

ANIMAL SUFFERING, EVOLUTION, AND THE ORIGINS OF EVIL: TOWARD A “FREE CREATURES” DEFENSE

by Joshua M. Moritz

Abstract. Does an affirmation of theistic evolution make the task of theodicy impossible? In this article, I will review a number of ancient and contemporary responses to the problem of evil as it concerns animal suffering and suggest a possible way forward which employs the ancient Jewish insight that evil—as resistance to God’s will that results in suffering and alienation from God’s purposes—precedes the arrival of human beings and already has a firm foothold in the nonhuman animal world long before humans are ever tempted to go astray. This theological intuition is conferred renewed relevance in light of the empirical reality of evolutionary gradualism and continuity and in view of the recent findings of cognitive ethology. Consequently, I suggest that taking biological evolution seriously entails understanding “moral evil” as a prehuman phenomenon that emerges gradually through the actions and intentions of “free creatures” which—as evolutionary history unfolded—increasingly possessed greater levels of freedom and degrees of moral culpability.

Keywords: animal morality; animal suffering; cognitive ethology; evil; evolution; the Fall; free will; theodicy

Pondering the problem of evil in light of the evolutionary origins of all life, philosopher Louis Pojman comments “theists may have good reason to fear evolutionary theory . . . , for evolution proposes a radical alternative paradigm to a theistic, purposive creation.” Pojman explains that “evolution holds that evil is not the result of Satan’s sin or Adam’s fall or human misuse of free will but rather the consequence of the species developing adaptive strategies that tend to be accompanied by pain, suffering, unhappiness, and conflicts of interest, the major categories of evil” (Pojman 2009, 77). Thus, reflects theologian Sarah Coakley, “modern evolutionary theory appears to intensify thereby the problem of evil intolerably” (Coakley 2013, 377). To say that God *creates through* Darwinian evolution only seems to exacerbate the problem. If, as philosopher of biology

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Michael Ruse says, “pain and suffering are right there at the heart of natural selection, and “are intimately involved in the adaptive process,” then it would appear that any God who is creating *through* this process would also be right at the causal heart of such pain and suffering (Ruse 2001, 131). In this kind of theistic evolutionary scenario “imperfections” manifested through instances of wastefulness, contingency, suffering, and cruelty in nature inevitably reflect on the character of the God who made them. Does an affirmation of theistic evolution, then, make the task of theodicy impossible? This is the fundamental question and guiding theological concern for many philosophers and theologians engaged in the current conversation on the topic of evolution and the problem of evil. In this article, I will review a number of ancient and contemporary responses to the problem of evil as it concerns animal suffering and then suggest a possible way forward. Drawing attention to the ancient Jewish insight that evil and sin—as resistance to God’s will that results in suffering and alienation—precede the arrival of human beings and already have a firm foothold in the prehuman animal world, I will then show that this ancient Semitic understanding of the origins of sin and evil is conferred renewed relevance in light of the empirical reality of evolutionary continuity and the recent findings of cognitive ethology with regard to animal freedom and morality. Finally, I will suggest that taking biological evolution seriously entails understanding “moral evil” as “existing” along an evolutionary spectrum. In the same way that the differences between the human and nonhuman capacities for mentality, free will, and morality are differences “of degree and not of kind” (Darwin 1871, 105) I maintain that moral evil is likewise a phenomenon that emerges gradually through the actions and intentions of prehuman creatures which—as evolutionary history unfolded—increasingly possessed greater levels of freedom and degrees of moral culpability.

ANIMAL SUFFERING AND THE CLASSICAL CHRISTIAN FOUNDATIONS OF EVOLUTIONARY THEODICY

The sobering reality of animal suffering is nothing new, and from ancient times sages and seers have reflected on the unfortunate fact that all is not perfect in the realm of nature. The pre-Socratic philosopher Heraclitus exclaimed that “struggle is the father of everything” (Heraclitus 1889, 62), and Aristotle observed the empirical reality of fierce competition between animals in nature (Aristotle 1941, 637–39). While polytheistic thinkers could understand such struggles in nature as a reflection of a deeper heavenly conflict between various opposing gods and the unseen impersonal forces of fate, for those adhering to the biblical tradition and confessing faith in one Creator God who is wholly good, the theological

situation was quite different. Believing that a single perfectly benevolent all-powerful God created physical reality as primordially “good,” Jews and Christians have been philosophically driven to reconcile the problem of animal suffering with the goodness of God.

In both Scripture and in the witness of the early church fathers, animal suffering was ubiquitously perceived as a symptom of a much deeper cause, and such suffering in the world of nature was never thought to be part of God’s original intention for creation. Suffering in nature was indeed understood to be a reflection of the *fallenness* of creation. Representative of the Eastern Christian and Syriac theological traditions, Bishop Theophilus of Antioch (b. 120) explains, “nothing was made evil by God, but all things good, yea, very good” (Theophilus 2007, 98). Embracing the ancient Hebrew biblical tradition regarding the close relationship between humans and animals, Theophilus argues that God’s original intent for human and animal creation was for peace and harmony to reign without interspecific bloodshed and violence. “The loss of animal life,” for Theophilus, “is not an indigenous phenomenon of paradise. It is an example of evil.” For him and for many of the early church fathers, predation and carnivorous bloodshed are contrary to God’s divine law and are the result of sin (Rogers 2000, 58).

While nearly all of the early church fathers agreed that there *was* a historical fall, there was not universal consensus on the *timing* of the fall, the *degree* of human and animal *perfection* before the fall, or the *extent* to which the human fall marred such initial goodness. Bishop Irenaeus of Lyons, for instance, believed that before the fall the “primitive condition of humans was one of innocence and childhood,” and “their intellectual powers were undeveloped,” for, he explains, “these are not necessary to please God” (Irenaeus, 1899 3.23.5; Osborn 2001, 219). Humankind, affirms Irenaeus, “was not made perfect from the beginning” (4.38) and thus he does not conceive of an absolute human or animal perfection existing before the fall. The first human was not perfect in the sense that Origen or Augustine would later develop, but rather “Adam’s perfection consisted in his proximity to the perfect God, in the sense that God’s Spirit is in him.” Growth and development are key theological realities for Irenaeus and human nature is understood as having an explicitly *evolutionary* or *developmental* dimension: “humankind is forever marked by growth, as the child grows in the womb and the wheat grows on the stalk” (2.26.1; 4.38.3; 2.28.1). Because of his theological focus on the historical development of the human race, Irenaeus, in fact, insisted on the *necessary imperfection* of the original creation, holding that it had the capacity for perfection only through course of time and in the grace of God (Brown 1975, 17–25). Completeness and perfection for Irenaeus, then, lie “at the end, not at the beginning, of humanity’s

education by God.” For him “humans are not *true* humans” until they have “reached the likeness of God” which is found historically and eschatologically in the “God-man” Christ Jesus (McGuckin 2004, 132). This was also the understanding of many of the Greek Orthodox Fathers who viewed not only humanity, but all of creation as being in a dynamic relational movement of growth toward God (Meyendorff 1979, 132–41; Gregorios 1988, 160ff.).

Augustine and the Western theological tradition that followed his lead, however, held a different interpretive opinion of creation’s original perfection. As is well known, Augustine argued that humans, animals, and the whole earth existed in a state of graced perfection before the historical human fall. The effect of human sin was to introduce a cataclysmic cascade of tragedy, suffering, and evil into the hitherto perfect created realm. Regarding the problem of suffering and evil, Augustine, writing against the Pelagians, introduced the principle *sub Deo justo, nemo miser nisi* (under a just God, no innocent suffers). His key concern here, however, was with the suffering of humans and not animals, and he was deploying this principle against his opponents to establish his doctrine of original sin. It is evident, said Augustine, that many infants suffer. Under a just God, therefore, these infants cannot be innocent. For Augustine this meant that these infants must have inherited guilt, as a result of Adam’s original trespass (i.e., they bear original sin) (Augustine 1992, 3.3–3.5; Harrison 1993, 523). With regard to how the suffering of animals relates to the problem of a just God, Augustine says, we need not be concerned. For example, explains Augustine,

Some try to extend the commandment [‘Thou shall not kill’] even to wild and domestic animals and maintain that it is wrong to kill any of them. Why not extend it to plants? . . . Hence putting aside these ravings . . . we do not understand this phrase to apply to bushes, because they have no sensation, nor to the unreasoning animals . . . because they are not partners with us in the faculty of reason. (Augustine quoted in Waldau, 191)

Since animals—excluded by their irrational nature—are not included within the moral community of humans, the suffering of animals, in Augustine’s view, is of little or no account to humans. “We can perceive by their cries that animals die in pain, although we make little of this since the beast, lacking a rational soul, is not related to us by a common nature” (Augustine 1887, 2.17.59; Passmore 1975, 197). Grounding his understanding of animals and their suffering in Stoic philosophy, rather than in the teachings of the Old Testament or even the New Testament, Augustine’s theology offers few direct resources for addressing the modern question of why God allows nonhuman animals to suffer (Passmore 1975, 198; Augustine 1982, 30).

THE CARTESIAN SOLUTION TO THE PROBLEM OF ANIMAL
SUFFERING AND ITS THEOLOGICAL DETRACTORS

Many generations later, however, Augustine's principle *sub Deo justo, nemo miser nisi* (under a just God, no innocent suffers) provided the key point of departure for many subsequent discussions of theodicy as it relates to animal suffering. For example, in the 1600s the Cartesians were partly driven by the theological concern for innocent animal suffering and the implied question of theodicy as they inherited the dilemma from the Augustinian tradition (quoted in Harrison 1993, 523). The French philosopher and theologian Nicolas Malebranche (1638–1715), a prominent early disciple of Descartes, makes this Augustinian theological concern explicit. Malebranche argues against the common theological opinion—that animals have souls and mental awareness—as giving rise to consequences directly opposite to what we are taught by faith: “Now they [animals] never sinned, or made ill use of their liberty, since they have none: Therefore God is unjust, in punishing them, and making them miserable; and unequally miserable, since they are equally innocent.” Malebranche goes on to argue that “if God renders justice to all his creatures, then animals must be incapable of suffering, for they have neither committed wrong, nor have they the opportunity for compensation in a future life.” If innocent animals do not feel pain, then God's goodness and justice, at least in that regard, can be upheld (quoted in Harrison 1993, 523).

