on a website and then flag it to their colleagues for feedback.

> It's pretty standard for people to do working papers…The way the distribution works in my field is…there are lots of working papers up there. I very rarely will go looking for a working paper. I get them from friends, which is really not all that different from the way it used to be when people would print off a paper…I call them working papers. I send them to friends, looking for some feedback.

> I'll email a working paper to people who I would want to see it, with the expectation that they won't read it. They certainly won't pore over it in any detail. They might glance at the abstract and the idea. You just need to let people know you're doing stuff and keep them a little bit up to date on how it fits in with the rest of your work and stuff like that. So you send a short email pushing it to them rather than just posting it on a website and letting them come and get it. That would be about the extent of it.

Formal working and occasional paper series

Some research centers and institutes or departments maintain published working or occasional paper series, though working paper repositories are not typical across all subfields. Having affiliations with prestigious centers is considered a boon.

> Our paper will be put online for just comments from whoever, as a working paper affiliated with the research institute…I've not worked with this particular institute before, but my coauthor has, and apparently a paper that he's written in the past has been put online in the same way. He got random comments from all over the world, which he felt were very helpful to him. And so he recommended that…And because it's going to be a working paper for that research institute, which is very well reputed, it should be less likely that people would try to steal those ideas because it's already published as a working paper…I've seen working papers online with different research institutes, and I often click on them and read them. I personally will always cite those papers, just like I would cite anyone. Actually, to me, it's the same as a conference paper, and sometimes, depending on the information, almost the same as an article in a refereed journal, because it could be just as helpful…If I'm going to cite, I will ask for permission, but I usually don't interact unless it's someone I know already, but that just could be my limited experience...I've noticed that Harvard has some research centers that have online publications. I think affiliation with Harvard is never a bad thing. But why would someone choose to publish online, even affiliated with a center, if they could find a print publisher? In my mind, ongoing research, research-in-progress being online, it's great. And I think some of those research centers, the purpose for their online publication, is that it's really research-in-progress.

> People have tried to create working paper repositories, but they never get off the ground because people don't contribute to them. Part of the reason people don't contribute to them is because nobody looks at them. Nobody looks at them because people don't.

> We (our department) don't do much in preprints, certainly not formally…A few departments have working paper series, but most do not.

Concerns about the working paper model

Quality of work

Sharing working papers on a website can be problematic for some scholars; there are tensions between the desire to share work early, in particular to stake a claim and elicit feedback, and the concern that this work is not "polished" enough for public consumption.

> In fact, I've encouraged my colleagues here, at a couple of the institutes here, to set up working papers on the websites of the institutes for faculty. But, to be honest, I don't actually do it, because I find that the papers really aren't quite finished. And I really don't want to have work that's not quite finished lurking up on a website because, once it's up there, you'll never be able to really take it down. And there will be some graduate student in Borneo who will get a hold of your preprint where you said some things that were really stupid or not quite right, and he'll quote you until the day you die on this half-baked version of your ideas…And so, inevitably, I have these papers that I don't mind people reading. Sometimes they'll be posted to the APSA website as an APSA paper, so they are out there. In fact, my APSA paper for this year got picked up by bloggers, and there were thousands of hits on it, even before APSA happened. But there are certain things about the paper that really aren't finished and where the facts and the claims are not really brought nicely into line…So, anyhow, I'm in this peculiar situation where I favor people putting up their preliminary work on either their personal website or their institute website, but I don't actually do it myself.
>
> Of course, most people want to get stuff out and published, especially junior scholars…I'm sure that in the old days scholars used to have papers they didn't publish. I think what happens now is those papers are finding their way out to the larger community because you posted it or put it in your archives somewhere, people can download it and read it, or you get an email and somebody wants it or whatever. But it's in a variety of different places now, in different forms, and so it's easy for people to get to it. It's basically a good thing. I think there is the danger that you sometimes want to have a little time to perfect things and so preliminary results sometimes have a life that extends beyond what they should and you could imagine misleading people.
>
> At any one time, the best version is on my website, and, eventually, it becomes fixed. So, I think it works well. I don't really want the old versions around, because the new one's better.

Although few scholars are concerned about poaching when posting a working paper, younger scholars may being nervous about being scooped and about the lack of privacy associated with personal websites.

> Some people might steal your ideas and never cite you. And that happens. It totally happens. It has not happened to me, but I have heard of cases where some people have said, "Well, be aware of that person because that person might steal your ideas in-progress and not cite you."…Some people feel, "Well, if it's published I can cite you, but if it's not published, it's fair game."…And I think one of the fears of publishing in-progress papers is that fear of having your ideas taken without reference…so I think the concerns may be different in different stages of your academic career.

Retaining copyright

Scholars we interviewed expressed varying degrees of concern about intellectual property and copyright protection. In some cases, for scholars wanting to share working papers or earlier

versions of a forthcoming article, copyright arrangements with journals could become complicated. One scholar took a proactive approach by retaining copyright on all published work, while others had little concern about copyright protection.

> I had the choice of putting it up on the institute website as an occasional paper, but I just haven't done it yet because I haven't gone back to the paper and fixed the handful of things that I think need to be fixed before I call it an occasional paper. But by the time I do that, it will probably be coming out in a journal, and then the journal doesn't want to have the same thing up on a website as an occasional paper.

> I'm sure copyright is an issue for journals. I don't really care. Maybe I will some day, I don't know. I don't get paid for what I write. I get paid for the notoriety that I create by writing…There are occasionally problems with posting working papers, maybe. I think there may be a slight increase in plagiarism by academics as well as students, but I think the compensating factor is, there's a big increase in the cross-pollination of ideas, which is the point of this thing, so I think that's a small price to pay.

> When I sign the copyright agreement with a journal, I write on there that they must send me a PDF of the final article and I have the right to put it on my website. You will find all my articles on my website…I insist that, even if the journal is only available by subscription, I make sure that it's available free from my website, at least for me.

P3.4 Data Sharing

The notion of replication is important to some scholars and the sharing of data sets post-publication appears to be the norm among quantitative political scientists. While there is some hesitation about sharing raw data, out of fear that mistakes might be unearthed or that others could interpret publishable findings before the original author (thereby usurping "credit"), most scholars we interviewed regularly share processed data openly or upon request (and some journals require that it be available). Typically, scholars want a first pass on data so they can "skim off the cream" before making it available to peers. Sharing data serves to stimulate scholarly exchange and can drive new scholarship. There are different models for data sharing, including personal and journal websites and repositories. Some scholars who work with human subjects may release data in line with particular restrictions or confidentiality agreements.

> My impression is that everybody, younger and older scholars, shares their data sets after publication. It's just part of transparency and accountability. It's like having footnotes, you just have to do it. But I'm not a quantitative guy. I personally don't get involved at all with the data set sharing and creating. I just kibitz with my colleague about what we do with the data sets and am aware of them, but it's pretty much at an arm's-length remove from me.

> I know some people who wouldn't share anything with anybody. I've always been committed to sharing data. There are some people at some institutions who, as soon as they gather the data, they put it right up on the Internet and anybody can use it. I'm delighted when I come across such data…They're very good about putting it up. My view is—I want to skim off the cream, which I want to do fairly quickly, and then make it publicly available. If I spend a lot of money and a lot of time asking questions on some subject that no one has ever thought of, but the answer is—once you see the questions—immediately obvious, then I don't want to give it away so that I don't get the credit from it. I remain somewhat selfish and I think that's legitimate. But most of us try to get it out fairly soon.

> Oh yeah, people are afraid of poaching. And one wants to be careful. I'm not afraid of poaching. I hear about it…I don't think it's just people in traditional fields; I think it's a personality issue of people who are more paranoid about poaching than others. A lot of economists are good about sharing their work and yet I hear once in a while from economists, "Oh my, I've shared my stuff and all those people do is use it to criticize me, so I'm not going to share anymore. They're going to poach my stuff and publish before me. If I share my data they don't know any of the problems, they're just going to take my data and publish important stuff before I can." I think that's just a personality thing. There's so much interesting work you could do with the research materials we have that we don't have time to complete. That's my philosophy. I don't see that there's any reason not to share…I don't worry about poaching very much. Others probably feel differently.
>
> I'm in the process of getting data from a couple of empirical papers to post on my own website, just so people can replicate what you do, which I think is an important aspect of this field. I get publicly available data but there are 100 different things you have to do to a data set to parse it, to make it into the shape to write the paper. For somebody to retrace your steps, you can't just say, "Oh, I used so-and-so's data and combined it with this data on election returns across 50 states since 1872." They would not be able to reproduce your results with that information. They need more than that…We want people to take it and use it to generate new scholarship. We want people to do it while crediting you for the work that you have done, and for the individual scholar who's gathered the work, that person wants to publish a lot of stuff. From the point of view of scientific integrity—if you want to get very philosophical about the process—if I never release my data and I just say, "Oh, I found this," there's no credibility to what I have done. So…one of the arguments is, you want to put your data out there so that people can look at it, so that they can use it. That will benefit you. If they find mistakes, great, you can improve the process and, if they disagree with your findings, then you can get in an exchange and that's good for scholarly debate…I think some people are afraid that somebody's going to find out "I did something wrong," and that does happen. It's happened with my work, and I've found mistakes with other people's work, and that's just part of the process, right?
>
> We had a big discussion in our discipline maybe five years ago about the idea of replication data sets or replication databases…Some people were saying, "I don't want to release my data because you can take it and do something better. I spent two years doing fieldwork, gathering this, that, and the other. Why should I make my data available for other people to use?"
>
> Our policy was that, before we started publishing, we wouldn't share our data. But, then, once we started publishing, we, of course, make the data available that the publications are based on. And we share data…There are a bunch of people who have all sorts of great data sets on our research subject that we didn't have, so we got them to make available the data sets that they had used for their publications. That sort of thing is routine. We get lots of graduate students who want to replicate our study and they'll ask for the data set, so we'll send that. We use off-the-shelf data sets that anybody can get, but we've processed the off-the-shelf data sets in a particular way for our study. And we don't make that available except by request, but if people request the processed data, we always give it to them.

Similar to sharing work-in-progress, some younger scholars may be more inclined to keep data close to their chest, though this could prove counterproductive.

> You might have thought offhand that it would have been the younger people who were pro-technology and wanted to share their data, but in this case it was the opposite. They were the ones who were really worried about, "I need time to work with my data and so I don't want it out there." Now, despite that, I only know of one or two people who ever really embargoed

> their data for a long period of time—and I actually think it hurt them significantly because they were finding different results, reaching different conclusions than other scholars who were looking at the same question. Nobody could tell why because we couldn't get this person's data to figure out what it is that is going on. So I think that person lost…I don't know if credibility is exactly the right word, but nobody knew whether to believe it. And if this one person is getting this finding and the other eight people are getting this other finding, where do you put the weight?
>
> As far as sharing, occasionally graduate students will come and say, "Should I keep this under wraps until...?" Usually the answer is no. Somebody else may pick up on it and get some of the glory, but they're going to pay you back in terms of notarizing you. And the cases I've seen where people have kept things close, until they were finished, they didn't get as well publicized or they weren't as timely when they came out. It took longer.

Sharing software/code

Scholars who program ensure code and analyses are transparent and may use open-source and other widely accessible programs to enable easy access.

> Well, first, if you take the trouble to download the data, even though it's so easy to do, you are trying to find something, and that places you on a path, so at that point…I think your analysis is your work…I like programs, I like to code… On occasion, when I get started, I ask people who have more knowledge than I do to help me out to write the code. There are two reasons why this kind of work requires that. One is for replicability, because once the analysis is done, then anyone who wants to check what you've done can do that, the replication is a fundamental feature of the things we do because if it cannot be replicated…leave it. So to write the computer code is a way to allow other people to see what has been done to the data. That is one element of why I write the computer code to do that. And the other element is that sometimes not everything is prepackaged in computer software…I use this package that is a free open-source program. And I use STATA, which is a standard proprietary software program that you have to buy. And I use another program…Those are the three major programs in computer packages that I use.

