10 Anthropomorphism and Cross-Species Modeling

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In this reading, Mitchell evaluates the concept of anthropomorphism, particularly as it relates to chimpanzees. She argues that broad arguments against anthropomorphism are not supported, but also that there is no easy application of human descriptive concepts to nonhumans. Rather, anthropomorphic models are specific claims of similarity between humans and nonhumans that are scientifically accessible and must be substantiated by evidence. In the moral sphere, she argues that rather than establishing the similarities and differences between humans and nonhumans, a more fundamental concern might be establishing what capacities in any creature might be the basis of moral consideration.

Introduction

"Anthropomorphism" has long been considered a bad word in science.[1] It carries the stale dust of nineteenth-century anecdotal evidence for the continuity of humans with nonhuman animals. Darwin claims that "there can, I think, be no doubt that a dog feels shame . . . and something very like modesty when begging too often for food."[2] But anthropomorphism is neither prima facie bad or necessarily nonscientific. It can be both, but it need not be either.

[. . .]

There has been a recent resurgence of interest in anthropomorphism, attributable to two developments—the rise of cognitive ethology and the requirements of various forms of expanded, environmental ethics.

Some of the most interesting and relevant work in this area has been directed at explaining the behavior of chimpanzees. Since it is generally agreed that the chimp is our phylogenetically closest relative, it makes evolutionary sense that the features of that species are more likely to be similar to features of our species than those of species whose connection is more attenuated. Darwin's and our love of dogs notwithstanding, it is in primate research that the most plausible anthropomorphic theses are to be found. Or, as Daniel Povinelli claims in *Folk Physics for Apes*, "if the argument by analogy cannot be sustained when it comes to behaviors that we share in common with our nearest living relatives, it can hardly be expected to survive more general scrutiny."[3] Indeed, as I will report later, Povinelli argues just this—that a strong version of anthropomorphism cannot be sustained in explaining even some chimpanzee behaviors.

A strong version of anthropomorphism found in some advocates of cognitive ethology aims to explain behaviors of nonhumans by appeal to mental states similar to the ones we take to explain our own behavior. Of particular interest is the thesis that chimps have a "theory of mind," that is, beliefs about the beliefs of others. Such second-order beliefs are invoked to make sense of behavioral variation. For example, a human would respond differently to two actors on the basis of beliefs about what those actors could see. If one of them had a clear view of a source of food, while the other's view of the food was blocked by a barrier, then it would make sense to follow any indication of food given by the one whom you believe can see the food and hence will know where it is. Do chimps do the

same thing? Do they do it for the same reasons? As I will discuss below, arguments from analogy and experimental results are brought to bear on answering this type of question.

The second source of interest in the similarities of humans and nonhuman animals arises from the animal rights and environmental ethics movements, which have sought to transform the criteria by which we determine what beings merit moral consideration. Animal welfare and animal rights ethical positions make the nature of nonhuman experience determinate of who and what we must count in judging the moral correctness of our actions. [. . .] Thus, the existence of feelings and cognitive states of nonhuman organisms is no longer just an academic question of whether or not Rumbaugh's Kanzi has language[4] or dolphins can recognize themselves in a mirror[5] but is rather a set of facts about the world that we need to know to ethically decide what to eat and what to wear. Thus, the manner and degree to which nonhuman animals are similar to human beings becomes an even more pressing scientific problem in a context in which the very morality of our actions depends on the answer.

At its basis, anthropomorphism involves claims about the similarity of nonhuman objects or beings to humans and the centrality of human concepts and abilities to classify behaviors across ontological categories. Strong anthropomorphism asserts that some description of a feature of human beings applies in the same way to a feature of a nonhuman animal. Critics of anthropomorphism often attack the presumptive character of such claims, like Darwin's *lack of doubt* of the internal nature of a dog's experience. Observers have been too willing to characterize nonhumans using descriptive language that has humans as its primary referent. By describing a dog as feeling shame when it walks away with its tail between its legs, one is not gathering neutral data with which to test the myriad of theories about the nature of dogs but rather is assuming in that very description that dogs have mental or emotional states like human mental and emotional states. But what is at fault here? Is it the presumptiveness or the anthropomorphism?