Those who were dissatisfied with the Cartesian mechanistic redefinition of animals as unconscious (and thus not suffering) *beast-machines*, focused on the eschatological side of the Augustinian theodicy equation and argued for the final redemption of animals and ultimate transformation of their suffering. The Scholastics of the seventeenth and eighteenth centuries continued to maintain the reality of animal souls and the fact of animal suffering against the Cartesians (Attfield 1991, 38). The Puritans—including John Milton and Richard Overton—likewise held that animals had souls, that they should be treated with compassion, and they passed the first modern laws for the protection of animals (Ryder 2000, 49). Overton indeed declared that “all other creatures as well as man shall be raised and delivered from death at the resurrection” (quoted in Preece and Fraser 2000, 257). George Fox and the Quakers, Bishop Joseph Butler and the Anglicans, and John Wesley and the Methodists agreed, and together they bore the standard of the biblically inspired vision of the final restoration of the nonhuman animal creation, proclaiming the ultimate salvation and resurrection of animals (Linzey and Regan 1989, 100–03; Ryder 2000, 55). In arguing for a final redemption of animals and the transformation of their suffering these Christian thinkers were indeed following in the line of a long and distinguished theological pedigree that includes John Calvin, Martin Luther, Bonaventure, John of the Cross, John Chrysostom, Basil

of Caesarea, Irenaeus, Theophilus of Antioch, and numerous others (St. John of the Cross 1989, 93; Sorabji 1995, 199; Moritz 2012a).¹

POST-DARWINIAN RESPONSES TO THE PROBLEM OF ANIMAL SUFFERING

While the idea that nature is red in tooth and claw preceded the scientific work of Charles Darwin, with Darwin's publication of *On the Origin of Species* the character and extent of animal suffering, both in the present and throughout biological history, came into full focus. Meditating upon the "brutal inefficiency" of evolution by natural selection, Darwin lamented to his friend Joseph Hooker, "What a book a devil's chaplain might write on the clumsy, wasteful, blundering, low and horribly cruel works of Nature!" (Dawkins 2003, 11). Many standard accounts of Darwinian evolution emphasize the central role of death, pain, contingency, and selfishness, as being entailed in the *very process* by which organisms are created and the "insights of Darwinian science suggest" that "competition, predation, and extinctions prove indeed to be necessary elements in the evolution of the sort of biosphere we know now" (Southgate 2011, 384). An inescapable sobering reality of natural selection, reflects philosopher Holmes Rolston III, is the fact that "organic nature is savage" and "life preys on life" (Rolston 2003, 78). And, as biologist Arthur Peacocke explains, "the development of pain and suffering, as well as decay, death, and indeed extinction . . . are necessary concomitants of the evolutionary process" (Peacocke 2001). In so far as this dark side of natural history is essential to the mechanism of natural selection, and in so far as God uses evolution through natural selection to create life, then God is ultimately accountable for such pain and suffering that result from this process (Ruse 2001, 131).

One way around this dilemma is to argue, as Ruse has, that Darwinian natural selection is the "only way in which complex adaptation could be produced by [natural] law," and that God essentially had his hands tied when creating biological life (Ruse 2008, 97). Biologist Francisco J. Ayala has likewise contended that if we view cases of cruelty and "evil" in nature as a "consequence of the clumsy ways of the evolutionary process" then a major "burden is removed from the shoulders of believers" (Ayala 2007, xi, 159). Consequently, there is a ready-made theodicy inherent in the necessity of natural selection to produce adaptively complex life. "Physical evil exists and Darwinism explains why God had no choice but to allow it to occur" (Ruse 2001, 136–37).

Were Darwinian natural selection an *ontological* imperative in God's creation of the cosmos, Ruse and Ayala's theodicy might be *philosophically* adequate to the task. As it stands, however, this line of argument is, in the end, found *theologically* wanting because it does not address why God, creating the universe *ex nihilo*, would choose to create life through such

callously indifferent and bloodthirsty biophysical laws in the first place. If natural selection really demands such intense competition, ruthless struggle, coldhearted selfishness, and even extinction, why would God choose this specific mechanism to create life?

One theological answer to this question is to emphasize that this indeed is the way that the God of Scripture often works. The Creator affirmed throughout the Hebrew Bible is, after all, the God of both Noah's Flood and the Exodus. Throughout the Old Testament, new life and new horizons emerge from death and suffering, and in the New Testament the renewal of all creation is anchored upon the suffering and death of Jesus Christ on the cross (Gregersen 2001). While the ultimate theological reasons for why it is necessary for suffering to precede new life remain obscured in mystery, they are reasons nonetheless and as such remain firmly rooted in the very heart of the Judeo-Christian scriptural tradition. The fact that God might choose to create new life through evolutionary suffering, then, is in no way theologically inconsistent with the traditional Christian understanding of how God acts within history (Southgate 2008, 76ff). Appealing to the theological and scriptural traditions in light of what we know of the evolutionary emergence of life through natural selection, one might discern "evolutionary disvalues as part of the 'shadow side' of creation" (Southgate 2011, 384). In this way, says Rolston, one response to evolutionary suffering is to accept that "struggle is the dark side of creativity" (Rolston 2003, 79).

But perhaps there is another way to approach this dilemma *via* a shift in our *scientific* perspective. Perhaps it is in empirical fact *not the case* that "the system . . . is built on competition and premature death" (Rolston 2003, 79). One might consider, as evolutionary biologist Jeffrey Schloss has, that, "competition is neither a necessary nor a sufficient condition for natural selection. Natural selection is formally defined as the differential reproduction of genotypes (or information)." Moreover, says Schloss, "the claim that 'death drives evolutionary development' turns out to be problematic . . . Scientifically death does not 'drive' evolution." The same can be said of predation, suffering, and extinction. *In scientific principle*, then, death, ruthless competition, predation, parasitism, suffering, and extinction are not the *driving forces* of natural selection, but rather, are a *consequence* of limited resources and the contingencies of the natural world (Schloss 2012). It is neither logically nor empirically the case that evolution by natural selection is built on competition and premature death. Much of the observed change in the gene frequencies of different populations over time occurs without any vital contribution from either of these phenomena. Schloss's point is helpful in many ways and in fact removes the empirical burden of guilt for animal suffering from natural selection—and thus also from any God who would choose to create through natural selection. However, one may still wonder why God would allow such resources

to be so limited in the first place.² Given that competition for resources *does* tend to increase the *efficiency* of creation through natural selection, one might also ask why God's system of creativity has to be structured in such a way that *so much* evolutionary creativity should flow from selfish competition for these limited resources. One might likewise wonder why predation, though perhaps not technically *essential* to the dynamics of natural selection, must still play such a significant role in the evolutionary history of life. In other words, why should the system underlying life's evolutionary creation be so structured that "arms races" between predators and prey generate so much adaptive novelty (Vermeij, 1987)? Finally, one might ask why parasites should reap the evolutionary benefits of such ruthlessly selfish behaviors—taking "a tremendous toll of life with scarcely any return that we can see" (Rolston 1992, 255). Though such evolutionary evils or "disvalues" may not be ultimately *necessary* for the creation of life through natural selection, they are certainly behaviors that move selection *more effectively along* nevertheless.

A fourth possible way around the dilemma posed by God's creation of life through natural selection, which I have written on at length elsewhere, is to evaluate several recent developments in evolutionary thinking—such as evolution through cooperative symbiogenesis, self-organization, developmental constraints, epigenetic inheritance, and generic morphogenetic principles (e.g., biological structuralism)—where natural selection is *not* the central driving force (Moritz 2008). Within an extended evolutionary synthesis that integrates these alternative evolutionary processes wherein "natural selection is a trimming force at best, rather than having a creative and directional role" one finds that the influence of selfishness, contingency, and competition in the evolutionary creation of life is much mediated (Weber 2013, 70).

For example, molecular and cellular biologist Lynn Margulis and her colleagues have developed a theory of evolution through cooperation and mutualism called *symbiogenesis*. Margulis defines symbiogenesis as "the evolutionary origin of new morphologies and physiologies by symbiosis," (Margulis 1991, 1) and offers it as an alternative mechanism of evolution, which addresses the problem of generative novelty. Symbiogenesis involves the wholesale acquisition of new genomes and involves the "horizontal" transfer of genes, where a single descendant inherits the combined genetic material of disparate organisms (Margulis and Sagan 2003, 41). According to Margulis, "Symbiogenetics—the study of the evolution of new species and life-forms by relatively rapid mergers of distinct organisms—provides an empirically rich alternative to, and enhancement of, the theoretically plausible but unproven gradualism of neo-Darwinism" (Margulis and Sagan 2003, 207). Margulis and her colleagues believe that speciation through cooperative synergism, or symbiogenesis, has indeed been the

major driving force throughout the entire evolutionary history of life. In their view, the operation of natural selection is not completely eliminated from the evolutionary picture, but it *is* understood to play a peripheral role in the actual origin of species as “a strictly subtractive process . . . that never seems to lead, by itself, to new species.” (Margulis and Sagan 2003, 68). Margulis and her colleagues argue that “because it is nothing more than differential survival, natural selection perpetuates but it cannot create” (Margulis and Sagan 2003, 68). Heralding what she sees as a biological paradigm shift, she exclaims, “the view of evolution as chronic bloody competition among individuals and species, a popular distortion of Darwin’s ‘survival of the fittest,’ dissolves before a new view of continual cooperation, strong interaction, and mutual dependence among life forms. Life did not take over the globe by combat, but by networking” (Margulis and Sagan 1986, 28).³

When considered philosophically and theologically, “the phenomenon of cooperation, seen now to be as deeply inculcated in the propulsion of evolution—from the bacterial level upwards—as Darwin’s celebrated principles of mutation and selection, provides a significant modification of the ‘nature red in tooth and claw’ image that Darwinism early accrued to itself” (Coakley 2013, 382). While cooperative models of evolution may result in “no less suffering or ‘wastage’” in the actual history of life, they do show that “there *is* an ever-present tendency *against* individualism or isolationism” within evolution and that “hostile competitiveness or individualism” plays a much smaller role in the grand evolutionary narrative of life’s creation (Coakley 2013, 382). In cooperative scenarios for evolution, and with regard to symbiogenesis in particular, relationality rather than struggle is the axis of creativity, and extreme parasitism and vicious predation ultimately have no evolutionary future (Margulis and Sagan 1986, 130). Cooperation-oriented models for evolutionary change do not remove the *fact* of particular instances of animal suffering throughout evolutionary history, but such models *do address* one important philosophical dimension of the problem of evil by responding to the charge that God heartlessly chose to create life predominantly through a mechanism that *intrinsically* relies on and moves forward through competition, selfishness, and bloodshed. In cooperative evolutionary mechanisms such as symbiogenesis, genetic selfishness is not evolutionarily rewarded for its own sake, and death, predation, and extinction, while still present as disquieting facts of life history, are no longer understood on the theoretical or empirical levels as the most efficient fuel for the creative fire that forges the emergence of species.

