

Commentary on:

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Reflections on the Evolution of the Human Psyche

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The edited volume *The Human Revolution* was published in 1989 with the aim of summarising the background to the appearance of modern humans. Dick Alexander contributed a lengthy piece to this volume on the evolution of the modern human mind – in effect, what it is to be human and how we came to be that way. His article (it is 60 pages long) divides naturally into three basic components. The first part sets out the background and agenda, and argues a trenchant case for the claim that the origins of the human mind lie in the social domain. The second part is as an interlude and revisits the thorny old debate surrounding the application of evolutionary theory to human behaviour and psychology – a reflection, perhaps, of the fact that, barely a decade after the “Sociobiological Revolution”, the vitriolic debate that had followed the publication of Ed Wilson’s *Sociobiology* and Dawkins’ *Selfish Gene* was still alive and kicking. (Sadly, although things are much improved in this respect three decades on, a deep-rooted antipathy to Darwinian ideas still colours attitudes in some parts of the humanities and social sciences.) The third part is the heart of the paper and addresses the question of how and why the human mind came to be so different. Dick placed a strong emphasis on this in the paper: the “cultural” activities of animals notwithstanding, humans *are* in a different league to everyone else in that they do things (like building cathedrals and writing plays) that no other species does.

The essence of his argument is summed up in a three remarkably prescient sentences at the outset of this third section:

“I think the key argument.... is that consciousness represents a system of (1) building scenarios or constructing possible (imagined) alternatives; (2) testing and adjusting them according to different projected circumstances; and (3) eventually using them according to whatever circumstances actually arise. [In a previous paper] I referred to such abilities as the capacity to over-ride immediate rewards and punishments in the interests of securing greater rewards visualized in the future..... In this view, consciousness, cognition, and related attributes – which probably represent the core of the problem in understanding the human psyche – have their value in social matters,

and the operation of consciousness can be compared to the planning that takes place in a game in which the moves of the other players cannot be known with certainty ahead of time.” [p. 477]

Play loomed large in this argument, but for Dick it had a special meaning over and above the more conventional interpretation of play as physical practice: central to his argument was what he termed ‘social/intellectual play’, the capacity to ruminate on and mull over alternative scenarios in the light of others’ possible responses to one’s actions. Play, in his view, allowed individuals to learn how to predict others’ strategic responses as adults, and so gave rise to the human capacity to evaluate the outcomes of alternative courses of action and thus choose between them more effectively – a capacity sometimes subsequently referred to as “mental time travel” (Barrett et al., 2003; Suddendorf et al., 2009).

In a singularly influential paper published a decade earlier (Alexander, 1974), Dick had argued that the evolution of group-living in primates (and other species) arose in response to one of two core problems: defence against predators or the opportunity to monopolise resources. Both these suggestions were taken up by others in later decades (e.g. van Schaik, 1983, Wrangham, 1980) and they continue to exercise debate even today. However, in his *Human Revolution* contribution, Dick eschews resource defence as a likely selection factor for group-living and comes down hard in favour of predation risk. Resource defence, he argues, could only have arisen *after* group-living had come about, and so must be a consequence, not a cause, of group-living. In this respect, his arguments have largely been borne out, at least in the case of primates and ungulates (see, for example, Shultz et al., 2006; Adamczak & Dunbar, 2008).

Predation as the driver for group-living is the bedrock on which Dick built his argument. The key steps can be summarised as: predation selects for living in groups; living in groups inexorably gives rise to competition between groups (thus, opening up the opportunity for resource defence); such competition selects for the capacity to cooperate in

mounting a defence (or attack) against rivals over resources; cooperation selects for consciousness (i.e., the cognitive abilities needed to manage effective group-level cooperation), which in turn selects for increased brain size etc. The problem to be solved was, as he put it:

“[W]hat kinds of mechanisms enabled group-cooperative humans to conduct intergroup aggression cooperatively. How did humans manage the coordination necessary to carry out raids efficiently, especially against enemies belonging to their own species and possessing the same general abilities and tendencies?” [p. 498]

