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SOCIAL EVOLUTION FORUM

Networking Past and Present

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Recent history has witnessed two important dramatic changes that have had a deep bearing on our social lives. One has been the way travel has shrunk the world to create a growing level of economic interdependence: butterflies flapping their wings in Brazil really do have reverberations on the economics and politics of every other continent in a way that has never previously been the case. The other has been the explosive rise of urban concentrations. In 1800, just 2% of the world's population lived in cities, but by 1900 the figure was 13%, by 1950 49%, and by 2000 60%, with a current forecast of 80% by 2050 (UN 2009). These two trajectories have influenced our social world in ways that could not have been anticipated.

Let's backtrack for a moment to the kinds of societies that we have lived in for most of our history as a species—and so at the very least for the last few hundred thousand years. The ancestral condition is what biologists usually refer to as a fission-fusion social system, the social system that characterises contemporary hunter-gatherers. These consist of a community that is normally fragmented into a number of separate foraging groups. These foraging groups typically number 30–50 in size and are relatively unstable, losing and gaining individuals and/or families over time. However, when they do gain members, they normally do so from other foraging groups within the same community. Communities typically average around 150, with a range in variation between 100–200. Unlike foraging groups, community membership is quite stable over time (aside, of course, from births and deaths). Communities themselves are clustered into higher order units, forming a series of hierarchically inclusive circles of sociality whose base is formed by clusters of best friends (typically around 5) and whose uppermost level (the 'tribe' defined as all the people that speak the same dialect) numbers about 1500. These layers have been shown to scale with a consistent scaling ratio of about 3 (each layer is three times as large as the layer immediately inside it, yielding a series of groupings of size 5, 15, 50, 150, 500 and 1500) (Zhou et al. 2005, Hamilton et al. 2007).

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The Neolithic Revolution that occurred around 10,000 years ago introduced agriculture and made possible a major sea-change in social style: the distributed networks of fission-fusion societies were able to converge on a single location and live together in settled villages. This set in train the increasing urbanisation of human societies that would take shape over the ensuing ten millennia. Though there is inevitably some variation in size, early settlements seem typically to have been of natural community size (i.e. about 150). And, indeed, aside from the drift to urban centres, rural villages seem to have remained about this size right through until modern times (Dunbar 2008).

In both dispersed hunter-gatherer and rural village societies, social exchange is common within the community layer, but much rarer between communities. The result is that most people share the same network of friends and relatives because they belong to the same community. The size of this social circle is around 150 individuals. We *know* more people than this (the number of individuals we can recognise and put names to is around 1500), but the number we can be said to have meaningful relationships with seems to be restricted to the 150 that form the natural community size of small scale societies.

Set against this long period of structural stability, the past half century has witnessed dramatic changes. These have been the direct result of the improvements in the speed and geographical scale of travel. This has enabled a degree of economic mobility unparalleled in the history of our species. People have, of course, always moved and no more so than during the nineteenth century when tens of millions of people drifted to the industrial centres of Europe to meet a voracious demand for labour or were part of the mass emigrations from Europe to the New World and Australasia. The big difference was that, in the past, people who moved lost their ties to their natal communities and created new small scale communities in their new homelands, whether these were the industrial urban centres of Europe or the plains of North America. Since the mid-twentieth century, however, fast cheap travel and efficient digital communication have meant that those who move no longer have to sever contacts with their home community. As a result, we move repeatedly, first to university, then every few years in the pursuit of jobs and promotion. Instead of consisting of 150 people who also share the same 150 contacts, our networks now consist of small subsets of friends that we accumulate with each successive move. This might not in itself be a problem, but for the fact that these subsets of friends do not overlap and rarely have the opportunity to meet up and get to know each other. The result has been that our social networks have become fragmented and geographically dispersed. Where once the immediate neighbours that we live among were our friends and family, they are now strangers. In our transient modern lifestyle, we live as 'Ruths among the alien corn' with casual acquaintances and strangers.

