

Homo Religiosus: Linnaeus and Beyond

with Peter Harrison, "Linnaeus as a Second Adam? Taxonomy and the Religious Vocation"; Mikael Stenmark, "Three Theories of Human Nature"; John F. Haught, "Theology, Evolution, and the Human Mind: How Much Can Biology Explain?" and Celia Deane-Drummond, "Are Animals Moral? A Theological Appraisal of the Evolution of Vice and Virtue"

ARE ANIMALS MORAL? A THEOLOGICAL APPRAISAL OF THE EVOLUTION OF VICE AND VIRTUE

by *Celia Deane-Drummond*

Abstract. I discuss controversial claims about the status of non-human animals as moral beings in relation to philosophical claims to the contrary. I address questions about the ontology of animals rather than ethical approaches as to how humans need to treat other animals through notions of, for example, animal rights. I explore the evolutionary origins of behavior that can be considered vices or virtues and suggest that Thomas Aquinas is closer to Darwin's view on nonhuman animals than we might suppose. An appreciation of the complexity of the emotional lives of social animals and their cooperative behaviors in light of the work of animal ethologists such as Frans de Waal and Marc Bekoff suggests that social animals can be considered moral in their own terms. I discuss the charge of anthropomorphism, drawing on the work of archaeologist Steven Mithen, and consider arguments for the evolution of conscience in the work of anthropologist Christopher Boehm. Only the biological basis for the development of conscience and religion has evolved in nonhuman animals, and this should not be confused with sophisticated moral systems of analysis or particular religious beliefs found in the human community.

Keywords: animal morality; Thomas Aquinas; cooperation; ethology; evolution; virtues

Celia Deane-Drummond is Professor of Theology and the Biosciences at the University of Chester and Director of the Centre for Religion and the Biosciences, Department of Theology and Religious Studies, Parkgate Road, Chester, CH1 4BJ; e-mail C.Deane-Drummond@chester.ac.uk (CDeane-Drummond@cafod.org.uk until June 2010).

[*Zygon*, vol. 44, no. 4 (December 2009)]

© 2009 by the Joint Publication Board of *Zygon*. ISSN 0591-2385

www.zygonjournal.org

When we reflect, even in a cursory manner, on religious practices and rituals in the human community, it becomes obvious that no such behavior exists in nonhuman animals.¹ How is it then that biologists are now speaking about evolution and religion in the same breath? What does the evolution of religion mean? In order to answer this question, I suggest that we need to go back to those patterns of behavior that are considered *moral* or not—in other words, to ask prior questions about the evolutionary roots of morality. Such a discussion is controversial in itself, but until this aspect of the argument is appraised, any discussion of the evolution of religion loses its force, because, in biological terms at least, one builds directly on the other. In addition, if we define *religion* merely as rules that seek to reinforce moral behavior, it becomes easier to see why biologists might seek to trace evolutionary roots to such practices. Of course, the way we define such terms affects the extent to which arguments for evolutionary origins are convincing or not, but this is part of the discussion. If *evolution* is used in the very general sense of change over time, the evolution of moral and religious behavior in human communities becomes as much a task of social anthropology as of evolutionary biology, philosophy, or religious studies. Such studies necessarily do not make any claim about the status of a religious belief or its theological basis. Such a second-order activity is a task for theologians and ethicists. In this article I draw on insights arising from the sciences of primatology, animal ethology, and archaeology in order to tease out the possible evolutionary roots of moral behavior, where evolution is understood to include biological evolution. I compare this with classical theories about vice, virtue, and conscience and the extent to which such behaviors might also exist in animals.

WHAT DOES MORALITY MEAN?

Thomas Huxley in his famous lecture *Evolution and Ethics* ([1894] 1989) proposed that human nature is essentially evil, the product of brutish evolutionary history, and that humankind invented a system of morality in order to curb such lower instincts. When its origin is explained in this way, morality seems to separate human culture from evolutionary history. Until relatively recently, the view that morality is a cultural invention exclusive to human societies dominated discussions about the origin of morality. But if we define morality in more general terms as an ability “to judge right and wrong, good and bad, and to behave accordingly” (Planalp 1999, 61), there is a possibility that nonhuman animals have this capacity. The more complex our definition of morality, the less likely we are to find such capacities in nonhumans. However, from a biologist’s point of view, what matters is the extent to which an underlying capability is present, regardless of how far this comes to be expressed in different shapes and forms in social and cultural terms. It is the capacity to make these kinds of judgments

that is relevant, not whether there is a sophisticated system of ethics that is the prerogative of the human animal. No one is suggesting, for example, that a chimpanzee could come up with a system like Kantian ethics if given enough time. But the establishment of a system of rules in order to promote some behavior and not others is a reasonable possibility. It is here that much confusion seems to lie, for philosophers regularly object to the idea of morality in animals on the basis that morality requires sophisticated mental abstraction that is not available to animals. Even animal lover and philosopher Stephen Clark resists the idea of morality in animals, for the following reasons:

Beasts, so far as we can tell, do not draw out from their own actions any principles of action on which they can comment, from which they can gradually dissent. . . . If I cannot bear to generalise my principles, do I have principles at all? . . . All these perplexities are our affair. Beasts may sometimes feel them too, but if they do, we do not know it, and it seems more likely, in general, that they do not. Beasts, let us say, are ethical; that is they respond to aspects of a situation and to features of their kindred that a good man would also respect. But they are not moral: for they do not, as far as we can see it, have any occasion to moralise about themselves or to construct intellectual systems to accommodate their immediate responses. (Clark 1982, 107)

He goes on to suggest that rationalists, “emphasising the moral, are likely to find beasts wholly other than human; empiricists, like David Hume, recognise beasts as our cousins, moved by ethical concerns that move us also” (1982, 107).

Note what Clark is doing here. First, he is suggesting that the kind of abstractions found in human rational thinking makes human morality what it is. Once humans are associated with abstraction, humans and animals seem to be radically other. Second, he associates ethics with particular emotional responses that also may be found in animals. Hence, whether we think of animals as potentially moral or not depends on our assumptions about the extent and degree of abstraction needed for something to be counted as moral. Holmes Rolston, however, aligns morality and ethics, and morality with complexity, in describing primate behavior as “pre-ethical. . . . Ethics is distinctively a product of human genius” (Rolston 1999, 112–13).

But of what might animals be capable according to the work of current animal behaviorists?