After all, similarity between humans and nonhuman animals is just what we should expect on the basis of an evolutionary account of the origin and diversification of life on the planet—but not any willy-nilly similarity. As a scientific claim about the facts of the world, any specific similarity between human immune systems, say, and mouse immune systems, or between human beliefs and chimp beliefs, must be grounded in more than a general truth of the continuum of life and backed by more than an imposition of the same descriptive language.

In what follows I will evaluate the arguments and evidence for a range of stances toward anthropomorphism from global rejections to specific models. The bumper sticker version of this essay could be: Science made too easy is bound to be wrong. In the end I will argue that specific anthropomorphic theses are supported or not supported by the same rigorous experimental and logical reasoning as any other scientific model. However, even though anthropomorphic models can be treated as science as usual, unique problems for these models still will remain. These problems have to do with the way in which language descriptive of our experiences travels back and forth between scientific and social domains.

I will first consider some global objections to anthropomorphism. These attack the logical or conceptual transgressions that the act of describing nonhumans in human terms is supposed to commit. I will then look at empirical arguments for and against specific instances of the anthropomorphism ascribed to nonhuman primates. Finally I will consider some social contextual concerns that arise from the scientific anthropomorphic models.

Logical Objections

A. Anthropomorphism entails a category mistake. To speak of dogs with feelings of shame is like referring to a Bach partita as being purple. This objection is easily dismissed as a relic of the view that humans are a separate and unique species, either created to be such or so far evolved that no predicates true of us could be true of other organisms. Surely the evolution of life on the planet tells against this being a logical claim. For a Cartesian who holds that animals are just complicated

machines that lack the souls that make humans human, it might hold sway, but we are centuries beyond that.[6]

B. Anthropomorphism is defined as the *overestimation* of the similarity of humans and nonhumans and hence by definition could not yield accurate accounts.[7] But this is humpty-dumptyism. "When *I* use a word," Humpty Dumpty said, in rather a scornful tone, "it means just what I choose it to mean—neither more nor less."[8]

If we choose to let "anthropomorphism" be so defined, then we merely shift the question to be, *When* is it anthropomorphism, and *when* is it possibly a legitimate similarity? That is, when does a relevant similarity hold such that describing a cognitive state like "believing Sue cannot see the banana" could be equally true of an adult human, a human infant, and a chimpanzee? Such substantive questions cannot be reduced to mere matters of definition.

C. Anthropomorphism is *necessary* or *unavoidable*, since there is no amorphism or neutral language with which to describe behavior. If we do not use the predicates that describe our own human behavior, such as "believing X, wanting Y, deceiving Z" for describing nonhuman animals, then we have to use language appropriate for machines, like "moving toward the object, picking up the banana, looking toward the gate."

This position makes two mistakes. The first is that it presupposes a conceptual and linguistic impoverishment that is not justified. It underestimates our ability to discriminate and refer to multiple states of a system or many-valued parameters. As recent research has suggested, we may end up thinking that chimpanzees do not have the same kind of mental representations that we have but nevertheless think they have mental representations that mediate their behavior. They are not input-output machines but cogitating organisms. They just may not do it the way we do.[9] The second mistake is to confuse anthropocentrism with anthropomorphism. It is true that the descriptions we apply to anything are created *by* us, but they need not be *of* us. That is, we are the source of the terms and predicates, but they need not be terms and predicates that apply principally to our behaviors.

If anthropomorphism is not bad for *logical* reasons, then the extent of the acceptability of claims of similarity must be empirically grounded. This indeed is the conclusion that many recent commentators on anthropomorphism have reached.[10] Do chimpanzees have language, like us? Do they have beliefs about the beliefs of other chimps or of humans? Testing for the presence or absence of mental states, representations internal to the cognizing agent and presumably causally relevant to the behaviors we can observe, is no easy matter. I will now turn to the two main types of observational evidence that are used to justify anthropomorphism; the argument by analogy and experimentation.

Empirical Questions

Argument by Analogy

An *argument by analogy* is invoked to support a claim about the unobserved features of one system—the "target" of the analogy—based on the presence of that feature in another system—the "model system." The relevant similarities between the two systems are what justify the inference. Traditional analyses of analogical arguments render them fairly weak.