One by-product of this is that our social networks are no longer as densely interconnected as they once were. Some might view this as an advantage: one of the commonest complaints about small communities is their cloying oppressiveness—everyone knows your business. But that is also precisely their strength. We have shown, for example, that more densely interconnected networks of friends are more likely to support each other and behave altruistically towards each other than those who have weakly interconnected networks (Curry & Dunbar 2011).

The other side of the coin, of course, is the fact that besides being more altruistic, members of densely interconnected networks are also more likely to be critical of each other's behaviour—in order words, they act as informal policemen of the community's social norms. It is perhaps inevitable that, in the kinds of weakly interconnected communities in which we now live, people are no longer so willing to intervene either in minor infringements of social mores or in the abuse and mistreatment of others. We are no longer prepared to protect the wider interests of the community. There are probably two separate, but mutually reinforcing, reasons for this. One is the simple fact that we no longer owe obligations to those we pass among. The second is, almost certainly, the fact that if we do intervene, it is quite unlikely that anyone else will support us. We risk exposing ourselves to concerted attack. And these days, thanks to a misplaced obsession with private rights on the part of the legal profession, we may even face the added risk of prosecution. It may be no surprise that as our world has become more urbanised, so there has been a parallel decline in our levels of social engagement with the wider community and a corresponding decline in social satisfaction (Putnam 2001, Wilkinson & Pickett 2009). We live in an increasingly disengaged, dissatisfied and self-obsessed world.

The ready availability of the online environment has merely served to exacerbate this problem. In a recent stratified national survey, no less than a third of respondents had witnessed or been involved in cyber-bullying, while 13% admitted that they had actively encouraged it (Dunbar 2012). There was a striking age difference in this respect. Nearly half (47%) of 18–24 year olds had observed online bullying, but only 16% of those aged 55 and over had done so. It is not clear whether this reflects a natural ageing process (we are more likely to speak before thinking when young, and only learn to tune our behaviour more sensitively as we age) or is a reflection of the changing pattern of social network structure (the older pre-Facebook generations rely on more direct face-to-face interaction to manage their relationships, and so have more closely structured networks).

There have, of course, been repeated claims that the advent of digital media has offered us the means of solving this problem. The most common claim is that the world of Facebook and other social networking sites (SNSs) allow us to maintain larger networks of friends. The online world has enabled us to break

through the constraints imposed by Dunbar's Number (the limit of 150 on the number of 'friends' we can have). Unfortunately, this claim has been based on a misunderstanding of the issues at stake, partly thanks to Facebook's rather loose use of the term 'friend' to cover all kinds of relationships.

The reality is that Facebook does not allow people to have more *friends*. In fact, the average number of friends on Facebook pages is around 150 (Marlow 2011, Facebook 2011). Moreover, those who use social digital media (SNSs, etc) more do not seem to have larger offline social networks (Pollet et al. 2011a). Rather, what we do when inviting large numbers of people to sign up as 'friends' on our Facebook page is to create the layer of acquaintances between 150 and 500 that we already have in natural offline social networks. This, of course, does not make these friends in any meaningful sense: their status with respect to us does not change by virtue of the fact that they are formally recorded as 'friends' on a social networking site. Just because we have a larger everyday offline social networks, it doesn't mean to say that we are more social or sociable. Our research has shown that those who have large numbers of genuine friends (i.e. a larger than average face-to-face network size) typically sacrifice relationship quality to be able to do so (Pollet et al. 2011b). It is as though we have a limited amount of social capital and we can choose to spread that thinly (and have many weak friends) or thickly (and have a few strong friends) (see also Sutcliffe et al. 2012).