ANIMAL EMOTIONS AND COMPLEX BEHAVIOR

Frans de Waal, a leading international expert in primatology, has researched the behaviors of primates extensively. He argues that the social nature of animal behavior is crucial in thinking about morality (de Waal 2006a, 6–7). He suggests that the choice we have is to view morality as a cultural innovation achieved only by the human species or to see it as an outgrowth

of social instincts that we share with animals, that is, a product of social evolution. According to him the problem with the first theory is that morality seems more like a veneer hiding an otherwise brutish nature. Richard Dawkins, among others, views ethics as a reaction to inbuilt tendencies toward immoral and self-seeking behavior. Any altruistic behavior is seen as self-deception (Dawkins 2006, 201). De Waal believes that this was the dominant theory among biologists until quite recently. This leaves the second option as the only reasonable one. But is this contrast too stark? Veneer theory would seem mistaken inasmuch as it implies a dualistic approach to behavior. But there also are differences in social behavior between animals and humans; in other words, it may not be quite the continuum that he implies. For example, archaeologists have uncovered plenty of evidence for cultural innovation among early hominids (I return to this later). In de Waal's schema the ambiguity that is likely to be present in seeking to understand the evolutionary origins of morality do not come sufficiently to the surface. With Leonard Katz, I suggest that it is clear that "We may wonder with Darwin how exactly to divide the credit for morality between natural selection, culture and learning, but suspect like him that, especially in the later stages of the evolution of morality, culture and learning, both individual and social, had the larger roles" (Katz 2000, ix).

Leaving aside debates about different theories of social evolution for the moment, it is worth considering de Waal's insistence on the importance of the evolution of cooperative and sympathetic tendencies in primates and other social animal species. Charles Darwin also speculated in this vein: "Any animal whatever, endowed with a well marked social instinct, the parental and filial affections being here included, would inevitably acquire a moral sense or conscience, as soon as its intellectual powers had become as well developed, or nearly as well developed, as in man. . . . Many animals sympathize with each other's distress or danger" (Darwin [1871] 1982, 71–72, 77). De Waal argues that tendencies for sympathy have evolved in those species that are social, such as elephants, wolves, dolphins, and humans. He suggests that such an impulse has survival value: "The impulse to help was therefore never truly without survival value to the ones showing the impulse. But, as so often, the impulse became divorced from the consequences that shaped its evolution. This permitted expression even when payoffs were unlikely, such as when strangers were beneficiaries" (de Waal 2006a, 15). Such a view allows de Waal to claim that helping behaviors were beneficial initially in evolutionary terms but also explains puzzles such as helping strangers without going down the route of self-deception. In other words, *genuinely* cooperative behaviors have evolved.²

Empathy is a capability that exists in nonhuman animals that is there even before the influence of language and culture. There is high selection pressure in its favor, because nonhuman primates rely on emotional mediation for their communication with one another. *Emotional contagion* is

perhaps the first stage of empathy, which allows the animal to feel the distress of another. True helping motivations will go beyond this. In order to illustrate that apes are capable of the latter, and not just of emotional contagion, de Waal recounts the following story about Kuni, a female bonobo, that shows a remarkable exchange between two unrelated species.

One day Kuni captured a starling. Out of fear that she might molest the stunned bird, which appeared undamaged, the helper urged the ape to let the bird go. Kuni picked up the starling with one hand and climbed to the highest point of the highest tree where she wrapped her legs around the trunk so that she had both hands free to hold the bird. She then carefully unfolded its wings and spread them wide open, one wing in each hand, before throwing the bird as hard as she could towards the barrier of the enclosure. (de Waal 2006a, 31)

This kind of evidence is entertaining, but anecdotal, and there are some difficulties with obtaining appropriate evidence. John Dupré, for example, strongly objects to conclusions arrived at through methods involving anecdotal evidence, although he recognizes the difficulty of designing experimental methods that would not interfere with outcomes (Dupré 2002, 220). However, rather more extensive experimental evidence has accumulated in support of such traits, as shown by learned behavior. Dupré's more important insight, perhaps, is that we should not seek after particular mental traits in animals, for example specific language skills, in an essentialist way (2002, 236–56). Ethologists such as Marc Bekoff do not seem to me to be making this mistake; they try to find what is apparent within the worlds occupied by the species under investigation rather than any sort of essentialist mapping onto human experience. De Waal, using careful experimental evidence based on hundreds of observations, believes that monkeys are capable only of emotional contagion, with genuine helping and consolation behavior confined to apes. Such capabilities seem to be related to the degree of self-awareness, as shown by mirror self-recognition.

In addition, social animals show a degree of acceptance toward those in their group that are injured or born with difficulties, as shown by examples of tolerance of a mentally retarded monkey in a group of rhesus macaques. In this instance, and many others, the popular idea of individual survival of the fittest does not make sense (de Waal 2006b, 217).

Yet we should be wary of painting too glowing a picture of primate behavior. Characteristics that in human beings would be called sinful are also present in ape behavior and in their tendencies toward violence to one another.³ Reconciling strategies, which have a particular protocol depending on the species, may follow violent eruptions. These behaviors seem to be learned rather than the result of some sort of blind instinct. Putting together rhesus and stump-tail juvenile monkeys where normally only the rhesus exhibits quarrelsome behavior showed that over time the rhesus monkeys learned to be more tolerant (de Waal 2006b, 147–48).

Are other animals capable of consolation behaviors? In some fascinating work, Bekoff has observed play behavior among canids. Dogs, coyotes, and wolves all learn quickly to play in a way that is fair according to the rules set up by the particular species. Those that fail to engage in fair play become more isolated and drift away from the group, where their chance of survival falls drastically (Bekoff 2007, 102). Fair play seems to foster group stability and overall survival rates of those in the group. “Rules” for fair play include play invitation signals, variations in sequence of actions, self-handicapping, and role reversing. Bekoff suggests that cooperation is more common than we might think.

When animals cooperate, they’re doing what comes naturally, and cooperation relies on established, well maintained social standards of behavior—that is, moral codes. . . . It’s clear that morality and virtue didn’t suddenly appear at the evolutionary epic beginning with humans. The origins of virtue, egalitarianism and morality are more ancient than our own species. While fair play in animals may be a rudimentary form of social morality, it still could be a forerunner of more complex and more sophisticated human moral systems. (pp. 107, 109)

In addition to a sense of fairness, many nonhuman animals also are capable of feeling love, where love is defined as preferring the company of another and protecting that other’s interests. Animals show signs of grief when loved ones die (p. 90). Animals seem capable of showing a considerable degree of care, even when there seems to be no advantage to them. Companionships between blind animals (including humans) and other animals abound, including unusual liaisons such as that between a one-year-old hippopotamus and a century-old tortoise (pp. 75–76). Joy is also in evidence in social play, with the same neurochemicals released in the brain of animals as in humans (p. 56).

