Panmorphism

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Anthropomorphism is defined as the attribution of human psychological characteristics to animals. Upon first encountering the term, a naive observer might find it ironic that scientists have dedicated a special term for this tendency, since it is all but inescapable. Who doesn’t wonder what the dog is “looking for” as it sniffs around the yard? Who doesn’t confidently presume the shorthand of announcing that squirrels “know” where they have hidden their acorns? Pamela Asquith (1984) has even gone as far as to claim that humans cannot avoid describing animals in anthropomorphic ways. We may not always attribute specific humanlike qualities to them such as sentimentality or mean-spiritedness, but, Asquith argues, we at least talk about them in general as if they had intentions, goals, plans, and knowledge states akin to our own. Thus, she concludes that short of extraordinary efforts of verbal self-control, almost all of our descriptions of animals are likely to be anthropomorphisms. This conclusion may seem to reinforce the irony present in the scientist’s need to create a special term to describe the obvious. However, part of the purpose of this chapter is to show that having access to the concept of anthropomorphism inadvertently provides us with a powerful tool for rethinking the psychology of other living organisms.

ANTHROPOMORPHISM AND MENTAL STATE ATTRIBUTION

By definition, anthropomorphism requires the capacity (and motivation) to attribute mental states such as intention, desire, knowledge,
Panmorphism

happiness, envy, joy, and the like, in the first place. Let me explain by way of an example. Suppose, for a moment, that one day while walking through a park you encountered a robot that was searching for a lost three-year-old child. That is, suppose that it could "see" (perceive) the external world through a camera lens, digitally record what it saw, and adjust its future actions on the basis of such information. Thus, upon encountering a tree directly in its path, the robot could easily update its locomotion program, sidestep the obstacle, and avoid all such similar objects in the future. Watching the robot, you might be curious to know how it was achieving such great success. Inevitably (and probably immediately), you would begin to wonder about what it was doing there in the park in the first place, what it wanted, whether it was lost, etcetera. In short, you would engage in a variety of anthropomorphic thoughts about the robot. Furthermore, I suspect that the amount of anthropomorphism that you would engage in would be directly proportional to the degree to which the robot's makers had been concerned with crafting a human-like physical appearance for the machine, or the distance from which you were observing the robot, or both.*

However, suppose the same robot encountered you. From its perspective, you would simply be another obstacle, albeit a complex and moving one. The robot, if equipped only as described above, would have no capacity—or need—to attribute mental characteristics to you. Because it is merely searching for a young child who is lost in the park, and because you are not that child, you represent just another object in its path. In short, because the robot was constructed without the capacity to attribute psychological characteristics to living organisms, it is incapable of entertaining its equivalent of even a fleeting "anthropomorphic" thought. The robot, given its design and mission, has no need to explain your behavior at all. It merely needs to respond to you in ways that will not jeopardize the attainment of its goal.

I do not detail the above example to suggest that machines will never be able to attribute mental states to other living (or nonliving) organisms. Quite to the contrary, I suspect that advances in the field of artificial intelligence will eventually produce machines that do reason about unobservable mental experiences. Indeed, some researchers have already begun to outline the programming procedures necessary to create such systems (Maida, Wainer, & Cho, 1991). The example is intended to demonstrate that humans engage in anthropomorphism only because at some point in the past evolution produced brains suffi-
ciently sophisticated to allow us to attribute mental experiences to ourselves and others. Indeed, as an evolutionary biologist, my interest in robot psychology is quite secondary. My primary concern is with the evolutionary processes that created the psychology of biological organisms—processes that organized the first life forms nearly a billion years ago, and which ultimately resulted in the entire scope of both the past and present diversity of life. Viewed in this light, the issue of anthropomorphism becomes one of understanding how and when the capacity to conceive of mental states evolved. In short, understanding the evolutionary history of anthropomorphism largely boils down to understanding the evolutionary history of mental state attribution.

PSYCHOLOGICAL DIVERSITY?

Understanding the evolutionary history of mental state attribution will not be an easy task. To begin with, psychologists have traditionally had a difficult time finding bona fide instances of phylogenetic psychological differences. To be sure, many psychological traits have been offered as potential candidates for phyletic differences in psychological processes. There are even one or two that have undergone fairly rigorous scrutiny, and may ultimately hold up as valid instances of psychological species differences (Bitterman, 1975; Rumbaugh & Pate, 1984). But by and large, comparative psychologists have had such a difficult time convincing themselves that species differences in intelligence exist in the first place, that at least one commentator has repeatedly advocated accepting the null hypothesis—that there are no phylogenetic differences in psychology (McPhail, 1987). Indeed, from one perspective the history of comparative psychology has been one of demonstrating that purported species differences do not exist (see Goldman-Rakic & Preuss, 1987).

