Commentary

Reflective consciousness and the emergence of memes: Serial evolutionary pathways?

1. Consciousness and memes

Among the most important questions that confront the scientific and philosophical understanding of the human mind, the exact role that consciousness plays in the way we perceive our external and internal worlds is one. We do not yet understand the biological mechanisms that underlie our conscious thoughts, our ability to reflect on our lives and on ourselves. What has also not been adequately understood are some closely related problems. These questions pertain to how consciousness evolved in the first place in the biological world, attained its present state of complexity and the directions in which it continues to evolve today, particularly in humans – the only species that everyone agrees is 'conscious'.

This essay discusses aspects of consciousness in non-human species, considers why reflective consciousness needed to evolve at all, and speculates about a likely evolutionary pathway that this form of consciousness may have generated in relatively recent times. I suggest that memes may have evolved to the fullest extent in humans, a species that is reflectively conscious, and that memetic fitness may be increasingly regulating the further evolution of the human race. I conclude with the example of altruism and point out that its evolution in humans is best explained by a memetic model.

2. A case for the animal mind

As in the case of any other biological system, evolutionary biology tells us that the human mind and human consciousness are products of evolution and subject to forces of Darwinian selection. This would imply that the mind had non-human antecedents. In the past, however, there was stiff resistance from Western scientific ideology and from Cartesian philosophy to attributing a mind and consciousness to non-human beings. This attitude was shaped largely by the assumption that humans were unique in possessing a complex mind capable of rational, conscious thought; animals being 'mere automata' were largely reflexive and, at most, capable of mastering certain associative learning paradigms.

Advances in the fields of animal behaviour, cognitive ethology, evolutionary biology, neurobiology and artificial intelligence have now revealed an evolutionary continuity in the anatomy, physiology and functionality of animal and human brains. The fact that the mind, though still poorly understood, is an emergent property of the brain has also been almost completely accepted. Studies of animals in their natural environments and innovative experiments by comparative psychologists in the laboratory, particularly on non-human primates, are slowly unraveling the existence of complex behavioural processes and cognitive capabilities of the animal mind. These include social knowledge, semantic communication – both vocal and gestural, mental representations of objects, events and properties, complex mental operations such as analogous reasoning and concept formation, attribution in the form of deception, teaching and imitation, emotions such as empathy and compassion, and finally, certain aspects of consciousness, including self-awareness (for extensive reviews, see Cheney and Seyfarth 1990; Griffin 1992; Tomasello and Call 1997; Hauser 2000). The time has come to put the mind back into its rightful place in nature.

3. Consciousness in animals?

The problem of understanding the biological origin and possible evolutionary routes of consciousness depends critically on the definition of consciousness in biological organisms. Unfortunately, since there have been as many definitions of its elusive quality (124 at last count! B V Sreekantan, personal communication) as there have been thinkers on the subject, the definitions obviously reflect several biological attributes of consciousness, each different from the other in its functional complexity (see Wilkes 1984; Rao 1999). It is conceivable that the different attributes of consciousness, represent different points of origin in evolution.

To begin with, let us consider a convenient, biologically functional definition of consciousness provided by Griffin (1992). He suggests *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. Many authors now seem to agree that non-human animals may possess perceptual consciousness, as manifested in the ability to carry out certain higher cognitive processes of the kind listed earlier, but the evidence for reflective consciousness is much more ambiguous.

In addition to these, there are two other categories of consciousness that remain controversial with regard to their applicability to non-human animals. *Phenomenal consciousness* refers to the qualitative, subjective, experiential, or phenomenological aspects of conscious experience, sometimes identified with qualia. Nagel (1974) suggested that there might be "something it is like" to be a member of another species, but disputed our ability to ever know, or describe in scientific terms, *what* it is like to be a member of that species. This influential view can be debated, but that is beyond the scope of this essay. In general, there seems to be some agreement that phenomenal consciousness is more likely in mammals and birds than it is in invertebrates, such as insects, crustaceans or molluscs, while reptiles, amphibians, and fish possibly lie somewhere in-between.

Self-consciousness refers to an individual's capacity to represent its own mental states. Because of its second-order character ("thought about thought"), the capacity for self-consciousness is closely related to questions about "theory of mind" in non-human animals – the capability of an animal to attribute mental states to oneself and to others (Premack and Woodruff 1978). Although questions about self-consciousness and theory of mind in animals continue to be subjects of active scientific controversy, they are at least considered empirically tractable, unlike the problem of phenomenal consciousness.