Bekoff suggests that “if we try to learn more about forgiveness, fairness, trust and cooperation in animals, maybe we’ll also learn to live more compassionately and cooperatively with one another” (p. 56). This comes close to naturalistic ethics—that is, what we learn of nonhuman animal behavior gives us a model for human acting and behaving. But before we dismiss this too readily, it is appropriate to consider the extent to which virtue ethics is grounded in biological realism.

Skeptics object to the categorization of nonhuman animals in terms of their similarity to human behavior, such as found in the writing of de Waal or Bekoff, by the claim that just because behaviors *look* like peace-keeping or justice-making or empathy does not mean they have similar underlying psychological motivation to that found in humans (Bernstein 2000a, 31–38). Other objections, based on the supposed lack of intentions of animals, revolve around the impossibility of animals’ feeling guilt because guilt requires that a voluntary act has both hurt another and could have been suppressed (Kagan 2000, 46–48). More strident still is the denial by authors such as Hans Kummer that what is being observed in ethological

studies is anything more than objects considered by human value judgment in such a way that they are presented as “shared solutions” rather than reflecting individual learning, a view that he prefers (Kummer 2000, 48–52). Jessica Flack and de Waal respond to such objections by arguing that they are making the case for the existence of *moral sentiments* in animals, not sophisticated moral judgment, and that the former are “building blocks” of morality rather than the kind of morality that is found in human societies. By “building blocks” the authors mean an underlying capacity for developing certain behaviors. These behaviors are usually only developed in social settings, rather than being inherited in a direct sense. In other words, behaviors are learned, but the underlying capacity gives a predisposition for that learning to take place. In such societies behaviors are constrained by shared values. These shared values are not judged good or bad by human standards but are the accepted norms within a group setting (Flack and de Waal 2000, 67–77). Also, while it is difficult to prove absolutely that underlying psychological tendencies are similar, the fact that similar neurons are present is strongly suggestive of close parallels. To resist this possibility entirely seems to fly in the face of the evidence and be based on prejudicial attitudes toward animals.

AQUINAS, MACINTYRE, AND VIRTUE ETHICS

The possibility that there are forms of human behavior that have roots in animal behavior should come as no surprise to us, for such an approach is common to thinking grounded in Aristotelian philosophy and the theology of Thomas Aquinas. Even though the latter was highly anthropocentric and instrumental in his attitude to the treatment of animals, he recognized the extent and complexity of animal emotions and responses in a way that sounds remarkably modern. There certainly are treatments of Aquinas that associate his thinking with particular interpretations of René Descartes and suggest that he thought of animals as unthinking automata. It is possible to find references that point in this direction (such as Aquinas 1970, Qu. 13.2), but once filtered through a particular interpretation of Descartes they fail to do justice to his thought as a whole. Such a limited perspective has been exploited by Andrew Linzey, who has regularly castigated Aquinas for his attitude to animal treatment in a way that ignores other aspects of his thought (see Linzey 1996, 29–33).

Like many moderns, Aquinas did speak of nonhuman animals as operating out of instinct alone, but he saw this as analogous to reasonable behavior in humans (Aquinas 1965, Qu. 46.4). The discussion of the meaning of *instinct* in Aquinas is crucial here. While Descartes associated instinct with unthinking behavior, a view that has crept into popular consciousness, Aquinas understood it as more closely aligned with intellectual activity. In particular, he associated instinct with the estimative sense⁴ and also

prudence, or practical wisdom.⁵ He also acknowledged the presence of hope and despair in animals, but he believed that animals appear to act as if they saw into the future, and that instinct is “bestowed by the divine intellect which does see into the future” (Aquinas 1965, Qu. 40.3). He believed animals were capable of what he termed an estimative capacity in relation to their senses: “In Dumb animals the sensory orexis is obviously not obedient to reason. Still it has the guidance of the estimative faculty, which is subject to higher reason, namely God’s; and to that extent their emotions bear some resemblance to moral goodness” (Aquinas 1967b, Qu. 24.4).⁶

In other words, capacities of nonhuman animals that seem to us to resemble that found in humans do so because as creatures under the divine law they share in divine reason. Indeed, it is integral to Aquinas’s thought that all creatures are needed in order to display most fully divine goodness, for “he brought things into existence so that his goodness might be communicated to creatures and re-enacted through them . . . for goodness, which in God is single or all together, in creatures is multiple and scattered. Hence the whole universe less incompletely than one alone shares and represents his goodness” (Aquinas 1967a, Qu. 47.1).

The difference between nonhuman and human animals for Aquinas lies in the latter’s power of universal (abstract) reasoning, so that he is prepared to admit to a degree of rationality in nonhumans, but to a lesser extent. Judith Barad (1995, 113–14) also has commented on this, comparing the judgments in animals as arising from a natural estimate rather than deliberation as such. Aquinas suggests that “we find that animals, in proportion to their connatural assessment of things, have a certain share of shrewdness with regard to particular activities. But man has—or can have—a universal shrewdness that is the measure of all possible activities” (1964, Qu. 96.1). The difference between humans and other animals seems to be the latter’s capacity for deliberation. He reinforces this in other places by suggesting that animals are restricted to operations of the sensitive appetite, so that they do not have powers of discrimination. For him, the common behavior of all members of a species suggests that prudence is only partially evident in nonhuman animals; “full practical wisdom or prudence is discovered in a person who has sound judgement about how things should be done, while a partial reflection of this is exhibited by some animals whose particular instinctive manifestations adapt them to tasks similar to those which tax human ingenuity” (1968, Qu. 3.1). According to him, the least developed forms of prudence include memory, then teachableness, and its fullest expression is found in human animals.⁷

In recognizing emotions in nonhuman animals, Aquinas resisted any image of other animals as unthinking automata. Although it is fair to suggest that human capabilities for universal reasoning far outweigh that of other animals, and in this sense humans remain distinctive, it also is incorrect to suggest that such animals can never make a choice or that they

always act merely in accordance with the dictates of compulsions or hard-wired instincts.⁸ In addition, it is fair to say that much of human moral deliberation is not the kind of detached reasoning of which humans are capable; more often than not humans behave by acting out of deeply seated emotions that they share with other animals. Can we say that only those actions detached from our emotions are moral? I argue that this is a false view of moral action. Action that is moral is that which tends toward the good and avoids evil. This is, of course, the first principle of natural law (Aquinas 1966, Qu. 94.1).

