

10 Animal thought and human thought—conclusions

Thought is a word, rather than a thing, and we can use the word as we choose. If we use it to refer to psychological processes which cannot take place in the absence of human linguistic abilities, then animal thought is a conjunction of words that has no real meaning. But if we take it that some thinking can be done without words, and that a thought may be a mental disposition, an image, intention or anticipation, then the question of whether this sort of thought can be said to occur in animals other than ourselves becomes genuine. Moreover, if mental states of all kinds are believed to refer to brain activities, there is a *prima facie* case for asking whether the activities of the human brain, which subserve our own mental processes, are in any way related to the activities of the brains of animals. I have argued in the previous chapters that perception, as the analysis of information received by the sense organs, and memory, as the retention or revival, or reconstruction of perceptions, are functions which are performed in the human brain in a way which is understandable in terms of the physical evolution of the vertebrate brain, and that, extrapolating across species, it makes sense to discuss animal perception and memory in the same breath as their human equivalents. Behavioural evidence as to the abilities of birds and mammals to recognise visual patterns, and to remember, for instance, recent locations of food, implies that the brains of these animals do in fact accomplish things which suggest a certain degree of mental organisation.

Behaviour such as the imitation of human actions, which suggests mental organisation more like our own than that of less closely related species, is found in the chimpanzee. But attempts to induce these animals to exhibit linguistic skills have as yet demonstrated little beyond extremely rudimentary forms of symbolic labelling. The gulf

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between all other living species of animals and ourselves thus remains large, despite these attempts artificially to close it, which is why animal thought is a very different topic from human thought. Nevertheless, the relation between animal cognitive capacities and those of man is still very much an open issue, rather than one that is permanently closed because of the obvious differences.

A number of other themes which I have either emphasised or neglected are far from resolution. To recapitulate and extend what I have said earlier I will now return to some of these.

Consciousness

This is a word I have tended to avoid because it is used in several distinctly different ways. If we use 'conscious' to refer to being awake, then it is relatively easy to answer the question 'Are animals conscious?' by describing cycles of sleeping and waking in, for instance, the cat. At the other extreme, if we are concerned with subjective verbal analysis of visual perception, things get much more difficult, since the attribution of consciousness may have more to do with the verbal analysis than with events in the eye or in the parts of the brain that react directly to visual stimulation. In order to answer questions about whether animals have conscious perceptions, or conscious intentions to act, I believe it would first be necessary to disentangle overt or potential verbal descriptions and beliefs from other mental states. Weiskrantz (1977) has pointed out that much experimental investigation of human memory and perception is in effect the investigation of people's verbal commentary on their own mental processes, which in most cases cannot be helped, but which inevitably makes comparison with research on animals hazardous. It is perfectly reasonable to say that animals do not comment on their own mental states, and in this sense lack consciousness, but this begs certain other questions. For instance we may be subjectively aware of pain, or of other intense emotional experiences, without being able to comment on this at the time, and without wishing publicly or privately to recount the event at a later date. The subjective intensity of the conscious experience in such cases does not seem to be related to the possibility of linguistic description. Should we therefore follow Popper (Popper and Eccles, 1977, p. 127) and entertain the theoretical possibility that dumb animals have a proto-awareness of emotionally

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significant perceptions, anticipations and expectancies? There does not seem to be any easy solution to this problem beyond stressing that we typically try to define our own subjective experiences in verbal terms, which is why we doubt their existence in other species in the first place.

A second matter of definition is that if we ascribe to the view that all our own mental states require the existence of certain forms of brain activity, then we ought to accept that there are physical limitations to the possible similarities between human and animal conscious experience. According to this view, we would be entitled to expect some degree of common ground between our own immediate awareness and that of the chimpanzee, but relatively little similarity between our own subjective experiences, however construed, and those of vertebrates in other orders and classes.

A final consideration is whether anything under the heading of consciousness can be said to have a utilitarian function, other than in providing topics for verbal discussion. Shallice (1972) has provided one of the few theories which identify consciousness with a distinct behaviour-controlling function in addition to functions related to speech: the selection of actions. In general it is possible to link

awareness with priorities either of action or attention. We may not always devote our conscious thoughts to objectively important subjects but it is arguable that human awareness serves to select perceptions and direct actions, and that only when we are neither perceiving nor acting are relatively frivolous trains of thought and streams of consciousness permitted to engage our attention. When consciousness refers to brain-states which direct and select perception, memory and action, even in the absence of verbal processes, there is no compelling reason to believe that it is uniquely human.

Encephalisation and the cerebral cortex

Conscious experience, linguistic expression, and all other forms of human cognition are attributed to the cerebral hemispheres and in particular to their surface covering, the neocortex. It is appealing to suppose that a progressive evolution of cognitive capacities paralleled the increase in the relative size of the cerebral hemispheres, in comparison with the rest of the brain, that can be observed over the time course of vertebrate evolution, roughly matching the increase in the size of the brain as a whole in relation to the rest of the body. I have argued that an important general feature of the vertebrate forebrain hemispheres is that they contain sensory projections which are remote from the untransformed output of the sense organs, and that the possibility of perceptual descriptions and representations which are relatively remote from immediate sense data supplies a functional advantage to forebrain evolutionary development. The more traditional view of encephalisation

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is that the forebrain expanded as, for unspecified reasons, it made successful take-over bids for the businesses of lower brain centres. It is certainly true that the most thoroughly analysed area of the forebrain, the primary visual cortex of the cat and the monkey (which is assumed to closely approximate, in anatomy and physiology, the corresponding part of the human brain) includes relatively direct transformations of visual patterns impinging on the retina of the eye. And in primates especially there are facilities for some fairly direct output from the cortex to muscle movements. But it may still be the case that the distinctive advantage of forebrain development lies in the independence of some of its activities from direct input-output connections—it has always been agreed that the mammalian cortex at any rate subserves flexible and integrated perception and action, allowing for choice, integration and shifting priorities, to a greater extent than the more automatic reactions of other parts of the brain. Recent anatomical evidence suggests that the cerebral hemispheres of birds and lower vertebrates can be seen as alternative forms of the same general plan.

