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PUTTING THE MIND BACK INTO NATURE: THE ORIGIN AND EVOLUTION OF CONSCIOUSNESS

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Much of twentieth century science has adopted an attitude that trivialises nonhuman animals. This can primarily be traced to the subtle influences of Biblical tradition and Cartesian philosophy on Western scientific ideology which, often implicitly, valued the inherent superiority of man over all other forms of life. And nowhere is this more pronounced than in the field of cognitive science which primarily investigates the nature of the mind in human beings and occasionally, in other so-called `lesser' organisms, taking care, of course, that the problem of consciousness is never too much dabbled with. The principal intellectual counter-revolution to such a prevalent assumption of inherent human superiority is, however, provided by evolutionary biology which supposes that the human mind and human consciousness are products of natural evolution, subject to forces of Darwinian selection. The time has thus come to put the mind back into nature!

The problem of understanding the biological origin and possible evolutionary routes of consciousness depends critically on the definition of consciousness in biological

organisms. And since there have been as many definitions of its elusive quality as there have been thinkers on the subject, it immediately becomes obvious that there are several corresponding attributes of consciousness which differ in their functional complexity and could, therefore, be attributed different points of origin in evolution (see also Rao, S.L., this volume). A convenient, biologically functional definition has been provided by Griffin (1992), who considers *perceptual consciousness* to be the state or faculty of being mentally conscious of anything, and *reflective consciousness* to be the recognition by the thinking subject of its own actions and mental states. Thus, to remember, anticipate, or think would entail perceptual consciousness; to be aware that one is remembering, anticipating, or thinking would involve reflective consciousness.

Let us first consider the more complex manifestation of consciousness – reflective consciousness – which will also henceforth be referred to as *introspection*. Humphrey (1980) first suggested that the power of introspection could allow an individual animal to make private use of its conscious experiences to provide a conceptual framework on which another individual's behaviour could be modeled. The first animal that became conscious, by this definition, was now transformed from an animal which simply `behaved' to one which at the same time informed its mind of the reasons for its behaviour. A `conscious brain' had evolved parallel to the older `executive brain' (Humphrey 1980). An animal with only a clever brain, but a blank mind, which could see now had evolved into an animal with also a clever mind which knew it could see.

Our understanding of phenomena like blindsight tells us that it is perfectly possible for us to have been perceptive, intelligent, complexly motivated creatures completely successful in leading lives without ever feeling the need for understanding what, why, and how we were doing what we were doing. Blindsight victims, for example, correctly `guess' the position or shape of objects present in the affected side of their visual fields. It however takes consciousness to provide our minds with the sensations that provide direct evidence for what our senses tell us.

And as soon as we became conscious, and thus, also capable of thought, of introspection, of examining the workings of our minds with that inner eye, we made a further tremendous leap – that of understanding the often-frightening complexity of social relationships. We gained an insight into the psychology of oneself and of others. We became capable of constructing a conceptual model of our own minds and, thus, acquired the ability to handle that ultimate challenge faced by any social organism – to understand, respond to, and manipulate the behaviour of other members of the species with which one leads a complex demanding coexistence.

An important related point needs to be addressed here. What about the sensation and expression of feelings in animals? Of pain and of pleasure? Expression of feelings is clearly a form of communication, and it can be argued without much difficulty that such a capacity could have evolved in the social sphere in order to influence the behaviour of other individuals with whom one is interacting. A clear testable hypothesis thus emerges here – greater the repertoire of expression of feelings, more complex must be the society in which it has evolved. The capacity for being conscious of feelings is a little more debatable. But what Humphrey (1982) argues is that it must have been essential for an individual to have direct access to the psychological concepts of feeling pain, fear, or satisfaction, since only then would it be able to completely model the behaviour of another individual. For example, when an animal is consciously aware of its own pain resulting from an injury, it automatically begins to understand the consequence of injury in another animal. But what about our appreciation of music? Our sensitivity to the colours of a rainbow? Were they too actively selected for? Or are they just pleasurable offshoots of our evolved social consciousness? What would be the quality of our life without colour, without music?

Assuming such a process of the opening of our inner eye, when did this remarkable evolutionary change begin to occur? If it had happened only in our own hunter-gatherer ancestors who first tasted the bittersweet realities of complex protohuman social life, it must have happened only about three to four million years ago. But, we

must also entertain the possibility that since consciousness had originally evolved in response to social pressures, chimpanzees, dolphins, elephants, or wolves, which enjoy comparably complex social relationships, may also be capable of reflection into their minds. We may, using certain empirical approaches (outlined in Sinha, this volume), one day discover whether and to what extent this is true, and thus rewrite the evolutionary history of the human mind.