In the face of such historical trends, how are we to go about characterizing psychological diversity in mental state attribution? Difficulties abound, and they are not merely methodological and empirical problems. Characterizing psychological diversity of the type described here faces theoretical challenges from three directions, effectively pinning researchers who wish to make progress in the field. From one direction there is a theoretical tradition that views questions related to animal metacognition as unanswerable, and hence unscientific (e.g., Warden, 1927). From another direction, theorists believe that even humans themselves cannot profitably study their own metacognitive processes (e.g., Skinner, 1987). Finally, a third intellectual tradition considers either some, most, or all animals as obviously possessing these
Parvomorphism

capacities (e.g., Griffin, 1976). In the face of such competing agendas, it may seem that the history of comparative psychology is a good guide to its future. This raises the question of whether psychology, somehow, has escaped the trend of continuous, branching diversity.

However, evolutionary biologists interested in the evolution of mental state attribution are likely to approach the issue as they would a given suite of morphological characteristics. Many facets of biological diversity have been well characterized by researchers who study the evolution and function of morphology. The earliest systematic approaches to biology were by naturalists predating Darwin such as Linneaus, Buffon, Lamarck and Cuvier, who organized their thinking about species around similarities and differences in their anatomical structures. At one level, characterizing this diversity was easy, even if tedious and time consuming. Bats have wings, chimpanzees do not. And even beyond anatomy, some of the functional implications of anatomy often escaped controversy. Bats and birds fly because they have wings; on the other hand, chimpanzees lack such wings, and hence they do not fly. Of course this trivializes the tremendous difficulties that functional morphologists face in interpreting form-function complexes (e.g., Oxnard, 1986). But such problems pale in comparison to the status of the field of “functional psychology,” which remains in its infancy. Perhaps the surest testament to this difference between the fields of biology and psychology is that the phrase “biological diversity” makes instant sense to biologists, but the comparable phrase—“psychological diversity”—gives most psychologists reason for pause.

It may turn out that there is a rather simple explanation for the apparent lack of diversity in structures of intelligence. It may be that researchers have focused for too long on areas that represent extremely primitive features of animal psychology, such as associative learning. Indeed, as McPhail (1987) has pointed out, “causality is a constraint common to all ecological niches” (p. 645). Hence, we might expect that even the most primitive organisms evolved the capacity to associate one environmental event with another, ultimately producing both instrumental and operant learning. Some researchers have recently emphasized that there may be adaptations in species favoring specific learning strategies (for example, Kamil, 1984). But as for novel domains of intelligence, there may truly be relatively few. But the fact that there are few does not mean that there are none. And I suspect that it is in those domains where the evidence for a psychological process in humans, but not in animals, is obvious, that we are most likely to find psychological characteristics uniquely derived at some as-of-yet-uncertain point in the primate lineage.
The extent to which empirical investigations ultimately support the uniqueness of humans (or even nonhuman primates) in these various domains is irrelevant. What is relevant is that we constrain our searches to areas in which there is reason to suspect that psychological diversity exists. Mental state attribution is one such area. Premack & Woodruff’s (1978) research into the capacity of chimpanzees to attribute intentions to others provided the first explicit attempt to provide a controlled demonstration of mental state attribution outside the human species, thus paving the way for future investigations into nonhuman theories of mind. Although the empirical evidence one way or the other remains weak, there are theoretical reasons related to species differences in the capacity for mirror self-recognition for predicting that very few species are aware of the mental states that govern both their own behavior, and that of other organisms (see Gallup, 1982, 1985). Recent comparative investigations have provided some initial (albeit tentative) support for this position by providing evidence that species differences in mental state attribution may mirror species differences in the capacity for self-recognition (Povinelli, Nelson, & Boysen, 1990, 1992; Povinelli, Parks, & Novak, 1991, 1992; but see Povinelli & Eddy, 1996). This research suggests that at some point within the past 25 million years or so, the capacity to conceive of intentions and knowledge evolved within the primate order, resulting in a detectable pattern of psychological diversity in extant representatives of the clade in question. If these differences hold up under the weight of advancing scientific scrutiny, it would mean that for some subset of processes related to mental state attribution, the human case is neither completely unique nor completely trivial. It would mean that humans share certain cognitive capacities in common with several remaining species of a once diverse hominoid radiation. And it would also mean that species that descended from earlier ancestors lack these cognitive features (regardless of whether they were specifically selected or not).

