

# **UC Santa Barbara**

## **Varenius Initiatives (1995-1999)**

### **Title**

Geographies of the Information Society, Introduction and Position Papers

### **Permalink**

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### **Author**

National Center for Geographic Information and Analysis - Varenius Project

### **Publication Date**

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# Workshop on Geographies of the Information Society

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## Location and Date

- Upham Hotel, Santa Barbara,
- CA February 28-March 1, 1997

## Background Information

- Objectives of the Workshop
  - See NCGIA's proposal to NSF
- "Advancing Geographic Information Science"
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### Day one breakout group summary

- Union list of possible research themes discussed
- Criteria for evaluating questions

### Day two breakout group summaries

## Discussion group summaries

- Institutions and GIS: Emerging frameworks in the information age
- Moving Beyond the Map as Metaphor: Representation and multiple realities
- Modeling and Simulating Geographies in a Digital World
- Access to Spatial Data in Networked Environments
- Accessibility in a Wired World
- Emergent Social Forms
- Social/Geographic Implications of Information Technologies
- Virtual Geographies

## List of Participants

## Participant position statements

## Objectives of the Workshop:

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The workshop is the first such event in **Project Varenus**, a three-year research project being undertaken by NCGIA (the National Center for Geographic Information and Analysis, <http://www.ncgia.ucsb.edu>) to advance the field of geographic information science, with funding anticipated from the National Science Foundation. In the proposal for Varenus we identified three strategic areas for research in geographic information science: cognitive models of geographic space; computational implementations of geographic concepts; and geographies of the information society. We defined the third area to include those issues of fundamental significance raised by the growth of geographic information and associated technologies. It includes impacts of digital geographic information and associated technologies on society; the social, institutional, and economic issues that they raise; the kinds of geographies being constructed in virtual worlds; and the future roles of geographic information in society.

### The objectives of the meeting:

- to examine the range of research topics identified in this strategic area;
  - to identify important gaps in the set of topics;
  - to summarize progress to date, including that achieved by previous initiatives, such as the European Science Foundation's **GISDATA program**; NCGIA's past and current research initiatives that fall in this area; the National Research Council's 1996 workshop on the future of the National Spatial Data Infrastructure; etc.
  - to identify those topics most likely to yield to research organized according to the mechanisms and timetable of the Varenus Project;
  - among these, to recommend topics of high priority for subsequent development as Varenus Project research initiatives; and
  - to identify suitable members for a five-person science panel to track progress in this strategic area.
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## **List of potential research themes from first breakout discussions**

1. The new information society is already looking very different, and is not easily represented with traditional tools, e.g. cartographic. How might one represent the new information society?
2. Access is limited by issues of privacy, control, intellectual property rights, pricing, expertise, costs of acquisition, and the ability to create alternative information. Can we enumerate the full set of limitations, and study their dimensions?
3. What new organizational structures are needed for the new information technologies, and by what processes will they emerge? What responses to new technologies can we expect from organizations?
4. Both spatial technologies (*sensu* Couclelis) and geographic information technologies have the potential to modify geography. How can we study these impacts?
5. Can digital geographic worlds accommodate casual action and movement (e.g., sketch map, user mobility)?
6. Methods for modeling and simulating geographies are emerging in the digital world. Can we make them the object of study? What can we learn as a result?
7. Can we redefine the concept of scale for an information society in ways that move us away from mechanistic definitions towards ones that are political and human?
8. How does information flow within an institution, e.g., a firm?
9. How will global electronic and digital commerce lead to time/space convergence?
10. We need to study the implications of telecommunications: for travel behavior, loss of face-to-face communication, loss of community, organization of work, spatial organization, socio-economic inequality.
11. To what degree is GIS a promoter of empowerment, a vehicle for participation in governance (or the reverse)?
12. Will information technologies be the initiators of new, 'scale-less' institutions, groups, or actors, who will use them for promotion of their interests?
13. Daily transactions are increasingly likely to be geocoded. What are the impacts on privacy, groups, locations, politics, of living in a geocoded world?
14. How do next-generation visualization capabilities influence information dissemination and use, e.g., in education?

15. How can non-spatial 'geo' concepts be integrated into GIS, e.g., sense of place, safety, emotion, sound? Can spatial analysis be used on non-spatial data (spatialization)?
  16. What are the spatial and temporal patterns of information inequality and levels of literacy? Do they vary by society, region, culture, gender, class, language, discipline?
  17. What are the impacts of GI and GIS in practice: how is it used in decision-making, how does its use play out with respect to power balances, how does it work within institutions to affect the division of labor, gender and ethnicity, what are its impacts on universities?
  18. How does putting a spatial boundary on a unit transform its interactions? Can GIS data models fit non-bounded objects?
  19. Can we define a concept of information poverty, and identify its geography and other characteristics as reflected in access, use of public transport, voter information, etc.?
  20. How can new geographic information technologies be developed that support multiple views and multiple realities, and what impacts will they have on decision-making?
  21. Is the potential for integration of data about an individual or place an opportunity or a problem? Can technology interact with a free society?
  22. What are the social implications of multiple and potentially conflicting representations: representations of geographies, temporality, scale, distortion and manipulation, error and uncertainty?
  23. In a fully digital world, in which the technology is entirely pervasive, what will define the haves and have nots, what institutions will exist, how will the ability to represent phenomena be defined?
  24. Geographic and geospatial literacy define the ability of users of GI technologies to express themselves. How can we raise awareness of the limitations of such forms of expression?
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## Criteria for evaluating questions

- Is it a researchable question?
  - Is it important?
  - Is it central to this corner of the Varenius triangle?
  - Are the Varenius mechanisms appropriate?
  - Similar to other research questions?
  - How geographic is the problem?
  - How is the question linked to the other corners?
  - What is the time frame for producing results?
  - Can we make a difference?
  - Is it exciting?
-

## **Institutions and GIS: Emerging Frameworks in the Information Age**

Geographies of and in information societies must exist within a basic framework of institutions. Society organizes itself into for-profit, governmental, and non-profit institutions in order to provide for the well being of its members. Despite the large potential benefits from the use of new technologies and spatial information there is striking little knowledge to guide the transformation of organizations to respond to new opportunities and address priorities. What are the emerging frameworks for new institutions for geographies within the information society? What will be the paths of evolution for existing institutions in response to society's move to an information society? What processes and structures could maximize the utility of GIS in improving the efficiency, effectiveness, and equity of the work of the institution. These changes will provide the frameworks within which geographies in information societies will occur and these frameworks will set constraints or limits on the geographies. It is incumbent that we understand these limitations as we structure our institutions in the information age.