Let me now move to less complex animals, those who are much older than us in terms of evolutionary history. Insects, for example. Certain insects, especially those that live in elaborate societies, like wasps, bees and ants, exhibit fairly complex behaviours reminiscent of those shown by higher animals. A particularly impressive form of symbolic communication in insects, to choose a notable example, is that of the dance language of honey bees. Although a detailed description of this language is outside the scope of this paper, honey bee foragers are able to communicate the exact direction and distance of a certain food source to other members of the hive through elaborate dances. Considering the complexity, symbolic nature and limited flexibility of such communication, Griffin (1992) has argued that the bees may actually be expressing simple thoughts during their dances. (Indeed, it was originally Darwin (1871/1981) who wrote of these social insects – "It is certain that there may be extraordinary mental activity with an extremely small absolute mass of nervous matter".) However, given that the honey bee dance language is comparatively rigid and inflexible, and given also that a number of fairly elaborate behaviours in insects are known to be under simple genetic control, it is more likely that the dance of the honeybee reflects an inherent instinctive ability, or at most may be, in part, a learned behavioural response to successful attempts at finding food. These relatively simpler mechanisms are, in fact, believed to underlie much of the behaviour displayed by animals, including human beings, thus precluding the need to invoke consciousness as a possible explanatory principle.

Griffin (1992), however, suggests that conscious mental states, on one hand, and such instinctive behaviour or learned behavioural contingencies, shaped by

Darwinian selection, on the other, need not be mutually exclusive phenomena. A complex genetically programmed behaviour pattern, therefore, may or may not be accompanied or guided by conscious thinking. Furthermore, Griffin believes that early on in evolution, genetic influences may have led to a central nervous system that developed conscious thoughts in a wide variety of organisms, be they honey bees or human beings, especially when such thinking was adaptive and may have been selected for in the course of the animal's evolutionary history.

Although Griffin makes a very strong theoretical argument, it is difficult to conceive what kind of evidence would support his contention. The honeybee dance language singularly lacks intraspecific variability, and does not seem to provide any evidence that individual decision-making processes are involved in its execution. Moreover, the principle of parsimony would make it difficult to acknowledge the additional role of a complex process like consciousness in the manifestation of a behaviour which almost all authors agree seem to primarily be a hard-wired species-specific instinct.

At another end of the spectrum are philosophers who have argued that consciousness is a phenomenon possibly ubiquitous to all living forms. They usually begin by questioning the claim that consciousness is a brain activity exclusive to humans on the ground that such assumptions have not been properly examined and are based on a disposition to set humans categorically apart from the rest of nature. This exclusivity ascribed to humans naturally fails to take hominids into account (since they are not strictly considered human – all humans are hominids, but not all hominids are human) – particularly the evolution of tool use, tool making, burial practices and the like over the last two and a half million years. Moreover, the manufacture and use of tools by nonhuman primates, as well as the patterns of sophisticated social behaviour exhibited by them (so similar to those of humans, at least phenotypically) also remain unexamined in terms of their underlying mental mechanisms.

Such philosophers have, therefore, questioned not only the privileging of the human brain, but also explanations of consciousness in narrative terms, the evolution of the conscious from the unconscious, and by extension, the selective definitions of consciousness and even that of life that are often put forward. Curtis (1975) and Sheets-Johnstone (1998), for example, define life in terms of the responsivity and animation typically exhibited by all living forms. Animation, in terms of sampling, assessment of the environment, movement, and striking out in new directions, thus appear to be legitimate properties of all living organisms – from bacteria to bats, from hard-bodied invertebrates to human beings – and such cognitive or mindful properties, so typical of life, necessarily blur the artificial division between the `higher' and the `lower' organisms. According to them, qualia are integral to bodily life in all living organisms. The origin of consciousness can accordingly be traced to the awareness of one's own body, in terms of the sensations received, the monitoring of the environment that it lives in and the responses that it makes towards different aspects of this environment, as well as the spatio-temporal and energy dynamics of its movement. If this is an acceptable position, the biological origin of consciousness must then be traced back to the beginnings of evolutionary time, the beginnings of life itself.