Data repositories

Some scholars share their data through data repositories, such as the Interuniversity Consortium for Political and Social Research (ICPSR) and the Harvard-MIT Data Center (the latter is a member of the Institute for Quantitative Social Science). Although there is a move to coordinate data access, this can be a challenge. Faculty are often unwilling to invest the time to prepare data for sharing and preservation. Both ICPSR and IQSS provide scholars with new standards for finding, verifying, and sharing data.

> I mount my data in two places. One, we put them in the big data repository at the Harvard MIT Data Center, but I also give it to the Inter-university Consortium for Political and Social Research (ICPSR). And if somebody else wants it I give it to them. One of the things that's happening is that various agencies, such as the ICPSR at Michigan, the Roper Center and the US Census Bureau, are working together to try to get some kind of a coordinated way of making these data available and dealing with a number of the social problems involved with making it available. Say my colleague at the University of Wisconsin has done a major study and they don't want to give it to the Harvard MIT Data Center. But Harvard MIT wants to set it up in such a way that, if someone comes looking for the data, it is stored in a way that's easy to get at, but it's going to pop up as University of Wisconsin data collected by Professor X.

> That's absolutely crucial and legitimate for Wisconsin and Professor X to want, and so they want to set it up really as something that maintains the brand. The social organization of this thing is as complicated, maybe more complicated, than the technical organization of these kinds of repositories…The amount of data that's available is huge. One of the things that IQSS (The Institute for Quantitative Social Science) is doing…is, they have a program that they're trying to build up, to make it easy to find these data, to verify that they are really the data that they're supposed to be, and to make them publicly available, insofar as the people who created them want to make them available. So it's a major change in what will be available for research, that's a big change.
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> There are a couple central archives, including ICPSR at the University of Michigan…and 15 years ago that was the ultimate in data accessibility. You wanted to get your data deposited with ICPSR and that was the public record. Since then, it's become individual webpages, which people can update and upload much more quickly. You don't have to wait, submit it to get it in particular formats, and get the code book just right according to somebody's standards and wait, and eventually it'll get out there. So now it's much more individual sites. And people in the discipline, people who do quantitative international relations know to go to the Polity Project website at the University of Maryland and pull down the latest version of the data or go to the Correlates of War Project website at Penn State, and do this, that, and the other…So some data are generated by individual scholars who collect information for their own research and then clean up the data and then make it available to others through the Correlates of War Project or through their own websites.
>
> It depends on how much you value your data…I hear a lot of people say, "I don't want to do the work to make the data really in good shape," and that's your choice. If you don't think that your data are that important, then I would be the last one to tell you your data are important. A big part of ICPSR is curation, and by curation I mean making sure that things are in a format so that they can be found, reused, and preserved for a long period of time…Now if their sponsor says "You've got to do something with it that's permanent," then ICPSR is happy to help.
>
> ICPSR has got a preservationist mentality, so it's going to preserve those data forever. It's got a documentation mentality, to make sure you can figure out what the heck you've got.

Online data from international and national organizations are often free. The cost of accessing data that are not free is met, in some instances, by library subscriptions and institutional membership in data archives.

> I need data, so I get them from OECD, the UN, UNDP, and a good thing is these are international public organizations, so a lot of times the data are free. If you can just access them online, you get them…industry-level and sectoral-level data…And if they're not free, you can access them through the university, because the university purchases them, and they're free…There are some research institutes where they let you know they have the data and you can purchase them. So in a sense, they are publicly available, you just have to have money to pay for them.
>
> Data on university-hosted websites, such as Penn State's Correlates of War Project or the University of Maryland's Polity Project are actually publicly available, free…Most universities are members of ICPSR, and I believe you have to be a member institution to access data…I'm sure somebody at the university is paying…The webpages are free to access…you could do it from this university, you could do it from any Internet station. All that's free.

Journal and funding mandates for sharing data

Some journals in the discipline now require scholars to publish data sets or back-end data and code on a website to accompany the text of the publication, though this is not a requirement by journals across the board. Both journals and funding bodies enable scholars to embargo data for a reasonable period of time to allow scholars to publish results and stake a claim.

> The useful development there is that the journal [*Quarterly Journal of Political Science*] will publish a lot of stuff in an online appendix. So the journal maintains a website that has extra material, maybe has an appendix, maybe has a data set. Not all journals require publication of data sets; *QJPS* does, which I think is great. *APSR, AJPS,* and *JOP* don't require publication of the data set, but they do publish an online appendix in some of these places and so that's a useful development.

> It is now required to…once the paper is accepted and it's published, then you need to provide all your data, all your code, all the code books for the values. The journals themselves have websites where all those replication materials are available, and they are great, and that is a practice that has been…standard for five years, five, six years. And it was mostly promoted and put forward by two people. Gary King of Harvard University and then Bruce Russett, and basically around 2000, several journals had issued editorial statements that from now on this is standard practice and it has been great.

> Journals typically have a policy that you have to put out your replication data within a certain period of time of publication. Typically, it has to be on your website or in some repository by the time the article appears in print. They will make some exceptions; if it has been a five-year-long data collection project and you have a series of things coming out, they will allow you to embargo your data for two years or four years, something like that, but there is ultimately an expectation now that we will make our raw data available for others to look at.

Some federal funders, such as the National Science Foundation (NSF) and the National Institutes of Health (NIH), require their grant holders to share data with the scholarly community, pending publication. Though such funding mandates are generally welcomed, scholars noted that they were often "murky" and, as a result, data sharing practices tend to be idiosyncratic.

> I can speak specifically about the quantitative community. We have a norm of sharing data. Now, you're expected to be able to hush the data to yourself until you've been published, but once you publish you have to share the data with everyone else. It can be either raw or processed data. There is an issue; there's not as much diversity of raw data as maybe there should be. But there are certain areas where you can make the case that maybe more data should be collected. But the data that are collected are actually easily accessible…almost all of the data are available. Part of that is the requirement of the National Science Foundation, that any study that uses their funding has to share the data, and that's a terrific norm, it's affected this community so tremendously. And it's meant that our biggest problem isn't getting access to available data.

> Typically, when we get a grant from National Science Foundation, part of the requirement is that we are going to make the data available to the scholarly community…Typically, it is a funding requirement, yes.

> If you get a big NIH grant, you have to have a plan for sharing the background data for any publication. But, of course, that can be an extremely difficult process. How do you put it up, digitize it, how do you put it up in a form that other people could make sense of? The question

> of at what point you're willing to share is a real problem. If you look at the rules that NIH has, they say that the PI has privileged access to the data but only for a reasonable period of time, after which it should be available to the scientific community…It's a very murky area, "reasonable period of time," what does it mean?…My experience has been that the scientists who live in the world of replication, and that's what drives it, they have no problem, they understand data sharing…For the social scientists, on the other hand, it's a different world.
>
> The NIH rules are a softball. You only have to have a data sharing plan if you are spending more than half a million dollars a year. Half a million dollars a year of direct cost is really a lot of money. I have some projects that are close to that, but I don't have any that are over that. And then you only have to have a plan and your plan can be: I'm not going to share the data…Now, if you want to come back and get more money again later, you want to have a good plan…NIH has a soft policy for all but the really big projects. People who have large-scale projects from NIH are the best. They really do a great job. They care…I have colleagues who run these big NIH- and NSF-funded projects, and they'll compete over who has the most secondary work using their data…There's really competition because it's money in the bank. If your data are used widely it's a very important way to show that your project has value for continuation.
>
> I have to admit, as a graduate student, I haven't thought too much about data sharing. Obviously, historians do that all the time, archive their interviews, archive their documents. People who do survey research or run regressions and stuff like that, a lot of times the data that they use to even run those regressions are public anyway. So people create their own and then they do definitely publish it in political science. The survey data stuff, if it's funded by some national foundation or research institute, it gets published. A lot of people don't publish survey data until maybe after the book comes out. I hope to do some surveys later myself, and I probably won't publish the data until I've published results…You need to explain your research design, where are you getting this stuff, but it's different from when you're using some existing data set. I think some people share their data sets, but I think part of it is because they have either created it and they want people to use it, or it's a data set that's publicly available anyway—you just have to purchase it, but they decided that, "Well, now I'm going to let people use it for free."

Data preservation

One of the fundamental challenges in political science is preserving and creating access to large amounts of diverse data (including speeches, polling data, survey data, documents, media, and politically oriented webpages), particularly as scholars retire, leaving a lifetime of scholarly work. Concern about data preservation is amplified in the case of digital data. Several scholars cited the need for institutional repositories or a robust centralized infrastructure—similar to the networked research environment currently in place in Europe—for data preservation.

> What we need a lot more of is archives. We've got some with polling results, but there's a ton of polling data out there that's never been put in an archive, and it would be great if somebody had the resources to do that.
>
> There is one database...and the original information was collected 30 years ago by people on this data project. We can't find the original sources, and it's very hard to figure out what happened—records have been lost over time, so some people set up a wiki: "If you were an expert in X history and you knew something about this crisis, please put up your information." And they built a little more fleshed-out database of some knowledge on that. But that's really rare. We don't see wikis very often.

Preservation is a challenge unless you're in the preservation business. I worry about preservation for all these things. I worry about preservation of all these digital materials, that they're not getting scooped up and saved.

A scholar came to us about two or three years ago…and said, "I'm getting near retirement. I really don't want this data to die when I retire. It's important to me that people continue to use this resource." This scholar gets thousands of hits a year because people want to look at this incredible data. S/he said, "What can we can do?" The trouble is, right now, where do you get the money to support this enterprise?…You can't preserve everything probably, but there are some things you should…I think it's a really dangerous thing because there are always faculty members gathering wonderful data sets. But what happens when faculty retire? Now you might argue that the library should be preserving data. Somewhat true, but the trouble is libraries are often not technically expert enough. And, furthermore, they don't have the funding for that these days. The IT department has the technical expertise but, frankly, doesn't have a clue about research kinds of things, whereas libraries have had collection specialists, historically. We need to think of an institution that solves this problem…What we need is institutions like collection specialists and libraries who keep collections alive by saying, "We ought to keep getting that newspaper. We ought to keep getting that ephemera…whatever…I'm going to look at the book lists and figure out which books we keep." And we need mechanisms like that in some of these reserves. It's daunting. I'm not saying it's easy. I'm just saying we've got to do it because otherwise we're going to have a situation where we're going to be losing important data.

The real problem is: it's a collective action. The best thing would be if another institution put on a huge program to digitize and preserve the digitized objects of lots and lots of things, and we can take advantage of it. The question is: who should do it?…If you just let it sit, it disappears…That's the problem with digital data: they so easily disappear because the technology has changed. There are lots of ways of trying to overcome that, but it turns out to be very expensive and not easy to arrange. And so that's a big problem for libraries and it's a big problem for information that originates as digital, like server research responses. Now that's a problem that's going to last for a long, long time.

I think there need to be interdisciplinary groups that cut across domains: scientists, computer scientists, and more broadly speaking, data scientists or information scientists, who can work together…What we need is a real understanding on the part of the scientific establishment that we need very significant resources for this if we're going to get results from it…The Europeans in this area seem to be way ahead of us in terms of their willingness to invest in this kind of infrastructure, led by government agencies. The European Social Science Data Archives, they have a two-million-dollar planning grant to plan the future of their activities, and if they get the real grant, it's going to be 30 or 40 million euro, so almost 50 million dollars, to build an infrastructure. And that's just in the social sciences. We have nothing along those lines coming down. NIH and NSF—and I sympathize with them—need to have a way to find the resources, if they think that this is important, of preserving and sharing data and building the infrastructure.

P3.5 New Technologies for Sharing

Although some scholars read and write blogs, they are not considered a typical means for disseminating scholarly work. Social networking sites for scholarly purposes were not reported as being used.