So, the question that we are left with is how to create a more engaged community despite the natural constraints that our psychology and the modern world impose on us. There are probably two options. One is to manipulate our psychology so as to improve our capacity to manage more individuals. However, if the constraint on the number of relationships we can manage is a hardware constraint and there is a monotonic relationship between network size and brain (or even frontal lobe) size as implied by the findings of Lewis et al. (2011) and Powell et al. (2012), then a significant increase in network size is not likely to be possible. The problem is that we already face a severe constraint on brain size at birth: the birthing process is already difficult for us because the human neonate's head only just fits through the pelvic birth canal. In any case, we have tried to resolve this problem already by giving birth to premature babies which complete brain growth outside the womb. A further reduction in the length of gestation is not a serious option since our babies are already born as close to the margin of survival as we can manage. In any case, even if we could compensate for an increase in natal brain size, this could only be achieved by a proportional increase in women's hip size (with knock-on consequences for their ability to walk). A more feasible possibility might be to extend the period of growth outside the womb. However, all of these solutions require genetic changes, and selection is too slow to solve the problem within the time scale we need it to.

The alternative is to find ways to exploit the bonding mechanisms that we use to maintain small scale societies and personal social networks and extend them to super-large networks and communities. In fact, we have already tried this during the course of recent human history. Two obvious examples are the military and world religions. However, both resort to the same strategy of using hierarchical structures and strict discipline to ensure cohesion on the very large scale (Dunbar 2011). Even so, the military option works only in very specific circumstances (battlefields where men's lives are at risk) and really works only when draconian discipline (and/or a great deal of repetitive training in the form of drill) is imposed. Without that, humans seem especially prone to undermining any forms of discipline imposed from above. This is no doubt why the world religions are so bedeviled by constant fragmentation into sects and cults. In any case, neither of these options seems especially attractive. Social cohesion on the very large scale will always be more effective when the commitment comes (bottom up) from the individual. To some extent, religions do this by creating a sense of a 'grand project' that attracts the commitment of the members, but they do so at the expense of having to impose a theology and this invariably creates an 'us *versus* them' mindset—something that is not especially desirable if the aim is wider social integration. The problem, then, is how to conceive of a grand enough project to induce that sense of commitment. If we could figure that one out, we might have a serious chance of engineering planet-wide cooperation and goodwill.

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Commentaries

Nicolas Baumard: *The Evolution of Cooperation: from Networks to Institutions*

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Our ancestral environment differed greatly from our current environment, for the better (we enjoy better, safer and longer lives than our ancestors) but also for the worse. In his text, Dunbar points out, in particular, that while we used to spend our whole life with the same people, we now live mostly with strangers, people we have not known for long and with whom we will probably

not interact in the future. This, Dunbar argues, may threaten the very foundation of our social life: "in the kinds of weakly interconnected communities in which we now live, people are no longer so willing to intervene either in minor infringements of social mores or in the abuse and mistreatment of others. We are no longer prepared to protect the wider interests of the community."

It might be, however, that things are not that much worse, for two reasons linked to the evolution of human cooperation. Let's first consider the biological aspect of human cooperation. In his text, Dunbar assumes that social cooperation is sustained by third-party intervention (in line with group selection, see for instance Boyd et al. 2005). However, empirical studies demonstrate that, actually, third-party intervention plays a minor role in the prevention of cheating. Among hunter-gatherers, punishment is rare if not absent (Marlowe 2010, Wiessner 2005, for a review, see Baumard 2010 and Guala 2012). Instead, what leads individuals to cooperate is the prospect of losing their partners. As Dunbar points out, human ancestral groups were highly fluid, and individuals were constantly moving from one group to another, seeking better and more reliable partners. In this situation, what prevented individuals from cheating others was the prospect of losing their reputation as reliable partners and deterring future partners from cooperating with them (Baumard et al. in press).

If this view is correct, then it might be the case that our modern environment is more (and not less) favorable to cooperation than the ancestral environment. Indeed, we may move from one university to the other, from one job to the next, but our administrative identity, our Facebook page, our credit rating always follow us. Today, information circulates much better than before and the whole planet is now totally connected. It is thus harder to escape from a bad reputation and as a result the costs of a bad reputation are higher than before.