Ideally we will examine all principles under which traditional institutions involved in geographic work have adhered. We should reaffirm them, discard them, adapt them, and create new ones as needed. This calls for scrutiny of current affinities with some disciplines and an examination of possible future affinities with different disciplines. It requires looking at the current division of institutions into categories and examining the current rules and laws which govern what each institution accepts responsibility for in the information age.

The objective of the research is to formalize conceptual frameworks for existing and newly emerging institutions. We hope to better understand the inter-organizational linkages and new forms of organizations that are enabled by changing technologies. Case studies will be drawn from institutions such as:

- Federal Geographic Data Committee
- Federal Agencies
- State and local GIS Coordinating Committees
- Digital library implementations
- private sector firms
- non-profit community groups

Disciplines and practitioners involved must include public administration, sociology of information utility, management, information science (libraries), geographers, NSGIC representatives, and Center for Neighborhood Technology. Information technology is a levelizer of hierarchically structured management systems, currently making it possible for a new firm of twenty employees to successfully compete with a mega corporation such as AT&T. Consortia of existing firms and agencies can compete globally with similar institutional groups from other nations.

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**Workshop Home Page...**

## Moving beyond the map as metaphor: representation and multiple realities

### Original questions:

1. Society not easily represented with traditional tools
7. Redefine concept of scale
14. Next generation visualization tools
15. 'Non-spatial' geo-concepts and 'spatialization' as analysis
20. Technologies to support multiple realities and multiple views
22. Implications of conflicting representation for decision making

Current representation within GIS is tied to the map as metaphor. There are consequences and problems that arise from the exclusion of alternative forms of knowledge, ways of knowing, and representation. Historically, there is evidence of broader and richer ways of knowing in both western and non-western societies. The cartographic metaphor would appear to be a more recent consequence of the academization of geography, the privileging of the map, and the conceptualization of GIS based on spatial primitives. New GIS, multi-media and visualization technologies now allow us to move beyond the map metaphor to include other forms of knowledge representation that are driven by real human problems and forms of reasoning.

### Current status

Cartographic metaphor  
Map  
voice,

'threatening' graphic  
representation

static

spatially deterministic

visual

scale - mechanistic map-based  
scales

quantitative assessment of  
spatial data (spatialization)

top-down expert view of  
realities  
reality(privileged forms  
of representation)

### Research

alternative metaphors  
map, image, text-narrative,  
sound, visualization, sketches,  
multi-media  
hyper-media  
intertextuality  
historical antecedence

non-threatening graphics and  
representation  
role playing, game metaphor,  
public vs private, panoramic to  
abstraction, increasing levels  
of complexity

dynamic, interactive, participatory

beyond spatial primitives

visual plus other senses plus .....?

social/cultural/natural language

blending quantitative and qualitative  
assessment and analysis, sense of  
place, cognition

multiple views of geographical

top-down meets bottom up  
local knowledge

|                                      |                                                                                                                          |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
|                                      | inclusive<br>democratization<br>collaboration                                                                            |
| focus on error and<br>distortion     | focus on learning to be critical<br>of different interpretations,<br>self-critical systems                               |
| imposed objective<br>decision making | collaborative decision making<br>and conflict resolution,<br>understanding different<br>perspectives to an issue         |
| non-culturally sensitive             | culturally sensitive<br>non-western conceptualizations of<br>space-time, native conceptualizations<br>and representation |

## Research

Specific case studies which address one or more of the above issues.

- Research on representation design and evaluation
  - intertextuality
  - multi-media and GIS
  - non-threatening graphics
- Collaborative decision-making based on multiple realities
- Historical and cultural perspectives on these issues

## Disciplines involved:

- Geography
  - Cartography, visualization, multi-media
  - Psychology
  - Planning
  - Anthropology
  - Education
-

## Modeling and simulating geographies in a digital world

GIScience, conceptualized as scientific activity conducted in a GIS environment, should not be exclusively data-driven, inductive, and theoretically naïve. There should be scope for speculation, experimentation, a plurality of theorisations; in short, GIScience should embrace imaginary or conceptual geographies. Such geographies are already well established features of the information society. A paradigmatic example is SimCity. But SimCity embodies only one (highly contestable) theoretical position and represents only one kind of simulation and one form of visualization.

- The modeling and simulation initiative should first establish who is doing what where - in modeling urban futures, global climate, ecological systems, etc. - and it should get them to talk to each other.
- It should explore the use and potential use of GIS-like models and simulations in research, education, and intelligent play.
- It should examine the roles of GIS-like models and simulations in theory development and policy experimentation.
- It should stimulate the development of participatory GIS and facilitate conversations among groups with very different conceptions of urban (etc.) futures and their determinants.
- Progress on understanding how GIS can improve pluralistic and inclusive planning processes depend upon a richer conceptualization of the multiple ways in which geographies are discussed and brought into the planning and policy-making process.

Traditional views of GIS embody a bookkeeping approach to accounting for space and a deterministic, usually single-framework, view of aggregation, generalization, etc. in order to digest and interpret spatial data into forecasts and causal interpretations. As use of GIS is pushed into policy and planning levels - especially in arenas like city and regional planning with pluralistic views of structure, interaction, and importance - such a view is frustrating and difficult to incorporate. Can GIS technologies help identify robust frameworks, forecasts, etc.? What technology is needed to facilitate/moderate discussion. Juxtaposition, and visualization of **differing** conceptualizations of space. One direction involves drawing from research on the use of cellular automata simulations to help discover emergent form and robust micro-behavioral models. Another involves explicit attempts to visualize and/or address (a) stochastic elements of spatial movement, boundaries, and interactions and (b) differences in spatial conceptualizations.

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## **Access to Spatial Data in Networked Environments**

This topic was discussed by two separate groups ("Access to Spatial Data in Networked Environments" and "Equity") but at the following plenary session, it was concluded that these topics are so strongly related that they should be considered a single theme. The Equity discussion is appended here.

### **1. Access to Spatial Data in Networked Environments**

- Information is substantially reducing society's dependence on traditional sources of labor, capital, and raw materials.
- Information and the knowledge it brings can substitute for these other materials and thus is a source of power.
- Access to digital geographic information is a source of power.

#### **Key Scientific question:**

How might the future be constructed (i.e., organizations, economic approaches, laws, infrastructure-networks, etc.) such that all segments of society have equal opportunity or less disparate opportunity in accessing geographic information?

(exploring approaches for providing equal opportunity to access all forms of information or equal opportunity to access all resources is outside the expertise of this group)

#### **Sample Researchable Questions:**

##### **1. Reflective research**

- What forms of virtual spatial data libraries would best meet the needs of varied segments of society?
- What forms would meet the specific needs of those in society currently disenfranchised or marginalized?
- Should such virtual libraries allow/promote two way discourse?
- Allow those accessing to be both suppliers and users of spatial data and knowledge?
- How can physical access to spatial data be enhanced with additional tools for gaining or supplying knowledge?
- How might an analog to the traditional "public goods" library model be retained in our digital future whereby any person (child, scientist, business person, etc.) may browse, study, and borrow spatial data resources from the virtual library at no direct cost?  
.....etc.