Blogs

Reading blogs

While some political scientists read blogs, others do not, citing a lack of interest or preferring to get their news from journals or newspapers. Some senior political scientists with cross-disciplinary interests have expressed high regard for blogs in other fields, like economics. There is also growing interest in blogs as objects of academic research, particularly among scholars interested in political media and new tools for political organization. If research is picked up by a blog, it may garner more hits and interest than that harnessed through more traditional venues.

> I read blogs and, increasingly, you have to pay attention to them…The one that's probably the most important is run by a man named Jack Balkan. It's called Balkanization and he's a con law professor at Yale Law School. There are a couple of others…There are a lot of law professors who are running these things…There are a number of political scientists who write for Balkan's blog…I think what happened was that the listservs got really clogged…In a funny way, blogs have served to re-establish an elitist hierarchy, because the listservs were open to anybody, but blogs are mediated through the blog master, and so, as a result, as more and more people chimed in on the listserv, the more famous people disappeared, and now they've all re-emerged on the blogs where they don't have to be bothered with the thoughts of people that they don't know or care about.
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> Blogs are unreliable and they're dependent on the taste of the people running the blog, which is usually questionable at best. Within the last year, a political science research blog has started, where the bloggers will highlight something they recently read that was interesting. I check it out from time to time and I usually think they have terrible taste…One blog about scholarship, as opposed to a blog about politics…is a lot more interesting to read…the Monkey Cage. They're a little bit different. They're not necessarily the core of my field.
>
> Some colleagues of mine have blogs, but…I'm not that interested in knowing what so-and-so thinks about X—this person wakes up in the morning and writes whatever…If that person is a friend of mine, I'd probably be talking to that person and willing to read the blog. If that person is not a friend of mine, I wouldn't be interested, I would be interested in the scholarly work that that person produces and that I would find in the journals and in the academic conferences and in these other ways.
>
> I don't really read any blogs regularly. I have a blog that my students and I organize, so I do look at that one, and some of the ones that are linked from there, but only when I get bored.
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> Some of my colleagues read blogs all the time. I don't do very much. I usually read about them in the paper, but I don't really go on the Internet. I'm not a blogger at all, and I rarely go on there to look at anything. If I do, it's for the *New York Times,* which is really very limited.
>
> Once in a while, I go and look at blogs. I know there are people devoted to them…I know there's a blog out there that I am told talks about political science, and I'm told that sometimes it has comments about me, and they're reported to me. But the truth is, I wouldn't even know how to get to the blog. I assume with a little Google searching I could find it, but…I don't even know exactly where it is…That blog—I've at least been told and I'm willing to believe it—has got a lot of gossip on it…I would actually go to Brad DeLong's blog if I know that I'm going to have a reporter coming in and asking about politics and economics. So I'd go

> and I'd maybe read what he's saying about what's going on in the economics sphere so I can relate it to the political stuff, because he's very clear and lucid.
>
> Now I'm interested in blogs as an object of study…Because it's clear that they've had an impact on politics in a big way, and so I'm very interested in the kinds of impacts they've had…There's a story on a blog about some event that's supposedly occurred in a particular candidate's life. That can have a big impact on that candidate. So they're very interesting from that perspective, stuff that only used to end up in *National Enquirer* now ends up on blogs and then gets passed around universally, and therefore it can make an enormous impact even if it's totally false.
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> Well, strangely enough, I've spent a lot more time reading the economics blogs lately, because I'm starting to think that, whether it's true or not…as a politician you can say a lot of things, you can promise a lot of things, but, at the end of the day, if the economy won't support it, it's not going to happen, right? And especially in the United States, maybe even in the UK, because that level's pretty high, we're coming to a point where the nature of the economy and the debt are such that politicians are going to continue to make broad promises, but they're not going to be able to meet most of them. So what they're saying is not as important as what they're going to be able to do. Hillary Clinton says, "Well, we're going to put a freeze on foreclosures." Well, okay, fine, you're going to put a freeze on forecloses. What does that mean? It means absolutely nothing. It sounds nice, a lot of people can say that's a good idea, but all it means is you're going to do a lot more foreclosures before, and a lot more foreclosures after? And for 30 days you won't do any. So what? Should I spend a lot of time thinking about that or should I look at the nature of the process they're trying to influence? I've chosen the latter.
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> I would never have predicted that blogs would be as serious as they are. I thought anybody can set one up and send out some messages, and who's going to pay attention to them? There are 20 million people doing it, and they would all drown in each other's noise. It is happening and it isn't. You read about these things in the paper and you know that they're somewhat paid attention to. Enough people are putting real effort into it that people are taking them seriously. And I would not have expected people to do so.
>
> I don't follow any blogs unless somebody emails me and says, "They're talking about your work on such and such a blog." And then I'll go read it, but other than that I never read blogs.
>
> I don't read blogs very much. It's not what I do. I think it's another generation, younger.

Writing blogs

Blogs are not considered a typical means for sharing or disseminating scholarly work, although political scientists mentioned some instances—such as election periods—when scholars may blog about contemporary issues. One scholar wrote blog posts dependent upon personal "time and inclination." Writing a blog in political science, however, is still viewed as outside the realm of scholarship, a distraction from "real" work, and is generally considered an extramural activity. Although some senior scholars noted that blogging is a generational phenomenon, the pre-tenure scholars were no more likely to read or write blogs for scholarly purposes.

> Come to think of it, some political scientists are now getting very involved in the election blogging, I believe. I believe that is going on quite a bit now.

> The world of blogs…for one reason or another has never caught on with me…I can think of some people, quite prominent people, who have blogs…but I would say that, in general, I see blogs as a hobby. Some people like going to the gym, some people like going cycling, some people go to the opera, and some people write blogs.
>
> I guess blogging is more relevant for other people's research. I find myself thinking more and more about Marx's stance on these things, that a lot of the current events–type discussion about politics is noise. It's—from my perspective, from my research agenda—stuff that sort of wiggles things around a little bit from day to day but doesn't really tell you what the important trends are. Because it's so much into the trees that it doesn't see the forest. And so, I'm interested in it, but I try not to spend too much time on that because it's going to distract me from what I'm trying to do, which is understand the process at a more fundamental level.
>
> As far as blogs are concerned, it's the world. A lot of young people are doing it…I think there's a world out there where you can say your piece a lot more easily than you could a few years ago, but I think people see that as a separate enterprise than what's going on in their professional arena.
>
> In terms of disseminating and how we share work with each other, there's nobody in my field who has done what Brad DeLong has done, in deciding that the best way to disseminate his work was to do it on the Web…I think it was a very courageous experiment, really. And it's worked for him. It wouldn't work for everybody…I think sometimes engaging in real-world, relevant conversations can help you frame problems in ways you would otherwise not frame them. But, there's still a lot of hesitancy to do that.

Social networking/Web 2.0

Social networking sites for scholarly purposes are virtually nonexistent among political scientists at this time. One pre-tenure scholar doing work in an emerging field, however, recently began using Facebook, but noted that senior scholars were nearly absent from this platform. Another found his/her university's Web-based teaching and communication site to be useful.

> It builds community among people who study in the same subfield. Even before technology, some departments or disciplines are good at that and some are less good at that. In the social sciences, and specifically in political science, it's a very individual sport. We're not in labs where we do work with other people, and so I do think building community is always a good thing and especially now—technology definitely plays a role in helping people do that. So I actually don't think it's a bad thing. Maybe it will become practice if people use it more often. It's a circular argument. But it is true, right? If people use it more, then it becomes more acceptable and then people will use it more often. So I do think it will become more acceptable and people will use it more often.

4. HOW DO YOU COLLABORATE WITH OTHER SCHOLARS? AT WHAT STAGE OF RESEARCH?

Political science, a traditionally solitary discipline, has witnessed a rise in collaborative research focusing on increasingly complex multidisciplinary questions. Motivations for collaboration vary, including a need for diverse expertise and access to data and technologies. Collaborative relationships are often forged from graduate school connections or from encounters with scholars at conferences and seminars. Data-intensive research frequently involves the use of mixed

methods that may require sophisticated computational analysis and GIS applications. Evaluating individual contributions in team-based research, including technical support, is a growing challenge. Political scientists, in general, seem wedded to traditional mechanisms for collaboration; face-to-face interaction and email are integral for maintaining productive working relationships.

P4.1 The Nature of Collaboration

Collaboration is not integral for scholars in political science, though it is a growing trend. Political scientists frequently converge around complex and broad-ranging questions that require diverse expertise, data, and technologies. Although some research simply does not lend itself to collaboration (such as in the more humanistic fields of political philosophy or theory), team-based research is very common in the quantitative arms of the field, and is increasing in American politics, international relations, and comparative politics.

> Historically the way that research in our community was done is that it was always single-authored, and that's been relaxed recently because of the increasing complexity of the methodology that's being used. People are having trouble being good at so many different things…You see probably a third of the papers, maybe 40 percent of the papers, are multiple-authored now, maybe even a half.
>
> In the political sciences in general, rates of coauthorship have increased, I think by 700 percent in the last 50 years. Political methodology is probably one of the most collaborative…It's the most scientific end of the continuum…If you go all the way through the humanities to the sciences, you steadily increase the number of coauthorships. Research becomes more collaborative, more interdisciplinary, and larger scale, and it just becomes infeasible to do it by yourself.
>
> Collaboration seems to be a necessity, in part because our field has moved toward efforts that come to draw global conclusions and to collect better and more broadly based data. If you do that, then there's a real advantage to collaborating. The same is true with faculty who are working on new quantitative methods where people have different parts of the skill set, so collaboration can actually help a lot…We have people collaborating with other social science departments…There's a premium on having better data and more information. It takes more than one person.
>
> For the kind of projects I do—large empirical projects—you just have to collaborate…I have collaborators all over the country. You name it…I have people I collaborate with in other countries as well, but mostly they've done surveys for me but have not actually written with me. There's a little bit I've written with them, but mostly there are a few who I've worked with to help collect data.
>
> Collaboration is pretty rare in political philosophy. It's very common in methodology. It's pretty common in American politics and comparative and international relations. There was an article on coauthorship in *PS*, which is a sort of "news and notes in political science," on the subject of collaboration and coauthorships.
>
> I do an enormous amount of collaboration, and, increasingly, more and more people are doing that. It also depends upon what subfield. The theorists tend to be the least collaborative. I'm not sure why that is. By theorist, I mean people who do Aristotle, Plato, Hobbes, Locke, that kind of stuff. You also have theorists who write mathematical models. That's a different kind

of theorist entirely. The old-style theorists seem to all have their own particular take and they talk about it on their own, and that's their approach.

I've done very little of what I would call genuine collaboration…It's not something I'm opposed to, it's just that I've done fairly idiosyncratic work and so it hasn't really lent itself to that at this point.

P4.2 How Do Collaborations Arise and How Are They Sustained?

Informal networking drives many small-scale collaborations. Collaborations may develop out of graduate school relationships or evolve from meeting other scholars at conferences and seminars. Many scholars are motivated to collaborate because it is "fun," "interesting," and time efficient. In some cases, ideas—often not very well developed—are "kicked around" with trusted colleagues. Despite its benefits, collaboration can be challenging in the face of conflicting work schedules and work habits.

I do collaborate, but it's with a fairly tight network of friends.

I tend to favor working with people who I can talk about the ideas with. My personal style (and this is also reflected in the fact that I coauthor a lot) is collaborative. I like to talk to people about stuff. I don't want to squirrel away my little nuts here in my office and huddle them to myself and then unfurl them on the world when they're all done. The ideas are the interesting part and talking about them with people is the interesting part.

Sometimes the best coauthor is somebody who knows something different than you. Sometimes the best coauthor is somebody who knows the same things as you and can give you feedback on a very hard problem…And also, it's more fun. It's more interesting. You get feedback about things.