Traditional account of analogical argument structure

Premise 1:	System M is observed to have features a, b, c.
Premise 2:	System T is observed to have features a, b, c.
Premise 3:	System M is observed also to have feature d.
Conclusion:	Therefore, system T must have feature d.

This inductive argument structure is supposed to capture everyday reasoning. For example, suppose two students in a class have the same study habits and the same grades on the midterm exam. I observe that student M gets an A on the final exam. Suppose student T has not yet taken the exam.

On the basis of the observed similarities, I can infer that student T will also get an A. This is clearly not deductively valid, as student T might be ill or fail to study in the manner she studied in the past or might have lost her book or for any number of reasons not perform the way I expect on the basis of her similarity to student M. Thus there is no deductive guarantee that the conclusion "Student T will get an A on the exam" is true. Nevertheless, the analogy permits inductive support for the inference. Certainly I would have more reason to believe student T would get an A than I would of other students who bear no similarities to student M.

The strength of an analogy is sometimes rendered in terms of the number of similarities between the two systems. The more features in common, the more likely the target system will have the ascribed unobserved feature. But quantifying over similarities is notoriously difficult and, quite frankly, beside the point. The sheer number of similar features does not immediately warrant the relevance of the similarities for the presence or absence of the feature of interest. Humans and mice have a large number of differences, and yet we are comfortable using the results of drug tests on mice to infer the consequences of those drugs on human biochemistry.

A more sophisticated rendering of the logic of analogical arguments, developed by Weitzenfeld[11] and related to structure-based accounts given in the cognitive sciences,[12] suggests that the inference of the presence of the unobserved feature in the target system is based on assumptions about the relations within each of the two analogous structures, rather than just their unstructured sets of properties. For example, according to Weitzenfeld's account, a claim that a human being will have an adverse reaction to saccharine based on experimental studies on mice is entailed by an assumption of the isomorphism obtaining between the causal structures governing mouse and human biochemistry. Thus, when using information about the model system to draw conclusions about the target system—for example, mice to human inferences or, as we shall see, human beliefs in anthropomorphic inferences to chimp beliefs—what establishes the relevant similarities will be the causal or determining structures in those two systems. If they have isomorphic structures, then the inference is sound. If not, then the conclusions are not supported.

There are two important components to this account of analogy. The first is that it is structural isomorphism between the model and target that deductively guarantees an inference from the observed feature of the model to the unobserved feature of the target. However, isomorphism is a rather weak relationship between two structures, since the reason the mapping works may be accidental. Think of the mapping from stellar constellations as seen from earth such as Orion or Ursa Major to the spatial configurations of hunters and bears. For analogical arguments to be informative, the reason the relations in the model structure—for example, mouse ingestion of large quantities of saccharine inducing mouse production of tumors—map onto the relations in the target structure; that is, human ingestion of saccharine in diet foods and subsequent cancers must be nonaccidental, that is, governed by a rule or causal law. This is all rather abstract philosophy. The main point of the structural approach to analogical arguments is to focus attention on the relationships between the variables in each system as well as the relationships between the two systems, rather than on simply the number of features shared by the two systems. Let's bring it back to the case at hand.

A clear reconstruction of the analogical argument for inferring that chimps are like us is provided by Povinelli:

P1: *I exhibit bodily behaviors of type B (i.e., those normally thought to be caused by second-order mental states).*

P2: *Chimps exhibit bodily behaviors of type B.*

P3: *My own bodily behaviors of type B are usually caused by my second-order mental states of type A.*

C: *Therefore bodily behaviors of type B exhibited by chimps are caused by their second-order mental states of type A, and so* a fortiori *chimps have second-order mental states of type A.*

(*Povinelli, Folk Physics for Apes*, 13)