Another approach to evolutionary innovation that bypasses the problems associated with God’s creation through selfishness, competition, contingency, parasitism, and predator-prey “arms races” (and the suffering entailed therein) is found in the work of theoretical biologists and complex

systems researchers such as Stuart Kauffman. For Kauffman and others, the concept of natural selection does “not answer the question of how forms, morphologies, phenotypes, and behaviors arise in the first place” (Kauffman 1999, 22). These researchers have argued that, rather than seeing life as resulting from random mutations, predator-prey dynamics, and the struggle for existence, we need to recognize “there is a natural, spontaneous, law-like source of order *beyond* that provided by natural selection” (Depew and Weber 1995, 431). Drawing from complexity theory and studies on networked systems, Kauffman insists that “self-organization is a natural property of complex genetic systems” and that one finds “a spontaneous crystallization of generic order out of complex systems, with no need for natural selection or any other external force.” Kauffman and other complexity theorists argue that biological evolution is primarily the product of these self-organizing tendencies, and they maintain that dynamical systems can achieve new ordered states without any external selective pressures. Only after such order emerges does natural selection subsequently come into play. This means that natural selection is *highly constrained* by the emergent phenomenon of self-organization (Kauffman 1992, 16) and consequently “natural selection does not have a lot to do except act as a coarse filter that rejects the utter failures” (Hoelzer, Pepper, and Smith 2006, 1787). In fact, argue these biologists, complex biological systems emerge and persist “*in spite of selection*” (Kauffman 1992, 16; Depew and Weber 1995, 446). As a result, biological life and its various manifestations are not “unexpected, and orphaned in the spellbinding vastness of space” but are anticipated and written into the very mathematics of complex organic dynamics (Kauffman 1995, 98). Here, the evolutionary narrative of life history is not characterized by randomness and blind contingency, but rather by expectedness and inevitability. Moreover, selection pressures from the forces of predation are not seen as driving evolutionary development, and the competitive struggle to perpetuate selfish genes adds nothing essential to the production of generative novelty. Consequently, the animal suffering that results from predation and genetic selfishness is not a necessary component of the actual evolutionary mechanism through which new forms of life emerge.

Yet another related perspective is offered by biologists conducting research in the area of evolutionary-developmental biology (*evo-devo*) and evolutionary and *ecological* developmental biology (*evo-eco-devo*). These researchers maintain that biological form in both development (ontogeny) and evolution (phylogeny) is constrained not so much by historical contingencies and pathways as by *relational laws*, which govern development, morphological structure, and interacting ecologies (Gilbert and Epel 2009). This means, contra the standard neo-Darwinian view, that certain morphological forms are possible and even inevitable while others are not (Goodwin 1990, 107; Griffiths 2002a, b). Other evolutionary

biologists such as Simon Conway Morris and George McGhee have investigated instances of the evolutionary convergence of biological form, showing how countless different historical evolutionary trajectories, which began from radically dissimilar starting places, have arrived at the same morphological destination (Conway Morris 2004, 151; McGhee 2011). For Conway Morris and McGhee this empirical observation seems to reveal “deeper structural principles” within life’s evolution, and indicates that the pathways which evolution takes are “*highly constrained*.” Conway Morris argues that “certain groups have an innate tendency to evolve in a specific direction” and that these constraints on evolution and “the ubiquity of convergence make the emergence of something like ourselves a near-inevitability” (Conway Morris 2010, 150). In other words, the devilish details of the process of natural selection and “the contingencies of biological history . . . make no long-term difference to the outcome” (Conway Morris 2004, 328).

Such evolutionary alternatives to standard accounts of neo-Darwinian natural selection present an elegant view of biological change over time and offer a quite different assessment of the place of life in the cosmos. Eliminating the *structural necessity* of competition and predation as the central driving forces of evolution, these mechanisms—to varying degrees—remove the harsh theological overtones of some of the most severe evolutionary evils. Lessening the roles of contingency and happenstance in the evolutionary tale of life’s creation, the alternative models of evolution which focus on the overriding role of generic biological law even go so far as to intimate that life is not so much “unexpected, orphaned in the spellbinding vastness of space” as it is “truly at home in the universe” (Kauffman 1995, 20). With such scientific understandings in mind it is possible to perceive the evolutionary creation of life in a way that the most disquieting behaviors and phenomena highlighted by Darwin’s hypothetical “devil’s chaplain” play no necessary or essential role in how or why organismal change and complexification proceeds over time. In these mechanisms for evolution (where natural selection is not the driving force), generative transformation would occur regardless of the types of troubling occurrences that give rise to the theological problem of evolutionary evils. According to two of these “alternative” evolutionary research programs the multifarious forms in which life becomes embodied over time owe little or nothing to historical accident, coincidence, or chance because the morphologies and generative principles giving rise to the spectrum of evolutionary incarnations are the expression of “deeper structures,” “principles,” or even “prior organizational templates” written in mathematically quantifiable laws of nature (Goodwin 2009; Conway Morris 2010, 153; McGhee 2011). In all of these alternative conceptions of evolutionary theory, many of the so-called evils of evolution are not entailed in the *very processes* by which organisms are created. Here, life’s evolutionary creation comes without

several of the intrinsic theological costs that are associated with natural selection, as randomness and contingency are replaced with evolutionary inevitability, and ruthless competition and predation are replaced with natural law or cooperative synergism.

THE PREHUMAN ANIMAL ORIGINS OF PARTICULAR
EVOLUTIONARY EVILS: RECLAIMING AN ANCIENT JEWISH INSIGHT

The empirical reality and efficacy of alternative evolutionary mechanisms reveals that when “God invoked the powers of generativity latent in the earth by his own creative action,” God may have chosen to use natural selection to a very limited degree, or even not at all (Stone 1999, 51). The future of empirical research in evolutionary biology will reveal whether or not this is in fact the case, but let us assume—for the sake of argument—that these alternative evolutionary research programs continue to be fruitful, and indeed show that natural selection need not have played *the primary* role in life’s evolution. If this were indeed the empirical case, then the *philosophical-theoretical* necessity of evolutionary evil would be gone from the font of life’s creativity, but we would still be faced with the *fact* of so much pain and suffering within and throughout the history of nature. In other words, even if these alternative evolutionary mechanisms were entirely efficacious in their construction of complex life in all its grandeur and variety of forms, we would still be left with the *fact of particular instances* of suffering, pain, and “evils” throughout evolutionary history. We thus are thrown back upon the question of how one might make theological and scientific sense of the occurrence (or possibility) of particular instances of prehuman suffering and/or evil throughout the history of life’s evolutionary creation.

Confronted with the universal *fact* of evolutionary evils without any *systemic necessity* for them, we must revisit Epicurus’ and Augustine’s perennial question: *Unde Malum*—from where or what source does evil arise? Stemming from Augustine’s initial response, a traditional solution to the moral and human aspect of this dilemma has centered on some form of the *free will theodicy*: as human beings exercise their free will and choose to reject God, moral evil enters into the human world resulting in a tragic cascade of calamitous consequences. The free will theodicy seeks to ground its theological logic in the existence of a type of “universal contingent,” described by Robert John Russell as events or circumstances, which while not necessary in themselves, give rise to conditions that are presently unavoidable (Russell 1984, 1990). As the logic of the “universal contingent” was traditionally conceived, humans *could have originally* (or at some point) freely chosen to obey God’s commandment, but now, given the ubiquity of the reality of sin, that choice is *no longer* up to us. However, if the theistic evolutionary scenario for human and animal origins is true, then suffering and death occurred long before humans ever showed up—what

Russell refers to as “the problem of the Fall without the Fall” (Russell 2008, 10–11). As theologian Christopher Southgate explains, “the evolutionary narrative of the long history of life on Earth banishes forever the notion that it was human action, human sin, that caused the presence of violence and suffering in nature.” Thus, it is scientifically clear that “human sin did not cause nature to be red in tooth and claw” (Southgate 2011, 372).

In light of the problem of “the Fall without the Fall,” can Augustine’s theological logic of universal contingents play any significant role within the current scientific understanding of how animal pain and suffering entered into the evolutionary picture? At first glance it would seem not. However, drawing attention to a few important details of the Genesis 3 narrative that are in danger of being overlooked in the contemporary discussion I would like to more deeply explore this theological and scientific question at the core of the problem of animal suffering and evolutionary evil. In the third chapter of Genesis, we find a description of a *nonhuman animal* who possesses intelligence, rationality, language, moral discernment, and death-awareness—namely, the serpent. It is clear the Genesis 3 author considered the serpent to be a clever representative from the animal world and not a fallen angel or spiritual being. Old Testament exegete John Sailhamer explains that “it should not be overlooked that the serpent is said to be one of the ‘wild animals’ (*hayyat hassadeh*) that the Lord God had made (cf. 1:25; 2:19)” (Sailhamer 1990, 50). The purpose of this statement, argues Bible scholar Otto Procksch, is to exclude the notion that the serpent was a supernatural being (Procksch 1924, 32). “The serpent,” explains Old Testament scholar Benno Jacob, “is none other than *a serpent*” (Jacob 1974, 102). I thus suggest that we resist reading back into the Genesis text the deutero-canonical *Wisdom of Solomon*’s interpretation of the serpent as Satan, and instead take the language of the Genesis 3 narrative at face value (i.e., we resist reading it *symbolically* or *allegorically*). The serpent who is described as the “cleverest of the animals” is, in the Genesis 3 story, depicted as the intellectual equal of the human pair. This nonhuman animal has an understanding of God’s commandments and knows the consequences of breaking them. If the description of the serpent is taken at face value within the context of the narrative, one notices that it is clearly an example of a nonhuman animal who is *intentionally rebelling* against the express will of God.