Let me know change perspectives, and move from our distant past to the palpable present. From wondering about how our consciousness evolved to how it may be shaping our lives today. I now present a speculative model of one possible route of human cultural evolution, a distinct product of our cognitive abilities and consciousness, which may constitute a novel, but important, form of human evolution in our times.

One of the most striking features of cultural evolution, in contrast to Darwinian evolution, is the remarkable rapidity with which culture evolves. The tremendous variation in cultural norms, traditional practices, employment of tools and other artifacts, and such intellectual progress that we have achieved in a relatively short span of a few hundreds of years far outstrips the range of biological variation that

characterises modern humans and that evolved over the preceding millions of years. We obviously have a complex brain, a mind, and perhaps some genes, which allow us to acquire, maintain and transmit ideas (or what Dawkins called *memes*; Dawkins 1989) at fairly high levels of complexity. It may be noted here that although there does exist simple culture in the great apes, mainly in the form of tool manufacture and modification, and their appropriate use in different situations, in no way do they match the range and complexity of human cultural practices.

In course of his controversial speculations on the nature of genetic evolution in humans, Dawkins (1989) first pointed out that we are the only species who can alter the course of evolution, and we do so every time we use a contraceptive! It is also true that a wide variety of modern cultural artifacts and practices protect and insulate most human populations from the raw `environment', the stage on which biological evolution has traditionally performed. Moreover, there are several traditional examples (priests and religious leaders, for example) and an increasing number of cases (particularly among the urban middle-class populations) within human societies where reproduction does not appear to be of much importance. Have such sections of these populations then moved outside the purview of biological evolution today?

My proposal is that genes are perhaps gradually being replaced by memes as the currency on which evolution currently acts. This is essentially a Lamarckian model which bases itself on the ability of human memes (ideas, culture) to be acquired and evolved during one's lifetime, and then transmitted both horizontally across individuals within the same generation and vertically across successive generations. Since there will obviously be only a limited number of memes that can be borne by each individual during his or her lifetime, it is envisaged that different memes would compete with each other for survival and preferential transmission within and across generations. Just as a gene expresses itself in a particular phenotype which is then subject to natural selection, a meme may be driven by two motivational forces: the acquisition of personal satisfaction, joy and happiness at the level of each

individual, and that of social status, popularity, and fame at the level of the population. Both these sets of acquisitions perceptively feed back into an improvement of each individual's quality of life, and would, therefore, be subject to natural selection. Empirical evidence for such a model can perhaps be obtained if the palpable influence of these factors on certain human life-history variables, such as survival and longevity, can actually be measured.

Certain interesting parallels between classical Darwinian evolution and the present model immediately present themselves, but need to be explored in some detail. One such example is that of *altruism*. Darwin had himself expressed concern about whether his theory could reconcile itself to the altruism shown by sterile social insect workers who help other individuals in the colony to reproduce but themselves fail to leave behind any offspring (Darwin 1859/1968). Such behaviour was, however, later brought into the purview of normal selfish behaviour when it was realised that although such individuals did not directly transmit their genes to the next generation, they were able to acquire indirect fitness through the reproduction of their genetic relatives (Hamilton 1964). And thus, perhaps, do better evolutionarily than they would have if they had directly reproduced.

Genetic models of evolution have, however, found it difficult to explain the motivations underlying human altruism. This is primarily because acts of altruism in humans are not necessarily directed towards one's genetic relatives. The present model suggests that such altruism, nevertheless, can also be driven by a certain kind of selfishness. Such atypical behavioural patterns thus could arise due to either of two conscious or subconscious processes. First, the principle of *reciprocal altruism* (Trivers 1971) – best summarised by that old English proverb, "Every good turn deserves another" – could drive individuals to be altruistic in the hope that they themselves would be beneficiaries of such altruism in the future if the need ever arose. Second, and perhaps more important, acts of altruism could be driven by a sense of personal satisfaction or happiness that rewards an altruistic individual; these benefits may or may not also be accompanied by a simultaneous increase in

social status and fame of such individuals. Benefits such as these, once acquired, can critically influence the quality of one's life, and hence, perhaps their survival and longevity; this, in turn, may either directly (social status and fame) or indirectly (personal satisfaction and happiness) have far-reaching and more crucial consequences for the transfer of one's memes within and across generations.

Finally, let me end with an old adage, which beautifully captures the essence of the ideas expressed here:

"To live on in the minds of those we leave behind is not to die"

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