##### **2. Observation of the current impacts of following certain organizational, institutional, and policy approaches in regard to digital geographic information.**

Information from these studies is needed in order to arrive at conceptual designs more likely to arrive at desirable virtual library outcomes.

- To what extent do current virtual spatial data libraries exist and meet or fail to meet the needs of the various segments of society?
- To what extent are people and organizations voluntarily providing geographic data freely on the net? What caused them to share their data? What are the impediments to their sharing of even greater amounts of spatial data?
- Does a shift away from the public sector supplying certain forms of geographic data lead to loss of quality, misuse, and uneven access? The opposite?
- Who is using GIS to collect or process personal information, to what extent, and for what purposes? What are the short and long term impacts of the different legal approaches to handling personal privacy issues in different jurisdictions. ....etc.

### **Key External Participants:**

Information economics

Library information systems futurists

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## **2. Equity**

### **Premises:**

- There are substantial analogies between the information society and economic society.
- There will be successes and failures in transferring concepts from economic geography into the information era. We wish to explore this. We need a clear understanding of what is currently known about economic geography, and we wish to explore the degree to which these concepts apply in a digital geographic world, an information economy, a world in which information is increasingly significant.

### **Topics:**

- What are overt symptoms of information poverty?
- What are the social pathologies of information poverty?
- What are the geographic dimensions of the information economy?
- What is the economic geography of the information economy?
- What is the role of philanthropy?
- What is the legal context?
- More specifically: What does the future hold for the spatial organization of the information economy for spatial equity?
- What new institutions and public policies are needed to modify, regulate, improve, and intervene in the information economy?
- What about equity of access to information, which is embedded in FOI?
- What are the international dimensions, e.g. WIPO?
- Is it technically or legally possible or desirable, to regulate geographic flows of

information?

- Can you build a system in which client requests for information are reliably location stamped?
  - Must there be a geographic basis to information poverty?
  - What possibilities exist for social programs to address information poverty?
  - Can we devise metrics to measure information poverty on a global scale, and use them to monitor trends?
  - What are the consequences of the distribution of information poverty for representative democracy?
  - Can we define a form of information poverty related to the creation of information (as well as its consumption)?
-

## Accessibility in a Wired World

The information society is bringing about fundamental spatial and temporal changes in the organization of human activity. Current urban models are no longer capable of representing spatial structures and behaviors of a wired society. These models are based on physical notions of distance and connectivity that are inadequate to understanding these new forms of structures and behaviors. Physical accessibility is still important, but telecommunications and information technologies are dramatically modifying and expanding the scope of this core geographic concept. Paradoxically, GIS is a product of this new information society, and yet it remains rooted in traditional modes of geographical representation. While the conceptual issues are relevant at all geographic scales, we propose to focus on the urban scale in order to create special synergies of need and expertise that fit especially well into the Varenius framework.

### Themes

- The **development of space-time topologies** that accommodate both the real and virtual worlds. This accommodation includes a conceptual topology and actual technical implementation. This task is fundamental to the other activities noted below and to urban analysis in general.
- The development of the **graphical representation of these topologies in geographic information systems**.
- A second goal is to lay the foundation for a **new generation of urban models** that incorporate these conceptual and technical perspectives, including a specification of new data needs.
- A third set of tasks is the application of these new models to **conduct simulations** that explore possible future behaviors and structures.

### Categories of participants:

- mathematical geographers
  - urban modelers
  - GIS
  - telecommunications experts
  - simulation experts
  - space-time experts
  - urban geographers
  - futurists
-

## Emergent Social Forms

Given that the social is spatially constructed (and vice versa), new information technologies relate in powerful ways to the transformation of social identities.

### Central fringe questions:

What new spaces and social structures are being constructed by local access to globally disseminated information technologies?

How do the information technologies enable or constrain the formation of new political identities: In what ways are individuals, families and social groups transformed?

What is the relationship between political empowerment, social action and technology use?

### Disciplines

- Philosophy
  - Urban Planning
  - Geography
  - Political ecology
  - Environmental justice
-

## **Social/Geographic Implications of Information Technologies**

New information technologies are helping "re-write" both the geographical configuration of material artifacts (the built environment; the spatial organization of economic activities) but also the ways in which people interact with one another and how identities are constructed. A fair bit of work is underway on the former within geography, but there is relatively little systematic understanding of how the Web, telecommuting, etc. is affecting the relationship between identity and place. Traditional conceptions of boundedness (nation state, neighborhood, home) are being undermined; ideas of separateness/belonging are being reconstituted; and notions of place/space as a container and as belonging are shifting.

### **IMPLICATIONS include:**

- Redefinition of/loss of community
- Changing the power/influence of different social groups
- The role and relevance of local legal standards/regulation
- Intersection with the internationalization of standards and practices
- Redefinition of home-work relations and domestic work
- Democratization

### **CORE SCIENCE TO BE PERFORMED**

To trace, study and document the nature of the changes that are underway;

Comparative case studies of these phenomena

- across different political/legal and technological contexts
- for different kinds of communities within common national contexts.

### **DISCIPLINES**

- Political science/sociology
  - Law
  - Communications
  - Anthropology
  - Geography
-

## Virtual Geographies

This theme integrates a number of research specializations and agendas in geography and related disciplines concerned with spatial design, social communication and networking, and digital environments. Included in these cybergeographies are those who use electronic forms of communication including email and listservs, GIS and related forms of cartographic expression, electronic and public scholarly communities, and the learning and research environments associated with the World Wide Web. The fascinating and intriguing worlds associated with cyberspace provide creative opportunities for geographers, architects, librarians, engineers, advertisers and marketers, and social planners. The underlying meanings of distance, place, speed, identity and community are concepts that call for innovative field work, new instructional delivery systems, new meanings of literacy and comprehension, network advocacy and participation observation processes, re-thinking institutional and disciplinary boundaries, and how these information and communication technologies are shaping human environments of work, play, living, social organization, and governance.