4. Why do we need reflective consciousness?

It has been suggested that the evolution of sophisticated cognitive abilities in animals, particularly primates has largely been driven by the social pressures that individuals faced as they began to live in increasingly complex societies (Jolly 1966; Kummer 1971; Humphrey 1976). Individuals in social groups, had to interact with each other, establish relationships with members of different age and sex groups and had to choose from a multitude of competitive and cooperative life-history strategies in order to further their own survival and reproduction.

Could the origin of reflective consciousness in animals or, for that matter, in humans, be a culmination of the evolution of cognitive abilities? Humphrey (1980) hypothesised that reflective consciousness or the power of introspection could, in fact, 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. This would obviously be of great importance in complex societies when the first animal that became reflectively conscious now transformed itself from an animal that simply 'behaved' to one which at the same time informed its mind of the reasons for its behaviour and, at one step removed, for another's behaviour. An animal that could see with a clever brain but a 'blank mind', now had evolved into an animal that *knew* it could see. This was a tremendous leap – for as soon as such an individual became capable of thought, of introspection, of examining the workings of its own mind, it gained insight into the psychology of itself and of others. It became capable of

constructing a conceptual model of its own mind. It thereby acquired the ability to handle the challenge faced by any social organism – to understand, respond to, and manipulate the behaviour of other members of the species with which it had to achieve an occasionally conflicting, often demanding, co-existence.

There is an argument that can be raised against such a scheme for the evolution of reflective consciousness. The argument stems from our knowledge that certain complex behavioural tasks can be accomplished successfully without any contribution from reflective consciousness. For example, blindsight victims with impaired connectivity to the higher visual cortex correctly guess the position or shape of objects present in the affected side of their visual fields or are able to manipulate their way through obstacles without perceiving that they had accomplished such a task. Phenomena like blindsight show that it may be perfectly possible for us to be intelligent, complexly motivated creatures and lead successful lives without ever feeling the need to understand what, why, and how we do what ever it is that we do. But it takes consciousness to provide our minds with the sensations that offer direct evidence for what our senses tell us; and gaining insight into our own actions, thoughts and experience obviously is an advantage while planning ahead.

An important related point can be raised here. How could one explain the sensation and expression of feelings in animals? Of pain and of pleasure? *Expression* of feelings is a form of communication, and it can be argued that such a capacity would have evolved in the social sphere in order to influence the behaviour of other individuals with whom one is interacting. A clear and testable hypothesis thus emerges here – the greater the repertoire of expression of feelings, the more complex must be the society in which it has evolved. The capacity for being conscious of feelings is a little more debatable. Humphrey (1982) argues that it must have been essential for an individual to have direct access to the psychological concepts of feeling pain, fear, and 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 perhaps begins to understand the consequence of injury in another animal. But how did our appreciation of music originate? 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 life be like without colour, without music? Are these sensitivities linked to a sense of well-being and that, in turn, to better chances of survival and an improved quality of life?

5. The origin and evolution of reflective consciousness

When did this remarkable evolutionary change begin? If it was with our hunter-gatherer ancestors who, one might say, 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 demands, chimpanzees, dolphins, elephants, or wolves, which enjoy comparably complex social relationships, may also be capable of reflection into their minds. Using empirical approaches (see Sinha 1999a), we may one day discover whether and to what extent this is true. Then we could rewrite the evolutionary history of the human mind.

Let us now consider less complex animals, those that are much older than us in terms of evolutionary history (insects, for example). Is there any evidence that such animals could be reflectively conscious? 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 and well-known form of symbolic communication in insects is the dance language of honeybees (von Frisch 1967). Most remarkably, honeybee foragers are able to communicate the exact direction and distance of a food source to other members of the hive by means of elaborate dances. Considering the complexity and symbolic nature of the signals, Griffin (1992) has argued that the bees may actually be expressing simple thoughts during their dances. Indeed, Darwin (1871/1981) 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, the honeybee dance language is comparatively rigid and inflexible, and a number of fairly elaborate behaviours in insects are known to be

under simple genetic control. This makes it more likely that the dance of the honeybee reflects an inherent instinctive ability, or perhaps (at least in part) a learnt behavioural response to successful attempts at finding food.

Griffin (1992) insists that conscious mental states, on one hand, and 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 argues 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 honeybees or human beings, especially when such thinking was adaptive and so could have been selected for in the course of the animal's evolutionary history.

Although Griffin makes a strong theoretical argument, it is difficult to imagine what kind of evidence might support his contention. The honeybee dance language 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 primarily to be a 'hard-wired' species-specific instinct. In fact, it is very likely that relatively simpler mechanisms underlie much of the behavioural repertoire of animals, including human beings, thus precluding the need to invoke consciousness as a possible explanatory principle for most behaviours.