Alasdair MacIntyre's *Dependent Rational Animals* (1999) explores the kind of virtues arising out of human vulnerability and our animal condition. His emphasis on dependence stresses the social character of human life that has some analogies with dependencies in other social animals. He examines the difference between humans and other animals. Unlike Martin Heidegger, he refuses to lump together all animals under one category as those incapable of relating to something as something; for Heidegger animals are merely captive in their worlds. Although this tendency to group animals together is also found in Aquinas, at least he was aware that animals are rational to different extents. MacIntyre, like many animal ethologists, compares animals with children in suggesting that their initial reasoning skill is based on having reasons for acting in a certain way. We can readily agree that children may be morally culpable but not yet capable of the kind of sophisticated moral reasoning that matures with time. Eventually we arrive at "its specifically human state of being able to evaluate those reasons, to revise them or to abandon them and replace them with others" (MacIntyre 1999, 91). Virtues, similarly, can be characterized in two different ways (1999, 92). In the first sense they are qualities shown in response to different situations, such as when to take risks, when to be cautious, when to praise or not, when to be relaxed or demanding, when to show anger or tell a joke, and so on. In the second sense they involve practical reasoning, or prudence, in terms of what action is best to take in given circumstances, according to particular premises about the goods that are at stake and possible harms. How far is it helpful to speak of nonhuman animals as having virtues, that is, habits of mind that lead to particular behaviors that enhance flourishing?

ANTHROPOMORPHISM: DOES IT HELP OR HINDER UNDERSTANDING MORALITY?

Much ink has been spilled on how animal behaviorists, ethologists, and others commit the fallacy that is a common tendency for humans, namely, reading into animal behavior that which is found in human communities. Mary Midgley in her epic book *Beast and Man* ([1979] 1995) correctly alerted us to historical examples in which humans regularly projected their

frustrations onto animal communities, portraying human evil as a mirror of that found in our beastly cousins. She continues this line of thought in her more recent *The Ethical Primate: Humans, Freedom and Morality*, where she states that kinship with other animals depends on how they are conceived, so that “at a deep imaginative level, people still tend to see animals as symbols of odious, anti-human qualities” and as a consequence resist the idea of kinship (1994, 129–30). According to the social contract view, there is virtually no difference between humans and other animals; both are egoists, although humans are enlightened and self-aware egoists. The opposite view draws a sharp division between human and nonhuman animals, viewing only humans as capable of possessing mind, which is contained in an animal body. Both, she suggests, buy into the mythical view of animals. Yet she does not hold back from suggesting that “everyone knows that animals are as incapable of vice as they are of virtue” ([1979] 1995, 31); for her all such portrayals are symbolizing, not real. She softens this harder line in her more recent work by referring to the work of ethologists who have observed the ability of other animals to live together and cooperate, so much so that she suggests that this ability “has to be their natural disposition to love and trust one another” (1994, 131).

Are animal ethologists committing a category mistake in describing animal emotions such as joy, happiness, embarrassment, hope, grief, and despair, and behavior patterns such as reconciliation, peacemaking, or love? The difficulty, of course, is how to describe what is observed. Its variety and flexibility does not lend support to the idea of purely instinctive behaviors supposedly detached from reasoning. Moreover, inasmuch as this language serves as a heuristic tool in understanding animal behavior, it needs to be welcomed, regardless of the extent to which such behavior shares an identical biological basis with similar human behaviors.

Insights from archaeologists are helpful in tracing the evolution of cognitive capacities in early hominids. Steven Mithen suggests that the early human mind possessed a separate social intelligence and a technical intelligence, like a Swiss army knife, but that the modern human mind was able to integrate these, a process known as cognitive fluidity.⁹ This cognitive fluidity leads to anthropomorphic thinking, in which animals are treated as more like persons, and totemic thinking, in which humans take on characteristics of animals, and appeared in the Upper Paleolithic groups of humans (Mithen 1996, 186–87).¹⁰ For Mithen, Neanderthals were capable of music but not much more, certainly not religion. He resists the idea that animals have minds that are like humans’, believing that this is unwarranted anthropomorphism that seems to be built into the way humans relate to the creaturely world (1996, 188). In this respect he relies on the work of J. S. Kennedy (1992). He also suggests that, unlike humans, chimpanzees rely on general intelligence for tool making, rather than exhibiting

a specialist cognitive capacity for tool making. Unlike de Waal, he is hesitant to ascribe “cultural” activities to primates, viewing their tool making as still showing simple repetitive actions that one would expect if it stemmed from a generalized intelligence (1996, 85).

But does the fact that humans have supposedly evolved specialist intelligence in tool making and natural history necessarily rule out the possibility that animals share aspects of the *social* intelligence characteristic of humans? Mithen compares the evolution of human minds with that of a cathedral; even the earliest minds share the great nave of general intelligence. He readily admits that even early humans and chimpanzees share a specialist social intelligence, so one might have anticipated a form of morality to develop in this sphere in order to serve that intelligence without needing to invoke the idea that this simply stems from unwarranted anthropomorphism that distorts rather than illuminates what is happening in animals.

IS CONSCIENCE AN EVOLVED CAPACITY?

The crucial question for moral decision making is how far and to what extent animals are aware or conscious that an action is wrong or right. In human societies, a person who acts wrongly without sensitivity to the fact is known as someone with a dulled conscience. Is conscience a capacity that has evolved? If so, it is intimately bound up with the evolution of what we term bad and good behaviors, vice and virtue. This is not a projection of human values into animal behavior, for I am not speaking about those predatory behaviors that have sometimes been referred to as natural evil. When humans project human vices into the behavior of, say, wolves, they often focus on their predatory capacity rather than the social relationships characteristic of wolf societies. Medieval accounts of animals “on trial” for various misdemeanors reflect the projection of human vices onto other creatures, especially in instances where the animal is blamed in not just in a literal but also a moral sense for an attack on a human being. Rather, what seems to be at stake here are those *social* capacities in animals that seem to present the individual animal with a choice for good or not in relation to its own social world. Morality for an animal is what is considered good in terms of its own society, that is, what will contribute to its flourishing. What might scientists add to this discussion?