- Social networks emerging in new information spaces
  - New ways of visualizing and representing space
  - Information spaces and information flows
  - The mapping and meaning of speed
  - Field work in virtual geographies
  - Virtual field courses (distance learning)
  - Constructing virtual geographies
  - Second and third order effects of the wired world
  - Diffusion of noninformation technologies
  - Identities, selves and spaces
  - Politics, policies and democracies (cyberdemocracy)
  - Fluidity of disciplines and institutions
  - Cyberpeace and cyberwar
-

## Participant Information List

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## Listing of Statements

- Stuart Aitken
  - Michael Batty
  - Stanley Brunn
  - Elizabeth K. Burns
  - Keith Clarke
  - William J. Craig
  - Michael Curry
  - Wm Randolph Franklin
  - Trevor Harris
  - Barbara Herr Harthorn
  - David Hodge
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  - Annette J. Krygiel
  - Michele Masucci
  - Joel Morrison
  - Donald G. Janelle
  - Paul Schroeder
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## Workshop on Geographies of the Information Society

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### Location and Date

- Upham Hotel, Santa Barbara, CA
- February 28-March 1, 1997

### Background Information

- **Objectives of the Workshop**
  - <http://escholarship.org/uc/item/7mh0r0bt>  
NCGIA's proposal  
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## List of Participants

## Participant position statements

## Stuart Aitken

### Statement of Interest

Bill Warntz's 1989 Annals paper on the "Geographia Generalis Varenii" suggests that Bernhard Varenius view of world was quite "special." Varenius saw geography as a science mixed with mathematics which taught about the quantitative states of the Earth (p. 172). Varenius's focus on a Cartesian view of space permeates most aspects of geography to this day, particularly in planning and GIS. This, I believe, should be of some concern because, as some critical theorists in geography point out, it is a view that hides the power of space. I argue that if we reconstitute our questions to penetrate the power of space then we need to pose them in a way that de-stabilizes the "fundamental nature" of space and time. Certain advances in critical social theory enable us to pose questions that contest the naturalness of space and time. These critiques are based upon the belief that space is a complex social product and the social is a complex spatial product. Although based upon Descartes, it may be argued that Varenius's special geography was not necessarily from an Archimedian hilltop. Although not discussed in any great detail by Warntz, Varenius's special geography also included aspects of the aesthetic and vernacular such as "life, food, drink, common speech and language, cities, memorable histories, crafts, inventions, illustrious men and women and so forth." The commingling of perspectives such as these with spatial analysis (in all its forms), GIS and planning suggests an intriguing agenda for the Varenius Project.

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## Barbara Herr Harthorn

### Statement of interests

- GIS and health on micro- and macro- levels
  - Mapping global flows, e.g. economic (commodity chains and reindustrialization), population (diaspora)
  - Mapping global environmental change on global economic and demographic change
  - Role of GIS and the internet in community organizing, especially regarding issues of sustainable development, environmental degradation, and environmental justice
  - Use of multi-perspective GIS analyses in applied social research applications
  - Political economy of information technology distribution and use around the globe
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## Trevor Harris and Daniel Weiner (not attending)

### Statement of Interests

Trevor Harris and Daniel Weiner are co-leaders of the NCGIA Initiative # 19: "GIS and Society: the social implications of how people, space, and environment are represented in GIS." (<http://www.geo.wvu.edu/www.i19/page.html>) They are also co-PIs of an NSF

funded research project which integrates GIS and political ecology for rural reconstruction in the South African lowveld. Harris's interests are in the use of GIS in geo-archaeology, GIS and society, environmental impact assessment, and spatio-temporal modeling. Weiner's research interests include political ecology, GIS and society, and African land use and agrarian reform.

The issues which interest us in the context of our research and the *Geographies of the Information Society* include the following:

1. The political economy of GIS To what extent does GIS support top-down and elitist decision-making and whose information is being represented? How are specific GISs politically embedded and how does the rapid diffusion of GIS change societal patterns of information access? In what ways does the use of GIS alter local power relations?
2. GIS epistemologies We are concerned here with how the world is being represented in specific GISs and what forms of knowledge are privileged over others. Of particular concern to our research is how local knowledge of space and environment might be incorporated into GIS production and use.
3. GIS and the Representations of Nature GIS is contributing to changes in how the earth's physical resource base is being represented. Our research is concerned with how this impacts the management and use of natural resources and explores GIS production and use in the context of socially differentiated access to environment.
4. Democratizing Spatial Decision Making Does GIS further bureaucratize decisions which are disconnected from ordinary people or does it provides unique opportunities for more inclusive decision-making? We are interested in GIS as a technology that democratizes and marginalizes simultaneously and are investigating the possibilities for using GIS to further democratize spatial decision-making.
5. Alternative GIS Production and Use There are many examples of people trying to use GIS with communities that are economically and politically marginalized (land rights issues for indigenous peoples in the Americas for example). Can "bottom up" GIS be successfully developed and what policy/decision making impacts might a GIS with conflicting information associated with multiple realities of space have?

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## Michael Batty

### Exploring, Defining and Classifying Virtual Geographies

I was immediately struck by the title of the NCGIA initiative in that *Geographies* rather than *Geography* is emphasized. This is in contrast to the early thinking about the impact of new information technologies on geography in which a less pluralistic focus was adopted. For example, Mark Hepworth's (1989) book was called *The Geography of the Information Economy* and in much of the writing in the 1980s, there was an implication that the geography that was emerging might be all embracing in some way. Since then the vast proliferation of computers and communications which continues to take use by surprise - I defy anyone to say otherwise - has complicated the picture immensely and is probably pushing us to adopt a much more pluralistic approach.

I am conscious however of how diverse and complex the many geographies that are emerging are and how the study of geography itself is changing in countless ways. I think some part of this initiative should be devoted to classifying and deriving typologies, no matter how contingent and pragmatic, so that we have some chance of making better sense of what is happening. For example, I think a clearer distinction can be made between geographies which are being formally invented for diverse digital purposes, and geographies which are emerging as a function of using information technologies in activities that were hitherto independent of any digital processes. For example, new kinds of geography which are entirely dependent upon computer games, on internet communications, on manipulating software within and between computers have largely emerged as a consequence of computers and communications per se. Existing geographies which are being fast affected by the use of information technologies in production and consumption on the other hand are changing traditional non digital processes and the geographies which have developed around them. Thus my first distinction would be between new geographies of information and the changing old geography of information.

A second theme that I consider important is the distinction between geographies inside computers and geographies which result from communicating with computers. The latter is cyberspace in Gibson's parlance, and although much of the new technology is drifting from inside computers to cyberspace - to the ether as it were - this distinction although changing will remain important. It is one of centering geography on the self, or on others and it clearly relates to the new geographies of node and nets, spaces and flows. For example, inside computers, all kinds of simulation involve both formally structured and informally organized geographies from games to CAD and GIS, as well as from the geography of the screen to the geography of software inside the machine. This might seem a diverse and eclectic bunch of perspectives on geography and one that has not particularly caught the interest of professional geography in the past but there is little doubt that these new geographies provide a new sense of space and the spatial paradigm within contemporary societies. Cyberspace itself and all that goes with it is somewhat easier to pin down geographically because everything from IRC to email to web traffic can be seen in terms of traditional geographies as part of the space of

flows. But how agents and actors are behaving in terms of these spaces is as opaque as ever, and harder to observe.