I coauthor with other scholars because it's usually an efficient way to use my time. Ideally what I would do is: I care about a project for the first two drafts and after that, it's drudgery. And I find that I have a better time if I can coauthor with somebody who's better at finishing things off…usually in a couple of different disciplines. There's just so much to do. I feel like I'm not going to run out of topics.

You have some great idea, some theory, some hypothesis about X. I think I have a way to test it. I've done a number of coauthored things, and…I tend to be a little better on the methods side and my coauthor tends to come up with great ideas and ways of framing something to be really interesting. So I can look at something in the results and say, "Gee, isn't this funny?" And my coauthor says, "Oh, that relates to this thing." So there is some…I don't like the word "synergy," but some complementarity of what we what both bring to the table. There is a lot of emailing papers back and forth. And, for a couple of regular coauthors and me, by the time our papers are done now, we don't know who wrote what at the end.

I collaborate a lot. It depends a little bit on the coauthor. I have a couple coauthors who I'm very, very close with and have known since graduate school…We will send each other the smallest, silliest little ideas in an email, completely half baked, and just kind of kick it around, and almost always nothing happens. Occasionally it's really cool. Those are people you talk about the inception of the idea with. Other people who I'm not as necessarily close with personally, it can be more of a *quid pro quo*: you have data and I have an idea of something to do with your data. How about we coauthor a paper?...That's another way to do it…my colleague and I were just together one day and I said, "I have a wild hunch…How hard would

it be to do a statistical study and see if that's the case?" So that's how that one got started…I've coauthored with a bunch of people, some of them at my own institution, but more commonly people who are not at my own institution. Although most of my coauthors are people who have been at my institution at one point or another and I got to know them well. Sometimes it started when we were both at this institution and sometimes it just happened later after the other person had left…And later there will be some comparative advantage, I'll do the theory and the other person will do the stats, or I'll do the cases and the other person will do the theory, or something like that.

My coauthored works have arisen in a lot of different ways. Once I had a graduate student who wrote essentially the same paper that I wrote—his was a term paper and mine was a conference paper—and we had the same argument, only the theory section of his paper was really good and the history section of my paper was really good, so we decided to staple them together and double the quality of our paper and send it off. And other ones grew out of dissertation advisees, whose projects were related to an interest of mine, but it was the case that they knew a lot about the topic, whereas I had some theoretical or policy question that I wanted to work on that was loosely related to their dissertation project, and then we started working on a spin-off article in collaboration. So it works in different ways.

Collaboration…is not a piece of cake. You have different work habits, you have different questions. I've benefited because somebody at a top research institution has technological skills that I don't have. I have some conceptual skills and theoretical skills, and so the book is sort of twice as good technically and twice as good conceptually because the two of us are doing it. So when it works, it works very, very well. But then we can be on very different schedules and one can have a leave and is ready to sit and write, but the other is overcommitted, and so collaboration is tricky.

P4.3 Judging Multiple Authorship

Until the reward system is sufficiently nuanced to judge multiple authorship, evaluating collaborative research is a challenge. While ability to work independently remains essential, credit for collaborative research is attributed to scholars who can identify their creative contributions to the work.

I've seen efforts to put percentages on individual contributions and we sometimes do that in our own tenure cases, but, almost inevitably, the percentages add up to more than a hundred. If I were looking at a C.V., I would always want to see some single-authored papers, because I think the contributions that a person makes by themselves are essentially different from the contributions they make in a group. So the full measure of the person I can really only get from at least some single-authored papers…I think the counter-argument that things have become so complex that we have to collaborate, yes, there's some truth in that, but still I think somebody who is an active collaborator can still, every now and then, sit back and distill from the collaboration something that becomes that person's own personal contribution…Then publish it.

With respect to tenure and promotion, what I keep an eye on is: does this paper fit in naturally with something that is uniquely mine, with a set of ideas that are uniquely mine?…I don't coauthor with people on their stuff…the reason being I can't connect it to anything that's mine. I can't connect it to a stream of ideas that I will write in my own tenure statement as, "This is my contribution." It's been reinforced by people who I've talked to many times that coauthoring isn't necessarily a problem, as long as you can identify your own contribution to it. If you are just the serial co-processor for other people, that's not going to add up to tenure… I know a guy who got denied tenure last year. He had several publications in the top

three journals in the field, but nothing was on his stuff so you can't say, "Well, he checked off all these boxes so he gets the prize." It doesn't work that way.

It's only a problem if people have coauthored with the same person for a long period of time, or they've only coauthored with someone much more senior than themselves. So you just explain to students that you've got to have some stuff on your own and some stuff with sets of authors, and you're fine. There doesn't seem to be much of an issue.

Evaluating coauthored work can be a bit of a challenge, but whenever faculty members are reviewed, they are asked for a statement of, "What did you do on this project?" And you can also talk to the coauthors. So it can be a problem for some people doing the evaluations, but, pretty much, it's recognized that coauthorship is just a fact of life.

Multiple authorship is quite rare in my subfield. That said, I think every article I've published has another author on it…I've gotten some pushback against that…People in my department, the budget committee, one of the letters was, "Why all these coauthored publications?" despite the fact that I clearly explained that in my note going with the thing.

We have a standard line that people put in there when they're writing tenure review letters: "Professor X has five sole-author publications, and five coauthored publications. This is typical in our discipline and I can see Professor X's contribution in those five coauthored papers because they all use this technique, and Professor Y is known to be an expert in something else." So I think it's quite common to have multiple authors. When we do citation counts and journal counts, I don't know what our rules are now, if we're supposed to count half a publication if you're a coauthor, I'm not sure. I don't think it works that way. I think the coauthored publication can take just as much time as a single-author publication, but the other person is bringing something to it, so that presumably it's a better project than it would have been with just one person.

Judging technical contributions

As collaborations grow in complexity and size in political science, technically savvy (often young) individuals provide much-needed support in data collection and analysis. While such contributions may be central to the success of a research project, they are often viewed as "support" rather than "scholarship," particularly as they frequently involve collaborating in the "mechanical" aspects of the research, rather than in coauthorship.

This is purely definitional, organizational, and political…Someone who is the best mathematician in the world might seem like a plumber in the sociology department, and that's an issue. And it's a big issue…But getting everybody's respect within the group is a complicated thing. It's not just that the technical people have a problem. Sometimes it's the non-technical people. It just depends on what's available, like, "Is there a department of what you do?" I understand the issue that you're raising in biology and a lot of these fields. There are people who…they run big machines. And you could only have a very high-level individual running this big machine, but a faculty member in that field couldn't get tenure running the machine. So then they have these alternative career paths, where they're something like senior research scientists.

One thing we don't do, actually, that physics does and I wish we did, is we don't necessarily give credit in our papers to people who collected the data.

It's like many other areas that straddle disciplinary boundaries and become edge objects, if you like, and have complex relationships with a number of disciplines…The arguments are

usually along the lines of whether GIS is a recognized part of the core of computer science to which people could contribute in pursuit of tenure, or whether it's an application.

Intergenerational coauthorship

According to the American Political Science Association (APSA), the "asymmetric" rank between graduate students and faculty, and between untenured and tenured faculty, can lead to young scholars being assigned inequitable credit for their scholarly contributions.[103] While publication credit is not well clarified in the field, many scholars are generous toward their younger colleagues.

> Those are my graduate students, and I felt part of my job was to help them advance their careers…The way I treat it is, if I have a graduate student who works with me on a paper—it's usually graduate students working with me on a paper—and they do anything more than the very minimal research assistant work—they contribute a thought—then they get coauthorship, because that's what counts in my field, to have their name on things. From my perspective, there's no cost to it for me, and it's to their benefit, and so…that's my policy.

> The person who is making the claim for promotion needs to be honest about explaining what their role has been. I think it's perfectly reasonable to say that a junior person wasn't responsible for the underlying funding and the ideas that led to the project, but they did make important contributions to the writing of the papers. You see that in fields like history and sociology, where they're first author…The politics of how academic appointments work here…are every bit as weird as they are everywhere else. It's hard to make sure people's careers advance properly…There are a whole bunch of people who work very hard on behalf of things that I think are important, whose careers are not necessarily advancing as well as they should. It's really hard, and my advice to everybody is to get as much publication credit as you can. I'm always inclined, if at all possible, to be number two, not number one, so that the younger people get as much credit as they can, if it's right. On the other hand, if I'm the one who's done 90 percent of the work, then I need to be responsible for it; then they're number two. But I try to be a fairly generous colleague.

> We tend toward multiple authorship…We tend to give equal credit to our graduate students, more so than in the medical sciences or the biological sciences…And, furthermore, we tend not to necessarily presume that just because something was done at our lab, that you get credit and get your name on it. That hardly ever happens in political science, where as I understand it, it happens at a lot of other labs—the head of the lab gets his or her name on the publication, even though he or she has done essentially nothing but help raise money for it…I do a lot of collaborating with graduate students in this center because this is a lab, basically. The way people learn how to do the kinds of research we do here, is that you sit with them.

> I collaborate a lot. I try to write with graduate students because I think that's the best way to teach them.

P4.4 Mechanisms for Collaboration

Some political scientists noted that progress in collaborative relationships requires face-to-face meetings, although email, in particular, facilitates global collaborative research. Circulating a Microsoft® Word document using tracked changes is a predominant mechanism for coauthorship,

[103] Chandra, Kanchan, Jennifer Gandhi, Gary King, Arthur Lupia, and Edward Mansfield. 2006. Report of APSA Working Group on Collaboration. American Political Science Association, August 9. http://www.apsanet.org/imgtest/CollaborationReport08-09-06.pdf

although an increase in the number of authors involved in a project can complicate the writing process.

> So the physical work of collaboration typically will involve face-to-face meetings throughout the process, but intermittently. It generally takes a face-to-face meeting to really get the project rolling. But most of the process is by email and occasional phone calls.
>
> We email all the time, we talk on the telephone, but we never really make any interesting intellectual progress unless we're sitting in the same room together, face to face…It may be psychological. It may be that you can talk much more rapidly. I don't know, but all of us agree to that. Now it may also be generational. Kids these days can do anything on their cell phones or certainly on the computer that people of my age, psychologically, just don't do. But face-to-face communication pleases me very much, because I don't want everything to become electronic. I like the interaction because we're working together and we're friends and we gossip, and it puts it into a social context, but a context that does foster creativity. I don't really know if it's generational. I think a little bit of each. Early on, the telephone was thought to be for business purposes…but now the telephone is a means of communicating the most important, deepest personal thoughts…So maybe the next generation will text message each other and not see it as different from sitting in the same room, which I think would be terrible, but who knows?
>
> I've done collaboration, back in the old days, by fax. Believe me, that was not good. Having email is a huge advantage in collaborating with people who aren't physically at your own institution. It's not absolutely necessary, but, when email came along it made it hugely easier to coauthor at a distance. Any other technology that you could name I think would make no difference whatsoever.
>
> I can't really imagine how people collaborated before email. I spend more time in intellectual discussions with people halfway around the world than I do with the people next door. And so in my virtual community of colleagues—and I think most active scholarship is like this now—you're in a department, you're with 40 other professors, and you meet them occasionally…I see people in the hallway and say hello…but mostly I have colleagues around the world…I talk with them on the phone, I talk with them or write to them by email, and we exchange papers back and forth electronically.
>
> Well, definitely, you send documents over email, very similar to how I would go about this with my committee—documents over email, tracked changes. I'm sure there might be something, some newer technology out there, but that's what we do.
>
> We use now a lot of email, a lot of telephone, a fair amount of in-person meetings…I would say the one dominant thing that's changed everything has been email. It has just changed. It's so easy to send a draft back and forth to comment on it, and then to follow up with another email or a telephone call. It's made it really, really possible to do that.
>
> We share data, we send more emails than you can imagine. We sometimes actually get the same data up on the screen, on the East Coast and on the West Coast, and talk about it. Technology really does facilitate collaboration greatly.
>
> It's extremely rare to have more than three authors on a paper. It's usually two or three. And the reason is that every additional person creates exponentially more need for communication to get anything done. I have a project now with four authors on it. It's much harder to write that paper because everything has to go through this quorum process and the value added is

> not all that clear, because once you get two or three people on a paper, if you haven't covered all the bases in terms of the research skills that are needed, it's very unusual.