Through introducing the serpent as one of the “wild animals” that God had made, the author of Genesis acknowledges that there was disobedience (or sin) present within the animal world *before* humans disobeyed God. From the defiant disposition and unashamed questioning of the prudence of God’s commandments posed by the “cleverest of the animals,” it is evident that the Genesis 3 text discerns a *prehuman rebellion* against God within the animal creation—an insurgence that had arisen through the primeval disobedient intentions and/or actions of nonhuman animals

(Moritz 2009; Moritz 2011). Within the world of the narrative described in Genesis 3, there is thus *a nonhuman animal “Fall” which happens before the human “Fall”* (Moritz 2008). In other words, the fallenness of creation is *assumed* by the author of Genesis and the onus of this primordial fall lies with prehuman animals.⁴ Scripture presents the fallenness of the prehuman animal creation as a given, and one need not speculate on how or when this happened any more than the author of Genesis 3 does.

Nor is the concept of animal rebellion itself an isolated incident that is found in Genesis 3 alone. As the Genesis story unfolds we see that God holds “all flesh” or “all living creatures” (Heb. *kol basar*) accountable—at least to some degree—for the actions whereby they stray from God’s primeval purposes for a peaceable creation. In the Flood account God judges both humans *and animals* for their bloodthirsty behavior.

Now the earth was corrupt in God’s sight, and the earth was filled with violence. And God saw the earth, and behold, it was corrupt; for all animals and humans (*kol basar*) had corrupted their way upon the earth. And God said to Noah, “I have determined to make an end to all humans and animals (*kol basar*); for the earth is filled with violence through them.” (Genesis 6:11–14)⁵

The Flood in Genesis is thus as much a punishment for the wayward ways of animals as for those of humans. In a similar manner, “at Mount Sinai, animals as well as humans are threatened with punishment should they touch the mountain.” While earlier Mesopotamian legal codes exact no such punishment, for the Hebrews an ox that gores and kills a human is to be held capitally guilty (Schochet 1984, 54). In a similar fashion, animals are to fast and to put on sackcloth and ashes with the rest of the repenting Ninevites in Jonah, lest they be destroyed by God’s judgment upon the city (Cohn-Sherbok and Linzey 1997, 26). The Hebrew Bible clearly reflects a theological zoology in which animals possess the capacity to obey and stray from the will of God. Throughout scripture, sin is characterized as forgetting God’s ways, and it is plain that as “*non-human animals depart from the mode of flourishing God intended for them,*” they, like their human counterparts, are described as genuinely sinful (Clough ch. 2 and ch. 5, 2012). Moreover, “the doctrine of reward and punishment,” and “retributive justice, is extended to beasts as well as to men . . . and scripture does not spare animals from responsibility for their deeds” (Schochet 1984, 54). In the biblical vision the phenomena of virtue and vice are found in both humans and animals, and the difference between their moral lives and choices, great as it is, certainly is one of *degree* and not of *kind*.

While the Biblical notion of animal sin may sound a bit odd, archaic, or overly romantic to our modern post-Enlightenment and post-Cartesian ears, this was an understanding that continued to hold sway in the early church and was quite common among the church fathers (Clough ch 5.

2012). Theophilus of Antioch, for example, believed that animals are guilty of sin just as humans are. He points out that the original God-intended diet for both humans and animals was vegetarian (Grant 2000, 101–02),⁶ and he sees the consumption of a fellow creature’s flesh—in both humans and animals—as harming the weak and transgressing God’s precepts. While some animals, explains Theophilus, “keep the law of God and eat the seeds of the earth” and thus adhere to their “original goodness,” others such as “the great fish and carnivorous birds” are like “robbers, murderers, and the godless” devouring “those weaker than themselves” (Grant 2000, 75).

THE THEOLOGICAL SIGNIFICANCE OF ANIMAL INTENTIONS AND CHOICES IN THE LIGHT OF EVOLUTIONARY CONTINUITY

According to a straightforward or a narrative reading of the Genesis 3 text, the humans who were “taken,” or selected, by God and “put” in the garden in Eden (Gen 2:15) lived in a world which was already impacted by sin and death.⁷ Given Scripture’s portrayal of a *prehuman animal fall* one might wonder what theological relevance (if any) this has for the contemporary theodicy question as it relates to the problem of evolutionary suffering and evil. One might indeed question whether it is not in fact the case that scripture here is committing a type of fundamental fallacy by attributing moral evil to nonmoral agents. Is there not some sort of “category mistake” involved in anthropomorphically ascribing “uniquely human characteristics” to nonhuman animals? (Rolston 1994, 211). And is it also not a “category mistake to describe (and censure) what goes on in wild nature with terms borrowed from [human] culture and projected onto [non-human] nature” (Rolston 1992, 258)?

Those who would declare all talk of “animal minds,” “animal self-conscious intentions,” and “animal morality” guilty of committing the “scientific sin of anthropomorphism,” often define the “category mistake” at issue as “the ascription of human characteristics to things not human” (Fisher 1996, 3). Viewing anthropomorphism as a scientific category mistake assumes that there is a clearly defined biological category called *human nature*—of which mentality, consciousness, intentions, free will, and moral behavior are a key part—that may be juxtaposed to the clearly defined natures of other animals. For the sake of argument, let us for a moment imagine that species *do have* clearly discernible biological natures that can be defined by certain unique and essential characteristics—perhaps owing to traits and behaviors that are “written” in their genomes. Let us further suppose that *Homo sapiens* are found to be the only known animals with various capacities such as mental awareness, self-consciousness, culture, full-blown language, freedom, and a certain type of cognitively sophisticated morality. Even if humans were discovered to be unique in all these areas, would this then decide the issue and condemn anthropomorphism

as a category mistake? Certainly not. Even if humans were discovered to be in a different category than other animals, it would not follow that to compare the species *Homo sapiens* with other animals is a fundamental category mistake. It is widely acknowledged—even by those who reject evolution—that as humans “we share many features, physical, biological, and social, with other animals, and it remains an empirical question which, if any, mental characteristics, humans have uniquely” (Fisher 1996, 4). In order for scientists to conclude that there *are* some such characteristics that other animals have only minimally (say emotion-based morality and signaling systems), which humans possess maximally (e.g., more complex language with syntax and deontological morality), they will have to *empirically study* animals to reach this conclusion; “it is not an *a priori* conclusion they can make in any other way” (Fisher 1996, 4).

The “sin” of anthropomorphism as a type of category mistake was a charge that was often leveled at Darwin himself and at his own interpretations of animal behavior. Even today historians of science such as Peter Bowler will comment that Darwin “fell into the all-too-obvious trap of anthropomorphism in his anxiety to make the case for evolution” (Bowler 2003, 290). This is because in distilling his careful research and observations of the natural world for a larger scientific audience, Darwin “stressed not only the evolutionary continuity in the physical form of animals and human beings,” but also took “great pains to demonstrate continuity in mentality as well.” Darwin did not hesitate to ascribe “goals and purposes to the actions of wild and domestic animals,” and he maintained that “animals reasoned, gave evidence of wonder, curiosity, dread, and joy” (Degler 1991, 330). In his meticulous investigations of different nonhuman animals Darwin discerned “abstractions, self-consciousness, mental individuality,” freedom, and even a type of primitive morality that he believed rivaled that of certain human cultures (Richards 1987, 195–212; Degler 1991, 8). On a purely empirical basis, Darwin thus concluded that “the difference in mind between man and the higher animals, great as it is, certainly is one of *degree* and not of *kind*” (Darwin 1871, 105).

But perhaps Darwin was mistaken on this account and the empirical research of the last century and a half have rendered his views on animal mental behavior as biologically incoherent. Perhaps evolution is not as continuous and as gradual as Darwin thought, and perhaps his detractors, such as Richard Owen, who made a biological case for qualitative human uniqueness, have in reality won the scientific day. In other words, we might inquire whether scientific research over the last century and a half has substantiated Darwin’s understanding of animal self-awareness, intentions, freedom, and even morality.

While it is of course unknown what future research in human and animal mentality may reveal, many contemporary biologists and philosophers of biology would argue that it is currently not the case that qualitative

human uniqueness has been clearly established by science. Consequently, it would seem that Darwin's initial insights regarding the continuity of human and animal mentality have thus far withstood the empirical test of time. Since the publication of *On the Origin of Species*, numerous studies in animal behavior have led researchers to the same conclusions as Darwin—that a countless number of nonhuman creatures are clearly conscious, that “many animals are self-aware” (DeGrazia 2009, 201), that intentions and free choices—as opposed to innate instinct—play a central role in animal behavior (Avital and Jablonka 2000, 22; de Waal and Tyack 2003; Griffiths 2006), and that “animals have a broad repertoire of moral behavior” with notions such as “*ought* and *should* regarding what's right and wrong playing an important role in their social interactions” (Bekoff 2001, 82; Bekoff 2004a, b; Bekoff and Pierce 2009, x; Rowlands 2012). The accusation of anthropomorphism against cognitive ethologists who interpretively ascribe mentality to animals thus rests ultimately upon an unscientific *anthropocentrism of the gaps* which assumes a sort of human uniqueness that many would argue cannot clearly be substantiated from the current findings of evolutionary biology (Moritz 2012b). Furthermore, those who argue against anthropomorphism as unscientific, basing their position on the notion that only humans have mental self-awareness, freedom, or morality, wrongly assume that the attribution of such mental states to *humans* is in itself unproblematic (Chalmers 1997).

Although our knowledge in this area is far from exhaustive, all that we do know “does not suggest that there is anything uniquely human about the basic neural structures and functions that give rise to human consciousness” (Griffin 2001, 13). According to evolutionary biologists and cognitive ethologists who study the animal mind it is not possible to exclude the phenomena of “consciousness, choice, deliberation, planning, intentions, and other mental processes” in animals from scientific consideration (Bekoff, Allen, and Burghardt 2002, xi). Intensive studies of animal behavior in both the field and the laboratory have substantiated these findings. A wealth of empirical evidence has likewise uncovered that numerous animal groups share the type of higher cognitive and communicative capacities that were once thought to be uniquely human. Biologists have found that the “capacity for symbolic communication in animals of all kinds is much greater than previously supposed” (Alger and Alger 1997). In addition to this, our increased understanding of the extent and versatility of animal communication has rendered “the distinction between animal communication and human language a less critical criterion of human uniqueness” (Griffin 2001, 22). When combined with the fact that many scholars have now “abandoned the formerly widespread belief that human language is essential for conscious thinking” the question of the extent of animal awareness and intentionality naturally arises (Griffin 2001, 258). Investigations into animal behavior have been forcefully addressing this question and have

discovered evidence pointing to phenomena corresponding to culture and individual personality not only in mammals, but also in other vertebrates. For example, a recent study has found that not only are many “birds able to think simple thoughts and have simple feelings, but they also are fundamentally as aware, intelligent, mindful, emotional, and individualistic as ordinary people” (Barber 1993, 165). As a result researchers have come to hold understandings of nonhuman animal behavior that assume “awareness,” “consciousness,” and “intention” to be at least as persuasive as—if not more than—those explanations that “rely on assumptions of instinct or genetic programming” (Alger and Alger 1997, 66–67). Beyond this, the concept of “innate instinct” as a useful explanatory category has come under serious scientific fire. Many philosophers of biology have judged the genetic “concept of innateness [to be] irretrievably confused” (Griffiths 2002a, b, 70) even as biologists have found that much animal “behavior is emergent at the phenotypic level” rather than reducible to the level of instinct or genes (Reid 2007, 337).