A third theme which is much more controversial for our study is the theoretical stance we might take on such matters. It is possible to write about any of the matters raised from a multitude of perspectives. For example, Castells recent book (1996) *The Rise of the Network Society* takes a somewhat low key but nevertheless explicit structuralist approach to the space of flows. Sherry Turkle's (1996) *Life on the Screen* takes a somewhat informal postmodern approach, while Kevin Kelly's (1993) *Out of Control* takes a manifestly casual and perhaps journalistic approach. Some of the best writings on the information society are in this vein, and my plea would be to argue that such diversity is necessary and inevitable and that the NCGIA initiative should applaud this. I do not consider that everything about any geography of the information society should be grounded in deep social theory just as I would never argue that it should be grounded in the equally contentious language of evolution and competition where everything is seen as a triumph of the selfish gene. A plurality of viewpoints must be welcomed.

Let me try to summarize my approach to classification. I consider a threefold approach which is about manageable:

new geographies in contrast to changing but pre-existent geographies

geographies inside computers in contrast to geographies between computers, and

geographies from many viewpoints and theoretical perspectives

Mapping all these onto one another is a mammoth task and not necessary as such, but clear organization of the domain is in my view a prerequisite to good work. I have had a very preliminary go at writing about this in a paper I have called *RVirtual GeographyS* which is forthcoming in a rather interesting special issue of the journal *Futures* entitled *RG Geographic Perspectives on the FutureS* which will come out later this year. If you want to look at the paper I have put it on our web site - if you point and click on <http://www.geog.ucl.ac.uk/casa/mike> then you will get it. It's very preliminary and I expect it will change a lot as I think more about it at conferences like the one we are to attend.

### Case Studies of Virtual Geographies

My own specific interest which I would like to think might be a focus of a little of this initiative is the study of geographies which are emerging and being designed from new digital media. What I have in mind here is the vast array of internet and stand-alone computer softwares which embody geography in some way in their representation. This is potentially a vast field for all software which is visual in some sense contains spatial relations which when activated and adapted by users and other participants generate new geographies. What I am specifically interested in is the kinds of new geographies which are emerging from serious uses of cyberspace to represent virtual spaces such as cities and various other place-based domains. City-Net has thousands of virtual city

sites which are web pages largely given over to advertising their wares through explicit information and links to other places/web sites. I consider that a serious study of these geographies which presumably are constituted quite informally, would be revealing of ways in which the net was constraining representation and the way users were being guided to it. Use and demand would be important here but also important is a sense of how such geographies were designed and what their potential and limits were. For all we know they may be worthless, unusable, at best a diversion, at worst quite distorting. I suspect not but we have no feel for the area.

Associated with this are the many interfaces that are emerging which do represent geography in more considered terms but are constrained by data and software and access. I am thinking here of the move to put visual interfaces on GIS which make them virtual in some sense, linking GIS to CAD and so on inside computers and across the net. In my group at UCL we have a couple of projects which are developing such media for GIS - one called Wired Whitehall is an interface to an urban design for that area being developed by Norman Foster Associates and the kinds of geography being called for by them and their clients are pretty different from those that usually comprise a GIS. Our second project involves linking GIS to urban design and building formal geographies but under a wide array of different geometric representations into a form where designers can manipulate the GIS. These are rather narrowly constrained digital geographies but they are subject to the same kinds of analysis that one might employ in examining say power relations on the internet where structural considerations constrain and emphasize elements of society to the detriment or positive benefit of other elements. I consider that some good case studies of ourselves, as working digital designers in geography are making decisions, are as worthy as those that we might undertake at arms length. Some of these are on our home page noted above.

One last point. The mix of people at this meeting is one which infuses commentators, philosophers and theorists on and of the information society with those who are actively involved in technical development of the very media that one might stand back and comment upon. This is probably a good thing but it is necessary to retain a balance. A good deal of rhetoric has been written, for example about GIS recently, which suggests a set of mindless fools playing with technology while Rome burns. This initiative should be wary of this as I feel there is much to geographies of information that can only come by moving between detailed knowledge of technologies and their limits and the wider social context. I hope this initiative embraces this.

## References

M. Batty (1995) The Computable City, at <http://www.geog.buffalo.edu/Geo666/batty/melbourne.html>

M. Batty (1997) Virtual Geography, at <http://www.geog.ucl.ac.uk/casa/mike/>

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## **Michele Masucci**

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### Interests -

The impact of GIS technology use on planning activities and appropriate development and use of GIS technology for community planning and local environmental management

The role of local NGOs (nongovernmental organizations) in local environmental monitoring and community planning

The outlook of NGOs using GIS; that is, learning how NGOs define decision making needs with respect to technology use, including GIS

Geography of the Internet--emerging problems and issues of accessibility related to local environmental quality and community development

### Issues -

Understanding how factors that constrain the use of GIS and Internet technologies are interrelated to community empowerment, especially at the community institutional level

Understanding how the advent of a new round of Internet capabilities impacts GIS development and management decisions for low-resource planning and NGO settings

http site (Caution - Site under construction!) <http://www.auburn.edu/~masucmm>

This site is the www homepage of a research project (Community - University Environmental Analysis Partnerships - UCenP) sponsored by USIA that I co-direct.

The project aims to develop and assess models of inter-institutional linkages for environmental quality monitoring in Alabama and Brazil. Its themes are: 1) to identify critical issues in technology sharing (including development of GIS technology) between universities, NGOs and community planning and, 2) to develop models of appropriate use of technology for improving local environmental quality in both Alabama and Brazil.

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## Paul Schroeder

### Statement of Interest

I see information relations as social relations, and conceive that information-seeking is society-building activity. There are physical aspects to this (as in telecommunications networks, the distribution of daily newspapers, resources in community libraries, etc.) as well as social aspects (as in knowledge-building and sharing social structures). These two aspects ought to be viewed together when defining an "information society."

As a librarian I could say: connecting people to what they need to know, when they need to know it, is fundamental practice for information professionals. Further: an interest in blockages, barriers and obstacles to information reflects my orientation toward public information resources.

This speaking in terms of barriers, blockages and obstacles, however, advances an unwanted notion that information is a kind of object that can be held, transferred, owned, sold and so forth. Pre-workshop documents in part articulate aspects of this tradition: "The possession of information, and the ownership or control of the means to produce, distribute, and consume it ..."