However, it is an open question whether mental state attribution evolved as a complete package as it is found in adult humans. There are many indices along which chimpanzees, orangutans, gorillas, and humans might differ with respect to mental state attribution. Let me take as a case in point knowledge attribution. First, it is possible—and the data from young children suggest that it is even likely—that knowledge attribution is dissociable into several ontogenetic steps. For example, in terms of human development, children may make several transitions in their understanding of knowledge as a mental state. Longitudinal data on the development of the child’s use of the word “to
know” suggests that its first appearance occurs at around 28 months of age (Shatz, Wellman, & Silber, 1983). Interestingly, preliminary data from our laboratory, using nonverbal tasks, suggests that at around 28 or 29 months of age children may come to conceive of knowledge as an unobservable mental state, even though they have little or no appreciation of exactly how those mental states are formed. Later, perhaps as early as 36 months (possibly earlier), children may come to understand that knowledge governs behavior. That is, they may begin to understand that knowledge acts as a causative agent in directing the behavior of themselves and others. Knowledge may remain “miraculous,” however, in the sense that children may still not understand how it is formed either in others or in themselves (Leslie, 1987; Wimmer, Hogrefe, & Perner, 1988; Gopnik & Graf, 1988; O’Neill & Gopnik, 1991; Povinelli & deBlois, 1992). It is only later that children may come to understand how perception (vision, olfaction, audition, etc.) gathers the information from which knowledge is formed. On the heels of this discovery, or perhaps coincident with it, children may also come to realize that knowledge may in many cases really be mere belief, and beliefs, because they are only representations of reality, can be false (Wimmer & Perner, 1983; Moses & Flavell, 1990). Later still, perhaps by about 5 years of age, children come to grasp the idea that individuals can be less than certain about their beliefs, and hence they may come to understand the true meaning of the concept “to guess” or the distinction implied in the contrast between words such as “probably,” “possibly,” and “maybe” (Johnson & Wellman, 1980; Moore, Pure, & Furrow, 1990).

The broader implication of the dissociable (developmental) nature of the concept of knowledge is that anthropomorphism is not a unitary phenomenon. The situations in which a four-year-old will engage in knowledge attribution to nonhumans (as well as the possible scope of those attributions) must be fundamentally different from those situations when a two-year-old will make such attributions. More generally, at each developmental transition in an individual’s appreciation of the mental world, a new form of anthropomorphism emerges. The type and scope of mental states attributed to others will be distinct, and hence the form of anthropomorphisms possible will be unique. A three-year-old child who attributes humanlike characteristics to nonhumans will, by necessity, attribute her own understanding of what it is like to be human, not her mother’s or father’s or older sibling’s. Her anthropomorphism will be sharply delimited by the scope of mental states and activities she is capable of conceiving of in the first place. Lest we think that such transformations of anthropomorphisms are exclusively
restricted to infancy and early childhood, it is sobering to reflect upon (and would be even more fascinating to investigate) the ways in which dramatic political, interpersonal, and educational experiences in adulthood transform our appreciation of what it means to be human. Indeed, I suspect that the common quip, “But I am not that naive anymore,” usually indexes profound developmental turning points in an adult’s psychological life, forever altering the exact form of their anthropomorphisms.

Finally, although I have focused almost exclusively on the cognitive underpinnings of anthropomorphism, the cultural influences that shape our psychological attributions to animals must be considered if we are ever to develop a complete understanding of the phenomenon. The necessity of examining the role of culture is apparent when one considers strong cross-cultural differences in the willingness to attribute mental experiences to animals (for an example see Asquith, 1986).* It might be that purported cross-cultural differences in the tendency to consider mental states such as private knowledge or intention may somehow be correlated with cross-cultural differences in anthropomorphism. Laurie Godfrey and I examined in some detail the arguments advanced by some cultural anthropologists who argue for strong psychological differences between cultures (see Povinelli & Godfrey, 1993). We concluded that although such surface distinctions exist, and are very important from a cultural perspective, there are probably no fundamental underlying differences among human societies in their ascriptions to a fundamental belief in the unobservable mental universe of themselves, and of others. The weight given to various aspects of these subjective experiences and beliefs may differ, but they appear to be present everywhere. In addition, recent cross-cultural experiments suggest that important psychological transitions in theory of mind may be present in cultures that differ radically from our own (Avis & Harris, 1991). This is not to say that cultural differences in conceptions of the mind are nonexistent. Rather, it is simply to say that such differences may be just that, cultural ones imposed over an underlying similar psychology. Thus, although these important cultural distinctions in conceptions of the place of humans in nature may determine the exact form and timing of conscious anthropomorphisms, the underlying subset of psychological states more or less automatically attributed to other species (such as desire, intention, knowledge, belief, jealousy, envy, joy) is probably more or less constant across our species.1