6. Whither reflective consciousness?

Let us move from the distant past to the present, from wondering how reflective 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 seen as a distinct product of our sophisticated cognitive faculties. This may constitute a novel, but important, form of recent human evolution (see also Sinha 1999b).

A striking feature of cultural evolution, in contrast to Darwinian evolution, is the remarkable rapidity with which it occurs. The tremendous changes 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, is generally agreed to far outstrip the range of biological variation that characterises modern humans (and which evolved over the preceding millions of years). I suspect that all of this has been made possible due to our reflective consciousness. We have been able to reflect on each cultural norm or artifact, on our intellect that enabled us to conceive of it, on our experience in being able to practice or fabricate it, as well as to recreate or modify it appropriately. It should be pointed out that although there exists simple culture in the great apes, mainly in the form of tool manufacture, modification and their appropriate use in different situations, in no way does this come close to the range and complexity of human cultural practices and artifacts.

7. Memes and memetic fitness

Virtually every single cultural practice or tool that we use can be conceived of as an *idea*. Thanks to a complex brain, a mind, and perhaps some genes, we are able to acquire, maintain and transmit these ideas (Dawkins's *memes*; Dawkins 1976, also see Cloak 1973) at fairly high levels of complexity. A meme is a unit of intellectual or cultural information that survives as such long enough, and that can be passed on from mind to mind. In contrast to genes which can be propagated only across generations, memes can move vertically through generations as well as horizontally between members of the same generation. Memes can also differ in terms of their 'fitness' in the human mind – some may reproduce very fast but be short-lived (for example, fashions in clothes), while others could survive for long periods of time but reproduce at low rates (for example, certain religious beliefs), and so on.

In the course of his controversial speculations on the nature of genetic evolution in humans, Dawkins (1976) first pointed out that we are the only species that can alter the course of genetic evolution, and that we do so every time we use a contraceptive. Also, a wide variety of 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 (that of celibate priests and religious leaders, for example) and an increasing number of modern practices (of voluntary adoption and voluntary childlessness, particularly among urban populations) within human societies where reproduction completely ceases to be a part of a life-history strategy. Have human populations moved outside the purview of biological evolution (read genetic evolution) today? Wherein lies the fitness of these members of the human race? How do such practices and traits survive?

I propose that when compared to genes, today memes represent an increasingly important agency through which evolution acts in humans (Sinha 1999b). This model is based on the ability of human memes (ideas, culture) to be acquired and to evolve during one's lifetime, and then be transmitted both horizontally across individuals within the same generation and vertically across generations. It is obvious that there will only be a limited number of memes that can be borne by each individual during his or her lifetime – not only in terms of the space available for different memes in the memory but also in terms of the time available during the lifetime of a person for a meme to be acquired. Different memes would compete with each other for survival and some memes would be preferentially transmitted within and across generations (see also Blackmore 1999 and references therein).

Although there has been much discussion on memetic fitness in the literature (reviewed in Blackmore 1999), the factors that favour the propagation of certain memes over others have not been clearly articulated. A gene, for example, expresses itself in the context of a phenotype which is then subject to natural selection, and the preferential survival of the gene-bearing individual and its reproduction propagates the gene to the next generation. Specific memes may be driven by two forces, both motivational in nature. First, an individual could internally acquire a sense of personal satisfaction, joy and happiness when he or she receives a particular meme. Second, a meme could bestow social status, popularity, or fame on an individual. Either or both of these acquisitions could perceptively translate into an improvement in the individual's quality of life, and this could serve to propagate the specific meme further by a process of competitive advantage akin to that which is seen in natural selection. This could happen either indirectly due to increased survival and longevity of the individual or more directly because of active efforts by the meme-bearer to selectively spread the meme to other individuals. Of course, if a meme provides social status and fame to an individual, it is also likely to be copied by other individuals anyway.

Empirical evidence for or against such a model can be obtained by measuring the direct influence of a sense of personal well-being, social status and fame, acquired through specific memes on human life-history variables such as survival and longevity, and the effect of these variables, in turn, on the subsequent spread of the memes in question.

8. Human altruism – A case for memetic evolution?

I conclude this essay by considering a form of human behaviour, altruistic behaviour, that genetic models have found difficult to explain and which could perhaps be better accounted for by a memetic model. It is possible that this may serve as an example for other behavioural traits in modern humans – those that seem to be driven more by memetic fitness rather than the more traditional genetic one.