Scientific studies on animal minds have likewise underscored the vital role of rational deliberation, choice, and freedom in much nonhuman animal behavior. Such findings which question “an absolute all-or-nothing dichotomy between human brains uniquely capable of producing conscious experience, on the one hand, and all other brains that can never do so, on the other” are not surprising within a Darwinian evolutionary framework and are “consistent with our general belief in evolutionary continuity” (Griffin 2001, 18). At a broad interpretive level, it has become clear that “the capacity for abstract thinking does not belong to humans alone, as studies of other vertebrates, such as primates, pigeons and dolphins, have shown. Researchers have found that invertebrates, too, possess higher cognitive functions” (Wong 2005, 5). In-depth empirical studies on animal cognition, which have included primates, elephants, dolphins, whales, ravens, jays, quail, elephants, and dogs have shown that animals as a whole can no longer be categorically dismissed as beings who lack the capacity for rational thinking (Bekoff et al. 2002; Bermúdez 2003; Hurley and Nudds 2006). Such rational deliberation within animals as evidenced by numerous cognitive ethological investigations underscores the vital role of intentions, choice, and freedom in much animal behavior. Some researchers have suggested that a certain degree of mental freedom might even be extended to animals as “simple” as the fruit fly (Heisenberg, Wolf, and Brembs 2001; Maye et al. 2007).

Beyond this, researchers have observed that “complex cognitive abilities evolved multiple times in distantly related species with vastly different brain structures in order to solve similar socioecological problems” (Watanabe and Huber 2006, 241). Because the evolution of nervous systems, brains, sentience, and higher cognitive behaviors have been found to evolve convergently in a number of distantly related groups, some biologists have even

argued that the emergence of human-like intelligence “must be an evolutionary inevitability” that will undoubtedly be found in creatures besides human beings (Conway Morris 2010, 155).

Given the vast amount of empirical evidence indicating that the behavior of many kinds of nonhuman animals appears to be driven not by innate instinct but by conscious intentions, a certain degree of freedom, and by active choices, we might go on to ask how such choices of nonhuman creatures may account for certain types of suffering throughout evolutionary history. One way in which such choices may influence evolutionary history is due to the fact that historical animal decisions can lead to different evolutionary trajectories that may entail the eventual inheritance of particular types of behaviors that lead to suffering. Recent scientific “data show that the genome is far more responsive to the environment than previously thought, and that not all transmissible variation is underlain by genetic differences.” In fact there are several “types of inheritance (genetic, epigenetic, behavioral, and symbol-based), each of which can provide variations on which natural selection will act.” Because “some of these variations arise in response to developmental conditions . . . there are Lamarckian aspects to evolution” (Jablonka and Lamb 2007, 353). For example, it is now clear that changes in diet or lifestyle based on the preferences or choices of individual animals can lead to epigenetically heritable changes in the phenotypes of future generations (Jablonka and Lamb 1995; Gilbert and Epel 2009). Beyond this some biologists have argued that “epigenetic mechanisms are the generative agents of morphological character origination” in such a way that animal choices regarding diet, lifestyle, habitat, and so on have the potential to significantly impact the morphology or form of organism and their progeny (Newman and Müller 2000, 304).

In addition to the neo-Lamarckian scientific evidence showing how the intentional choices of animals can epigenetically influence a number of heritable factors, there is data that animals can actively influence Darwinian selection pressures through niche selection. It is clear that through niche construction and social learning, nonhuman animals “not only shape the nature of their world, but also in part determine the selection pressures to which they and their descendants are exposed” (Day, Laland, and Odling-Smee 2002, 81). In this way the behavioral decisions, environmental alterations—whether physical, social, or nutritional—and subjective choices of animals “play a major role in introducing evolutionary change” (Bateson 2004, 283–98). Evolutionary biologist Patrick Bateson elaborates specifically on how such evolutionary change takes place:

If a population of animals should change their habits (no doubt often on account of changes in their surroundings such as food supply, breeding sites, etc. but also sometimes due to their exploratory curiosity discovering new ways of life, such as new sources of food or new methods of exploitation) then, sooner or later, variations in the gene complex will turn up in the

population to produce small alterations in the animal's structure which will make them more efficient in relation to their new behavioral pattern. (Bateson 1988, 196)

All this is to say that while we may not currently know the precise evolutionary trajectories whereby certain “evolutionary evils” emerged (such as specific types of parasitism and predation), we do know that the choices of vertebrate and invertebrate animals, at least, can play some significant role in their emergence, and, in this way, intentionality and freedom come back into the larger scientific picture. As a result, an extended evolutionary synthetic understanding of human and animal behavioral origins informed by the empirical discovery of evolutionary gradualism and continuity, behaviorally induced epigenetic inheritance, and niche selection actually helps one to make more sense of a narrative reading of the Hebrew Bible's affirmation of the prehuman capacity for “sin” in animals. But perhaps, as Rolston argues, we should refrain altogether from making such moral judgments about the “amoral” realm of nonhuman animals and resist the temptation to attribute disvalue to the more disturbing aspects of the world of nature (Rolston 1992, 275). Since “we cannot formulate the question whether there is value in nature independently of human experience,” the perceived evils of predation and even parasitism become simply a matter of perspective (Rolston 1992, 251). “Selfishness,” says Rolston, “can be a disvalue in nature only if there is moral agency present” (Rolston 1992, 256). Should taking food from subordinates and sexual coercion of females in nonhuman primates be given a moral value and be called “stealing” and “rape” or is it simply the case in such situations that “the monkey with the superior genes gets fed and bred” (Rolston 1992, 257)? While to human eyes, says Rolston, a primate engaged in such activities may seem to be acting “selfishly” or “immorally” we must realize that in reality “there is no moral agency at issue . . . To ask these monkeys to behave as altruistic humans misunderstands the events and misvalues them accordingly” (Rolston 1992, 257).

However, any view of morality that hopes to be consistent with the findings of evolutionary biology must acknowledge that there is in reality no absolute or sharp dividing line between human morality and the morality of nonhuman primates. In Darwin's own view, morality—like all biological traits and behaviors—is seen as existing along a spectrum, rather than as a singularly unique phenomenon, which appears *de novo* with anatomically and behaviorally modern *Homo sapiens*. Darwin—largely indebted to David Hume's conception of moral theory—made a case for rooting moral judgment and behavior in the evolved emotional brain, and much recent empirical evidence substantiates Darwin's original intuitions on this point (Richards 1987, 207–08). A number of contemporary researchers have argued that given the understanding—taken from virtue theoretical and

Humean moral theory—that “moral cognition comprises any cognitive act that is related to helping us ascertain and act on what we should do” we may go on to acknowledge that “non-human animals (e.g., primates and other social animals) might also engage in robust moral reasoning” (Casebeer 2003, 842; Bekoff 2004a, b, 53).

Beyond this is the empirical finding that the vast majority of human moral behavior has very little to do with moral *reasoning* because human moral deliberation is typically a *nonrational* process. “Moral intuition is a kind of *cognition*, but it is not a kind of *reasoning*”; consequently, in humans, “moral *reasoning* is rarely the direct cause of moral judgment” (Haidt 2001, 814). Instead of moral decision-making being a chiefly rational process, scientific studies have revealed that moral judgments are “generally the result of quick, automatic evaluations (intuitions)” which have their origin in the *emotional* centers of the brain (Haidt 2001, 814). Moral action is primarily motivated by what are called the “moral emotions”—emotions that possess identifiable moral content (e.g., sympathy, compassion, kindness, tolerance, patience, fairness, anger, indignation, malice and spite). “These moral emotions, as Darwin emphasized, are part of our natural history,” and consequently they have genetic, epigenetic, and learned behavioral precursors within nonhuman animals (Rowlands 2012, 27). There is a shared biological foundation, then, for both human and nonhuman animal morality and values. Thus, for example, “human beings, like chimpanzees and bonobos, have dispositions to respond to the perceived needs and wants of others, capacities for fellow-feeling” and they will similarly act on such dispositions and be judged by their conspecifics on the basis on them (Kitcher 2006, 170). Many biologists, ethicists, and cognitive psychologists have accordingly argued that these moral emotions and capacities for fellow-feeling are the primordial evolutionary spring from which the cognitively sophisticated forms of human morality flow. Considering that these moral emotional centers are not unique to humans but are found among a wide range of mammalian species (Panksepp 2004; Morris, Doe, and Godsell 2008), and also birds and some reptiles (Sergeie and Armony 2006, 128; Rowlands 2012, 39) it has been argued that “to the extent that animals act off the basis of such emotions they act morally” and can be considered “moral *subjects*” (Rowlands 2012, 32–33). Given the fact that the structure of these moral emotions is highly conserved throughout the natural history of vertebrate species it is also quite likely that there exists a type of universal system or general sense of values that is shared across these species. Investigations in animal behavior have indeed hinted at this as they have increasingly found that the same emotion-based value systems that are operative within a given species (*intraspecific*) can occasionally be applied even between distinct species (*interspecific*) (Bekoff and Pierce 2009; Rowlands 2012; Hampikian 2013). In this view of morality, which takes seriously the reality of evolutionary continuity, there is no clear line

of demarcation between moral evil and natural evil. Rather the capacity for evil, like the capacity for morality, lies on a continuum that has mysterious beginnings in the emotional brain, includes a number of historical and extant vertebrate groups, and reaches its apex in the cognitive and moral sophistication of fully cognitively enculturated human beings.