*Editors' note. See Asquith (this volume).
What has all of this to do with scientific inquiry into the minds of animals? It should perhaps be obvious by now that our adult position vis-à-vis immature representatives of our species is fundamentally no different than our position vis-à-vis both mature and immature representatives of other species. The same difficulties that hold true in understanding the minds of chimpanzees apply with equal force in the case of understanding the minds of children. For any given psychological process related to comprehension of mental states, developmental psychologists who work with children must seek methods that can rule out simpler accounts of their behavior, including their linguistic behavior. Some researchers in the field of child development have missed this irony, and have lamented the fact that they work with a species which speaks (Chandler, Fritz, & Hala, 1989). From their point of view, linguistic responses cloud the issue by confounding the development of language and the development of metacognition. However, at some point in the child’s development at least the linguistic and behavioral evidence match each other in confirming the presence of the child’s awareness of a given mental state or activity (Povinelli & deBlois, 1992). This will literally never be true in the case of apes, who do not develop language. Admittedly, with respect to children this is the trivial case, because by the time that both linguistic responses and spontaneous and elicited behavior converge, there is little reason to debate the existence of the capacity in question. But before dismissing this instance simply because it is “trivial,” we should at least draw from it the clear lesson that in human development the typical question about metacognition is when, but with respect to apes and other animals it is whether it develops at all.²

It should also be obvious by now that the evolutionary history of mental state attribution (reflected in reconstructed phylogenies) may have created an analog to the developmental anthropomorphisms described above. In other words, beginning with the evolutionary advent of an awareness of the mental world, each new evolutionary innovation in mental state attribution created a novel “anthropomorphism.” However, in reality they were not (and are not) anthropomorphisms at all. If species other than humans engage in mental state attribution, they must (by definition) be engaged in an analog of anthropomorphism. However, because the exact scope and type of attributions they might make will depend on their own evolutionary histories, it is clear that there is a need to distinguish among the “mor-
philms" of which they may be guilty. For example, to the extent that there are chimpanzees (*Pan troglodytes*) that engage in mental state attribution, I propose that their unique constellation of attributions to members of other species be referred to as *Pan*morphism. Likewise, orangutans (*Pongo pygmaeus*), who are also likely candidates for mental state attribution (Gallup, 1982), should see members of other species through their own eyes and hence be guilty of *Pongomorphism*. In principle, this would be true for representatives of genera ranging from *Gorilla* to *Gallus*. Fortunately, we may be spared a terminological nightmare by the very real possibility that the evolution of metacognition may have been a relatively recent occurrence (Povinelli, 1993; Povinelli & Eddy, 1996). At any rate, before genera-specific (or, if need be, species-specific) morphisms are invoked, it will first be necessary to demonstrate the existence of mental state attribution using rigorous experimental or observational procedures. In the context of *Pan*morphism, this need is highlighted by the still relatively poor evidence that even chimpanzees attribute mental states to themselves and others (Premack, 1988b; Povinelli, 1993; Povinelli & Eddy, 1996). Not only are we nowhere near defining the scope of *Pan*morphism, we cannot as of yet determine with much certainty whether it even exists.

One implication of accepting the concept of species-specific morphisms is that it turns the question of the utility of anthropomorphism around. Instead of endlessly debating whether anthropomorphism clouds our judgment, produces poor science, or is a valuable heuristic tool, attempts to understand *Pan*morphism, for example (that is, attempts to characterize the theories of mind that chimpanzees possess) will ultimately inform us as to the accuracy of our inevitable anthropomorphic outlook on the world. Asquith (1984) may have been correct in arguing that we cannot escape anthropomorphism, but we may not need to escape it in order to make scientific progress in understanding the minds that reside in other species. Studies of mental state attribution in a diverse array of animal species may reveal when our anthropomorphisms reflect reality, and when they merely reflect the biases inherent in our mental machinery. After all, simply because as young infants we believe that the moon is a person, this does not necessarily make it so.