Now consider the cultural dimension of human cooperation. Dunbar is right that networks have their limits in regulating individuals' behavior. As we move from hunter-gatherer groups to bigger and bigger societies, reputation becomes less and less useful in cooperation involving thousands of people who often do not have the time and resources to inquire into their partners' reputations. However, since the Neolithic revolution, humans have developed a new way to sustain cooperation: namely, *institutions*. Economists define institutions as second-order collective actions: that is, collective actions that regulate first-order collective actions such as collective fishing, collective defense, collective insurance, etc. (North 1990). In his article, Dunbar evokes the army (that is, the state) as an example of such second-order collective actions, but empirical studies show that people spontaneously set up associations and organizations, appoint watchmen and arbitrators, define rules

and fines for breaking these rules, and do so without any kind of state support (Ostrom, 1990).

Institutions allow humans to regulate herding in a common pasture, fishing in a common fishery, water consumption in an irrigation system, etc. More generally, history suggests that institutions have been very successful, decreasing the level of violence, creating large markets, redistributing resources from the rich to the poor, etc. Thus, while as Dunbar points out, we are more and more surrounded with strangers, our society has also appointed more and more strangers to help us. We now have policemen, firemen, judges, teachers, journalists, epidemiologists, therapists, etc. In fact, the welfare state now accounts from a third to half of GDP in most developed countries.

To conclude, while there are indeed some reasons to worry—trust is in decline (Putnam 2001) and well-being is not progressing as much as it used to do (Wilkinson and Pickett 2009)—this might not be because networks are becoming looser, but rather because the foundations of our institutions are not as strong as they were. Many studies, for instance, suggest that equality is an important factor in the creation of open, fair and efficient institutions (Alesina and Glaeser, 2004; Fukuyama, 2011). If this is true, then the rise of inequalities might be an central problem in the years to come.

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Marcus J. Hamilton: *Commentary on Dunbar*

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In *Networking Past and Present* Dunbar offers a brief, but important overview of the importance of understanding the role of complex network structures in all types of human organizations and societies, from the internal substructure of traditional subsistence societies to the frequency of friending on Facebook. Remarkably, the empirical statistical structures of these seemingly very different types of networks are often very similar (Arenas et al. 2004). Human social networks, and the organizations they form, are commonly 1) *modular*, in that there is a discrete substructure to the basal units within the network, such as nuclear families in populations, or cliques within friendship networks; 2) *hierarchical*, in the sense that interactions between individuals occur at multiple levels of social organization; and 3) *nested*, such that basal modular units are aggregated into larger groups at higher hierarchical levels, facilitating the flows of energy, materials, and information between individuals. These fundamental features of human social networks are in fact fundamental features of all kinds of complex systems in nature (Oltvai & Barabasi 2002; Ravasz & Barabasi 2003), and seem to represent a common solution to the problem of building complex systems by integrating flows over multiple scales of interaction in living systems. Therefore, we might well ask whether it is in fact surprising that there may be general principles that describe how humans organize themselves into groups for mutual benefit across the socioeconomic and cultural evolutionary spectrum. After all, humans across the anthropological spectrum share the same cognitive and communicative abilities, and it is our differential access to technologies that alter the scale over which these basic interactions can occur.

As complex networks are fundamental features of human societies, understanding their ecological and evolutionary dynamics will play a fundamental role in developing a 21st century anthropological science. This development will require both the inductive, empirical analysis of common

patterns that emerge from anthropological, ethnographic, archaeological, and sociological data (such as the origin and potential universality of 'Dunbar's numbers') and the development of quantitative mechanistic theory to explain how these structures evolved, theory that must be derived from the first principles of physics, chemistry, and biology, and so internally consistent across the sciences. Now that we understand the ubiquity of network structures in human social organization, we need to explore what this means for understanding the ecological and evolutionary dynamics of human systems, and the role of more fundamental scientific processes in these dynamics.

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Paul Hooper: *Socioecology of Networks*

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Dunbar's article provides a quick trip through major historical transitions in the structure of human social networks. He addresses continuity and change in network structure between traditional small-scale human societies, on the one hand, and modern urbanized societies on the other. He argues that while the total size of co-resident populations (i.e. towns, cities) has grown, the number of close relationships maintained by each individual has remained roughly the same. At the same time, modern networks are less transitive[1] than traditional networks, as long-distance communication allows us to maintain geographically dispersed social ties, despite high rates of residential mobility between regions.