In the traditional philosophical analysis of analogical arguments, the number of similarities between humans and chimpanzees would determine the strength of support for the conclusion. Phylogenetic proximity is brought to bear to suggest that we have more similarities with chimps than other species, since we are historically closer to them. Divergence occurred more recently from chimpanzees than from other species and hence we expect them to be more like us than would be toads or amoebae. But notice how weak this support actually is. Divergence is presumed, and distinction is required for humans and chimps *not* to be the same species. Many features may be shared, but just the ones we are interested in, second-order mental states, for example, may be the ones that constitute the break in the lineage. So evolutionary proximity may entail more similar features but not necessarily the relevant features.[13]

The more sophisticated analysis of analogical inference suggests a different understanding of the argument. Here, what makes human experience relevant to conclusions about chimp experience is not the number of similarities but the presence of isomorphic causal structures. What causes a human behavior B is, supposedly, a human second-order mental state A. But is this the same causal structure found in chimpanzees? If it is, then even though we cannot ask the chimp what belief motivated its behavior, we can be justified in thinking that if the human and chimp behaviors are the same or similar, then the beliefs that cause them are the same or similar. However, this shifts the question of the legitimacy of analogical reasoning to the determination of whether the causal structures generating behaviors in humans and in chimpanzees are isomorphic. That is the subject of the second type of empirical evidence that I will discuss below.

To summarize so far, anthropomorphic theses can be seen as instances of analogical inferences. We ascribe to other organisms the features we take to be true of us. Phylogenetic relatedness seems to render weak support for the conclusion of such inferences, so weak that they can only garner some modest plausibility for the conclusions. However, a stronger analogical inference is supported when there is justification for isomorphism of causal structures in the two systems generating the features we are interested in. On this account the analogy requires a different type of evidence than evolutionary history alone. Statistical and experimental data are required to support the premises that would entail the inference. So how can empirical evidence help?

Argument from Experimental Data

Advocates of cognitive ethology cry foul when their opponents reject the enterprise from the beginning just for being anthropomorphic. They would rather let the facts decide. But this is not as easy as it might sound. The controversial anthropomorphic theses ascribe to nonhumans just those sorts of features that are not directly accessible to observation. Allen and Hauser want to know whether apes have a concept of death.[14] Premack and Woodruff explore whether apes have a "theory of mind" that is invoked in generating behaviors that appear to be acts of deception.[15] It is obvious that we cannot just look at a chimpanzee, or another human being for that matter, and see its internal mental state. [. . .] We cannot ask a chimpanzee to report to us the content of its cognition. We have access experimentally and observationally only to the very behaviors we take as the effects of the ascribed mental causes. So how can observation and experiment help decide this issue?

It is worth noting that the reason one suggests that concepts and second-order beliefs might be the causes of nonhuman behaviors is because we believe that they are the causes of our own behaviors. This view assumes that there is a causal structure or mechanism that we can investigate that generates behaviors as the effect of beliefs.[16] When I think my husband is joking about where the car keys are, but a friend who is with us is telling the truth, then I do not walk in the direction of the place mentioned by my husband to find my keys. Rather I go to the location cited by my friend. I hear the utterances of each of them, and my behavior is caused not just by those utterances but also by my beliefs about the beliefs of the speakers.

[. . .]

How do I know this? It is introspection or personal self-knowledge that gives me insight into the causal structure that underlies my actions.

If the evidence for beliefs being the cause of behavior is solely the subjective experience of the believer/actor, then I need to ascribe to other human beings the possession of an unobservable mental cause to explain their reasoned behaviors. This is the well-known philosophical problem of "other minds." But the ascription of unobservable mental causes to humans seems to be very much like the ascription to nonhuman beings. Why should it be sanctioned in the case of other humans and not sanctioned in the case of, say, honeybees? And where does that leave the inference when directed toward chimpanzee behavior?

There are two places to look for answers to these questions: background assumptions about the nature of intra- and interspecific similarity and behavioral experiments. I will first consider the background assumptions. There are good grounds to assume that basic causal structures or mechanisms are the same for different members of the same species of organism. Although different individual organisms are spatiotemporally distinct and harbor all sorts of variation in particular features, the basic biological mechanisms most directly connected to surviving and reproducing are most likely to be the same. The reason is that these are the features upon which evolution by natural selection will have been quickest and strongest to act. Variations that have relatively negative effects on survival and reproduction are not kept around. That is how evolution by natural selection works. Even with the caveat of recognizing the continual generation of variation within a species, it nevertheless is a safe assumption that there will be little variation in the basic functioning of organisms within a species. The species is the correct boundary for this degree of similarity because it is the potentially interbreeding population that is the receptacle for the consequences of natural selection.