Darwin himself had expressed concern about whether natural selection could account for the altruism shown by sterile social insect workers who help other individuals in the colony to reproduce but do not have any offspring themselves (Darwin 1859/1968). Such behaviour was, however, later sought to be explained by a genetic model and brought into the purview of normal 'selfish' behaviour when it was realised that although such individuals did not transmit their genes to the next generation directly, they were able to enhance their genetic fitness indirectly through the reproduction of their genetic relatives (Hamilton 1964). This would be an evolutionary adaptation because by behaving altruistically the workers could increase the frequency of their genes in subsequent generations beyond what would have been the case if they had reproduced on their own.

In contrast, a genetic rationale for human altruism—atypical as the phenomenon may be – has been difficult to find. This is primarily because altruistic acts by humans are not necessarily directed towards their genetic relatives. The present memetic model suggests that human altruism can also be driven by a certain kind of selfishness. Altruistic behaviour could arise due to either of two conscious or subconscious processes. First, the principle of *reciprocal altruism* (Trivers 1971) – best summarised by the saying "Every good turn deserves another" – could drive individuals to be altruistic in the hope that they themselves would be beneficiaries of similar altruism in the future from the recipients of their earlier act, if the need arose. Second, and perhaps more important, acts of altruism could be driven by a personal sense of satisfaction or happiness that rewards an altruistic individual. These benefits may or may not also be accompanied by a simultaneous increase in the social status and popular fame of such individuals. Benefits such as these, once acquired, can critically influence the quality of one's life; and this, in turn, may have far-reaching and crucial consequences for the transfer of one's memes within and across generations as detailed earlier. To use an extreme example, altruistic people who have lost their lives in the performance of an altruistic act may not have necessarily left their genes behind, but they will be remembered and, more importantly from the point of view of the meme, emulated.

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References

Blackmore S 1999 *The meme machine* (Oxford: Oxford University Press)
Cheney D L and Seyfarth R M 1990 *How monkeys see the world* (Chicago: The University of Chicago Press)
Cloak F T 1973 *Elementary self-replicating instructions and their works: Toward a radical reconstruction of general anthropology through a general theory of natural selection*. Paper presented at the Ninth International Congress of Anthropological and Ethnographical Sciences, Chicago
Darwin C 1859/1968 *The origin of species* (Harmondsworth: Penguin)
Darwin C 1871/1981 *The descent of man and selection in relation to sex* (Princeton: Princeton University Press)
Dawkins R 1976 *The selfish gene* (Oxford: Oxford University Press)
Griffin D R 1992 *Animal minds* (Chicago: The University of Chicago Press)
Hamilton W D 1964 The genetical evolution of social behavior; *J. Theor. Biol.* **7** 1–51
Hauser M D 2000 *Wild minds* (New York: Henry Holt and Company)
Humphrey N K 1976 The social function of intellect; in *Growing points in ethology* (eds) P P G Bateson and R A Hinde (Cambridge: Cambridge University Press) pp 303–317
Humphrey N K 1980 Nature's psychologists; in *Consciousness and the physical world* (eds) B Josephson and V Ramachandran (Oxford: Pergamon Press) pp 57–80
Humphrey N K 1982 Consciousness: A just-so story; *New Sci.* **95** 474–475
Jolly A 1966 Lemur social behavior and primate intelligence; *Science* **153** 501–506
Kummer H 1971 *Primate societies* (Chicago: Aldine)
Nagel T 1974 What is it like to be a bat?; *Philos. Rev.* **83** 435–450
Premack D and Woodruff G 1978 Does the chimpanzee have a theory of mind?; *Behav. Brain Sci.* **1** 515–526
Rao S L 1999 The neural basis of attributes of consciousness; in *Scientific and philosophical studies on consciousness* (eds) S Menon, M G Narasimhan, A Sinha and B V Sreekantan (Bangalore: National Institute of Advanced Studies) pp 114–126
Sinha A 1999a Almost minds? The search for consciousness in nonhuman primates; in *Scientific and philosophical studies on consciousness* (eds) S Menon, M G Narasimhan, A Sinha and B V Sreekantan (Bangalore: National Institute of Advanced Studies) pp 149–158
Sinha A 1999b Putting the mind back into nature: The origin and evolution of consciousness; in *Scientific and philosophical studies on consciousness* (eds) S Menon, M G Narasimhan, A Sinha and B V Sreekantan (Bangalore: National Institute of Advanced Studies) pp 158–167
Tomasello M and Call J 1997 *Primate cognition* (New York: Oxford University Press)

Trivers R L 1971 The evolution of reciprocal altruism; *Q. Rev. Biol.* **46** 35–57
von Frisch K 1967 *The dance language and orientation of honeybees* (Cambridge, Mass.: Belknap/Harvard University Press)
Wilkes K 1984 Is consciousness important?; *Br. J. Philos. Sci.* **35** 223–243

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