Few scholars mentioned newer communication technologies, such as instant messaging services, as a means to aid collaboration. The graduate student we interviewed used Skype and chat services, but also expressed concern that communication technologies required self-imposed controls to avoid wasting time.

> We don't do much chat. We don't do anything with something like Facebook. Skype's a telephone system so that's just another form of telephones.

> The person that I am going to be collaborating with…we had a meeting over Skype, because my colleague was in a different country…I was always an emailer for a long time. I got into chat only because Gmail and Skype had chat. But even then, it's not always on…partly just because I need to get work done, and, also, it's just not my practice. But I do know that people in my generation, some of them got really into that early on because of ICQ and AIM. I would advise younger scholars to definitely use it. Why not, right? But, like any communication, it's like the cell phone: If you needed to work, just don't answer it or don't turn it on. It's the same thing with chat and email. I think it's easier to avoid email until you have time, but if you're on chat and you put yourself as online, then people expect instant responses. So there's nothing wrong with that if you have time.

Wikis and shared workspaces

There were instances in which wikis or shared workspaces were used, especially for large-group or data-intensive projects. Although wikis are used for sharing ideas and data, scholars were unenthusiastic about wikis for coauthorship of text. Limited wiki uptake was explained, in part, by user incompetency and the absence of a "curator" to assume primary responsibility for the everyday running of a wiki.

> We use a little bit of wikis in some of our projects…More for thought process and discussion than for writing. Writing, we more often do the shared workspace thing…Almost everybody is using shared workspace products of one kind or another. There are a lot of different things on the market, but there are shared workspace services that work quite well for us and others.

> There may be people in other fields who are doing larger group collaborations with collective data sets where they have more exotic ways of sharing and working together on things. I did a project where we did a group document that involved a website where we wrote drafts, we had access to everybody else's drafts, we had wikis, we had face-to-face meetings, and it was a pretty large number of people working on the document all at the same time, and what we wrote was a big mess…I think that those technologies were conducive to making it a big mess rather than conducive to making it coherent and good…The problem was that it was too decentralized. There was no single, coherent intelligence that was really in control of the process. And it was kind of anarchical…I've done all of those things…I really hate the wikis and the tracked changes. I find that not only am I incompetent in using them, but also that other people are incompetent in using them, and that people have better things to do with their time than to blog onto wikis. If you send them an email, it's in their face. When they're doing their email, they'll reply, but if it's one of these group-oriented things, people just don't do it in my experience.

> Wikis, for example, don't help most of the ends that people are working on. But if they did, if it was appropriate for some project, that would be perfectly fine.

Some scholars saw exciting new possibilities for the future of collaboration, though more training in using new technologies may be required before scholars can make full use of them.

> I believe that our mechanisms for communication—this sounds trite, and I don't think I can give it in words—and collaboration are on a really rapid path to improving. For people who make use of those things, and I think there are a lot of them, there's going to be lots of opportunities to do more research, to do more publication to get the word out better. I think that we're really looking at very interesting and exciting times.

5. WHAT DO YOU NEED TO CONDUCT YOUR RESEARCH?

Political science is an interdisciplinary, heterogeneous, and multi-faceted discipline with an array of subfields that embrace different epistemologies. Scholars in political science engage in mixed research practices and rely on a variety of primary and secondary sources, and tools and technologies. Although advances in quantitative methods and computation are enabling scholars to collect and produce new kinds of data, there is an increasing need for tools to synthesize this body of information. Across the field, political scientists depend on their institutions to provide training and technical support.

P5.1 What Do Scholars Do in Their Research? How Is What They Do Changing or Not?

Research practice in political science

Resource use and data generation reflect the wide variation in research practices among political scientists. Data collection involves, but is not limited to, survey, archival, and ethnographic methods. Data can be drawn from governments, international organizations (such as the UN or OECD), membership-based organizations (such as ICPSR), private foundations, universities, the private business sector, and individual researchers.

> The social sciences are undoubtedly the most heterogeneous group in the university. You have everything from data-free formal modeling, through econometric analysis of quantitative data sets, through case studies and comparative case studies based on documentary and interview evidence, to postmodernist political theory and social theory. In the social sciences, there is no single methodology or, for that matter, epistemology. It's all over the map. The only ones who don't really need data, if by data we mean evidence, are the pure theorists who are making logical arguments, whether that takes the form of a formal model that they, in turn, manipulate mathematically, or whether it takes the form of postmodernist exegesis that propounds a theory. That doesn't even have to be postmodernist. But for all the rest, the people who do quantitative analysis are seeking data sets or seeking to construct data sets based upon survey research, based upon existing data sets that aggregate all kinds of demographic and other information, those kinds of data are used very heavily in the quantitative areas of political science—for the most part, American politics, but some comparative politics…Then you have the case study approach, which sometimes is called qualitative data, which is usually based upon archival research or ethnographic research, documentary studies, interviews…That is the norm in much of political science…And, finally, you have the postmodernist trends, which you will find within…small parts of political science.

Archival research

Scholars in traditionally qualitative subfields (such as comparative politics, public law, political philosophy, and political theory) conduct archival research through the close reading of texts, including newspapers, historical documents, archival manuscripts, public records, speeches, interviews, etc. Information and communication technologies are increasing online access to diverse resources, such as multimedia archives of audio and video recordings and international media.

> Yale has an enormous thing called the Avalon Project, which has full-text, searchable, original documents from Magna Carta to yesterday. The congressional record is completely searchable. So, for the type of work I do, technology has been essential, but it's a fairly simple amount of technology.
>
> I'm using a much broader set of sources than I had in the past, much broader. If I were to open up my folder for stuff I've been doing…you'd find things that I never would have had access to a few years ago, English translations of overseas daily newspapers, data stuff that comes not only from other academics, but from institutes…just because I can.
>
> Most of what I do, which is primarily text and historical documents and public records in the public domain, the Web is phenomenal and it's pretty accessible…I'm almost 98 percent text.
>
> The access is just amazing…There's no way I could have possibly written the book that I did in the time that I did without online access to material. It's material that is particular to that book.
>
> There is an archive, for example, called Oyez, Oyez, which is about the Supreme Court, and that's an extraordinary place. You can go there and get the text of opinions. You can get who voted how. You can get the audio of the oral arguments, all there organized for you. The archival newspapers, some of which now are being made available through Lexis-Nexis, and some of the Pro Search, whatever it is, those are incredible resources for a lot of what we do…I don't have to go to Washington the way I used to have to go to collect data. I just go to the Web and it's amazing how much of this stuff that I, otherwise, would have gone to Washington for…Well, they've now put that up online in PDFs. And so, I go and look at PDFs and take the data down from the comfort of my computer, or my research assistants do this.
>
> There is a video archive at Vanderbilt of the television news since, I think, '64. There's advertising data at Wisconsin that people are archiving, and they're also archiving all the information…this is really neat. They get all the satellite data…When you buy advertising time these days, it's typically all determined by satellite… messages that go to satellites that broadcast down to the local affiliate and that determines which ad goes on at which time. So if you have all these data, you can literally track every advertisement…which advertisement and at what time it was put on at which affiliate. And so you can then…track political advertising, for example. You know that in Des Moines at 4 o'clock in the afternoon they show this advertisement, so that's pretty astonishing.

Selective digitization

The scale of digitization of many archival materials has increased remote access to primary sources, although traveling to the archive remains essential for many. As in history and other humanistic disciplines, the selectivity of what is being digitized is a concern for some, since research may focus on digitally available documentation sources.

> I think the biggest concern with the digital is…that it really skews research to the things that have been digitized. But, to the degree that I need original materials, it's either still accessible in the libraries here, or I do occasionally have to go to the Library of Congress or the National Archives in Washington. And then with the comparative work, that hasn't really been digitized. I did some work on another country, and I had to go and read in their library there. In terms of preservation…it's in pretty good shape…But what I'm concerned about is that there'd be just enough digitized that you would not make the extra effort and you'd miss a lot…I think it's still the case that digitization efforts are going to be selective and it's going to therefore skew what gets worked on because it's so much easier to sit here and do it than to travel there…I have confidence that, ultimately, the US will put everything that it has online, but I'm not so sure about Third World or developing countries, both because of resources and because there may be some political choices being made about what gets up and what doesn't get up.
>
> I think there's probably less archival work. This is actually a big criticism of our field from some people who do more qualitative work, which is: it is very easy to download a data set on, say, wars, and run some analyses, and not have any feel or sense of what was really happening in any of these cases. And, because I haven't gone to the…archives and I haven't done this, that, and the other, I really can't have any sense of what a key political figure was thinking during the war, whatever case you might come up with.

Hybrid and quantitative methodologies

Political science has a strong methodological and computational component that can stand alone or be used in concert with the more traditional qualitative approaches. Large-scale data collection efforts are widespread in the quantitative arms of the field, such as international relations. Scholars produce their data, for example, through survey research, or rely on existing online data sets, such as the Correlates of War Project. Political scientists frequently use Google to locate data of interest.

> Let me give you the gist of what a typical project might be that we look at…We go through history books, we go through diplomatic history, we go through government records, we have data on alliances…We have data on the types of governments in each country, democratic, military dictatorship, something else. Those were gathered by going through histories of…different countries. There are a number of different major data collection projects around the country. At Penn State, they are the host of the Correlates of War Project, which has about 10 of these major data sets. University of Maryland hosts the Polity Project, which has information about government type and regime type in all countries around the world…Some of the projects have been funded by the National Science Foundation or other government funding…The Polity Project has gotten support from, I think, the Carnegie Foundation, and they look at a place like France and its government…They're scattered all over the place.
>
> Usually I use data sets that are publicly available or available on the Internet. When I do empirical work, it tends to be that kind of stuff. That partly reflects my own style of research, basically, but it tends to be stuff I can get on the Internet.
>
> I use data sets and try to keep abreast of what the data sets are that are in my field that are good ones.
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> If you look at that aspect of the work I do, the use of large data sets, it's not that difficult to find what you need very quickly online, and therefore you have a whole series of resources that are very easily available. I'll give you a funny story: It was about the mid-1990s, I was in Europe…I needed all these data sets, so to get them meant I had to call this institute at a

university in the States, saying I will need the data, and so they sent me the data, and this was a major production…on a floppy disk and all that, and now we just…use Google.

When I started, it used to be a very formalized system, and there were certain big archives of 16-track tapes and things like that at the ICPSR at Michigan and other places like that. And you'd have to go to a person on campus and they'd request data and it would be sent and come in two weeks or six weeks or whatever. Now, everybody's bypassed that. All the interesting stuff is online and you can download it, because that's one way that technology has dramatically changed this process. If I want a data set I can Google it and find the data and download it and be working with it within minutes. There are certain archives, but really what their role is now, they're websites, and you know about them and so you can go there and it's convenience more than anything else. But even if people had them all in separate places, it'd be a matter of additional minutes instead of days or weeks. So now it's pretty easy to get the data.

New technologies for data analysis

Political science draws on a variety of social science and humanities disciplines and is bleeding into the sciences and information technology. Use of complex computational and quantitative methodologies in the field (including natural language processing, agent-based modeling, and field and survey-based experiments) is widespread, particularly following an increase in computing power. Tools to analyze burgeoning data drawn from multiple sources are needed.