In the Biblical Eden—a microcosm of an eschatological reality—the election or calling of the human species to image God (as royal vice-regents and priests of creation) was God’s response to the problem of evolutionary evil (Moritz 2011). In the vision of scripture, and in the Jewish and Christian theological traditions, God’s intended macrocosmic destiny for animal relationships is captured in the well-known image of the Peaceable Kingdom, which is initiated by God’s Messiah—the renewed image of God. In God’s Messianic Kingdom, aggression between animals ceases and intraspecific bloodshed and the suffering caused by it ends (Hosea 2:18). *Here the mode of flourishing that God intends for nonhuman animals excludes behavioral violence, and bloodshed within and between species appears to have no proper place.* The Messianic Age or Kingdom of God is characterized by God’s creatures living together in harmony (Isaiah 11:1–10) and by dominion properly exercised by a humanity renewed in the image of God. God’s invitation to the Peaceable Kingdom is the call to both intraspecific and interspecific altruism.⁸

The Christian scriptures and the theological tradition both affirm that God calls both humans and animals (or at least “land animals” possessing the “breath of life”) to a type of “righteousness” that entails the cessation of violence. But, one might object, animals, unlike humans, are driven by their innate instincts—“behavior patterns fixed genetically in every detail” (Midgely 1995, 52–53)—and have no real choice or freedom to follow God’s call. One might thus ask, is it at all realistic (from the perspective of natural history) to picture animals as *actively choosing* different behavioral pathways in such a way that they could be seen as trying to respond to God’s will for the peaceable kingdom? This is an extremely complex question that, at this point, does not have a definite scientific answer. There are, however, some recent empirical hints pointing to some deeper dimensions of evolutionary dynamics that allow more theoretical space for this theological discussion. One such hint, as mentioned above, is the fact that a good number of biologists and philosophers of biology have come to question the adequacy of the concepts of animal instinct or genetic innateness that are implicitly assumed in the question above. They have argued that such notions of innateness and instinct are expressions of a type of psychological essentialism that is rooted in a largely discredited folk-biological theory of animal natures “whose conceptual structure is fundamentally inhospitable to developmental perspective on biology” (Griffiths 2011, 319). Instead of seeing the decisions of individual animals as expressions of some inner instinctual nature, these biologists and philosophers have stressed the

central role of behavioral plasticity and variability in animal actions where the learning of habits and conscious decision making plays an important role. Because learned behavioral traditions or “variations in transmissible habits have played a major role in the evolution of all higher animals, [and] not just man,” these biologists and philosophers of science emphatically reject any view of the nonhuman animal mind “which ignores the roles of heritable habits and traditions, and explains the specificity and the stability of all patterns of behaviour in terms of specific genetic ‘programs’” (Avital and Jablonka 2000, 353).

For example, recent research has discovered that for many animals the fear of other potentially harmful animals or objects is *learned* rather than instinctual or innate. In the oft-cited case of a monkey’s supposed instinctual fear of snakes, it appears that, contrary to longstanding belief,⁹ monkeys—both in the lab and in the wild—are born *without* a fear of snakes. “Laboratory-raised monkeys are in fact not afraid on the first exposure to a snake” (LeDoux 1996, 237) and in the wild “infant monkeys are aroused by the perception of fear in their mothers in the presence of a snake” thus “*learning* to fear snakes without the need for a more costly direct experience” (Preston and de Waal 2000, 289). In the same way “a fawn is not born with fear of a wolf” but rather such fearful behavior is learned by observing that of its mother (Marks and Nesse 1994, 255).

Another recent empirical hint that points to an answer to the question about animal choice above is the finding that behavioral plasticity in animals can directly influence the course of evolution. Evolutionary developmental biologists Patrick Bateson and Peter Gluckman argue that “animals can be active agents in the evolutionary change of their descendants” and that individual choices and behaviors were “likely to have been important in initiating evolutionary change in animals” (Bateson and Gluckman 2011, 103). One way in which animal choices combined with developmental and behavioral plasticity can initiate evolutionary change is that “organisms often expose themselves to new conditions that may reveal heritable variability and open up possibilities for evolutionary changes that would not otherwise have taken place.” In such instances “a cascade of [developmental and genetic] changes flow from the initial behavioural event” (Bateson and Gluckman 2011, 110). For example,

A group of animals might be forced into living in an unusual place after losing their way, but they cope by changing their preferences to suitable foods that are locally abundant. Later, those descendants that did not need to learn so much when foraging might be more likely to survive than those that could only show a fully functional phenotype by learning. A cost would have been incurred in the time taken to learn. As a consequence, what began as a purely phenotypic difference between animals of the same species living in different habitats becomes a genotypic difference. (Bateson and Gluckman 2011, 110)

Beyond this, biologist Kevin Laland gives many excellent examples “of how a change in diet leads to the evolution of new digestive enzymes” (Laland, Odling-Smee, and Myles 2010). Developmental biologist Mary Jane West-Eberhard has called such plasticity-driven structural responses of the genome to individual phenotypic behavioral choices “genetic accommodation” (West-Eberhard 2003). Through such processes individual animal choices result in a type of ratcheting effect whereby “organisms become ‘addicted’ to innumerable aspects of their environment” (Griffiths 2011, 324). A well-documented example of genetic accommodation through a ratcheting effect initiated by behavior is how the fruit-eating choices of primates led to a disabling of the ascorbic acid synthesis pathway by mutation during a period when vitamin C deficiencies would not have been selected against (Deacon 2003, 93).

Beyond this, the history of animal domestication has shown us that— with human intervention—many “natural born killers” can choose not to follow the path of bloodshed. Animal trainers (such as Siegfried Fischbacher and Roy Horn) have shown that even lions, tigers, and cheetahs can forgo the inclination to kill and can live in sustained community with potential prey.¹⁰ In terms of interspecies “friendships” there are the well-documented cases of Koko the gorilla and All Ball the kitten (Patterson 1987) and the hippo Owen and the tortoise Mzee. Observations by field biologists and others have likewise revealed that even without human intervention predators do not always choose to pursue their prey and may at times even “befriend” them (Holland 2011). Jennifer Holland, senior science writer for National Geographic, documents a number of such cases including that of a wild leopard that returned each night to the Indian village of Antoli to affectionately groom and sleep with a particular cow (Holland 2011, 70), and that of a Kenyan lioness that adopted a baby antelope (or oryx). The lioness, explains Holland, protected the antelope and “kept the oryx close at all times, licking it gently and treating it as her own young. And the oryx, apparently having not fully imprinted on its own kind and not aware that this was a predator at its side, wasn’t fearful, and even tried to suckle from the big cat” (Holland 2011, 84).

Other recent empirical hints which begin to address the question above come from current research on the evolutionary origins of moral behavior. Through studies of the biological roots of morality researchers have learned that the natural conscience—which in most moral decision-making discerns right from wrong—is an evolutionarily derived capacity and that much of the actual normative content of the moral conscience is cognitively intuitive (Barrett 2004, 47; Krebs and Janicki 2004, 163). Also, a number of investigations have indicated that the moral conscience is a phenomenon not unique to the human species but one possessed by a number

of creatures along an evolutionary continuum (Goodall 2000; Rowlands 2012).

It would seem, then, that lions, cheetahs and other potential predators have—like human beings—the capacity to choose *not* to hunt and kill. Still, most big cats of prey, like most humans (regardless of considerations of compassion or natural conscience), do prefer to eat meat when given the opportunity. According to Scripture, God calls human beings toward a vegetarian ideal that, in the eschaton, will be established as the culinary norm (Linzey 1994). While human obedience with regard to God’s command to “not eat” is possible, though, our continued disobedience appears to be all but inevitable. However, the empirical reality of our straying from God’s peaceful intentions for our species does not negate the theological reality of such intentions. Nor does the empirical reality of interspecific violence among other animals negate the theological reality that all creatures are ultimately called toward harmonious association. The tragic failure of humans to live up to God’s proximate calling with regard to the responsible stewardship of creation and compassion toward our fellow creatures is not scientifically controversial. Much more controversial is the Biblical and traditional theological idea that nonhuman animals can proximately *choose* to be violent or not and are ultimately held accountable by God for their choices. However, granting theological plausibility and given the above scientific and philosophical considerations, it is at least empirically possible that God has been calling *all creatures* bearing conscience toward God’s intended peaceable ends since the time in evolutionary history when they could first respond. Scientifically we know that the capacity to respond (and to suffer) emerged within evolutionary history by at least the dawn of the vertebrates (van Bergen, Hoppitt, and Laland 2004).¹¹ Within the capacities to respond to God’s call, to experience suffering, and to cause suffering there also lies the capacity to cause both good and evil. Given the ubiquity of evolutionary convergence in the areas of cognition, freedom, and moral behavior, and the discovery that all intelligences “tend toward a similar end point” one might similarly expect that the capacity to intentionally resist God’s will (i.e., sin) is also an evolutionary convergent phenomenon (Conway Morris 2008, 58). If this is in fact the case, then, to a significant degree “the *whole* creation *groans* and suffers” (Romans 8:22) on account of the sins of all flesh.

TOWARD A FREE CREATURES DEFENSE TO THE PROBLEM OF EVOLUTIONARY EVIL

Evolutionary biology understands the mental capacities of humans and animals as existing along a continuum. Freedom—including that which causes suffering—is thus not *qualitatively unique* to humans, and within a Darwinian perspective the difference between the agential freedom found

in humans and that found in animals is “one of *degree* and not of *kind*.” Within this type of evolutionary framework the Hebrew biblical notion of a *prehuman fall*—where animals have actively or intentionally resisted the will of God for creation—becomes far more plausible than in a non-Darwinian account of creation, which stresses the radical biological and behavioral *uniqueness* of human beings. In a gradualist approach to evolution that focuses on the dynamics of convergence, behaviorally induced epigenetic inheritance, and niche selection, nonhuman animals are viewed as playing an *active* rather than *passive* part in their own evolutionary creation, and animal choices, though perhaps not as self-conscious, free, or morally culpable as those of humans, are still theologically significant insofar as they influence the degree and specific types of evolutionary suffering that are brought into existence through such choices. The intentions, choices, and subsequent behavioral habits of nonhuman animals serve as a significant *universal contingent* in prehuman evolutionary history and such animal choices impact the actual occurrence of evolutionary evils by playing a central role in determining many of the specific forms in which instances of suffering become historically embodied (Moritz 2008). In this way, “as life grew more complex and evolved more capacities, the greater capacities brought more evil into the world” (Williams 2008). Evolutionary biology enables us to understand the existence of evolutionary evil as directly related to an organism’s capacities to suffer, to cause suffering, and to choose different pathways of action which in turn may affect the actual course of evolutionary suffering.