An alternative notion is that information is perpetually created by end users within the contexts of their own questions. Information equity and cycles of information poverty could be related to relative abilities to engage and find voice within the informational / social environment. Access to information resources and the ability to create new knowledge based on these resources ought to be an established right, rather than accepted as a consequence of relative economic advantage.

Spatial technologies, including GIS and remote sensing imagery, have developed within institutional structures that contribute to informational imbalances. One challenge for workshop participants could be to find methods for applying the analytical capacities of these technologies toward discovery of the patterns of their own distribution and use.

Suggested readings on this topic:

Mitchell, William J. *City of Bits: Space, Place and the Infobahn*. Cambridge, MA: MIT Press, 1995.

"The Net is ... profoundly and fundamentally antispacial." (8) "Powerful organizations will seek like ancient despots to bring concentrations of population under their control." (18) "Nolli's famous map of Rome vividly depicted [built space as public / private hierarchy] ... perhaps some electronic cartographer of the future will produce an appropriately nuanced Nolli map of the Net." (131)

Stone, Allucquere Rosanne. *The War of Desire and Technology at the Close of the Mechanical Age*. Cambridge: MIT Press, 1995.

39 ff., Stone discusses the "hypertrophy of location technologies" and the "warranting of socially apprehensible citizens" who have been created as inhabitants of today's "imaginal territories."

Webster, Frank. "The Information Society: Conceptions and Critique." In, *Encyclopedia of Library and Information Science*, Vol. 58, Supp. 21, ed. Allen Kent, pp. 74-112. New York: Marcel Dekker, 1996.

Webster asks: is the "information society" fundamentally new, or are we simply looking at increased informatization of social relations that are already well established? (75) He looks at the diffusion of networks as measure of informatization. (88) Overall conclusion regarding spatial aspects: "All things happen in particular places and at specific times, but the characteristics of space and time have been transformed with the advent of the network society." (90)

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## **David Hodge**

My interests lie in the connections between information and communications technologies, transportation, and urban form. The rapid development of these technologies makes possible, from a practical point of view, a wide variety of different futures. Perhaps never before have we been so self-aware of the potentially profound impacts of these technologies on society. I am especially interested in understanding the implications of the new technologies for:

1. the spatial redistribution of activities (all types at all scales),
2. economic restructuring,
3. transportation demand, especially intelligent transportation systems and the notion of sustainability, and
4. sense of community.

These interests were the basis for an OTA study (along with Richard Morrill and Kiril Stanilov) that was published in the November issue of *URBAN GEOGRAPHY*.

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## **Xavier Lopez**

Enormous institutional, legal, and public policy uncertainties confront the creators of digital libraries for geographic information. There is little understanding of the inter organizational issues needed to support the creation, management, dissemination, brokering, and archiving of spatial information in distributed settings. Foremost is the uncertainty regarding the ability of government, non-profit data centers, and research institutes to acquire and share valuable spatial information resources. Flexible legal and

policy frameworks are necessary to support the creation of these federated digital libraries spanning more than a single organization -- increasingly common in science, government and industry. Without rigorous and impartial research on the exchange of networked scientific information, future developments in digital libraries and Web-based GIS are likely to be reactive rather than prospective.

Some issues:

- Comparative access to local, state, national and international sources of spatial data
  - Ownership, economic, and privacy issues pertaining to GIS information
  - Inter organizational networks to advance spatial information infrastructure
  - Electronic markets for spatial information: digital libraries and electronic commerce on the Web
  - Promoting endogenous GIS innovation through spatial information dissemination
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### **Elizabeth K. Burns**

The following interests and issues related to the conference topics are part of my on-going research activities in metropolitan Phoenix on urban travel, inner city economic development, and spatial technologies.

Interests:

- The role of spatial technologies in urban travel and travel substitution, with emphasis on the impacts on specific demographic groups
- the diffusion of spatial and information technologies in public and private organizations
- individual and group access to information, communication, and spatial technologies and geographically-referenced information

Issues:

- integration of spatial technologies (GPS, GIS) with improved travel research design and field data collection
  - the gap of spatial display capabilities and organizational needs and data
  - lack of connection between place-based efforts such as neighborhood initiatives with spatial information available from private employers, public agencies, and schools.
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## Comments to Date 02/10/97

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### Stanley Brunn

I like many of the topics proposed, as they relate to themes in my class on the Geography of Information and Communication and also current research on the content analysis of WEB pages of countries and cities and on human rights and welfare in the electronic state. To clarify:

- I teach an upper division course on the Geography of Information and Communication and last semester I coordinated an interdisciplinary seminar on Worlds of Cyberspace.
- My research agenda includes projects dealing with human rights and welfare in the electronic state; electronic scholarly networking and communities; the "worldviews" of small countries on the WWW, and innovative time-distance-cost mapping.

I also have interests in the "non-wired" individuals, communities and states as well as the contributions scholars in the sciences, arts, and humanities can provide in helping us understand the often hidden and deeper meanings of information and communication.

Recent research and publications:

"Geopolitical information and communication in shrinking and expanding worlds: 1900-2100," in George Demko and William Wood, eds., REORDERING THE WORLD: GEOPOLITICAL PERSPECTIVES ON THE 21ST CENTURY. Boulder, CO: Westview Press, 1994, pp. 301-22 (with J. A. Jones).

"Ethnic communities in the evolving 'electronic state,'" in W. A. Galluser et al. POLITICAL BOUNDARIES AND CO-EXISTENCE, Berne, New York and Vienna: Peter Lang, 1994, pp. 415-24 (with D. Purcell and J. A. Jones).

"Ethnic 'electronic communities:' new immigrant linkages in a wired world," in M. Klemencic, ed. ETHNIC FRATERNALISM IN IMMIGRANT COUNTRIES. Maribor, Slovenia: Univerza v Maribor, 1996, pp. 337-43 (with D. Purcell).

"The Internationalization of Diasporas in a Shrinking World," in G. Prevelakis, ed. LES RESEAUX DES DIASPORAS. THE NETWORKS OF DIASPORAS. Nicosia, Cyprus: Cyprus Research Center, 1996, pp. 259-72.

"The GEOGRAPH electronic mailing list: The emergence of a new scholarly community," FENNIA 175 (1997), forthcoming (with K. Husso, P. Kokkonen, and M. Pyyhtia).

"Writing and communicating in Cyberspace: a new world of scholarly discourse," in A.

Buttimer and S. D. Brunn, eds., TEXT AND IMAGE; SOCIAL CONSTRUCTION OF REGIONAL KNOWLEDGES, Leipzig: Institut fuer Laenderkunde, 1997, forthcoming (with K. Husso and M. Pyyhia).

"Cyberboosterism: the 'selling' of small states on the World Wide Web," manuscript submitted for publication (with C. Cottle).