There are two final caveats that are worth considering, both of which involve the issue of diversity. The first is that just as humans may have evolved unique specializations or elaborations of ancestral psychological traits, so too may have other species. Thus, in the case of chimpanzees, *Pan*morphism may not merely be a restricted subset of human mental attributions, but may include other attributio
ties not shared by humans. For example, Povinelli and Eddy (1996) have investigated the possibility that chimpanzees appreciate underlying mental states such as attention in others, but base their attributions on the presence or absence of behaviors specific to their species. Thus, individual species may have evolved autapomorphic (uniquely derived) features of cognition related to mental state attribution. In short, Panmorphism and anthropomorphism may be conceptualized as Venn diagrams of either completely overlapping or partially overlapping mental state attributions. The final point about diversity I wish to raise concerns within-species variation. Not all individuals within a species will possess all (or even any) psychological capacities for metacognition. Thus, we must always keep in mind that our species-specific morphisms may not incorporate all members of a species. We are accustomed to dealing with this fact in our own species by defining certain human populations as "exceptional," and hence restricting our generalizations to the majority of human cases. But when it comes to other species, individual variation in psychological characteristics related to mental state attribution may be far greater than in our own (for example, potential individual differences in self-recognition, Swartz & Evans, 1991; Povinelli, Rulf, Landau, & Bierschwale, 1993).

CONCLUSION

Notions about the internal awareness of animals have a way of cycling through time. What is common sense today will be passé tommorrow, only to be resurrected the following week as the obvious truth. The only method available to us for breaking this pattern is hypothesis testing—theory construction and falsification. Questions about metacognition in chimpanzees, for instance, cannot be answered by the mere force of poetry or prose. To be sure, such artistic literary endeavors can forever play a vital role at the cutting edge of science by organizing our ignorance and highlighting our humility. And as humans who practice science at least part-time this is a fact well worth remembering. Even Charles Darwin, logical positivist par excellence, was not above turning to metaphor when ignorance dictated the need:

An anthropomorphous ape, if he could take a dispassionate view of his own case, would admit that though he could form an artful plan to plunder a garden—though he could use stones for fighting or for breaking open nuts, yet that the thought of fashioning a stone into a tool was quite beyond his scope. Still less, as he would admit, could he follow out a train of metaphysical reasoning, or solve a mathematical
Anthropomorphism and Mental State Attribution

problem, or reflect on God, or admire a grand natural scene. Some apes, however, would probably declare that they could and did admire the beauty of the coloured skin and fur of their partners in marriage. They would admit, that though they could make other apes understand by cries some of their perceptions and simpler wants, the notion of expressing definite ideas by definite sounds had never crossed their minds. They might insist that they were ready to aid their fellow-apes of the same troop in many ways, to risk their lives for them, and to take charge of their orphans; but they would be forced to acknowledge that disinterested love for all living creatures, the most noble attribute of man, was quite beyond their comprehension (Darwin, 1871/1981, pp. 104-105).

If we assume that Darwin’s ape was a chimpanzee, then he had, in granting it the ability to move between its own psychology and that of humans, created a creature able to detail its Panmorphic world view through conversation alone. But no such anthropomorphous ape is likely to rescue evolutionary biologists who follow in Darwin’s footsteps. Anthropomorphc apes are part of the fictional world, and are thus only valuable at the edge of our knowledge. Our legacy, as David Premack (1986) has pointed out, will be written with the behavioral results of questions we ask of apes through behavioral means. Such explorations remain in their primal infancy, but they threaten to reach adolescence soon. What this adolescent will have to say, and how much of it we will be able (or willing) to understand, may surprise us all. Darwin may have misjudged the chimpanzee’s Panmorphic outlook on the problem of mind, but it remains to be seen by how much.

NOTES

1. Some limited evidence on the emotional end of this point comes from investigations by Ekman (1973) and colleagues who have gathered intriguing evidence that humans are capable of accurately judging the emotions behind facial expressions from individuals of cultures very different from their own. Other indirect evidence has been gathered by cultural anthropologists in the 1940s and 1950s who used a number of projective psychological tests such as the Thematic Apperception Test in a number of different cultures. The important point does not concern the validity of the interpretation of such tests, but rather the fact that in all cases the subjects’ responses are laden with psychological attributions related to knowledge and intention (for examples see Wallace, [1952] on the Iroquois of New York and Gladwin & Sarason [1953] on the Truk of Micronesia).

2. The study of autistic children represents an excellent exception to this rule. The typical question about an autistic child’s theory of mind for a given
metacognitive capacity (for example, their ability to represent false beliefs) is whether they develop it at all. (See, for example, Perner, Frith, Leslie, & Leek- man, 1989.)

3. The extent to which a situation could exist in which the relationship between two species' capacities for mental state attribution would need to be represented as a non-overlapping Venn diagram is an intriguing philosophical problem, although I admit that such a situation seems unlikely. In terms of evolutionary biology this would translate into a situation in which two species had evolved completely separate theories about the mental world. But even at the lowest order such species would seem to overlap at least insofar as they believed in the existence of the mental world.