To take seriously the emerging scientific notion of freedom and morality as existing across a spectrum of life forms opens up the theological possibility of what I have elsewhere referred to as a *free creatures defense* to the problem of evolutionary evil. In the free creatures defense God has created a truly good world (“very good,” in fact) where freedom and the capacity to directly respond to God’s will are not solely the possession of one creaturely kind, but of many. Here the Creator is concerned not only with the moral development of human beings, but with that of all creatures who have at least some capacity to heed God’s purposes. This is a view that has very deep roots in the scriptural and theological traditions and one that has an increasing amount support from data of the natural sciences. In my own philosophical and theological assessment this world of *many free creatures* is truly a *better or more valuable world* than “the best of all possible worlds” that contains only *one free creature* who can regard or disregard the voice of its Creator. A world of many free creatures is a world in which God’s plans and purposes are not wrapped up in the prerogatives and problems of one unique type of being, but are instead akin to convergent endpoints of evolution that a spectrum of animal species can, and will, reach. Indeed, a world of many free creatures is a world in which “the Glory of the Lord

will be revealed and all living things (Heb. *kol basar*) will see it together” (Isaiah 40:5).

CONCLUSION

In this article I have reviewed a number of classical and contemporary approaches to the theological problem of animal suffering as witnessed throughout the evolutionary history of life’s creation. I have found that even as Darwin’s theory of evolution *via* natural selection has posed this problem in its most profoundly potent form, Darwin’s other insights regarding the common ancestry and radical continuity of all life contain the seeds of a scientifically informed theological response to the evolutionary theodicy dilemma. If the nature of biological life—including the vast diversity of traits and behaviors—is that of a spectrum, then there is ultimately no sharp biological dividing line between moral evil and natural evil. Theologically then, one may see the fallenness of creation as reaching all the way back to the first inklings of animal consciousness, freedom, and self-awareness—and, as a consequence, moral culpability can likewise be envisioned as existing in a variety of gradations along this spectrum. This evolutionary shift in perspective regarding the gradual nature of evil’s emergence through the actions and intentions of “free creatures” (who increasingly possess greater levels of freedom as life’s evolutionary history unfolds) echoes the fundamental insight of the story of the rebellious nonhuman animal serpent in Genesis 3. Evil—as resistance to God’s will that results in suffering—precedes the arrival of human beings and already has a firm foothold in the nonhuman animal world long before humans are ever tempted to go astray. As it stands, the world of human and nonhuman animals still abounds with ample evidence of both suffering and joy, evil and good. In this way our world appears to be structured so that the individual lives, and evolutionary destinies of countless creatures and their lineages, are profoundly balanced on the edge of decision. Indeed, it would seem that such a balance is precisely that required if all God’s creatures are to be called and courted to freely respond to their Creator in obedience, faith, and love.

NOTES

1. John of the Cross, for example, says Christ in his incarnation and resurrection clothed both humans and animals with beauty and dignity (St. John of the Cross 1989, 93). For a discussion of the early church views, see Sorabji (1995, 199); see also Moritz (2012a).

2. One possible philosophical response to this question is to follow David Hume in arguing that justice and fairness could never exist in a situation of unlimited resources and unlimited benevolence. Since justice and fairness are important for our moral development, God allows for conditions where resources are limited. Robert John Russell points out that the question of limited resources is also related to the role that entropy plays in nature. Entropy fuels the physical, chemical, and biological processes that drive biological evolution, and yet it ultimately leads to the dissipation, decay, and death that pervade these same processes (Russell 1984, 1990). However, Russell asks, could we conceive of a universe that could sustain intelligent and moral life

without something akin to the second law of thermodynamics? It would seem not. According to Russell, the generation of entropy plays a key role in the conditions of nature which are necessary for an anthropic universe that has the potential to develop conscious, intelligent life, free, and moral agents (Russell 1998).

3. Discussing the role of cooperative strategies in evolution in her recent Gifford Lectures, Sarah Coakley similarly remarks that these cooperative strategies are “no mere background of detritus to the agonistic competitiveness of evolution that is centrally at work in selection, but just as necessary to the very workings and continuation of evolutionary life” (Coakley 2012, 5–6).

4. This is much closer to Irenaeus’ understanding of the Fall than Augustine’s (see Brown 1975, 17–25). This prehuman understanding of the Fall likewise addresses “the problem of the Fall without the Fall” as detailed by Robert John Russell.

5. The Hebrew word *Basar* refers to all living things besides plants, that is, animals and humans.

6. “He appointed from the first that humans should find nourishment from the fruits of the earth, and from seeds, and herbs, and acorns, having at the same time appointed that the animals be of habits similar to humans, that they also might eat of an the seeds of the earth.” Theophilus “To Autolycus” 2:18 (2007) 101–02.

7. In Genesis 2, verse 15, where God “took man and put him in the Garden of Eden” an uncommon term for “put” (*wayyannibehu*) is used that is elsewhere reserved for two specific purposes: “God’s ‘rest’ or ‘safety,’ which he gives to man in the land (e.g., Gen 19:16; Deut 3:20; 12:10; 25:19), and the ‘dedication’ of something in the presence of the Lord (Exod 16:33–34; Lev 16:23; Num 17:4; Deut 26:4, 10).” Both nuances of this term may be understood to lie behind the author’s use in Gen 2:15—“Man was ‘put’ into the garden where he could ‘rest’ and be ‘safe,’ and man was ‘put’ into the garden ‘in God’s presence’ where he could have fellowship with God (3:8).” Sailhamer 1990, 45. The conversation between God and the humans and the subsequent conversation between the humans and the serpent seems to presuppose a human awareness of death. Death-awareness appears to have been required in order for the first humans to comprehend the consequences of disobedience. Otherwise the humans would not have been able to understand God’s warning, “you will surely die” (Gen 2:17), or the serpent’s questioning of God’s admonition along with the serpent’s counter assurance, “You will not surely die” (Gen 3:4). From the context in which the first commandment was given we may surmise that there was at least some knowledge of death *before* the humans disobeyed.

8. Today the challenge of living in anticipation of the Peaceable Kingdom is essentially the challenge of environmental ethics. As Holmes Rolston says, “humans have learned some intraspecific altruism. The challenge now is to learn interspecific altruism” (Rolston 2012, 132).

9. For example, Terry Burnham and Jay Phelan say, “Snakes produce one of the strongest instinctual fear responses . . . Even adult chimpanzees and monkeys that have spent their whole lives in zoos and have never seen a snake share our instinctual herpetological fear.” *Mean Genes: From Sex to Money to Food, Taming Our Primal Instincts* (Cambridge, MA: Perseus Publishing, 2000), 25.

10. Horn and Fischbacher did not so much train the animals as bond with them through a technique they called “affection conditioning,” raising tiger cubs from birth and sleeping with them until they were a year old. They lived with the animals in their “Jungle Palace” compound where 63 tigers and 16 lions, none of them declawed, roamed freely about using the bedrooms and even the pool without restrictions. Roy meditated with at least one tiger every day. The injury from the Bengal tiger Montecore that Roy Horn sustained in 2003 was not an exception to this life of sustained community together. According to Siegfried Fischbacher, Horn fell during the act (possibly due to a stroke he suffered) and Montecore was attempting to drag him to safety, in the same way that a mother tigress would carry her cub by the neck. Fischbacher said Montecore had no way of knowing that Horn, unlike a tiger cub, did not have fur and thick skin covering his neck and that his neck was vulnerable to injury (Gliatto and Fleeman 2004).

11. However, researchers have also found that even “invertebrates such as cockroaches, flies and slugs . . . exhibit behavioural and physiological responses indicative of pain; and, apparently, experience learned helplessness.” Furthermore, “the similarity of these responses to those of vertebrates may indicate a level of consciousness or suffering that is not normally attributed to invertebrates” (Smith 1991; Sherwin 2001; Barr et al. 2008).