[1] Network transitivity is defined as the probability that an individual's partners are also connected to each other (Newman 2003).

Fieldwork with traditional human groups—in my case, the Tsimane' of lowland Amazonia—supports Dunbar's characterization of traditional networks in terms of nested hierarchies of interconnected clusters of individuals, increasing in breadth (i.e. number of individuals) but decreasing in strength (or intensity) as one moves up in scale. Dunbar emphasizes the relative constancy across societies of the size of clusters at each scale, which he argues reflects the binding constraint of species-typical cognitive abilities. I would also advocate that, to the extent that we build social relationships because they accomplish something valuable, the structure and scale of networks should also be patterned according to socioecological variation in the benefits and costs of relationships of different types and intensities.

We know that socioecology is useful in understanding the scale of residential communities. Tsimane' settlements in the early 20th century, for instance, tended to be smaller and more geographically dispersed than in the present day. The more recent introduction of novel public goods—schools, soccer fields, and religious missions—has driven geographically denser, more nucleated settlement patterns. Those villages with the greatest contact with the outside Spanish-speaking world have grown to 300–500 individuals, whereas more remote villages have remained smaller, usually with fewer than 100 individuals. Against this background of variation, the mean size of present-day Tsimane' villages is 126 individuals (± 97 SD), which remains roughly consistent with Dunbar's hypothesized natural community size.

We also know that the nature and volume of traffic on networks in traditional settings vary as a function of the benefits and costs of interaction. Among foragers and horticulturalists, who smooth risk through food sharing, foods with higher variance in return rates (e.g., hunted game) tend to be shared across significantly broader networks than low variance items, such as fruit or cultivated produce (Gurven 2004). Likewise, individuals in groups facing high levels of uncorrelated risk in production tend to share food more widely than those for whom production is more predictable (Kaplan & Gurven 2004). The negative effect of geographic distance on the intensity of sharing indicates that the strength of ties is also sensitive to transaction costs. The cost-benefit logic of endogenous network formation is in fact nicely articulated by Dunbar and colleagues in Sutcliffe et al. (2012; see also Jackson 2008).

By Dunbar's account, the breadth of social networks in modern industrialized societies remains roughly the same as those in traditional societies, despite an increase in the size of settlements, making us strangers to most of our neighbors. Mobility has broken down the transitivity of our networks, which he suggests undermines cooperation, norm enforcement, and civic engagement. There are other noteworthy aspects of modern institutional settings that are likely to shape the structure and content of networks. With monetary currency and developed markets, the exchange of goods no longer requires the establishment of trust in long-term social relationships. Contracts

can be formalized and enforced by courts. States monitor and sanction violations of social norms that are coded into law. The control structure of firms and organizations prod us to work hard and work together. Storage, savings accounts, and market-based insurance have reduced our dependence on close friends and family to carry us through crises. These modern institutions and markets may substitute for much of what traditional social relationships are meant to accomplish, transforming, if not the size of our networks, at least the flow of goods across them (Bowles & Gintis 2002, Seabright 2010).

It is interesting to consider Dunbar's statement that the willingness to enforce social norms has declined in pace with the disintegration of modern communities in light of the results of Henrich et al. (2010). Henrich and colleagues conducted economic experiments across societies ranging from hunter-gatherers to West African and US cities, and found a positive relationship between the size of the residential community (ranging from 20 to 4600) and willingness to punish stingy partners by withdrawing resources in anonymous ultimatum and third-party punishment games. This appears to run counter to Dunbar's hypothesis. Shouldn't modern city-dwellers be less willing to enforce a norm of fairness in exchange? Perhaps not: perhaps these inclinations are appropriate for a society dominated by anonymous market exchange, but less so for one in which exchanges are nearly always embedded in a history of long-term interaction. It would be instructive to know how rates of cooperation and punishment amongst regular social partners in every-day life compare between traditional and modern settings. Needless to say, more research is in order.