[. . .]

Nevertheless, there are good, if fallible grounds for believing that other human beings have the same sort of second-order beliefs that are causally relevant to their actions, since we have grounds for believing that the same causal mechanisms are at work in all members of the species.

What is the objection to extending this inference from humans to nonhumans? First of all, we have fewer types of supporting evidence than in the case of human-to-human inference. There is no self-reporting to be acquired from the chimp about the reasons for its actions. There is no shared species membership from which to support causal isomorphism. However, we can look to the similarity or dissimilarity of neurophysiological structure, sensory apparatus, and so on. And, importantly, we can look to behavioral observations and experimentation (see Table 10.1).

The experimental data on whether or not chimpanzees have second-order beliefs, unfortunately, permit multiple interpretations. Povinelli's *Folk Physics for Apes* reports a number of experiments done on captive chimpanzees over a five-year period to investigate how they conceive of the physics that underlies their use of tools in particular or, more generally, to "elucidate the nature of the mental representations that guide this behavior" (1). In service to this goal, Povinelli provides evidence against the strong argument by analogy. A series of experiments were done to determine whether chimpanzees have the concept that others "see." This is a basic second-order belief. I look at another human being and have a visual experience of that person. I look at their eyes and notice that they are directed at the door. I form a belief that the person sees the door, that is, a belief about her

Table 10.1 Grounds for attributing causal isomorphism

	Evolutionary relatedness	*Self-reporting*	*Neurophysiological and other physical features*	*Behavioral statistics*
Human-to-human inference	Strong support	Strong support	Strong support	Strong support
Human-to-chimpanzee inference	Weak support	N/a	Some support	Mixed support

internal visual representation. I can then act on the basis of what I believe that she does or does not see. Povinelli's group studied whether chimpanzees engage in the same kind of cognitive process.

Povinelli dissects forming a belief that another organism sees a particular object into a number of components. The organism must notice the eyes of the other and then follow the gaze of the other toward the object under perception. Interest in eyes and gaze direction are present in a wide range of species, and these abilities may well have emerged as adaptations to predation and social interactions. But how much like humans are the internal states of other organisms that engage in these behaviors? Povinelli puts the point as follows:

> Some researchers interpret the mutual gaze that occurs between infants and adults, as well as among great apes during complex social interactions as *prima facie* evidence of an understanding of the attentional aspect of seeing. And admittedly, there is a certain allure to the idea that, because mutual gaze in adult humans is often attended by representations of the mental states of others, comparable behavior in human infants (or other species) is probably attended by similar representations. But is mutual gaze in apes (for example) really attended by the same psychological representations as in human adults, or is this just a projection of our own way of thinking onto other species?
>
> (22)

In short, is this just wishful anthropomorphism, or can we get evidence that apes have the same or similar cognitive state as humans?

The first step in Povinelli's study was to establish whether chimpanzees had the same behavioral abilities, that is, gaze following, as do human infants and human adults. For the analogical argument to work, the effects—behaviors in this case—expressed in the two systems have to be the same, and then one infers that the causes of these effects are also the same. Experiments show that chimps and one-and-one-half-year-old human infants similarly responded to head movement, eye movement, left/right specificity, gaze following outside of visual field, and so on. So he concluded that chimps and humans engage in similar responses to a series of eye movement stimuli presented to them. Behaviors are the same. But what more is going on?