Interesting research on the ancestor that is common to higher primates (bonobos, gorillas, chimpanzees, and humans) seeks to tease out the evolution of moral behavior in general and conscience in particular. How might we be able to go back to the Late Pleistocene past? Anthropologist Christopher Boehm has attempted to do this by assessing 329 foraging societies and eliminating those that were likely to be anomalous with respect to prehistoric societies. This left 154 “Pleistocene-appropriate” mobile hunter-

gatherer societies that also had been studied ethnographically. Fifty of these were subject to more intensive analysis, including assessment of moral universals, or moral rules. In this respect: “Typical deviances include being arrogantly overaggressive or stingy; being a thief, cheater, excessive liar or bully; or being an unpredictable recidivist killer. At the same time, active social sanctioning generally includes direct criticism and ‘social distancing’ (mild ostracism to group ejection) along with shaming and ridicule, capital punishment and supernatural sanctions” (Boehm forthcoming).¹¹ Cooperative behavior, on the other hand, led to reproductively significant social rewards. Can this behavior model that in Late Pleistocene times? Boehm suggests that the answer is yes, for it is known that people were in similarly sized small hunter-gatherer communities.

Although fascinating, Boehm’s working assumption seems to be that just because we cannot *rule out* analogies between suitably selected modern hunter-gatherer societies and late Pleistocene societies, meaningful comparisons can be made. He is certainly able to counter criticisms about the possible lack of diversity of physical environments. It is rather more difficult to justify assumptions about the egalitarian political structure of extant societies. In addition, he assumes that the earliest human communities mirrored male-dominant societies that, he believes, are characteristic of apes. Such aggressive behavior was then curbed.

Other scholars have questioned both the extent to which primates can be characterized in this way and the somewhat universal, speculative nature of his claims (Bernstein 2000b, 105–7; Black 2000, 107–19). In this research we find group mores that involve internalized values and rules, and what is termed a “self monitoring conscience based on sympathy . . . and a strong sense of shame” (Boehm forthcoming). Moralistic gossips agree on collective social sanctions that are then used to support these behaviors. The moral code includes proscription against murder, incest, boasting, bullying, deception, cheating, theft, and lying, as well as mild condemnation of adultery. There are proscriptions in favor of generosity, cooperativeness, and peacefulness in the group.

The locus of brain activity that leads to a sense of conscience is found in the prefrontal cortex. A sense of shame or embarrassment is much more universal compared with a sense of guilt, which is more limited in its distribution. Shame is linked with negative psychological reactions to past, present, or anticipated moral malfeasance. Hence, anthropologists define conscience as “a partly shame-driven means of moralistic self appraisal and self-control, which not only helps in avoiding the bad opinion of one’s fellows, but also serves to control many impulses that could have direct negative fitness consequences because of punitive group sanctioning” (Boehm forthcoming).

Although broadly sympathetic to the possibility of a sense of “culpritude” in chimpanzees, Boehm holds back on the attribution of this as moral, on

the basis that “It is having a self-judgmental conscience and shameful blushing that makes humans distinctively ‘moral,’ and this brings us back to shame, as a specialized manifestation of conscience. Chimpanzees and bonobos appear to experience neither socially induced facial flushing nor psychological malaise based on a sense of having broken internalized rules, so I believe that ancestral preadaptations for specifically *moral* emotions cannot be identified” (Boehm forthcoming).

But is this correct? Bekoff relates several anecdotal stories of apes and rhesus monkeys that suggest that they do feel shame or embarrassment (2007, 77–78). In spite of the difficulties with this evidence, inasmuch as it draws on anecdotal accounts, the possibility cannot be overlooked. In addition, to tie moral behavior specifically to conscience-laden activity limits the definition of morality and thereby constitutes a circular argument. For Boehm it is possible to be virtuous without being moral, for he attributes moral feelings specifically to having a self-judgmental conscience. For example, he argues that ancestral Pan had a nonmoral sense of “culpitude,” which seems to mean a basic sense of having done wrong and awareness of past offenses, but it was undeveloped into a value system that allowed self-judgment—that is, it lacked conscience.

Boehm suggests that conscience evolved as a result of selection pressure against greedy and aggressive behavior in a way that coincided with social self-inhibition functions in the brain. In other words, there was a gradual internalization of the external rules that led to social cohesion. It seems to me highly likely that the brain has evolved in such a way so that it became more capable of complex self-referential function. I am less sure that we can call this capacity for self-reference conscience, which seems to me to be taught, as much as depending on an innate capacity for that internalization. I would agree that the capacity for embarrassment or feeling shame is likely to be biologically based, but this is not the same as a developed conscience, even according to anthropological definitions, that reacts internally to given externally imposed rules and deviations from these rules. We know as much from the education of young children; a sense of shame arises only in relation to knowledge about certain rules and expectations of the community.

IS RELIGIOUS SENSIBILITY PRESENT IN NONHUMAN ANIMALS?

It also is possible that nonhuman primates feel a sense of wonder and that this capacity, like shame, reflects a biological propensity for religious sensibility. Bekoff, among others, has spent many years observing animals, and he believes that feelings akin to wonder do exist in animals.

Sometimes a chimpanzee, usually an adult male, will dance at a waterfall with total abandon. Why? The actions are deliberate but obscure. Could they be a joyous response to being alive, or even an expression of the chimp’s awe of nature?

Jane Goodall wonders whether these dances are indicative of religious behavior, precursors of religious ritual. She describes a chimpanzee approaching one of these falls with slighted bristled hair, a sign of heightened arousal. . . . Goodall wonders, "If the chimpanzee could share his questions and feelings with others, might these wild elemental displays become ritualised into some form of animistic religion? Would they worship the falls, the deluge from the sky, the thunder and lightning—the gods of the elements? So all-powerful; so incomprehensible." (Bekoff 2007, 61–62)

Clearly the development of conscience and religious practices in human societies are somewhat removed from the way these are described by anthropologists interested in the lives of the earliest human communities and the hints of experiences of wonder in chimpanzees described by Goodall. De Waal speaks of a "tower of morality," suggesting that animals occupy the lower levels only. Although this helps to unite human morality with particular behaviors in animals, it has the disadvantage of supposing that the only morality present in animals is a precursor to that in humans. Gregory Peterson has spoken of "proto-morality" in animals for this reason (Peterson 1999, 283–306; 2000, 469–80). We need to ask here whether it is condescending to animals to speak of their behavior in such terms or whether it is an accurate rendition of what animals are really like.