Dunbar concludes by posing the question of how to restore the strength of our communities, considering (and rejecting) brain modification and top-down control as potential solutions. A third alternative may be to simply live more locally. In many domains of interaction, higher scales of integration sometimes provide very little benefit at significant cost. High regional mobility may be efficient in terms of income maximization (on the part of individuals) and profit maximization (on the part of firms), but may entail sacrifice of other, non-monetary inputs into well-being, such as social connectedness. If we were to weigh this trade-off differently, perhaps we could be happier.

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Daniel N. Finkel: *Social Cognition in a Digital World*

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In his excellent target article, *Networking Past and Present*, Dunbar argues that though contemporary personal networks are often geographically dispersed and not densely interconnected, the number of personal relationships individuals can maintain has not changed since our origins in tribal communities. He further suggests that despite the hype surrounding Internet social networking sites (SNS's), they have also not increased the number of real relationships the average person is able to maintain from around 150. Instead, the online environment may have exacerbated the social problems that arise from living among strangers in urban environments, such as decreased interpersonal altruism, cyber-bullying, and the reluctance many feel towards enforcing moral norms. While my commentary will not dispute these main points, there are several additional factors to consider when examining the mismatch between the evolutionary constraints on the size of our social networks and the modern/urban environments in which many of us live today.

First, it has been argued that reputational concerns are one driving force that promotes prosocial behavior, and indeed there is experimental evidence supporting this idea (Di Cagno and Sciubba 2010). This is likely one reason that cyber-bullying is prevalent—it is anonymous, so the reputational repercussions of such aggression are not enforceable, and therefore not a concern. Why shouldn't I knock a competitor down (emotionally) if there is no chance they will ever know it was me? This behavior, though it is mean, could be the extension of an evolutionarily advantageous strategy. Of course, this does not excuse such behavior; that type of justification would be committing the naturalistic fallacy.

On the other hand, it doesn't seem that bullies, at least before adulthood, always suffer losses in reputation from their mean behavior. On the contrary, aggressive behavior among young men is often rewarded with both resources and sexual benefits (Vaillancourt and Hymel 2006). Though we might like to think that such behavior leads to less cooperation, it might actually lead less aggressive individuals to seek the friendship of bullies, if only to avoid being the target of their bullying.

Another reason SNS's don't necessarily enhance social engagement is that their primary communicative medium is terse writing. While written words (even tersely written ones) can certainly convey loads of emotional content, what they lack are the subtle, mostly non-conscious auditory and kinetic cues that we receive and produce when we engage in face-to-face conversations. These cues are essential pieces of the empathic process that takes place when we use our Theory of Mind (ToM) to try to understand the intentions, beliefs, desires, and emotions of others (Frith and Frith 2010). Without these cues, our own senses of empathy may not be as engaged, and we may therefore again be more likely to commit written acts that violate social norms we would otherwise be constrained to uphold. This is a risk of conducting important social interactions through texts, emails, or SNS posts. We lose important communicative aspects of the social signal when we convert it from analog to digital.

Third, it is not in SNS's that we should look for online versions of the densely interconnected social networks that characterized our evolutionary past. SNS's are full of mostly trivial interactions, and though they do enable us to connect with and keep track of individuals in our networks who are not geographically close, they are not typically used for relating anything intimate. We should consider Internet communities in which anonymity is less of a factor, in which repeated interactions necessitate reciprocal altruism and the informal policing of social norms, and in which collective actions rely on the successful collaboration of interconnected networks of individuals. This kind of community would make individuals accountable for their actions—they would risk the same sorts of social repercussions for misbehavior, including potential loss of group membership, which helped bond groups in the tribal

settings of our ancestors. These relationships could exist in Massive Multiplayer Online games, for example, and as Schiano et al. (2011) argue, engaging in collaboration in these venues does indeed serve to enhance real-life social relationships.