Povinelli devised ingenious experiments to try to test whether chimps' gaze-following behavior indicated the possession of second-order mental states. He entertained two possible explanations, a low-level and high-level account. The low-level account interprets the chimp's gaze-following behavior to express cognition about behavioral propensities of the person whose gaze they followed, where the high-level account claims chimps form concepts about the internal mental states of the person whose gaze they are following. That is, the low-level model is akin to what happens when a human visually follows the path of a billiard ball being hit by a cue ball. We see the ball being hit and its initial motion and develop expectations of its behavior at a subsequent time. It initially moves towards the corner pocket, hence it will continue to move in a straight line toward the pocket. The high-level model is akin to a human watching another human looking in the direction of the billiard ball. In this case the perceived eye motion induces beliefs about what the observer *sees*. The human's eyes move following the ball, hence the human sees the ball's motion. The Povinelli group hypothesized that the high- and low-level accounts would make different predictions in cases where the observed individual's gaze was obstructed by an opaque barrier. If the low-level account were right, the observing chimp would just scan a line from the eyes of the observed being until something was noticed. This is based on eyes looking right indicating something is right, and a barrier would be irrelevant. If the high-level account were right, the observing chimp would walk around the barrier to see what was being seen. This would be based on eyes looking right indicating there must be something that is seen that is on the other side of the barrier. The results of an opaque-barrier test were unambiguously in support of the high-level model. The chimps walked around the barrier to see what the person in the experiment was looking at. The conclusion naturally drawn was that chimps understand what it is for someone else to see or represent the world; hence they have second-order beliefs just like humans.

However, a dozen other experiments involving seeing supported the low-level model of cognition. In these experiments, the chimps were presented with two humans displaying different capacities to see them, and it was observed whether the chimps responded differently to the two humans. The test response was begging behavior, and the question was did the chimps beg significantly more to the human who did not have his gaze obstructed? The obstruction conditions of the humans in the test included being blindfolded, having a bucket over one's head, having hands over one's eyes, and facing backward in relation to the observing chimpanzee.

In three of the four conditions, the chimps were as likely to gesture to the person who could *not* see them as to the person who could. However, in the front-facing-versus-back-facing case they did beg more to the human with his front facing the chimp. So the low-level account captured three of the experimental conditions, whereas the high-level account was supported by one of the experimental conditions. To try to distinguish whether it was the seeing that mattered or the front position, Povinelli introduced a fifth experimental setup. This time, both humans had their backs to the observing chimp, but one was looking over her shoulder at the chimp, the other was not. "To our surprise and in full support of the low-level model, on the looking-over-the-shoulder trials the apes did not prefer to gesture to the person who could see them" (*Folk Physics*, 34).

Povinelli's group continued to introduce new seeing/not seeing experimental conditions to the chimps using screens and eyes-open/eyes-shut conditions to try to figure out what was going on. In the end, Povinelli rejected the high-level, second-order belief model and suggested that through trial and error the apes learned a set of procedural rules about successful gesturing (1. gesture to person whose front is facing forward; 2. if both fronts present or absent, gesture to person whose face is visible; and 3. if both faces visible or occluded, gesture to person whose eyes are visible). The chimpanzees do not appear to be using a concept of seeing to help them decide to whom to gesture. Instead, the chimpanzees after lots of trial and error behaved "as if" they had our concept of seeing. Important for Povinelli's conclusion is the fact that the behavior at the end of the study was different from the chimps' behavior at the beginning of the study. They learned something, namely, how to gesture to the person *we* would say could see them. In contrast, three-year-old human children compared in these experiments were shown to have the behaviors appropriate to understanding a concept of seeing from the beginning; no variation in behavior occurred for the humans.

Do these experiments tell us whether the similarity of chimp and human behavior indicates a similarity of internal mental cognition? Povinelli concludes that it is still open to interpretation. Indeed, he postulates three different ways to account for the behaviors of the chimps in the experiments. First, they could have entered the test without a concept of seeing but through the testing came to construct the concept. Second, they could have entered the test with a general conception of attention and constructed a notion of visual attention. And third, they could have neither entered nor exited the tests with an understanding of the mental state of visual attention (*Folk Physics*, 42). Rather, they constructed an "as-if" understanding of seeing-as-attention. The third option is like the familiar case of Clever Hans, the horse who appeared to be able to do arithmetic.[17]

An anomaly for Povinelli's preferred low-level interpretation is that the opaque-barrier tests did support the high-level model of cognition for the chimps. Povinelli takes the preponderance of evidence to suggest that the low-level model is much better supported and gives a reinterpretation of the opaque-barrier test that would account for this contrary bit of evidence. On the way, he points out that if we walk into the laboratory with an anthropomorphic attitude, we are much more likely to continually refine and retest experimental results that support the low-level model and accept on its face the results of tests like the opaque barrier test that support an anthropomorphic high-level model.