I would say that the main difference between political methodology and other political science subfields is the sources of information that we have. Previously we would just read books that were recollections of government officials, and now the information available in political science and the social sciences more broadly is just spewing in. It's amazing how much information there is. Whereas, for 50 years, the main method of gathering information about people was the survey—random selections of people and you'd ask them a pop quiz and then throw them back in the pool. Now we have continuous time location information. I can put a little piece of software in your cell phone and it'll tell me where you are at all times, and I promise to protect your privacy. And there's another little piece of software that I can put in there that will tell me your mood based upon the tone of your voice, not what you're saying. There are electronic medical records. There are credit card transactions. There's satellite imagery. There's GIS. There's text information on the Internet. There are blogs. The amount of information that's becoming available is just multiplying exponentially. Figuring out how to store, preserve, analyze, extract information from, and find out what useful questions there are that you can answer with this information, is where we are going, I think…There are all kinds of sources…there's information on public officials, there's electoral data, there's some data on international conflict, there's data on blogs, there are gazillions of things.

It's hard for me to see what is really going to transform radically…In our research, where the technology has really helped so far has not been on the communications side, but actually on the substantive and methodological side of what's in those articles, that we can run statistical analyses and computer analyses now that we simply couldn't 10 years ago, because even if somebody imagined this particular solution to a problem, the computing power wasn't there to do it. Or you would have needed to do a supercomputer kind of setup. And now we can run that on the desktop. For a hard problem, it may take an hour, but it used to be a week. We have had a lot of methodological innovations on the quantitative side about statistical methods and data analyses and so on.

The incredible increase in computing power makes it possible to model things in a much more sophisticated manner. In fact, we haven't caught up to create the models yet that we could

> run using the power we have. And I see economists, statisticians, and computer scientists moving in, and I think that they have fairly naïve notions of politics, but once they get some of these things, that could be really interesting…The tricky part, sometimes, is knowing how to use it and, particularly, inexperienced researchers will use the data incorrectly or not use them as well as they could.
>
> I'm a quantitative modeler, so certainly I benefit from the computer revolution, and that allows me to do very easily things that 20 years ago would have required some nuclear physicist or whatever. So, in that sense, technology matters…On the other hand, if I think about the field of international relations, a scholar whose name was Chris Wright defined the study of international relations as the study of the causes of war and the consequences of peace. And I think that is going to remain the same. There will always remain the fundamental question that international relations scholars will try to answer…Computation has made a difference and I think that that will affect our *style* of research.

Natural language processing and data mining

The field has seen an increase in the "quantification" of archival work through the computational analysis of digitized political texts. Natural language processing in particular enables scholars to systematize and navigate large amounts of text, and several researchers called for tools to better synthesize such data.

> There is increasing interest in developing new technologies to analyze printed material or speech. Since there is so much text, something really effective has to be done to try to systematize it. There are different efforts going on now, some of them supported by the Defense Department, some of them more academically oriented, to try to process all the information that gets collected. Legislatures, for example, generate new material every day, and there are efforts now underway to figure out how to analyze such material. In the past, you sat some students down to code the material, or you did it yourself, and just went through all that material with a code book. But the amount of text available has grown dramatically, and hand-coding is not as feasible now. So there's more emphasis now on how to do this effectively. The computer scientists are interested in this…Of course, there may be problems trying to figure out the legitimacy of the sources and information, so data mining has to be combined with evaluation of the quality of the sources.
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> The problems with the growth of data are now you want to link it all up together and make sense of how it all fits together, and we don't have very good software tools for doing that.
>
> I don't do serious C++ programming or whatever, that kind of stuff I don't generally need to do, although it would be useful if it were easier to do…I don't have the time to invest in learning how to program in Perl, but I would love to have some kind of widely available Perl utility where I could just write a Perl script to grab text strings. But it would be really useful in many cases to do that, because you're looking at congressional hearings and there are strings of text you want to look for that appear in those hearings, but to automate that would basically make it possible to write a whole other string of papers that at the moment I can't write…Data mining activities are still very much sort of *sui generis*. There are people who do it in political science; it's just a little bit beyond my programming capabilities at the moment. It's a matter of what's the investment and what's the return? I've got enough stuff to do at the moment without digging into spending six months learning Perl or text processing in general, in order to make it worthwhile. Maybe some day but not right now.
>
> In some sense, there's no solution to the problem, there's just too much information out there. I think the more you can organize it, get some kind of a quality rating associated with

> it, it is very, very helpful…Basically what you want is the ability to sit down at the computer and say, "Give me a book on this subject," or "This book is here, tell me what it's about," so that you can then decide whether you want to read it or not. The computer doesn't yet do that, but some day it's going to, in a certain way. A lot of people are working on natural language searching and so forth. So I think that's going to play a big role in scholarly communication.

Visualization technologies

While some digitally innovative political scientists rely on visualization technologies to understand, analyze, and display their research findings, it is not mainstream practice; for some scholars simple charts and graphs suffice. Difficulties associated with mastering visualization may limit its utility across the field.

> Visualization technology is an essential thing that, if you have data, you've got to look at it, you've got to figure out what it is. You have to understand it. And visualizing it is one way of figuring out what's going on…I use visualization technologies all the time…All kinds of graphic images with color, and sometimes moving parts. We're always doing that…Either me or my students or a post-doc or staff…There's division of labor…If you have data, you've got to look at it, you've got to figure out what it is, you have to understand it. Visualizing it is one way of figuring out what's going on…There's a lot of division of labor. Some people are much better at visualization than others, and they can do it much faster than I can.

> I don't think there's any particular new technology, either GIS or visualization, that would make a huge difference to my research…perhaps the visual presentation of something, maybe there would be something that would be useful, but what I have at this point is so rudimentary—that's to say if there's any data, it's a simple graph or it's a simple set of facts.

> The tech-ier that people get with their graphs, the worse they are. Just to be utterly pedestrian: anything 3D. Terrible, just terrible, like 3D histograms, it's just a terrible development. You can't tell anything about what's going on with the distribution in that case. To use a graph to convey a lot of information is not for me, for the kind of stuff I do. It's not primarily a technological problem. It's a conceptual problem. To put yourself in the state of mind of someone who doesn't know the pattern, how can you get them the pattern to see lots of nuances, get the whole thing very quickly, but give them a lot of nuance so they can dig into it with some depth—how do you do that? That's not a technological problem. A computer can't do that for me. So it's conceptual, not technological…There has been a fair degree of disruption around how much should political science incorporate modeling. There are people out there who have strong visceral feelings about it. I don't possibly know why that's true, but it is. Probably the biggest issue is what will happen with that, how much of the field will accept a role for this kind of work.

> I've heard a lot about visualization recently, and it's intriguing to me. I think that there's great potential in this, but I think that the potential is very uneven. It'll matter a lot in certain areas. It's not going to matter a lot for most people and mainstream IR and political science's allied fields for a couple of reasons. One is: we have rotten theories and crappy data. So, you have a much more sophisticated way of eating oatmeal. So what, right? It's still garbage in, garbage out…So having better ways to see it, it's not going to work.

GIS and spatial analysis

GIS is an emerging tool adopted in political science over the past decade and quantitative geographers, in particular, have been key to spreading the "GIS gospel." The usefulness of GIS can depend on the subfield and types of questions asked. For example, GIS is particularly valuable for scholars working with electoral data, and war and conflict data.

> I think increasingly almost anybody who deals with political phenomena realizes that GIS is important. It's important all the way to the very big macro scale. It's unlikely that certain countries are going to get into a war…Why is that so?…Because geography matters…It matters all the way down to the micro phenomenon of the cost of voting or just politics. Increasingly, we're beginning to realize that maybe the red and the blue states are different not just because of the people who have fallen into those places, but also because they may be made up of different cultures, which affect the people in those places. So if you take a bunch of Californians and put them in Kansas for a while, they might be different than other Californians…because Kansas might have a different culture.

> With the electoral district, obviously, you couldn't do it without GIS these days. You couldn't gerrymander without GIS, and you couldn't challenge something without GIS. The Supreme Court decision over the 12th District of North Carolina, back in the '90s, is a classic piece of GIS. And then you have the role of space in the development of political networks. In economics and political science, GIS is increasingly one of the most important tools we have.

> I think a lot of new effort is going into developing ways of thinking spatially, because there has been a very profound shift in the way that a lot of work is done…We have the Google Earths of the world changing, dramatically, people's degree of access to GIS concepts and GIS data…I think all of that is continuing to become easier…At a technical level, one of the issues is our ability to locate things on the earth's surface, which is growing rapidly…So we can already, for example, see the locations of every flight across the US in real time. We have, in the US vehicle fleet, approaching 40 million vehicles with GPS, and we know in real time where the locations of half a million trucks are on US highways. It's raising the possibility that, before too long, we will be capable of knowing the locations of an awful lot of things in real time. That's a world that is being talked about as the "spatial Web." And, technologically, it's extremely feasible. The interesting questions then are: What is its social impact? What is the privacy issue here? What do you do with it if you've got it? How would it be misused? And the sorts of questions then that we were asking about GIS 20 years ago are going to be asked about this newer world that is now quite imaginable.

Though most political scientists we interviewed did not work with GIS directly, most were aware of the technology, knew colleagues working with it, and acknowledged the benefits it could bring to the discipline by exposing spatial relationships among political data. The increased use of GIS may be driven by younger scholars, with some graduate students recommending their advisors explore its value.

> I haven't done it yet, but…I can see that GIS can become a quite interesting technology…that will allow us to ask new questions in new and interesting ways. People in political geography have been using GIS, and I can think of a few political scientists who are starting to do that, and sometimes it is young scholars and they find some support in some well-established person, and there will be sympathetic ears and eyes that are willing to read some interesting analysis in which the special element of a political phenomenon would be analyzed.

> There is some interest in GIS, and there's a bunch of people at PRIO, at South Carolina, and at some other places who are trying to code very precisely where conflicts have happened and where resources are. And they're going to make certain insights. For me, there's more value added right now in other directions. So basically there's a false precision. There's so many things that we could do more precisely and more accurately. The question is: which ones are going to pay off and which ones are not going to pay off?…In order to understand any political process, you're going to have to overlay politics onto the geography. We have very primitive notions of political geography. It's a fascinating field. I have friends who are working on this, and there's going to be a lot of expansion; but I think most of the work that needs to be done is figuring out how politics and geography interact before you go to GIS and start plugging new things in and seeing if it makes a difference…So I think there will come a time when that's very useful.
>
> A number of people are using GIS in their data analyses. One of my students did. This is a case where the student had an interest, was studying the spread of war and spread of crisis from one country to another…S/he took existing data sets, built in all the GIS coordinates needed, built maps, did all the necessary analysis to show that, yes, these things are spatially linked and so on.
>
> The graduate students will keep you alive in this business, because they're always challenging you with new ideas and new things. The GIS stuff, I actually started doing it on my own, but then a graduate student showed up here who was really interested in it, and s/he's pushed me much further than I'd imagine I would ever go in terms of getting involved and thinking about these issues.
>
> A few graduate students have been interested in GIS, but I can't say that there are a lot, and it may just be because we haven't seen enough applications close enough to the questions that people are interested in.
>
> The people being innovative are not necessarily younger, but the more methodologically inclined people tend to do more; the more statistically inclined people, I should say, tend to be more technologically innovative. They have the most whiz-bang presentation software. They're the people who can write their own Perl scripts and stuff like that.

fMRI and political psychology

While some convergence of political science and psychology is evident historically, there is a growing "biobehavioral trend" with increased interest in the biopsychological aspects of political behavior. One emerging interdisciplinary subfield is neuropolitics, which examines individuals' political behavior through the analysis of brain imaging scans, and employs tools such as fMRI and physiological assays. Another growing area, based on rational-choice lab experiments, is research on individual choice in collective decision-making. Cost and difficulty recruiting participants may limit widespread uptake.