Finally, Dunbar considers possible ways to extend the size of social networks in the name of becoming a more engaged community. While it does seem intuitive to imagine a grand project that could extend our natural sense of commitment to a group larger than 150 or 1500, perhaps it would be wiser to adhere to the constraints imposed by our cognitive capacity. Instead of thinking of ways to make strangers feel more connected on a grand scale, why not think of ways to increase involvement and engagement on a local scale, in the communities in which we already live. We know that participating in rituals, particularly those that involve synchronous music and movement can lead to group bonding (Wiltermuth and Heath 2009). In fact, these are among the techniques that militaries and world religions recruit for their own extensions of group identity. If we engaged in such rituals with our neighbors, then they wouldn't be strangers any more.

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Herbert Gintis: *Commentary on Dunbar and Baumard*

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In his engaging Social Evolution Forum contribution, *Networking Past and Present*, R.I.M. Dunbar argues that in traditional societies, most people share the same network of friends and relatives because they belong to the same community. In contemporary society, by contrast, our social networks have become fragmented, and we live predominantly with casual acquaintances and strangers. In contemporary life, then, people are no longer willing to intervene to correct violations of social morality, and hence are not prepared to protect the wider interests of the community. In his comment on Dunbar's analysis Nicolas Baumard argues that the sort of third-party punishment that Dunbar considers the stabilizing force of traditional societies is very unimportant, on grounds that among hunter-gatherers, punishment is rare if not absent. What leads individuals to cooperate, Baumard argues, is the prospect of losing their reputation as reliable partners. Baumard then observes that as we move from hunter-gatherer groups to modern societies, reputation becomes less and less useful because people must cooperate with large numbers of virtual strangers. However, he argues, contemporary institutions, including firms, service organizations and government bureaucracies, take the place of informal reputational systems. In addition, he asserts, citing the work of Elinor Ostrom, groups spontaneously set up such associations and do so without the need for formal state support.

Baumard concludes that while we are increasingly surrounded by strangers, our society has also appointed more and more strangers to help us—policemen, firemen, judges, teachers, journalists, epidemiologists, therapists, etc. "In fact," he observes, "the welfare state now accounts from a third to half of GDP in most developed countries."

I suggest that Dunbar is correct in stressing the centrality of third-party punishment of social deviants in maintaining social order in all known forms of human society. However, Dunbar views such punishment as the rational behavior of self-regarding individuals, and hence the incentive to punish is severely weakened in modern societies in which we are predominantly surrounded by strangers. In fact, there is a critical type of third-party punishment found in all known human societies that is based on moral values and is carried out by other-regarding individuals and coalitions of such individuals even though it is personally costly to the punishers. I believe Dunbar is simply incorrect in believing that contemporary societies generally have a problem sustaining a social morality, although of course there are

communities and even whole nations with low 'social capital' that function poorly.

I suggest also that Baumard's analysis is not well founded at all. The literature, to which he refers as denying the importance of altruistic punishment, is incorrect. I and my coauthors, in our *Behavioral and Brain Sciences* commentaries, have shown that Guala's (2012) and Baumard, Andre and Sperber's (forthcoming) critiques are not persuasive.

In fact, human beings are not purely self-regarding, but rather have moral preferences that often lead them, in situations involving unrelated other human beings, to cooperate and to punish non-cooperators at personal cost. The evidence for this is the high frequency of cooperation and punishment in social situations in which there is anonymity, or there is no repetition and hence no long-term reputational effect (so-called 'one-shot' interactions), or the probability of repetition is low. In these situations, self-interest cannot explain the observed prosocial behavior.

Christopher Boehm's systematic studies *Hierarchy in the Forest* (2000) and *Moral Origins: the Evolution of Virtue, Altruism, and Shame* (2012), carefully document the importance of third-party punishment in extant hunter-gatherer societies. In his newer book, Boehm located 150 simple hunter-gatherer societies. Boehm coded fifty of these societies from around the world. Despite the fact that these societies have faced highly variable ecological conditions, Boehm finds that their social organization maintains an egalitarian social order by means of the collective punishment of 'bullies,' and they subscribe to a common human social morality, operating through internalized norms, so that individuals act prosocially because they value moral behavior for its own sake and would feel guilty behaving otherwise.

