International Journal of Comparative Psychology, 2005, **18**, 202-206.

Animal Cognition and the New Anthropomorphism

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Animal behavior studies of the 19th century were characterized by an appeal to anthropomorphic attitudes, which were resolutely challenged beginning with the start of the 20th century, particularly by the forerunners of what became the behaviorist school. The ethological school founded by Tinbergen and Lorenz also rejected appeals to human-like cognitive abilities. In the l970s, under the leadership of the physiologist, Donald Griffin, animal cognition was again admitted into "respectable" ethological company, leading to a strong critique by another eminent physiologist, John Kennedy. (The influence of Tolman had previously made many comparative psychologists receptive to this possibility). Recent studies based upon developments on direct recordings of brain activity now suggest that Tolman and Griffin's prescience will carry the day.

In 1992, the eminent physiologist, John Kennedy, published a critique of what he termed "the new anthropomorphism". It was an attack on what he perceived to be a contemporary resort to facile explanations of seemingly complex behavior, reminiscent of explanations that characterized work from the late 19th and early 20th centuries. Darwin's account of evolution had assumed continuity to be a dominant principle, applying to behavior and mental ability as much as to morphology. Evolutionary change was seen as gradual and continuous. Thus, if humans were endowed with advanced cognitive abilities, a rich emotional life, and a complex memory system, these attributes could be expected to be found, if only in inchoate form, in lesser beasts as well. This assumption underlay the work of George J. Romanes and many of his contemporaries, whose anectdotal accounts of the mental life of animals sought to provide an evolutionary framework for understanding the behavior of animals (see Klopfer & Hailman, 1967, for more details on the historical allusions that follow). It was also consistent with the views of the influential Herbert Spencer, who believed there to be a continuity from reflex actions to reason (ibid).

A caveat was sounded by Lloyd Morgan in the closing decade of the 19th century. He proposed that no higher mental abilities ought be attributed to an animal unless required, viz, where mechanistic explanations suffice, allusions to mental processes were unnecessary, if not counterproductive. Indeed, physiologists such as Jacque Loeb, were able to suggest mechanisms that could account for a variety of seemingly complex behavior. It is important to note that Morgan did not discount the possibility of consciousness and associated cognitive capacities in nonhuman animals. Even a fertilized egg could be sentient, he argued, but so long as development is predetermined, the existence of consciousness is irrelevant. Consciousness (or cognitive processes, for, following Griffin, I conflate these concepts here; see below) need only be invoked where they influence the outcome of a behavioral response. He went on to postulate how and when consciousness might

I have to record my indebtedness to an anonymous and scholarly reviewer who tactfully brought to my attention the many gaps in my reading of the literature in comparative psychology. I thank him (or her) for having helped me eliminate at least my most egregious errors. Correspondence concerning this article should be addressed to Peter H. Klopfer, Biology Department, Duke University, Durham, NC 27708, U.S.A. (PHK@DUKE.EDU).

evolve. The significance of his canon, however, was to shift the burden of proof: only where no other explanation could be found could an appeal to higher mental functions be justified. Given the success of Loeb, and, subsequently, the associationists and behaviorists of the first part of the 20th century in offering mechanistic explanations, psychologists such as Thorndike, Watson, and Skinner (cf. Boring, 1957; Thorpe 1956) were able to invoke Morgan's parsimony principle to dismiss the question of animal cognition.

The rise of behaviorism, in particular, was accompanied by the view that consciousness might be more a source of noise than of guidance, and, at the least, was largely unnecessary for the description of the behavior of most animals. Explanations of problem solving by animals that were based on human-like mental activities were derided as examples of anthropomorphism and violative of Morgan's canon.

The rise of modern ethology in the middle of the 20th century, largely under the leadership of Niko Tinbergen and Konrad Lorenz, did little to weaken what had become an aversion to explanations that might be labled as anthropomorphic. Ethologists who wished to use metaphors drawn from human experience to describe or explain behavior often issued gratuitous disclaimers, not unlike the "but I am not a communist" apologia of 1950s labor organizers. Indeed, the emphasis on so-called innate behavior that was released by particular signals which in turn unleashed a hypothetical hydraulic system, left no more space for consciousness than the processes of the Skinnerians. To be sure, there were a few exceptions, particularly Otto Koehler, who had strongly promoted Lorenz and his then new school of ethology. Koehler's experiments on unnamed numbers and counting by passed as curiosities, and were rarely cited as challenges to the prevailing views of either Skinner or Lorenz and Tinbergen, who continued to emphasize the role of innate mechanisms to the exclusion of cognition. (Note recent studies of numeric concepts by Brannon, 2003, and in press, which vindicate Koehler).

With the publication of Donald Griffin's *The Question of Animal Awareness* in 1976, a sea change took place within the field of animal behavior studies. Griffin's stature as a hardcore physiologist made it difficult to dismiss anthropomorphic interpretations out of hand. Increasingly from that date on, studies of animal cognition, self-awareness and consciousness found their way into print, even in journals that were identified as ethological institutions.

As we survey the current scene, which might seem to be a return to the views of Darwin and Romanes, we are led to ask whether Kennedy's critique still applies. And if it does not, if anthropomorphic constructions have now once again become credible, is it the nature of the evidence that has changed, or the logic of the argument?