In theological traditions conscience is not simply related to shame. It is rooted in the biblical tradition of heart, understood as the seat of reasoning, intention, and emotions (Gula 2004, 51–62). In medieval traditions conscience was related to moral reasoning or prudence and directed a person to good rather than evil. Moreover, conscience is not simply negatively related to shame, what I should not do, but is related to what an individual may positively do in freedom. Richard Gula describes conscience as a capacity, a process, and a judgment. Understood as a capacity, it relates to a fundamental ability to distinguish between good and evil. It is this capacity, I suggest, that has been subject to evolutionary development. Conscience is also a process of discovering what the good entails and what actions are right or wrong. This aspect of conscience is learned through experience and contact with particular traditions. Convictions of conscience are shaped within particular societies. Such a process cannot easily be tied into evolved capacities in the brain, except to the extent that higher-level complexity allows such learning to take place. This kind of process then leads to a judgment that can conclude what the correct action may be. Yet I suggest it is a mistake to tie conscience specifically with moral behavior, because someone can have an active conscience but still behave immorally. Conscience may lead to a judgment, but the virtue of prudence leads to one's acting in one way rather than another. Moreover, conscience sets the boundary of what may be counted as acting with integrity. It is not freedom of the individual in contradiction to the norms set by a particular community, but a seeking to be subject to what is understood to be moral

truth. A religious believer also understands that following one's conscience is connected not just with the demands of society but also with a call of God. Formation of conscience is connected with character formation as well. Such subtle workings of the mind cannot be tied into evolved traits, even if there is biological ground for having such ability.

What about the possibility that a capacity for wonder can be found in nonhuman primates? I do not find such a possibility threatening from a theological perspective. As with conscience, the ability for reception of religious ideas may be evolved, but this does not explain the content of that religious belief. Social anthropologists may observe the evolution of a religious sense, but this does not explain religion away any more than neuropsychologists' finding that certain neurons light up in the brain after meditation explains what happens in a religious encounter. Whether we choose to believe in the possibility of a transcendent God or not may affect how we interpret such events. Or does the evolutionary separation of primates and humans from the common ancestor some six million years ago mean that searching for possible evolutionary origins of morality and religion in present nonhuman primates or other social animals is mere distraction, falsifiable by archaeological indications of differential complexity in hominid cognition? There is tension here in the scientific community, with cognitive ethologists coming down in favor of animal morality and archaeologists viewing such research with suspicion, as unwarranted anthropomorphisms in common with our early ancestors. J. Wentzel van Huyssteen in his monumental work *Alone in the World?* (2006) sides in favor of the archaeological account of Mithen and others that effectively excludes any serious discussion of primates and offers remarkably little discussion of morality. This is all the more surprising because he claims that "In our moral awareness as embedded in self consciousness is found the source for our uniqueness, for our understanding life in rational and moral terms" (van Huyssteen 2006, 290). I am inclined to believe that animal ethology has much to say to us that is significant in theological terms.

A brief mention of research on mirror neurons is relevant here that implies that animals do show genuine empathy. Some scholars have suggested that food sharing, for example, is just the toleration of theft by the weaker partner rather than genuine giving through an empathetic awareness of another's need for food. Research suggests that the tolerated-theft explanation is false. Consider Giacomo Rizzolatti's research on macaques monkeys at the University of Parma. Rizzolatti was cited in the *New York Times* as saying: "It took several years to believe what we were seeing. The monkey brain contains a special class of cells, called mirror neurons, that fire when the animal sees or hears an action and when the animal carries out the same action on its own. . . . Mirror neurons allow us to grasp the minds of others not through conceptual reasoning, but through direct stimulation. By feeling, not by thinking" (in Bekoff 2007, 129).

We have for too long shored up human morality to the exclusion of other creatures. Our nonhuman primate cousins can give us insights into the earliest origins of tendencies for good and ill, right and wrong. The fact that such tendencies have evolved does not mean that religion is now redundant, any more than the fact that humans now possess cognitive fluidity means that our earliest animal origins can be forgotten. Moreover, we do not need to argue for simplistic evolutionary continuity in situations where we find parallels in behavior or intelligence or, for that matter, moral or even religious capacity. Just as intelligence has evolved several times along different evolutionary pathways, it seems likely that highly intelligent creatures have converged on that morality and religious sense that we find expressed in humans.

In his book *The Singing Neanderthals* Mithen writes that Neanderthals were capable of music making, and the capacity for musical vocalizations in other animals demonstrates evolutionary convergence (Mithen 2006, 6). Surprisingly, Simon Conway Morris did not speak about the possibility of moral convergence in his significant book *Life's Solution: Inevitable Humans in a Lonely Universe* (2003). If we are prepared to call animals intelligent, even if such intelligence is not the same as that in humans, we also need to be prepared to allow for the possibility of a form of animal morality. There may be different ideas of what it means to be moral, as is the case with different intelligences, but I suggest that the similarities are such that the behavior can be named as intelligent or moral even if it is not identical to that in humans. The differences may tell us as much about human uniqueness as the similarities. The theological and ethical implications of such a shift are profound.

NOTES

A version of this essay was presented at a conference celebrating the 300th anniversary and achievements of Carl Linnaeus, "Linnaeus and *Homo Religiosus*: Religious Awareness and Human Identity," at the University of Uppsala, 30 May–2 June 2007. I thank Mikael Stenmark for the invitation to speak at the conference. Although not always widely appreciated, Linnaeus's revolutionary taxonomy *Systema Naturale* included fauna as well as flora. I also thank all of the conference participants for helpful questions and discussion, and I thank Christopher Boehm for allowing me access to his forthcoming work. For a modified and expanded version of this article see Deane-Drummond 2009.

1. In general I have tried in this essay to qualify the somewhat dualistic implication of using the term *animals* to mean nonhuman rather than human animals. Where the language becomes clumsy I have tended to use the term *nonhuman animal* in the first instance in a paragraph, and then imply this usage throughout. An alternative such as using the term *creatures* is also somewhat problematic as it might imply creatures wider than the category normally denoted by the term *animal*.