In the article, Dick makes a great deal of kin selection and tactical deception in this respect – something that was perhaps inevitable given that it was written in the immediate aftermath of the launch of the Machiavellian Intelligence Theory of primate brain evolution (Byrne & Whiten, 1988) and an increasing interest in the evolution of deception (e.g. Krebs & Dawkins, 1984). Kin selection, of course, remains a central plank in all evolutionary analyses, but the Machiavellian Intelligence Hypothesis has mutated into the softer form of the Social Brain Hypothesis (Dunbar, 1992a, 1998; Barton & Dunbar, 1996) in which affiliative bonding (and/or social learning) is emphasised at the expense of the deviousness implied by the term “Machiavellian” (Dunbar, 2011). Nonetheless, deception remains, of course, an important issue in evolution, as evidenced by the fact that it has spawned a number of important counter-strategies in terms of human cognitive evolution (notably the cheat detection mechanisms of Cosmides [1989; Cosmides & Tooby, 1992]). Re-reading the original text, however, reminds me how much it anticipates the emergence of theory of mind (or mentalising) as a central theme both in child development and in primate comparative psychology:

“[One of] the most effective ways to deal with human competitors [is].... the ability to see ourselves as others see us, so as to cause them to see us as we would like them to rather than as they would like to. The human psyche is evidently evolved to excel at such practices” [i.e., “the ability to see ourselves as others see us”]. [p. 491]

If this isn't an explicit reference to theory of mind, it's hard to see what else it could be.

This emphasis on the importance of cooperation in animal and human social evolution has, over the past decade or so, given rise to a minor industry in both experimental and modelling studies of the conditions under which cooperation can arise, with the numbers of papers generated by this theme running into many hundreds. For myself, however, I found his appreciation of the fundamental importance of the need for community cohesion in human evolution particularly prescient. Contemporary versions of the Social Brain Hypothesis place a singular premium on the problem of freeriders, the effect these have on destabilising the kinds of implicit social contracts on which cooperation necessarily depends and the mechanisms needed to prevent freeriders from overwhelming cooperators (Enquist & Leimar, 1994; Nettle & Dunbar, 1997; Dunbar, 1999, 2009). Prominent among the mechanisms being discussed in the contemporary literature are ethnic markers and the role of religion, both of which are explicitly mentioned by Dick:

“Acceptance of unifying myths or information or goals depends on the individual's acceptance of the value of group unity, including the position or status of himself that will result, or other effects on himself and his intimates (children, spouse, relatives, reciprocants). Even myths widely regarded as counterfactual may be accepted, repeated, and elaborated if their effect is seen as [socially] unifying.” [p. 493]

My own view has come to be that the central problem we have faced throughout our evolutionary history has been how to neutralise the destructive effects of freeriders as we have sought to push social community size above the limits set by social grooming (the standard mechanism that primates use to bond their social groups) (Dunbar, 1992b, 2008). There are two related issues here. One is the fact that time constraints impose what amounts to a glass ceiling at around 50 (the mean group size typical of the most social of the monkeys and apes, including baboons and chimpanzees) on the number of individuals with whom one can form coherent relationships. The second is that as community size increases, so the

pressure to defect on the social contract that underpins primate sociality increases proportionately. If some mechanism is not found to counteract this effect, the community will collapse back to the minimum size that primates can maintain by grooming. A solution to the first problem has to be able to solve the second.

What is needed is some process that effectively bridges across that barrier to reach more individuals, and laughter, music and religion (or at least the rituals of religion) appear to have been the mechanisms of choice – mainly because all three are extremely good at triggering the release of endorphins (the same mechanism that allows grooming to be an effective mechanism for social bonding: Dunbar, 2009a, 2010). This almost certainly has a long history, building successively through these three processes from around two million years ago (the first appearance of the genus *Homo* and the point at which the grooming time constraint first kicks in) until the appearance of fully fledged religion and language with the advent of anatomically modern humans around 250,000 years ago (Dunbar, 2003, 2009b). With the advent of language, shared myths (or worldviews) come to play a central role during the course of later human evolution because language allows us to coordinate religious rituals and provide them with a meaningful *raison d'être*.