"Human rights and welfare in the electronic state," paper presented at International Workshop on Exploring Electronic Space," Japan Center for Michigan Universities, Hikone, Japan, May 1996.

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## **Keith Clarke**

### Statement of Interests

- Future technologies in GIS, RS and cartography
- Impact of information age needs on education, both content and structure
- Mapping efforts possible with new technologies
- Integration of scientific visualization with GIS
- Future user interface improvements impacts on GIS

### Some Issues

Who controls geographic data at international levels? Ease of use of data via interoperable systems. Conflicts of public interest versus national security. Societal impact of high resolution imagery

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## **William J. Craig**

I have been working with urban neighborhoods, trying to understand how they use information and what barriers they face in getting the information they need. My particular focus is on formal grass-roots organizations, since they have the stability needed to address problems faced by residents and business in a particular geographic area. I would argue that any improvement of the quality of life in urban American will come such groups if they can organize properly and get the help they need from police and others who control the resources.

Most local governments are unable and unwilling to provide information to citizen groups. Many have set rigid price structures that effectively eliminate public access. Most have arcane bureaucracies or technologies that serve as barriers to outsiders seeking information. Even those few who provide access to citizens have little idea how to describe their services in a way that seems to answer the needs of citizen groups.

And citizens, for their part, are hungry for information without having a clear idea of what they want or what options are available for using this information. I have tentatively drafted a "use matrix" that helps these organizations think about possible

groups they wish to influence with this information, including themselves in their own research and self-education. For each group, I've identified the goal our organization has in trying to influence that group and how information is conveyed. Most organizations I've talked to about this matrix seem to see aspects which both confirm their own activities and help them see other areas for new uses. Much more development work needs to be done if this tool is to be of any value, and most of that work involves working with these groups on their new information-based activities.

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## **John Krygier**

A brief list of interests related to the meeting:

- interactive mapping and gis functionality via the WWW
- impacts of the www, information technologies, spatial information, and www-based mapping and gis, particularly in socially and economically marginalized communities
- substantive www design issues in relation to above two interests

My WWW site to link (description of projects related to above interests):

<http://www.geog.buffalo.edu/~jkrygier/>

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**New 02/18/97**

## **Eric Sheppard**

Statement of interests:

- The impact of mathematical and computational approaches in geography on modes of geographic inquiry
- The societal implications associated with the diffusion of GIS technology
- The social history of GIS as a form of technical knowledge
- Potentials and limitations associated with the use by grassroots groups of GIS as a tool for understanding, analyzing and displaying issues of community concern
- Use of GIS in community discussions and analysis of, education about, and negotiations around, questions of environmental risk and environmental justice

Issues of current concern:

- Are the GISs we now use appropriate for the variety of ways people understand the world? What are the possibilities for participatory GIS? See <http://ncgia.spatial.maine.edu/ppgis/ppgishom.html>
- What are the paths not taken by GIS, and why? See <http://www.geog.buffalo.edu/ncgia/i19/>
- What can GIS contribute to our understanding of current debates about environmental justice, and how can it affect those debates? cf. <http://www.geo.wvu.edu/www/i19/paper>

- How are the internal dynamics of community groups, and their position within and outside the community they represent, affected by access to and acquired expertise with GIS?
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## **Munroe Eagles**

### Statement of Interests:

I have interests broadly in a variety of applications of GIS and spatial analysis in political research. My current research (with Hugh Calkins and Pam Beal) seeks to employ GIS and spatial analysis in the field of "human and social capital research". Our focus is on understanding the contribution of block clubs to a neighborhood's social capital stock in one selected area of Buffalo. A general statement of my interests in this area, can be found at the following URL:

<http://ncgia.geog.buffalo.edu/humcap/hc1.html>.

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## **Michael Curry**

An associate professor in the Department of Geography at the University of California, Los Angeles, Dr. Curry holds degrees in liberal arts, philosophy, and geography. His research concerns the development of and interactions among geographic ideas (space, place, nature); geographic technologies (geographic information systems, the written work, the map); the structure of the discipline of geography; and the broader social, cultural, and legal contexts within which the discipline, ideas, and technologies are situated. He has recently published a book on the nature of the written work in geography, and on the development of that work in the context of traditions of scientific representation and rhetoric; he is completing a second book on the cultural, social, and ethical issues surrounding geographic information systems; and he is beginning projects on privacy, property, and place and on the ethics of spatio-visual representation.

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## **Annette J. Krygiel**

### Statement of Interests:

As a nation we are moving to conduct our national security affairs from a posture of information dominance. Certainly US military affairs are in the middle of a revolutionary phase with technology. We are already experiencing this in Bosnia.

I am on a rotational assignment to the Institute for National Strategic Studies at the National Defense University. I am researching the factors in methodology, processes, and technology that increase our ability to form federations of information systems. An important aspect of this collaboration is the ability to incorporate legacy and evolving data bases of geospatial information, share data, and share the software applications that create, maintain, and use the data. Geospatial information and geographic information systems are at the core of situational awareness, and provide an essential

orientation to the environment for the diplomat as well as the military commander.

The questions are many. Here are a few. For instance, what must we do to achieve openness? How do we evolve our systems to sustain the ability to exchange software and data? How should control be managed (if at all) within a federation of systems? How do we integrate legacy data bases across a federation? How can we ensure the ability to fuse other data, such as intelligence and weather, with geospatial information? Is the progress in data standards sufficient to ensure we can freely exchange geospatial data a decade hence? How do we deal with globalization as a factor in future data exchange?

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## **Joel Morrison**

Interests:

The impact of geographic information technology on organizational structures; the present attempts to use industrial age models for information age phenomena; the importance of the changing relationship between government, private industry, academia, and non-profits "Value" in the information age Free vs fee data, copyright, licensing, the role of data vs information in a service economy The expanded gulf between the "technological possible" and the "actual" for large numbers of people who do not have access to the tools of geographical information The relative importance of "where" in an informational society, with its cellular phones, e-mail, and telecommuting, vs an industrial society.

Issues:

In the mature information age of the future, is area (geographical space of states, counties, etc) the appropriate frame for the redistricting of Congress, or should it be affinity groups linked by networks? (e.g. consider the AAG, are the specialty groups stronger than the regions?) What are the new professional organizations of the future? Replacements for NSPS for example. A model for Business Geographics? How do you transition? What are the new universities of the future? Virtual geography departments?

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## **Donald G. Janelle**

Interest # 1: The Need for a National Periodic Survey on the Applications of Communication/Information Technologies in Everyday Life Is there a case to be made for periodic national surveys on the applications of communication/information technologies in the everyday activities of the population?