> We're going to be affected by the biobehavioral trend...Neuroscience, biological assays of hormones…There's a lot of work just starting up…There's just beginning to be interest in neuroscience. The problem is that neuroscience, in a way, is in its infancy, and many studies still focus on which areas of the brain respond to different stimuli. So it's hard to connect that with things political. But I'm already seeing some papers in the works with people using fMRIs and doing some really interesting things. Some people at Caltech are among the leaders in this, in economics. Right now it seems that one area where this kind of research can be especially valuable is in studying issues connected with "social desirability," such as racial

> attitudes or other things people might feel uncomfortable talking about explicitly…I think interest will grow within political science. It's already emerged in psychology and, given that many of us have interests in political attitudes and behavior, I think this is going to be a big development limited only by the cost. It's not cheap to get access to a magnet and it's a little hard to get people to agree to participate.
>
> There's functional magnetic resonance imaging where we're looking at a brain with a hot spot and this observer is looking at something and the brain is signaling that it's seeing it. A huge amount of those data are being gathered and people are going to want to see them…Neuroeconomics…And, of course, neuroethics, the whole fact that there are some ethical considerations that arise in the context of doing functional magnetic resonance imaging. What if you discovered a particular pattern of brain activation that was associated with violent impulses?…Or if, without screening, you discovered it by accident, would a court make use of it? There are a lot of problems there. I think…Hank Greely, at the law school at Stanford, has spent a lot of time thinking about this…Jon[athan] Cohen at Princeton is doing some very interesting fMRI studies in which he's putting subjects into morally challenging situations.
>
> There's the neuroscience of decision-making…fMRI has been an amazing tool. There are imaging tools, like PET scans and structural MRI and the Spec, etc., but it's really fMRI that has caused the enormous explosion of interest in the social consequences of neuroscience over the last six or seven years. It's the ability to say, "Aha, we see how the brain is working!" But of course what you're actually seeing is what areas of the brain are having slightly more or slightly less oxygenated or deoxygenated hemoglobin within this three cubic millimeter cube, two seconds after people have done or not done something. I think that right now we're in a period of enormous excitement; literally there are more than 1,000 peer-reviewed articles a year being published with scanner experiments on fMRI, most of which are about finding things that probably will not hold up…A wide variety of fields are getting into this. It's a wonderful, exciting tool. Everybody's over-reading it right now, but as we get more rigorous, as experiments get replicated…some things are actually going to prove to be useful in being able to make inferences about mental states from the scanner.
>
> The lab experiment stuff is going to stay fringe for a while, and it kind of needs to. This can't be a laboratory science. To the extent that we can get corroborating evidence from lab experiments about decision-making, we should have it, but that's going to always be a limited part of what political science can do, what kind of data political science should be based on, so I'm okay with that.

Search and discovery of secondary literature

Online access has transformed and even "revolutionized" bibliographic research practice in the field. While the use of JSTOR is prevalent, CDL, PROL, ERIC, Factiva, and PubMed Central (for neuropolitical scientists) are also utilized. Electronic search of literature is enabling scholars to make links between sources not afforded by more traditional search and discovery.

> The other thing that the technology's really done for me is I have all the published sources that I care about at my fingertips. I don't have to go to the library. It's all online. It's so easy to make connections…But then there's stuff that will come up because it's relevant and I haven't read about it, so I'll go get it. It's now so fast through the library electronic systems to get to papers and to read the paper, decide if I want to read the whole thing, and I think that means that I'm doing better work. I'm plugged into more different authors than I would have been under the old school.

> For all sorts of archival materials, data sets, all this stuff is just so much more easily available. It's been a huge, huge boon…I can't even imagine what life was like without JSTOR and this sort of thing…I can remember…I used to go to the library and Xerox pages. So the time savings there is profound.
>
> JSTOR is pretty good. I absolutely use JSTOR. And JSTOR is useful because you get an idea, usually somebody's already had that idea, so you've got to find out what's been done on it. JSTOR is certainly very useful for that.
>
> Given that searching is now so easy, the range of topics I can investigate gets broader every day.

Although digital access to bibliographic material through digital library portals has largely replaced library visits, some scholars lamented the days of visiting their library or complained about the overload of information. Some prefer browsing hard copies over electronic versions, while others noted that there are still longer-than-necessary lag times in journal availability through online repositories.

> I feel like there's a lot more to do, and I don't know if that's a function of the change in technology…or a change in my life…so I just don't have that much time to read…I feel like I have access to a lot more information now, obviously, like everybody else does, but as well as the anxiety of, "Hey, maybe there's something out there that I haven't looked at that I need to read," which is a little bit more intense now than it used to be.

Listservs are generally considered useful vehicles to share information and keep abreast of current scholarship, both specialized and tangential. Specialized listservs can be useful in reaching target audiences and advertising one's activities.

> My field actually sponsors a terrific online book review resource, because that's been a real problem. There are fewer and fewer journals that actually do book reviews…And so this online access has been tremendous because that's a place where speed is. You don't have to wait a year to see a review of a book. They're fed into your inbox every day and that's been huge…In terms of keeping up, well, that's another place where fairly simple technologies made a huge difference…There are a series of listservs that were generated by professors. And those have been a huge asset.
>
> I look regularly at websites of the centers on campus that I'm affiliated with. I'm on their mailing list. I'm on the mailing list of different people who study different subfields that I'm in. All that happens for keeping up to date.
>
> We have things like SSRN…They have listservs where you see the current papers and stuff like that.

Only one scholar we interviewed didn't use listservs to keep up to date.

> Listservs? No, we don't have any in my area. I work in an area of American politics that interfaces with applied game theory and mathematical modeling, and we think of ourselves as famously lacking in social connectivity. It's a very misanthropic subfield, so we don't have listservs.

Google searches

Use of Google is widespread, particularly for locating in-progress publications. Some scholars depend on Google searches rather than Web of Science to find working papers, and one scholar felt that this search behavior had the potential to replace some repositories, such as CIAO.

> Google, too, is useful, because you've got to know working papers. Just not Google Scholar, it's not good at keeping up to date on citation counts. But I would use JSTOR and Google, basically.
>
> I think the Web has revolutionized research for us, partly because of JSTOR, partly because of being able to Google not just English-language sources but others as well. I think we're at the tip of the iceberg there.
>
> Back in the old days, there were all these institutes and centers that had occasional paper series that were on paper, and they would mail some of them out and no one would know that they existed because they weren't indexed. And then CIAO came along and made them available, but, in a way, CIAO is getting superseded by Google. People now don't have to go through CIAO to make their occasional paper available. They could just put it up on their personal website, and you can search in Google, and you can find their paper on their personal website without going through CIAO.

P5.2 What Do Scholars Need? How Are Their Needs Being Met or Not?

Technical support and training for the use of new tools

In order to process and handle voluminous digital data, political scientists look to their institutions to provide technical support and training in the use of new tools and technologies. Demand for a networked research environment is prevalent among some scholars,[104] particularly the expertise provided by computer scientists. Graduate students could also support the research process.

> We need better systems for finding and using all kinds of data…How do you manage to locate and allow people to use all these new and complex forms of data?...We need good technologies for that, and we need technologies that will allow us to protect confidentiality. And that's a really critical thing, whether those are ways to simulate identifiers and effectively do analysis, whether it's some sort of grid-enabled computing that allows computing work to be done somewhere off in the ether so no human being ever sees it, whether it is a secure, online analysis system…We certainly need things that protect confidentiality. These are not rocket science things, I have to say. These are just good investments in existing technology and being willing to spend real money on that, and being sure that we have the right ways of handling it.
>
> We desperately need a group of computer science–oriented people who can help us with our increasing data needs. The people in biology have this. The people in physics have this. They often use postdocs to perform these roles. We are desperate for somebody like that. We just don't have the money. We're in no way nearly as well-funded…A big grant in political science is $50,000, $60,000, maybe $100,000. We typically put it all into the data collection or computers, or whatever we need to get the work done.

[104] Brady, Henry. Testimony before the ACLS Commission on Cyberinfrastructure in the Humanities and Social Sciences.

> There's been a big commitment to technology and support here, and that's increased over the past 15 years…Over the years, the institution has added a lot more computer support staff…Not every department has its own computer support person now, but every department can get support from this group. And that's new. Thirteen or so years ago, the college computer staff was four people and now it's 30 people…Our computer support people will work with novices…But for everything that our technology people want to do, our department head would say, "Now if it's going to help you publish so that you get tenure, then we should do it and you should set up this kind of project that you need." So we've had very good computer support.
>
> The main limiting factor in doing interesting new research is interesting new ideas, rather than technology…So as fast as I have new ideas, I have the resources to get them done. I've been very happy with that at different places I've worked. My demands aren't that great, so by the same token, I can generally get done what I need to…My needs are fairly basic and for people to throw a lot of technological resources at me…I'm sure that money could be better spent somewhere else.
>
> Time and resources would be great, more resources to hire research assistants, those sorts of things would all be tremendously helpful. But the basics are all here for what I do, but what I do is, as I say, pretty low-tech and fairly simple, so it's mostly a factor of time.

As data collection and analyses become increasingly complex in political science, computational and statistical training for graduate students is essential.

> Some graduate students come in with technical skills, some don't. We have our own computer lab and part of our methods sequence is teaching them how to use the software that they're going to need in order to do the statistical kind of analysis that we do.

6. TO WHAT DEGREE DO YOU OR YOUR COLLEAGUES ENGAGE WITH THE PUBLIC? HOW? WHY OR WHY NOT?

Public engagement varies across the field of political science, and many scholars perceive a disjunction between the aims of political science as an academic discipline and the interests of policymakers and the general public. For some, public engagement is seen as degrading the gravitas of scholarship, especially before securing tenure. Despite this, some political scientists see public debate as an important part of the academic enterprise. Public engagement can take many forms. While some scholars serve as political analysts or media commentators, others give public lectures or publish short articles in national magazines, journals of public affairs, and other more generalist publications. Journalists, bloggers, university public relations staff, and certain "public intellectuals" in some subfields can act as helpful mediators between scholarly research and the public interest.

P6.1 Why Do You Engage with the Public?

The degree to which a scholar engages with the public largely depends on personality. Although not all political scientists interact with the public, some form of public engagement is common within subfields that have popular resonance and are currently topical. In particular, many scholars believe they have a responsibility to the public, view engagement as part of their job

description, or wish to defend or promote their research. One scholar reported that research in the public interest may stand a higher chance of being funded.

> Political science is in odd circumstances, because it's something that's very public, it's very important, and it's also something on which everybody has a position and has a right to speak about as a citizen. So exactly how public one becomes, and how much one gets involved in public matters, really varies tremendously from person to person.

> People here clearly share the sense that we are a public institution and we do have a public mission. That's a part of what we do because we study politics and politics is public. There's more interest among political scientists in having that interaction than you would find in other departments. After all, some of our people study public opinion, so they're doing surveys all the time. You'd assume that they'd have some interest in interaction.

> I've been interested in policy my whole career. The whole point is to create knowledge that's relevant to public affairs and that can be practical. So when you create knowledge, you can disseminate it by having political scientists read it, which has a certain impact and is very important for the lasting impact of your ideas, getting on reading lists and in people's footnotes, and being installed in the literature as a piece of the canon. But the other thing you do is teach, or other people teach your books to their students, and then that's part of their intellectual capital going through life. But the final thing is to try to get your work into the public debate. I've always tried to do that in one way or another, with varying success…In my last project, we had a policy hook, which made it important to get out and also made it the kind of thing that would get picked up by a broader public debate.

> The idea that public engagement somehow degrades your currency is pretty pervasive among the top-tier departments in international politics, and I actually think it's a cultural fault of the subfield…When the Cold War ended, international relations was criticized when people said, "Hey, you didn't predict the end of the Cold War. It's the largest change in international politics in 100 years and you guys were asleep at the wheel."…So there was something really wrong in the way we were thinking about the world. But instead of actually seeing it as an opportunity to open up and rethink what we believed about the world, the field narrowed in on itself…which makes for an intellectual agenda that's a little too solipsistic…I just don't see a zero sum tradeoff between engagement with the world and with the field…and if one day I find it to be zero sum, I'll find myself another job.