What conclusion should we draw from these experiments on chimpanzees? Does the fact that their behavior and our behavior are sometimes indistinguishable indicate that the causes of those behaviors in us and in them are also the same? Does the fact that their behavior and our behavior are sometimes different indicate that the cause of their behaviors are not the same as ours? The experimental results are, at best, ambiguous and, according to Povinelli, lean toward a rejection

of strong anthropomorphism. Indeed, as you will recall, he said that if the similarity of human and nonhuman behaviors does not license the analogical inference to same causes for chimpanzees, then it can hardly be credible for other species. At least it should be clear how difficult it is to get unambiguous experimental results for anthropomorphic models. There is no consensus in the scientific community about the significance of the Povinelli experiments, with criticisms often focused on the possible crucial dissimilarity between captive chimps, the subjects of Povinelli's studies, and chimps in the wild.[18]

Conclusion

What is the fate of anthropomorphism in contemporary science? I have argued that the global arguments against anthropomorphism cannot be maintained in a post-Darwinian scientific world. Given that humans *are* biologically related to other species, the ascription of concepts whose natural home is in describing human features and behaviors may very well apply to nonhumans. That being said, there is also no global support for the cavalier exportation of human descriptive concepts to nonhumans. Rather, I have suggested that a piecemeal evaluation of the credibility of specific claims of similarity, based on a causal-isomorphism model of analogical reasoning, must be undertaken. There are a variety of types of evidential support for grounding specific anthropomorphic models, and so judgments of its legitimacy in different cases may well vary.

In short, anthropomorphic models are specific, scientifically accessible claims of similarity between humans and nonhumans. As such, they must be substantiated by evidence that there are similar causal mechanisms responsible for generating the apparently similar behaviors that are observed. If experimental and background theoretical support do provide that evidence, then there should be no objection to using the same descriptive language for both humans and nonhumans. If that evidence is not provided, then using the same predicate for a full-fledged human behavior to refer to an "as-if" nonhuman behavior will be misleading and inaccurate.

[. . .]

With respect to the issue of cognitive similarities, the current scientific debates indicate that it is difficult to get definitive evidence either way for even the simplest second-order belief that "A sees X." It would appear to get progressively more difficult when the descriptions carry not just casual assumptions but also social and moral baggage.

Not surprisingly, the most controversial and consequential claims about the similarity between humans and nonhuman animals are the most difficult to substantiate. And yet it is these claims that play a fundamental role in the growing field of cognitive ethology. Perhaps the most telling insights that will be gleaned from careful study of the nature of the cognitive similarity or dissimilarity between humans and nonhumans will be reflexive. That is, characterizing the ways in which nonhuman cognition differs from human cognition may force a reevaluation of our account of human cognition itself.

The same may be true for the advocates of expanding the domain of moral consideration to nonhumans. A deeper understanding of the lives of other animals may shift the focus from the anthropocentric question of whether other beings are sufficiently like humans to warrant the same moral rights as humans to a more generalized analysis of what capacities, whether found in humans or not, ought to be the basis of moral consideration.

Notes

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1. See J. B. Kennedy, *The New Anthropomorphism* (Cambridge: Cambridge University Press, 1992), for an account of the behaviorist attack on anthropomorphism; Stewart Elliott Guthrie, "Anthropomorphism: A

Definition and a Theory," in *Anthropomorphism, Anecdotes, and Animals: The Emperor's New Clothes?* ed. R. W. Mitchell, N. S. Thompson, and H. L. Miles (Albany: SUNY Press, 1996), 501, cites criticisms of anthropomorphism back to Bacon, Spinoza, and Hume.