2. Alternative evolutionary theories about how such behavior may have evolved include reciprocal altruism and kin selection, or even group selection. I do not discuss these alternatives in detail here, for they all consistently argue for altruism as an evolved capacity that brings evolutionary benefits in terms of reproductive fitness. The issue under discussion here is not so much whether such a capacity has evolved but what we mean when we use the language of altruism in relation to nonhuman animal behavior and how far this then allows us to speak of

animals as moral agents. Of course, as Rolston points out, fully mature moral reasoning is somewhat removed from simple altruism, as altruism implies self-sacrificing behavior whereas the golden moral rule speaks about helping others and self equally—that is, it is about justice (Rolston 1999, 215–22).

3. I am aware that *sin* often is defined specifically as breakdown in one's relationship with God, in which case such a category would be inappropriate here. But if *sin* is considered in a more inclusive way, as that which represents breakdown in social relationships, including but not exclusively that to God, animals could be said to share in *sin* to this extent. This of, course, raises other theological issues about atonement. For further discussion of this topic see Deane-Drummond 2008.

4. Thomas Gilby translates *estimative sense* as “instinct”: “Instinct translates *vis aestimativa*” (Aquinas 1970, 13).

5. The relationship between instinct and prudence is particularly clear: “And he allows wise judgment to ‘a few animals,’ and not exclusively to man, because even certain brute animals have a sort of prudence or wisdom, in that they instinctively form correct judgments on what they need to do” (Aquinas 1951, Book 111, Chap. 3, Lectio 4, n. 629).

6. In some passages Aquinas suggests that the reasonableness in animals is an indirect result of their activity being in some sense ordained by God's art (Aquinas 1970, Qu. 13.2). Such passages could be used to support the idea of animals as automata, but this is not actually what he claims here. He claims that they do not have choice of will in the way humans choose; rather their choice comes as a result of the sensitive appetite. There also is a sense in which humans are under divine providence as well, so the deeper distinction is that between God and other creaturely beings rather than humans and other animals.

7. There are plenty of references to this in Aquinas. A particularly useful citation comes from his *Commentary on the Metaphysics*:

Again, from the fact that some animals have memory and some do not, it follows that some are prudent and some not. For, since prudence makes provision for the future from memory of the past (and this is the reason why Tully in his *Rhetoric*, Book II, makes memory, understanding and foresight parts of prudence), prudence cannot be had by those animals which lack memory. Now those animals which have memory can have some prudence, although prudence has one meaning in the case of brute animals and another in the case of man. Men are prudent inasmuch as they deliberate rationally about what they ought to do. (1961, Book 1, Lectio 1, note 11)

Aquinas also believed that animals shared not only in memory but at a higher level, namely experience, but only to a limited extent (Lectio 1, note 15). The difference between animals and humans seems to be related to capacity for art and universal reason in the latter, and customary activity and particular reason in the former (note 16). He also considered that the productive activity of art differed from that of prudence:

And these also differ; for prudence directs us in actions which do not pass over into some external matter but are perfections of the one acting (which is the reason why prudence is defined in that work as the reasoned plan of things to be done), but art directs us in those productive actions, such as building and cutting, which pass over into external matter (which is the reason why art is defined as the reasoned plan of things to be made). (note 34)

In the light of current knowledge of animal behavior, their ability to reason in a planned way comes close to Aquinas's definition of art. See, for example, Clayton and Emery 2008, 128–42.

8. Instinct in modern usage is influenced by interpretations that draw on Descartes, as mentioned above.

9. However, if we follow social anthropologists who dispute evolutionary psychology, the idea of cognitive fluidity may prove unnecessary, because human minds have simply evolved to be flexible. To the extent that Mithen follows evolutionary psychology I part company with his ideas, especially the notion that the psychological workings of the brain are the result of specific inherited patterns of behavior according to given modules that emerge in the era of evolutionary adaptedness, far back in the history of the human species. I offer a critical engagement with evolutionary psychology in Deane-Drummond 2009a.

10. For dialogue see Mithen 2009; Deane-Drummond 2009b.

11. Boehm is acutely aware of the difficulties in using an appropriate present-day example to project back in history, but he argues that we can legitimately draw on those groups that cannot be ruled out as sharing common features. Also relevant is Boehm 2000, in which he

argues that the earliest forms of morality were those that were imposed in social hierarchies by individuals tending toward active intervention in the form of consolation, reconciliation, and active pacifying behavior. Once this behavior became collective and language could track it, he believes that “full-blown morality was on its way.” He suggests that bullying was one of the first forms of behavior to be labeled as morally deviant. Presumably conscience, as Boehm defines it, reflected accompanying psychological reactions to these newly developed rules. How far such evolutionary development follows Darwinian processes is still contested. In describing the development of morality more in political than in sociobiological terms Boehm avoids some of the fallacies committed by evolutionary psychology while allowing for lines of continuity between early hominid and modern human societies.