Why not?

Scholars who resist public engagement cite a gulf between their work (which may be theoretical or not directly related to policy issues) and the broader public interest. Several complained that the general public does not understand the "subtleties" of scholarly research, such as the value of incremental advances in knowledge or theoretical tendencies. This means to say that while political scientists possess a unique expertise to contextualize trends and raise pertinent questions regarding political issues, members of the public simply want a single and authoritative "answer." Consequently, many scholars leave public engagement to others and work on "other kinds of contributions" in their subfields that may inform policy or educate the public in a more indirect way.

> There's a huge gulf between how a researcher thinks about a topic, and what counts as an interesting research finding, and what the general public thinks of it. In empirical research, my limited experience with the general public is that if a finding is not pristine, ideal, and perfect, they consider it complete garbage. It's very binary. Either it's perfect, it closes the book, or

it's worth nothing. The public doesn't necessarily feel the same way I do about the value of an incremental piece of knowledge that builds to a larger end.

There are a couple of things you can do regarding the larger public. One is you can be a talking head and have opinions about things…To the degree that you tell people things that are factual that they might not know, that's informative…My specialty is theory and I can only tell people tendencies based on a lot of the theoretical knowledge that I have. People don't like tendencies though; what they want are certainties…The other possibility is that you talk in terms of tendencies and broad processes. For instance, China is rising, and I think that there's room in the public discourse to talk about what could happen with the US relationship with China…And I think that kind of discussion really needs to take place. And maybe, the academic community can make a contribution in that area, saying, "Well, what should our priorities be? And why do you think it should be this way?" But in the public arena, it really just comes down to opinion.

For most of my career as a university scholar—and I think it's more personality than anything—my primary audience has really been the few political scientists who are working in the same area. I want to do something that they will read and like…even though I work on problems that have significant implications for real politics. So there are a number of people who, like me, aren't public intellectuals. My child is always complaining, "How come so-and-so is always quoted in the *New York Times* and I never see your name?" I'm probably quoted more than my colleague is in the *American Political Science Review,* but children are not moved by this.

If you're only doing public engagement, you're not making an academic contribution. But, then again, most of us in academia live in these oases of beautiful surroundings…and a large fraction of them are paid for by taxpayers, so I think we have a responsibility to make sure that some of our work, at some point, eventually makes a contribution to the public. That doesn't mean that the public needs to hear me mouthing off about who I think should be president, because that's not an expertise, that's a policy opinion…Somebody should make that sort of contribution…but I think I have a comparative advantage to make other kinds of contributions.

I'm not particularly interested in public engagement, if by public engagement we mean giving interviews on TV. I am very involved in public engagement through teaching. So then how do I think my work matters to the public? What I study has great political relevance, even though I do not offer policy solutions to immediate problems. I think that people who read my research will gain greater knowledge of politics, and thus reconsider some of the positions they might have. That would be the public impact of my work. At the very end of his treatise The General Theory of Employment, Interest, and Money, John Maynard Keynes describes how even though we might think we are independent of any outside influence, we are actually all slaves of the ideas of "dead economists." We learn these old ideas in our formative years; and these ideas influence the way we see the world and the choices that we make. These ideas have long-lasting effects on how the world operates. And that is what scholarly work should do: it should challenge the theories of the "dead economists," that is offer intellectual tools to challenge and revisit the conventional wisdom, and help people define their own ways of thinking. So public engagement in political science is a paradox of sorts, because the people who are not so immediately involved in finding immediate solutions to current problems might have greater effects on public policy in the long term…We produce knowledge for a goal, and, in the end, the knowledge that is produced by the social sciences in general makes a difference…I think the discipline is important to producing a way to understand the world, and that actually makes a difference in ways that are more fundamental than being involved directly in Washington D.C. on some committee.

The contested nature of the "public intellectual"

Although some scholars feel a personal responsibility and interest to engage with the public, academics are generally advised to proceed with caution. Excessive public engagement in the early stages of an academic's career can be detrimental in the promotion process. Public engagement is generally considered a "sideline" venture best reserved for one's "nights and weekends." Consequently, it is best pursued after scholars have made a name for themselves in the field and achieved tenure.

> I don't think anybody directly says, "Write the theoretical book first and then get publicly engaged." And you see a great variation among my younger colleagues, some of whom get immediately involved with local school committees etc., and that's just their personality. I think they all know that they're not going to get much credit for public engagement. What really counts is whether the profession reads it. I think if someone were to really ignore either teaching or, more importantly, research and be a big campaign advisor with a lot of time taken off, one of the more senior faculty might give them avuncular advice along those lines.

> I've never had an engagement that interfaces with the general public at all. And it's not that I wouldn't welcome it. It could be interesting, but it is worth nothing in terms of a C.V…Until I was tenured, I avoided public engagement, because it struck me as having very little benefit. The risk is that you say something stupid and get punished for it, and there was almost nothing you could say that would be smart enough to get you tenure. But I think it's an important role. It tends to be something that people do at the end of their careers instead of the beginning. At that point, they're doing less research and they've also got enough status that people will listen to them…Even when you do have tenure, public engagement is not what gets you cited, and it's not what gets you published. If you want to be a public intellectual, if your personal taste is to do that, then by all means, have a go at it, have fun. What you do on nights and weekends is your business.

> We do relatively little public engagement, which may be partly explained by the fact that the expectations are pretty clear that people will get rewarded and promoted for more substantial scholarly work.

> If you do engage with the public, that needs to take up a very small amount of your time. Once you have your research stream going—if you've worked things out so that you're publishing two articles a year, for example, and everything's coming down the pipeline well and it looks good—then if you want to go do some of these other things, that's fine.

> It's quite tricky, actually. If you start doing a lot of public engagement and other types of publications, your productivity declines. So it will probably be used against you. One of the worst things you can say about a political scientist is that they're just a journalist…That is the kiss of death. So I would say that if you're already established and you're continuing the scholarly record, and you start doing op-ed pieces in the *Washington Post* and the *New York Times*, that'll be fine. But if you're an assistant professor and you're writing a lot in local newspapers, people will ask, "What is this person up to? Let's look carefully at what they're actually doing." So it's tricky.

> I tried to write a book that would be both respected in the scholarly community and actually appeal to a broader audience. It was successful, but it was really hard to do, and a real challenge. Commercially successful books aren't always looked upon well at the departmental level…So we as political scientists flirt with the edges of public engagement…For a long time I was not engaging at all, and in the last couple of years I've engaged rather aggressively and

> probably burnt my fingers a little bit, but I feel like I'm learning about new things…There's still, among many people, a notion that if something is interesting outside of the profession, by necessity it must not be of scholarly value. I think that can be true but doesn't have to be true, and there's room for both…And so, I'm pushing back against that, and there are some graduate students who are willing to bet their careers on it…that public engagement is more than just tolerable, and might make you a better scholar…So we're trying to change the culture a little bit.

P6.2 How Do Scholars Engage with the Public?

Public engagement in political science can take a variety of forms. Some scholars act as political analysts called upon by the television, radio, or print media to provide factual background for issues in the news. Many scholars speak at university, alumni, or public symposia in various capacities. While it is difficult to publish scholarly op-ed pieces in national newspapers, such as the *Washington Post*, there are a range of "serious, but accessible" publications like *The New Republic* where scholars can publish short articles and book reviews. Additionally, conventional academic publications are sometimes "picked up" by bloggers or venues such as the *New York Times Magazine*, who can act as mediators between "dry" research and issues of more general public interest. Some scholars also see the development of software, research tools, and data repositories as a form of public engagement with business and government entities. Public service on national or international regulatory bodies is another engagement option for well-established scholars in certain research areas.

> As a field, we have a fair amount of public engagement because people serve as political analysts and get on TV, and they write articles. Normally that's separate from your scholarly work…and I do a lot of public engagement. You may have even seen me on TV, typically talking about things about which I know virtually nothing, but luckily I'm a professor at a competitive university and I have some competence in a range of subjects. Actually, it's amazing how much you can say about a topic after five minutes of research on the Web…I'm also impressed by the reporters who know something about a topic, because they apparently do very little research. The skill of public engagement is really in knowing how to do it. I know exactly what sources to use to be able to say something about a topic within a minute or two…I know where they are and how to interpret them.

> You'll see people on the television news or talking on the Commonwealth Club. Often local organizations that want a talk about the Middle East or presidential politics or the Supreme Court will call you up as well. So there's a some of that. I've been on TV several times and I've written some things that get into more mainstream publications. These are short articles and book reviews, and there are still maybe half a dozen places that are interested in accessible but serious work…places like the *The New Republic*, *Washington Monthly*, *Prospect* magazine, and the *American Prospect*…Scholars in foreign policy or constitutional law also get tapped to do alumni events, because alumni are more interested in hearing about current events than they are about esoteric research that they don't understand.

> Sometimes a book will get picked up in the *New York Times Magazine*, or you'll be asked to go on NPR to talk about it…Some political scientists give talks in Washington, D.C. at the think tanks down there. NPR is in Washington as well, so sometimes they pick up on those things…And if you're consciously trying to promote a book…one strategy is to write op-eds. But it's hard to get them placed in prominent newspapers…One article got picked up by a blogger because the argument had some bearing on an issue in the political science blogosphere and there were 2,000 hits on it in a few days. So the bloggers really attracted

> attention to it…The chances of getting an op-ed in a big newspaper for a political science professor are really quite low. People have lots of things that they would rather read about than a political science debate…Writers of op-eds tend to be well known public intellectuals who write books with catchy titles, so it's easier for them to get placement in the *Washington Post* than it is for others…I'm sure that there are also some people who find out about work by Google search. So it's these kinds of diverse publicity pathways…that bring attention to a book.
>
> I don't spend a lot of time writing newspaper op-eds, but the work that I produce often has relevance to the public. For instance, I've developed statistical methods and software that are used widely in business and in government, by states and legislatures and marketing firms and places like that…So, I'll advise them on their use…But that's not public in the sense of going on *Nightline*. I could do that sort of thing, and I have on occasion, but this is closer to my work so I can make a bigger impact.
>
> We do public engagement as an organization all the time, and we all do it by ourselves as well. No one does as much as they would like, but we are out there. We do things as simple as having booths at academic conferences, which float around the country…my peers and I, and the leadership of the organization, are out all the time giving talks about what we do as an organization or contributing to the scientific debate in proactive ways.
>
> I just retired, although I am keeping up with my research…I've never been much of a political actor even though I have strong political views, but maybe it's just a stage of life, since I just took on a major public service role on an international committee…So I've gotten myself involved in something that I've always cared about, but hadn't done anything about.

One department chair called for improved organizational structures to facilitate public engagement with scholarly work. Rather than waiting for scholars to be "called upon" by the media, more work could be done at the departmental or institutional levels to promote new scholarship in relevant public spheres.

> We are not well set up institutionally to publicize our work…Right now there's a central administration media office, but it's hard for them to keep tabs on everything that's going on in every department. One thing that interests students and alumni is, "Have our faculty been cited in the news?"…Faculty would be willing to do that if we can make it relatively painless, but we haven't mastered the painless part yet…What tends to happen is people in the media office get phone calls from journalists asking, "Do you have anyone who knows about East Timor?"…And as these inquiries mount, they take up all of the office's time. It would be better for us to figure out how to promote new books by scholars as they come out. There's a pretty short window of time where new work is really salient, and it can't just wait for all of these other inquiries to be dealt with…But promoting work outside the academy requires resources and personnel. So, I think there needs to be more consistent effort to figure out what work might be of interest to the media and to filter some of those random inquiries from journalists.

SELECT RELEVANT LITERATURE AND LINKS

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