Hand in hand with the traditional account of progressive brain evolution and the difference between mammals and other vertebrate classes went the belief that the brains of lower vertebrates were entirely preprogrammed with reflexes and instinctive formulae for

patterns of reaction to stimuli, whereas the cortex of mammals allowed for perception and action that was not so innately predetermined, man being dominated by the cortex to such an extent that there were no innate determinants of human thought and cognition. There is clearly something in this, but it is ironic that the emphasis of current theories of cortical function is on predetermined organisation rather than the possibility of adaptation within the lifetime of the individual. There are two particular cases: visual perception and language. In the brain areas concerned with vision, the layout of individual neurons, as well as of interrelated topographic mappings, is consistent from individual to individual, and can be said to conform to innate plans, though

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naturally maturation and use are of some importance. The outstanding property of the human brain, the capacity for language, can at the same time be localised in broadly confined regions of cortex (usually in only the left hemisphere) and for linguistic reasons is supposed to require absolutely crucial forms of innate organisation in the brain. Thus any innate capacities required for language should be embodied in the neocortex rather than anywhere else.

Even the notion that man and other primates possess large areas of 'association cortex' which is without specific genetically assigned functions, and left as free as Locke's *tabula rasa* to record ideas acquired in the life of the individual, can be questioned on anatomical grounds. What was called association cortex, because it had no apparent specific sensory or motor properties, has predictable connections within the brain and can equally well be classified as a variety of secondary sensory areas. The cerebral cortex is thus not characterised by the lack of innate functional organisation, rather, it is innately organised in ways which allow for certain kinds of learning and the acquisition of knowledge by individuals. This is all part of the argument between nativists and empiricists, which is unlikely to cease. It is apparent, though, that it would be difficult now to claim that all animal behaviour is a matter of innate predetermination, while all human behaviour is not, on the basis that human abilities have come to depend on the cerebral cortex. As an alternative, one could say that all species have biologically determined innate propensities, and that human innate propensities include the faculties of language and reason, determined by brain organisation which is characteristic of our species.

Continuities and discontinuities

The contrast between human history and civilisation and the relatively fixed and constant adjustment of other species to natural environments is a complete and unassailable discontinuity. For many purposes, the place of man in nature and possible continuities between human and animal psychology can be wisely ignored. Theorists from Hume to Skinner who have sought to apply strictly identical explanations to human and animal cognition must always

be regarded with suspicion. The problem remains that man and other vertebrates

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patently share innumerable similarities of body and brain, and since Darwin it is impossible to give a complete and convincing account of the origin of human abilities without addressing the question of comparisons between man and other species. It appears to me that, oddly enough, a general fault which arises from considering human psychology in isolation is the assumption that civilised and artificial abilities, such as may be found in undergraduates participating in laboratory experiments, are attributable to mechanisms especially evolved for these purposes. To take an only partly hypothetical example, the recognition of individual typewritten letters may be studied as an example of human perception or cognition, but it is quite inconceivable that there should be a peculiarly human 'letter recognition mechanism'. The human visual system was around for a long time before letters were thought of, and most critical aspects of the system, such as the presence of binocular foveal vision, are a consequence of our membership of the order Primates. The primate eye and brain are not as they are so that we can identify letters, rather we are able to identify letters because of the nature of the primate eye and brain. Clearly there may be many psychological processes which are specific to the human species—speech-recognition mechanisms, or language-acquisition devices are more plausible candidates—but it is probable that even these grew out of capacities present in other animals.

Of all the discontinuities between man and animals that could be quoted, including the exclusively human faculties for abstraction, reason, morality, culture and technology, and the division of labour (see Chapters 1 and 2) the evergreen candidate for the fundamental discontinuity, which might qualify all others, is language. It is unlikely that a community of naked human beings, lacking all art and artifacts, but possessing language, ever existed, but it is usual to suppose that primitive levels of technology may exist along with a language that is in principle as complex as it is possible for speech to be. In a state of nature we expect humans to talk, and by comparison, the most unrelenting efforts to induce our closest living relatives to reveal hidden linguistic potential have left the discontinuity of speech bloodied, but unbowed.

It is therefore still reasonable to say that animals do not think as we do, when we think in words, and that in so far as we are only conscious when we think in words, they lack conscious awareness. Arguably

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perception, memory, reason, abstraction and feeling as processes of human thought are at the mercy of the faculty for speech. But tacit mental organisation is evident not only in ourselves but in many other species. The brain, as an organ of thought, is available for our use only because it was formed and developed before our time.

Our organ of thought may be superior, and we may play it

better, but it is surely vain to believe that other possessors of similar instruments leave them quite untouched.