Kennedy, in his critique (1992), links cognition with consciousness, as does Griffin (1976). It is possible to operationally distinguish the two, as do many who call themselves cognitive ethologists, but in these comments I will follow Kennedy and Griffin and infer consciousness whenever there is an attribution of cognition. If the latter is believed to follow human patterns or employ our rules of logic, we may speak of anthropomorphism, a term that is usually employed as a derogatory. This is not the original sense of anthropomorphism, however. As J. A. Fisher (1991) has pointed out, the term was originally applied to conceptions of

God that were defined in human terms. Anthropomorphism's meaning gradually became extended to all views that were based upon a human-eye-view of the world. It only fell into disrepute with the rise of positivist philosophy, which includes behaviorism, and the rejection of mental states as subjects of scientific inquiry (Fisher, 1991).

Kennedy's (1992) polemic against anthropomorphism is grounded upon a rejection of the argument of evolutionary continuity: Saltations do occur in evolution, and it is not necessarily the case that every character can be traced continuously back in time to its predecessor. Human consciousness, in particular, he argues, was favored when it appeared in humans because it allowed for the monitoring of communications and emotions, both linked to language and unique to *Homo sapiens*. Our readiness to anthropomorphize is not the result of a dispassionate study of the evidence, but rather an inborn trait, the consequence of selection of genes promoting empathy. It is further enhanced by the nature of our languages, which make anthropomorphic explanations especially easy to formulate, according to Kennedy (see also Whorf, 1950).

The polemic continues with an examination of various behavior patterns and processes, from nest building, migration, imitation, to reafference and motivation, and a demonstration of how each can be mechanistically explained. Indeed, Kennedy argues, even a machine can be designed to behave as if it were conscious, when, by definition, we know a machine cannot be.

Griffin (2001) drawing upon studies of animal communication as well as neurological evidence drawn from studies with humans, argues that it is counterproductive to assume the mental life of animals to be qualitatively distinct from that of humans. It is not an "innate" tendency to anthropomorphize that leads him to this conclusion, but the complexity of some behavior patterns that, for their explanation, demand the introduction of concepts such as consciousness. He acknowledges that no particular geographic areas of the brain can be identified as associated with consciousness, nor could he suggest what neural actions may be involved, though he was hopeful that evidence from studies of brain imaging and evoked potentials would remedy this.

A number of recent studies support Griffin's predictions: examples of complex, affectively toned behavior such as F. de Waal's demonstrations that monkeys trained to cooperate in the performance of a task react emotionally if one animal is given a reward superior to that given the partner, viz, a grape rather than a slice of cucumber (personal communication and film shown, at the Goettinger Freilandtage conference, Cooperation in Primates and Humans, 9-12 December, 2003). The behaviorist explanatory models of Skinner and his followers have been unable to account for this sort of reward relativity: viz, " a cucumber is fine so long as that is what my partner also receives, but if he gets a grape while I make do with the cucumber, then I won't work." Zuberbuehler (2003) offers new evidence for semanticity in primates, which also requires an assumption that purposiveness is a part of the animal's repertoire; Subiaul et al. (2004) demonstrate cognitive imitation in macaques; Nicolelis (personal communication, 2004, and cf. Kandel & Squire, 2000) has created a robotic arm which a rhesus macaque controls by means of impulses recorded from its cortex (see also Barinaga, 1999, for a summary of similar work elsewhere). These, and the related studies cited, are particularly sig-

nificant in that they indicate the monkey can be trained to think about moving its arm, which has been paralyzed and cannot move, and thereby, with a robotic arm move a cursor as if its own arm were functioning. Clearly, the electrical activity of the cortical cells which drive the robotic arm and cursor represent a physical measure of intent. To suggest the monkey is unaware of this is to make assumptions that run counter to the parsimony principle. Where Morgan's canon once precluded appeals to consciousness, it now requires them, viz, where the evidence is sufficiently strong as to force the acceptance of a more complex explanation, Morgan would not demur.

Obhi and Haggard (2004), working with humans, show that motor activity in the brain precedes our awareness of intentional movements and this was shown as well by Nicolelis (ibid) in his monkey model. Thus, it is the decision to move an arm that the organism evidently registers, not merely the motor response itself. More striking yet is the work by Musallam et al. (2004) who have detected cortical areas (of macaques) from which they can decode the signals of an intent to make a directed arm movement, even when that movement never takes place. These same areas also provide information about the animals relative interest or level of motivation. Whatever the monkey might tell us, could it speak, of its intentions and level of interest in achieving a particular goal, the activity of its cortex provides eloquent and precise information.

Comparative psychologists therefore have, I would argue, every reason to reject Kennedy's contentions. Granted the evidence that even small changes in the genome may have major effects (e.g., Pennisi, 2004) it remains the case that saltatory changes in evolution are the exception rather than the rule. Were it otherwise, neither comparative morphology nor comparative psychology could have made the contributions on which our understanding of evolution depends. As our experimental technologies come ever closer to providing us with the neural concomitants of mental experience, it is reasonable to expect that we will be able to confirm whether or not they exist in organisms other than man. The new anthropomorphism would seem to have a solid experimental basis, and the principle of parsimony (Morgan's canon) suggests we assume consciousness possible among animals.

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Received August 18, 2004.
First revision received October 7, 2004.
Second revision received October 29, 2004.
Third revision received December 13, 2004.
Accepted February 9, 2005.