REFERENCES

- Aquinas, Thomas. 1951. *Commentary on Aristotle's de Anima*. Trans. Kenelm Foster, O.P. and Sylvester Humphries, O.P. New Haven: Yale Univ. Press.
- . 1961. *Commentary on the Metaphysics*. Trans. John P. Rowan. Chicago: Henry Regnery. <http://www.josephkennedyjoyeurs.com/CDtexts/Metaphysics.htm>.
- . 1964. *Man Made in God's Image*. *Summa Theologiae*, Vol. 13, 1a. Trans. Edmund Hill. London: Blackfriars.
- . 1965. *Fear and Anger*. *Summa Theologiae*, Vol. 21, 1a2ae. Trans. John Patrick Reid. London: Blackfriars.
- . 1966. *Law and Political Theory*. *Summa Theologiae*, Vol. 28, 1a2ae. Trans. Thomas Gilby. London: Blackfriars.
- . 1967a. *Creation, Variety and Evil*. *Summa Theologiae*, Vol. 8, 1a. Trans. Thomas Gilby. London: Blackfriars.
- . 1967b. *The Emotions*. *Summa Theologiae*, Vol. 19, 1a2ae. Trans. Eric D'Arcy. London: Blackfriars.
- . 1968. *Purpose and Happiness*. *Summa Theologiae*, Vol 16, 1a2ae. Trans. Thomas Gilby. London: Blackfriars.
- . 1970. *Psychology of Human Acts*. *Summa Theologiae*, Vol. 17, 1a2ae. Trans. Thomas Gilby. London: Blackfriars.
- Barad, Judith. 1995. *Aquinas on the Nature and Treatment of Animals*. International Scholars Publications. San Francisco: Catholic Scholars Press.
- Bekoff, Marc. 2007. *The Emotional Lives of Animals*. Novato, Calif.: New World Library.
- Bernstein, I. S. 2000a. “The Law of Parsimony Prevails: Missing Premises Allow Any Conclusion.” In *Evolutionary Origins of Morality: Cross-Disciplinary Perspectives*, ed. Leonard D. Katz, 31–38. Thorverton, Exeter: Imprint Academic.
- . 2000b. “Logic and Human Morality: An Attractive if Untested Scenario.” In *Evolutionary Origins of Morality: Cross-Disciplinary Perspectives*, ed. Leonard D. Katz, 105–7. Thorverton, Exeter: Imprint Academic.
- Black, Donald. 2000. “On the Origins of Morality.” In *Evolutionary Origins of Morality: Cross-Disciplinary Perspectives*, ed. Leonard D. Katz, 107–19. Thorverton, Exeter: Imprint Academic.
- Boehm, Christopher. 2000. “Conflict and the Evolution of Social Control.” In *Evolutionary Origins of Morality: Cross-Disciplinary Perspectives*, ed. Leonard D. Katz, 79–101. Thorverton, Exeter: Imprint Academic.
- . Forthcoming. “Conscience Origins, Sanctioning Selection, and the Evolution of Altruism in *Homo sapiens*.” *Behavioral and Brain Sciences*.
- Clark, Stephen. 1982. *The Nature of the Beast: Are Animals Moral?* Oxford: Oxford Univ. Press.
- Clayton, Nicola S., and Nathan J. Emery. 2008. “Canny Corvids and Political Primates: A Case for Convergent Evolution in Intelligence.” In *The Deep Structure of Biology: Is Convergence Sufficiently Ubiquitous to Give a Directional Signal?* ed. Simon Conway Morris, 128–42. Philadelphia: Templeton Foundation Press.
- Conway Morris, Simon. 2003. *Life's Solution: Inevitable Humans in a Lonely Universe*. Cambridge: Cambridge Univ. Press.
- Darwin, Charles. [1871] 1982. *The Descent of Man*. Princeton: Princeton Univ. Press.
- Dawkins, Richard. 2006. *The Selfish Gene*. 30th anniversary ed. Oxford: Oxford Univ. Press.

- Deane-Drummond, Celia. 2008. "Shadow Sophia in Christological Perspective: The Evolution of Sin and the Redemption of Nature." *Theology and Science* 6:13–32.
- . 2009. "Are Animals Moral? Taking Soundings through Vice, Virtue, Conscience and *Imago Dei*." In *Creaturely Theology: God, Humans and Other Animals*, ed. C. Deane-Drummond and D. Clough, 190–210. London: SCM Press.
- . 2009a. *Christ and Evolution: Wonder and Wisdom*. Minneapolis: Fortress.
- . 2009b. "Whence Comes Religion? Mithen on Prehistory and Mind." In *Theology, Evolution and Mind*, ed. N. Spurway, 31–41. London: Scholars.
- De Waal, Frans. 2006a. "Primate Social Instincts, Human Morality and the Rise and Fall of Veneer Theory." In *Primates and Philosophers: How Morality Evolved*, ed. Stephen Macedo and Josiah Ober, 5–58. Princeton: Princeton Univ. Press.
- . 2006b. *Our Inner Ape: The Best and Worst of Human Nature*. London: Grant Books.
- Dupré, John. 2002. *Humans and Other Animals*. Oxford: Clarendon.
- Flack, Jessica, and Frans B. M. de Waal. 2000. "Being Nice Is Not a Building Block of Morality: Response to Commentary Discussion." In *Evolutionary Origins of Morality: Cross-Disciplinary Perspectives*, ed. Leonard D. Katz, 67–77. Thorverton, Exeter: Imprint Academic.
- Gula, Richard M. 2004. "The Moral Conscience." In *Conscience*, ed. Charles E. Curran, 51–62. New York: Paulist Press.
- Huxley, Thomas H. [1894] 1989. *Evolution and Ethics*. Princeton: Princeton Univ. Press.
- Kagan, Jerome. 2000. "Human Morality Is Distinctive." In *Evolutionary Origins of Morality: Cross-Disciplinary Perspectives*, ed. Leonard D. Katz, 46–48. Thorverton, Exeter: Imprint Academic.
- Katz, Leonard D. 2000. "Towards Good and Evil: Evolutionary Approaches to Aspects of Human Morality." In *Evolutionary Origins of Morality: Cross-Disciplinary Perspectives*, ed. Leonard D. Katz, ix–xvi. Thorverton, Exeter: Imprint Academic.
- Kennedy, J. S. 1992. *The New Anthropomorphism*. Cambridge: Cambridge Univ. Press.
- Kummer, Hans. 2000. "Ways Beyond Appearances." In *Evolutionary Origins of Morality: Cross-Disciplinary Perspectives*, ed. Leonard D. Katz, 48–52. Thorverton, Exeter: Imprint Academic.
- Linzey, Andrew. 1996. "Animal Rights." In *Dictionary of Ethics, Theology and Society*, ed. P. Clarke and A. Linzey, 29–33. London: Routledge.
- MacIntyre, Alasdair. 1999. *Dependent Rational Animals*. London: Duckworth.
- Midgley, Mary. [1979] 1995. *Beast and Man: The Roots of Human Nature*. 2d ed. London: Routledge.
- . 1994. *The Ethical Primate: Humans, Freedom and Morality*. London: Routledge.
- Mithen, Steven. 1996. *The Prehistory of the Mind*. London: Phoenix.
- . 2006. *The Singing Neanderthals: The Origins of Music, Language, Mind and Body*. London: Weidenfeld and Nicholson/Phoenix.
- . 2009. "The Evolution of the Religious Mind." In *Theology, Evolution and Mind*, ed. N. Spurway, 10–30. London: Scholars.
- Peterson, Gregory R. 1999. "The Evolution of Consciousness and the Theology of Nature." *Zygon: Journal of Religion and Science* 34:283–306.
- . 2000. "God, Genes, and Cognizing Agents." *Zygon: Journal of Religion and Science* 35:469–80.
- Planalp, S. 1999. *Communicating Emotion: Social, Moral and Cultural Processes*. Cambridge: Cambridge Univ. Press.
- Rolston, Holmes III. 1999. *Genes, Genesis and God: Values and Their Origins in Natural and Human History*. Cambridge: Cambridge Univ. Press.
- van Huyssteen, J. Wentzel. 2006. *Alone in the World? Human Uniqueness in Science and Theology*. Grand Rapids: Eerdmans.