More generally, Edward O. Wilson's *The Social Conquest of Earth* tells the story of human eusociality, in which other-regarding preferences and generalized within-group altruism are key to our success as a species in fitness-enhancing cooperation. Wilson summarizes his analysis of human evolutionary success as follows: "All normal people are capable of true altruism. We … attend to the sick and injured, help the poor, comfort the bereaved, and even willingly risk our own lives to save strangers… Authentic altruism… enhances the strength and competitiveness of groups, and it has been favored during human evolution by natural selection at the group level."

For evidence from behavioral game theory analyzing altruistic reward and punishment, I refer the reader to my book with Samuel Bowles, *A Cooperative Species* (2011), and Joseph Henrich, Robert Boyd, Samuel Bowles, Colin Camerer, Ernst Fehr and Herbert Gintis, *Foundations of Human Sociality: Economic Experiments and Ethnographic Evidence from Fifteen Small-Scale Societies* (2004) and the references therein.

Baumard's assertion that institutions can stabilize social cooperation with completely self-regarding agents who care about their reputations is obviously

incorrect. Baumard refers to the welfare state as one such institution, but in democratic countries, voters determine the size of the welfare state, and the observed size cannot be explained by the actions of self-interested voters, who would never vote for a redistribution to the poor.

More generally, a political democracy would be infeasible if its members were purely self-regarding. In large democratic elections, the rational self-regarding agent will not vote because the costs of voting are positive and significant, but the probability that one vote will alter the outcome of the election is vanishingly small. Thus the personal gain from voting is vanishingly small. For similar reasons, if one chooses to vote, there is no plausible reason to vote on the basis of the impact of the outcome of the election on one's self-regarding gains. It follows also that the voter, if rational, self-regarding, and incapable of personally influencing the opinions of more than a few others, will not bother to form opinions on political issues, because these opinions cannot affect the outcome of elections. Yet people do vote, and many do expend time and energy in forming political opinions. This behavior does not conform to Baumard's story.

It is a short step from the irrefutable logic of self-regarding political behavior that rational self-regarding individuals will not participate in the sort of collective actions that are responsible for the growth in the world of representative and democratic governance, the respect for civil liberties, the rights of minorities and women in public life, and the like. In the self-interest model, only small groups of socially dominant individuals will act politically. Yet modern egalitarian political institutions are the result of such collective actions. This behavior cannot be explained by the self-interest model.

Except for professional politicians and socially influential individuals, contrary to the implications of Baumard's theory, electoral politics is a vast morality play to which models of the self-regarding actor are a very poor fit.

Defenders of the self-interest model may respond that voters believe their votes make a difference, however untenable this belief might be under logical scrutiny. Indeed, when asked why they vote, voters' common response is that they are trying to help one or another party get elected to office. When apprised of the illogical character of that response, the common reply is that there are in fact close elections, where the balance is tipped in one direction or another by only a few hundred votes. When confronted with the fact that one vote will not affect even such close elections, the common repost is that "Well, if everyone thought like that, we couldn't run a democracy."

Politically active and informed citizens appear to operate on the principle that voting is both a duty and prerogative of citizenship, an altruistic act that is justified by the categorical imperative: act in conformance with the morally correct behavior for individuals in one's position, without regard to personal costs and benefits. Such mental reasoning, which has been called 'shared intentionality,' is implicated in many uniquely human cognitive characteristics,

including cumulative culture and language. Shared intentionality rests on a fundamentally prosocial disposition, not self-interest.

The model of human strategic interaction on which my argument is based suggests that the human capacities for thriving in a society of strangers was laid down long ago in the period of our evolutionary emergence, and is part of the passage of hominins from ape-like social organization to full sociality based on an evolved social morality in which individuals behave morally under normal conditions because it is the right thing to do, not because it serves their narrow self-interest.

It is also true that moral behavior is often highly rewarded in human society, which is doubtless why we teach our children to be moral. Indeed, classical philosophers, including Aristotle, never question but that being virtuous was a critical part of human flourishing. Nevertheless, it is a key aspect of moral behavior that one acts appropriately even in situations where the personal costs are high and even extreme. It is this aspect of human morality that accounts for our success as a species.