Central to this process is emotion, not least because endorphins have a positive effect on affect and are responsible for creating that sense of wellbeing and warmth that goes with successful social interactions (Zubieta et al., 2003). Dick makes a great deal of emotion and, unusually perhaps for an evolutionary biologist, of the physiological processes that underpin emotions. However, his discussion is largely couched in terms of the manipulation of others' emotions in order to deceive them – or avoid being deceived by them. As he saw it:

“Once individuals became capable of recognizing emotional states in other individuals, then it seems virtually certain that selection would alter both this ability and the emotional states themselves, or the external evidence of them, in ways that would be called communicative. This is the point (in evolution) at which it would

become important for us to know about our own ‘feelings’ or emotions – because we could then manipulate them to affect use by others of evidence about them.”

It has taken a long time, but emotions have finally begun to loom large in discussions of human cognitive evolution (see, for example, Gamble et al., 2011; Gowlett et al., in press).

The key to all this lies in a growing intensity of inter-group conflict, giving rise, in effect, to a perpetual state of war between neighbouring groups. War was undoubtedly out of fashion in the 1980s, notably among archaeologists and palaeoanthropologists who tended to take a rather benign view of human psychology and behaviour (Keeley, 1996; Wrangham & Peterson, 1997). However, war has become to surface as a likely driver of human demographic and psychological evolution and is currently undergoing a major resurgence of interest among evolutionary biologists and psychologists (Bowles, 2009; Mathew & Boyd, 2011; Gneezy & Fessler, 2011).

Persistent states of conflict of this kind imply competition for resources, and that in turn implies high population densities. Indeed, it is difficult to imagine why neighbouring communities should behave aggressively towards each other in the absence of competition for resources, since the costs of war are inevitably rather high. One question that troubled Dick was whether human palaeo-populations had ever been dense enough to instigate significant competition between groups. The word on the street among palaeoanthropologists tended to be “No”. Resources were in plentiful supply, population densities low and many (if not most) populations were continually expanding into new territories. Dick felt obliged to conclude that:

“...densities *per se* [are] not critical [to my argument], or else that estimates of densities [are] wrong. It is probably more important to know what kinds of social groups people lived in, and why, than to know densities *per se*.”

However, maybe there was an alternative explanation. For ecologists, the term resources inevitably means ecological resources. This need not always be so, of course, since

women remain a potentially limiting resource for men. Males might, therefore, compete to defend land in order to monopolise access to women, or compete to defend groups of females, rather than defend land for the sake of the food resources it contains. If competition was for women rather than ecological resources, this might have solved the problem that troubled Dick. Competition for women could in principle generate just the kind of arms' race that his hypothesis requires. Although it is not always clear what motivates warfare in small scale societies, women are often a trophy of such activity (see , for example, Chagnon 1968) and might be seen as the ultimate objective even where the *causus belli* is something more mundane. However, this is, I think a minor issue. The fact, as Dick himself was at pains to point out, is that traditional societies revolve around an in-group/out-group effect in which those from other communities are invariably viewed with suspicion and as game for exploitation.

Interestingly, in an aside, he was “led to wonder – entirely without empirical evidence – whether or not orangutans and gorillas once lived in social groups more like those of chimpanzees and humans than is presently the case – in other words, in larger multi-male groups, “perhaps multi-male groups in which the males were cooperative in hunting, or even in intergroup aggression” [p. 502]. The speculation turns out to have some validity. In the models that we have developed of great ape socioecology – models that use the time costs of foraging to model the constraints on social group size – it has become clear that gorillas and orang-utans represent alternative solutions to the chimpanzees' problem of coping with the ecological costs of sociality (Lehmann et al., 2008, in press). The orangutan's solitariness is simply the limiting condition in the chimpanzee's attempt to dissipate the costs of large social communities through a fission-fusion form of social organization, while the gorilla seems to represent an attempt to solve the same problem by increasing body size and shifting to a more folivorous diet. Once, both almost certainly had the same social system as the chimpanzee.