Arguments for this include:

- current census practices do not represent adequately the changing space-time dimensions of work and activity patterns;
- changing conditions of employment that have led to varied work days/weeks,

combinations of shiftwork, flexitime, staggered hours, overtime, shared jobs, temporary work, 24-hour commercial and service operations, mobile work, all-day/everyday and global-scale commercial uses of the Internet, and telecommuting represent growing complexity in the organization of daily life;

- changing patterns of activity behaviour at the individual and household levels greatly impact on requirements for public and private infrastructure;
- communication and information technologies have been integral to recent changes in lifestyles, but in ways that are poorly understood;
- the spatial dimensions of activity patterns, seen as space-time paths (Hagerstrand), have been altered greatly by communication/information technologies, influencing levels of interaction and travel behavior, and landuse decision making;
- the provision of emergency services are complicated greatly by the inherent complexity of space-time behavior in association with communication technologies and would benefit from a greater understanding of what is happening?
- the pace of change is so rapid that there is need for either ongoing or periodic surveys to capture the changing patterns and their implications for resource requirements;
- we know little about emerging technology uses in family communications (e.g., the pace to which email may be replacing post as a means of bonding among nuclear and extended families).

(expansion required -- needs group discussion) Arguments against this include:

- large-scale government-sponsored surveys could be seen as a further erosion of individual autonomy and privacy;
- it may be difficult to foresee or to control how such information is exploited;
- collection and processing of such data will be costly and complicated;
- private organizations may be better equipped to handle such exercises;

(expansion required; needs group discussion) Implementation Procedures/Considerations:

- Associated space-time activity diaries could provide a strong empirical contextual framework for technology applications, one that relates to significant social concerns and to theoretical discourse.
  - diary surveys may be structured to include household samples to represent weekdays and weekends.
  - household samples of week-long space-time diaries, on the premise that the week is becoming the primary temporal unit for structuring household activity patterns.
  - surveys distribution structured to sample the population over 52 weeks of the year, to capture seasonal variations.
- Use previous studies as models (with changes to incorporate spatial information and communication technologies), e.g., the World Time Budget Study (A. Szalai, ed., 1972 The Use of Time).
- Can a cost-benefit approach be used to evaluate the worth of such an enterprise?

- What organizational requirements would be needed (e.g., space, personnel, training, budgets)? Can this be grafted to on-going census operations.?Interest # 2 (Janelle) "Dormant Data" and "Latent Geographic Information": Issues of Social Surveillance and Scientific Value

Note: Interest statement # 2 relates to statement # 1 in the following way: if a survey approach to documenting the applications of communication/information technologies in everyday life is not feasible, could standard surveillance approaches be used within a GIS framework to do the same thing? I am aware of the numerous ethical issues that arise here and adhere strongly to the importance of designing studies that do not contravene protocols of ethical research -- reader beware!

This speculative statement considers the social and scientific issues that arise through the combination of "Dormant Data", releasing agents, and "Latent Information". Focusing on the role of Geographic Information Science, it juxtaposes the intentions, methods, and outcomes of social surveillance with those of scientific investigation.

#### Dormant Data and Latent Information:

Data stored on maps and in geo-coded digital files represent explicit geographic information, presumably gathered and compiled to satisfy specific needs. However, vast quantities of data (both spatial and non-spatial in character, both historical and current) lie dormant, even though they may have latent potentials for geographic insight. Dormancy implies that such data are temporarily out of action and awaiting someone or something to release them for a renewed existence or for possible transformation and integration with other data into higher- ordered information (ideas, concepts, and theories).

#### Releasing Agents and Geographic Information:

Computers and analytic procedures for match-and-merge cross- tabulations have the power to convert seemingly unrelated data sets into meaningful exposures of pattern and structure. GIS is one such tool for freeing isolated facts from their dormancy and for spatializing data that may have little apparent relationship to geographic patterns and processes.

Yet, how much more effective could GIS be if it could harness the expertise of enquiry represented in the collective talents of investigative lawyers, probing journalists, and detectives. Can algorithmic coding assist researchers in asking the right questions, systematically examining and piecing together the evidence, cross-examining different data sets for alternative interpretations, inferring missing pieces, and reaching new levels of insight into problems? In principle, if not in practice, GIS provides the ultimate resource for presenting information spatially, accurately and fast. Armed with the exploratory skills of the detective/journalist/lawyer and GIS, the researcher enhances prospects for cutting through confusing details and for increasing the probability of finding new and potentially important associations.

## Surveillance, Science, and Social Understanding -- the Dilemma of Co-existence:

It is in its role as a surveillance tool that Geographic Information Science faces one of its most important social challenges. With its capacity to represent data spatially, GIS enhances the latent surveillance role of spatialized information. Surveillance involves the gathering of information and careful monitoring of subjects. Latent Surveillance concerns the possible uses of existing data sources to reconstruct histories and geographies of persons, institutions, and places, either with or without their knowledge and acceptance. For example, credit card transactions, telephone bills, and company personnel records could be used to create an activity and linkage profile of a person in space and time. As with all forms of data, such records may be used in deceitful and negative ways or in ways that promote broadly desirable social and scientific outcomes.

Scientific understanding of society relies on varying degrees of surveillance. Yet, the impacts of surveillance technologies on individual privacy and on culture are of growing concern, and codes of scientific practice preclude any potential harm to research subjects. Surveillance may be voluntary when an individual agrees to complete a survey, fill out an application form, or document daily activities in a diary. It is considered desirable for security and acceptable when luggage is screened at an airport. But, if someone rummages through the garbage for receipts and other titbits of personal history, it is an invasion of one's personal history.

Covert and overt surveillance goes on continually -- often under the guises of intelligence gathering, spying, espionage, detective work, and undercover investigation, sometimes gathering information through secret clandestine operations or false pretence. For this reason, public expressions of suspicion over the out-sourcing of government data management to private firms (e.g., EDS in the U.K.), the introduction of national identity cards, the use of electronic badges in the work place, and the use of vehicle tracking systems (using GPS) are warranted. In contrast, these practices are advocated and used to create efficiencies and to enhance services for the general public or for specific client groups. They could also be used to create spatial databases for scientific investigations -- for example (in relation to Interest # 1, above) to explore the changing nature of human space-time activity patterns.

While it is evident that surveillance may benefit from spatial representation of data and information, it may be possible to turn this around, and to ask: how might the methods of surveillance be used to enhance the effectiveness of GIS in scientific research? And, can sufficient safeguards be incorporated to avoid jeopardizing the security and safety of research subjects? At this point the number of questions become so numerous and so broad in scope that it would be best to explore them among a range of private and public stakeholders, including representatives from many scholarly disciplines. Maybe we can pursue this at the NCGIA workshop.

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