2. Charles Darwin, *The Descent of Man, and Selection in Relation to Sex* (1871; reprint, Princeton, NJ: Princeton University Press, 1981), 42; quoted in Elizabeth Knoll, "Dogs, Darwinism, and English Sensibilities," in *Anthropomorphism, Anecdotes, and Animals: The Emperor's New Clothes?* ed. R. W. Mitchell, N. S. Thompson, and H. L. Miles (Albany: SUNY Press, 1996), 14.
3. Daniel J. Povinelli, *Folk Physics for Apes* (Oxford: Oxford University Press, 2000), 9.
4. Sue Savage-Rumbaugh, Stuart G. Shanker, and Talbot J. Taylor, *Apes, Language and the Human Mind* (New York: Oxford University Press, 1998). Kanzi is a bonobo chimpanzee who can manipulate physical symbols in a way that looks very much like human language.
5. Mark Derr, "Brainy Dolphins Pass the Human 'Mirror' Test," *New York Times*, 1 May 2001. http://www.nytimes.com/2001/05/01/science/brainy-dolphins-pass-the-human-mirror-test.html?pagewanted=all.
6. See Emanuela Cenami Spada, "Amorphism, Mechanomorphism, and Anthropomorphism," in *Anthropomorphism, Anecdotes, and Animals: The Emperor's New Clothes?* ed. R. W. Mitchell, N. S. Thompson, and H. L. Miles (Albany: SUNY Press, 1996), 37–50.
7. See Guthrie, "Anthropomorphism: A Definition," 53; and Hugh Lehman, "Anthropomorphism and Scientific Evidence for Animal Mental States," in *Anthropomorphism, Anecdotes, and Animals: The Emperor's New Clothes?* ed. R. W. Mitchell, N. S. Thompson, and H. L. Miles (Albany: SUNY Press, 1996), 105.
8. Lewis Carroll, *Through the Looking Glass* (New York: Putnam, 1972), chapter 6.
9. See Povinelli, *Folk Physics*.
10. See Marc Beckoff, Colin Allen, and Gordon M. Burghardt, eds., *Cognitive Animal: Empirical and Theoretical Perspectives on Animal Cognition* (Cambridge, MA: MIT Press, 2002); and Povinelli, *Folk Physics*.
11. Julian S. Weitzenfeld, "Valid Reasoning by Analogy," *Philosophy of Science* 51 (1984): 137–49.
12. See J. R. Hayes and H. A. Simon, "Understanding Tasks Stated in Natural Language," in *Speech Recognition*, ed. D. R. Reddy (New York: Academic Press, 1975), 443–470; and M. L. Gick and K. J. Holyoak, "Schema Induction and Analogical Transfer," *Cognitive Psychology* 15 (1983): 1–38.
13. See Christopher Lang, Elliott Sober, and Karen Strier, "Are Human Beings Part of the Rest of Nature?" *Biology and Philosophy* 17 (2002): 661–71, for a detailed assessment of the import of phylogenetic proximity for casual similarity.
14. Colin Allen and Marc Hauser, "Concept Attribution in Nonhuman Animals: Theoretical and Methodological Problems in Ascribing Complex Mental Processes," *Philosophy of Science* 58 (1991): 221–40.
15. D. Premack and G. Woodruff, "Does the Chimpanzee Have a Theory of Mind?" *Behavioral Brain Sciences* 1 (1978): 515–26.
16. Of course, there is a debate on whether the folk notion of belief is a part of a scientific account of behavior; alternatives include epiphenomenalism with respect to beliefs as well as eliminativism in favor of physical neural structures. See Owen J. Flanagan, *Science of the Mind*, 2nd ed. (Cambridge, MA: MIT Press, 1991), for an overview of the various positions.
17. Clever Hans was a horse who lived in Berlin at the beginning of the twentieth century who allegedly could do arithmetic, indicating sums by the number of times he tapped his hoof to the ground. Of course, he failed to display this ability when his trainer, from whom he presumably was getting cues for foot tapping, was absent from the scene. See Oskar Pfungst, *Clever Hans (the Horse of Mr. Von Osten)* (Bristol, UK: Thoemmes Press, 1911).
18. See M. D. Hauser, "Elementary, My Dear Chimpanzee," *Science* 291 (2001): 440–41; A. Whiten, "Tool Tests Challenge Chimpanzees," *Nature* 409 (2001): 133; and Colin Allen, "A Skeptic's Progress," *Biology and Philosophy* 17 (2002): 695–702.