One central question remains outstanding: why have only humans, of all the many species of primates and other mammals, needed to go so far in evolving their unique psyche? And associated with this are the subsidiary evolutionary questions as to what was the trigger for all this and when exactly did these traits first appear? These tantalising questions remain as opaque now as they were in 1989. Whatever happened on the long road from our common ancestor with the great apes some eight million years ago to the final appearance of modern humans around a quarter of a million years ago, the history of brain evolution in our lineage suggests that it probably happened quite late – during the last 800,000 years marked by the appearance of archaic humans. In looking for potential drivers of evolutionary change around this time, the most obvious feature of this period is the onset of climatic instability with rapid fluctuations between cold and warm periods that eventually give rise to increasingly deep ice ages. The cool, dry conditions that prevailed even in the tropics must have been very challenging for these early humans, requiring novel strategies to cope with them.

Like all ecologists, palaeoanthropologists tend to reach instinctively for the foraging innovations solution. After all, the Palaeolithic record provides us with more handmade stone tools than anything else, and, at the very least, tools imply the dismembering of carcasses. So conventional wisdom assumes that early humans survived because they evolved the intellectual skills to respond with novel ways of extracting nutrients from an increasingly challenging environment. But the question is whether these solutions to the challenges of survival related solely to foraging strategies (and, hence, essentially involved individual trial-and-error learning) or to something more social as implied by the Social Brain Hypothesis (such as mutual exchange networks that allowed communities to gain access to others' foraging territories as a buffer against local environmental catastrophes). It is difficult to see anything in the first option that would demand the doubling of brain size that occurred during the last half million years of human evolution. Certainly, as Wynn (1988) pointed out at

around the time Dick was writing his article, the tool kits manufactured by successive populations fail to suggest that the answer lies in technological inventiveness (see also Gowlett et al., in press). While brain volume increased exponentially through time, tool quality improved on something closer to a power curve: tools hardly changed in appearance or quality for the first nine-tenths of the period, and then underwent a dramatic development from about 50,000 years ago in a dazzling display of technical expertise – the very phenomenon that attracted attention as the “Human Revolution” of the title of the volume in which Dick’s paper was published. Meanwhile, if we are to believe the quantitative implications of the Social Brain Hypothesis, community sizes would have been increasing in the same exponential fashion as brain volume. Bigger groups means more stress, both in ecological terms and, more importantly perhaps, in social, reproductive and demographic terms.

Why would one need such large social groups if it was not to provide *social* solutions to the ecological problems that these early humans faced? The answer must surely have been a form of ecological buffering that exploited extended social networks whose geographical extension was sufficient to provide access to areas that still had resources even in the worst of times. Extended networks of this kind would surely have provided exactly the kinds of competitive regimes that Dick envisaged in his model, especially under environmental conditions in which populations frequently faced resourcing challenges. If so, then it implies that Dick’s warfare hypothesis is of relatively recent origin.

In sum, then, the 1989 article has stood up remarkably well to the passage of time. One can always criticise the details, but these are issues that Dick had to make the best of with the rather more limited knowledge available to us twenty years ago. Hindsight is always a wonderful thing. The main theme of his argument, in contrast, appears to be in good shape and as robust as it was when it was fresh ink on the page. Yet, despite this and all the research

that has been done since 1989, one question remains obdurately unanswered: just *why* are humans *so* different to other species of animals? While we are beginning to unpack the mechanistic explanations that provide an answer to how we are different (the neuropsychology of mentalising competences, for example), it is still no obvious answer to why we needed these competences, what environmental conditions selected for them, and when exactly these evolutionary events were set in train. These tantalising questions remain to be solved by those who follow in Dick's footsteps.

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