REFERENCES

- Alger, Janet, and Steven Alger. 1997. "Beyond Mead: Symbolic Interaction between Humans and Felines." *Society and Animals: Journal of Human-Animal Studies* 5:65-82.
- Aristotle. 1941. "The History of Animals." In *The Basic Works of Aristotle*, ed. Richard McKeon. New York: Random House.
- Attfield, Robin. 1991. *The Ethics of Environmental Concern*, 2nd ed. Athens, GA: University of Georgia Press.
- Augustine. 1887. *De Moribus Manicheorum*. In *Nicene and Post-Nicene Fathers*, First Series, Vol. 4, ed. Philip Schaff, trans. Richard Stothert. Buffalo, NY: Christian Literature Publishing Company.
- . 1982. "Question 30." In *83 Different Questions. Fathers of the Church*, Vol. 70, trans. David L. Mosher. Washington, DC: Catholic University of America Press.
- . 1992. *Against Julian*. In *Fathers of the Church*, Vol. 35, trans. Matthew A. Schumacher. Washington, DC: Catholic University of America Press.
- Avital, Eytan, and Eva Jablonka. 2000. *Animal Traditions: Behavioural Inheritance in Evolution*. Cambridge: Cambridge University Press.
- Ayala, Francisco J. 2007. *Darwin's Gift to Science and Religion*. Washington, DC: National Academies Press.
- Barber, Theodore. 1993. *The Human Nature of Birds: A Scientific Discovery with Startling Implications*. New York: St. Martin's Press.
- Barr, Stuart, Peter Laming, Jaimie Dick, and Robert Elwood. 2008. "Nociception or Pain in a Decapod Crustacean?" *Animal Behaviour* 75:745-51.
- Barrett, Justin. 2004. *Why Would Anyone Believe in God?* Lanham, MD: Alta Mira Press.
- Bateson, Patrick. 1988. "The Active Role of Behavior in Evolution." In *Evolutionary Processes and Metaphors*, ed. M. W. Ho and S. W. Fox, 191-207. London: John Wiley and Sons.
- . 2004. "The Active Role of Behavior in Evolution," *Biology and Philosophy* 19:283-98.
- Bateson, Patrick, and Peter Gluckman. 2011. *Plasticity, Robustness, Development and Evolution*. Cambridge: Cambridge University Press.
- Bekoff, Marc. 2001. "Social Play Behavior: Cooperation, Fairness, Trust, and the Evolution of Morality." *Journal of Consciousness Studies* 8:81-90.
- . 2004a. "Wild Justice, Cooperation, and Fair Play: Minding Manners, Being Nice, and Feeling Good." In *The Origins and Nature of Sociality*, ed. Robert W. Sussman and Audrey R. Chapman, 53-79. Chicago, IL: Aldine.
- . 2004b. "Wild Justice and Fair Play: Cooperation, Forgiveness, and Morality in Animals." *Biology and Philosophy* 19:489-520.
- Bekoff, Marc, Colin Allen, and Gordon Burghardt, ed. 2002. *The Cognitive Animal: Empirical and Theoretical Perspectives on Animal Cognition*. Cambridge, MA: MIT Press.
- Bekoff, Marc, and Jessica Pierce. 2009. *Wild Justice: The Moral Lives of Animals*. Chicago: University of Chicago Press.
- Bergen, Yfke van, William Hoppitt, and Kevin Laland. 2004. "Social Learning, Innovation, and Intelligence in Fish." In *Comparative Vertebrate Cognition: Are Primates Superior to Non-Primates?*, ed. Lesley J. Rogers and Gisela T. Kaplan, 141-70. New York: Kluwer Academic.
- Bermúdez, José Luis. 2003. *Thinking without Words*. New York: Oxford University Press.
- Bowler, Peter. 2003. *Evolution: The History of an Idea*. Berkeley: University of California Press.
- Brown, Robert F. 1975. "On the Necessary Imperfection of Creation: Irenaeus' *Adversus Haereses* IV, 38." *Scottish Journal of Theology* 28:17-25.
- Casebeer, William D. 2003. "Moral Cognition and Its Neural Constituents." *Nature Reviews Neuroscience* 4:840-47.
- Chalmers, David. 1997. "Moving Forward on the Problem of Consciousness." *Journal of Consciousness Studies* 4:3-46.
- Clough, David L. 2012. *On Animals, Vol. 1: Systematic Theology*. London: T&T Clark/Continuum.
- Coakley, Sarah. 2012. "Sacrifice Regained: Evolution, Cooperation and God." The Gifford Lectures, University of Aberdeen.

- . 2013. "Evolution, Cooperation, and Divine Providence." In *Evolution, Games and God: The Principle of Cooperation*. ed. Sarah Coakley and Martin Nowak, 375–85. Cambridge, MA: Harvard University Press.
- Cohn-Sherbok, Dan, and Andrew Linzey. 1997. *After Noah: Animals and the Liberation of Theology*. London: Mowbray.
- Conway Morris, Simon. 2004. *Life's Solution: Inevitable Humans in a Lonely Universe*. Cambridge: Cambridge University Press.
- . 2008. "Evolution and Convergence: Some Wider Considerations." In *The Deep Structure of Biology: Is Convergence Sufficiently Ubiquitous to Give a Directional Signal?*, ed. Simon Conway Morris, 46–67. West Conshohocken, PA: Templeton Press.
- . 2010. "Evolution and the Inevitability of Intelligent Life." In *The Cambridge Companion to Science and Religion*, ed. Peter Harrison, 148–72. Cambridge: Cambridge University Press.
- Darwin, Charles. 1871. *The Descent of Man and Selection in Relation to Sex*, 2nd ed. London: John Murray.
- Dawkins, Richard. 2003. *A Devil's Chaplain: Reflections on Hope, Lies, Science, and Love*. New York: Houghton Mifflin.
- Day, Rachel L., Kevin N. Laland, and John Odling-Smee. 2002. "Rethinking Adaptation: The Niche-Construction Perspective." *Perspectives in Biology and Medicine* 46:80–95.
- Deacon, Terrence. 2003. "Multilevel Selection in a Complex Adaptive System: The Problem of Language Origins." In *Evolution and Learning: The Baldwin Effect Reconsidered*, ed. Bruce Weber and David Depew, 81–106. Cambridge, MA: MIT Press.
- Degler, Carl. 1991. *In Search of Human Nature: The Decline and Revival of Darwinism in American Social Thought*. New York: Oxford University Press.
- DeGrazia, David. 2009. "Self-Awareness in Animals." In *The Philosophy of Animal Minds*, ed. Robert W. Lurz, 201–17. New York: Cambridge University Press.
- Depew, David, and Bruce Weber. 1995. *Darwinism Evolving: Systems Dynamics and the Genealogy of Natural Selection*. Cambridge, MA: MIT Press.
- De Waal, Frans, and Peter Tyack, ed. 2003. *Animal Social Complexity: Intelligence, Culture, and Individualized Societies*. Cambridge, MA: Harvard University Press.
- Fisher, John. 1996. "The Myth of Anthropomorphism." In *Readings in Animal Cognition*, ed. Marc Bekoff and D. Jamieson, 3–16. Cambridge, MA: MIT Press.
- Gilbert, Scott, and David Epel. 2009. *Ecological Developmental Biology: Integrating Epigenetics, Medicine, and Evolution*. Sunderland, MA: Sinauer.
- Gliatto, Tom, and Michael Fleeman. 2004. "Roy Horn: Tiger 'Saved My Life.'" *People* 62:20.
- Goodall, Jane. 2000. "The Roots of Evil." In *Reason for Hope: A Spiritual Journey*, ed. Jane Goodall and Phillip Berman. New York: Grand Central Publishing.
- Goodwin, Brian. 1990. "The Evolution of Generic Form." In *Organizational Constraints on the Dynamics of Evolution*, ed. J. Maynard Smith and G. Vida, 107–18. Manchester, England: Manchester University Press.
- . 2009. "Beyond the Darwinian Paradigm: Understanding Biological Forms." In *Evolution: The First Four Billion Years*, ed. Michael Ruse and Joseph Travis, 299–312. Cambridge, MA: Harvard University Press.
- Grant, Robert. 2000. *Theophilus of Antioch: The Life and Thought of a Second-Century Bishop*. Lanham, MD: Lexington Books.
- Gregersen, Niels Henrik. 2001. "The Cross of Christ in an Evolutionary World." *Dialog: A Journal of Theology* 40:192–207.
- Gregorios, Paulos Mar. 1988. *Cosmic Man: The Divine Presence. The Theology of Gregory of Nyssa (ca. 330 to 395 A.D.)*. New York: Paragon House.
- Griffin, Donald. 2001. *Animal Minds: Beyond Cognition to Consciousness*. Chicago: University of Chicago Press.
- Griffiths, Paul. 2002a. "Molecular and Developmental Biology." In *The Blackwell Guide to the Philosophy of Science*, ed. Peter K. Machamer and Michael Silberstein, 252–71. Malden, MA: Blackwell.
- . 2002b. "What is Innateness?" *The Monist* 85:70–85.
- . 2006. "The Fearless Vampire Conservator: Philip Kitcher, Genetic Determinism and the Informational Gene." In *Genes in Development: Re-Reading the Molecular Paradigm*, ed.

- C. Rehmann-Sutter and E. M. Neumann-Held, 175–98. Durham, NC: Duke University Press.
- . 2011. “Our Plastic Nature.” In *Transformations of Lamarckism: From Subtle Fluids to Molecular Biology*, ed. Snait Gissis and Eva Jablonka, 319–30. Cambridge, MA: MIT Press.
- Haidt, Jonathan. 2001. “The Emotional Dog and Its Rational Tail: A Social Intuitionist Approach to Moral Judgment.” *Psychological Review* 108:814–34.
- Hampikian, Daniel. 2013. “Moral Emotions in Nonhuman Animals.” PhD dissertation. University of Miami, Miami, FL.
- Harrison, Peter. 1993. “Animal Souls, Metempsychosis, and Theodicy in Seventeenth-Century English Thought.” *Journal of the History of Philosophy* 31:519–44.
- Heisenberg, Martin, Reinhard Wolf, and Björn Brembs. 2001. “Flexibility in a Single Behavioral Variable of *Drosophila*.” *Learning and Memory* 8:1–10.
- Heraclitus of Ephesus. 1889 [c. 500 BCE]. *The Fragments of the Work of Heraclitus of Ephesus on Nature*, ed. Ingram Bywater, trans. G. T. W. Patrick. Baltimore, MD: Murray.
- Hoelzer, Guy, John Pepper, and Eric Smith. 2006. “On the Logical Relationship between Natural Selection and Self-Organization.” *Journal of Evolutionary Biology*, 19:1785–94.
- Holland, Jennifer. 2011. *Unlikely Friendships: 47 Remarkable Stories from the Animal Kingdom*. New York: Workman.
- Hurley, Susan, and Matthew Nudds, ed. 2006. *Rational Animals?* New York: Oxford University Press.
- Irenaeus. 1899. *Against Heresies*. In *The Ante-Nicene Fathers*, Vol. 1, ed. Alexander Roberts and James Donaldson, 45–132. New York: Charles Scribner’s Sons.
- Jablonka, Eva, and Marion Lamb. 2007. “Précis of Evolution in Four Dimensions.” *Behavioral and Brain Sciences*. 30:353–65.
- . 1995. *Epigenetic Inheritance and Evolution: The Lamarckian Dimension*. Oxford: Oxford University Press.
- Jacob, Benno. 1974. *The First Book of the Bible: Genesis*. Jersey City, NJ: Ktav Publishing House.
- Kauffman, Stuart. 1992. “Origins of Order in Evolution: Self-Organization and Selection.” In *Theoretical Biology: Epigenetic and Evolutionary Order from Complex Systems*, ed. Brian Goodwin and Peter Saunders, 67–88. Baltimore, MD: John Hopkins University Press.
- . 1995. *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity*. New York: Oxford University Press.
- . 1999. “Darwinism, Neodarwinism, and an Autocatalytic Model of Cultural Evolution.” *Psycoloquy* 10(22):1–4.
- Kitcher, Philip. 2006. “Biology and Ethics.” *The Oxford Handbook of Ethical Theory*, ed. David Copp, 163–85. Oxford: Oxford University Press.
- Krebs, Dennis, and Maria Janicki. 2004. “Biological Foundations of Moral Norms.” In *Psychological Foundations of Culture*, ed. M. Schaller and C. Crandall, 125–48. Mahwah, NJ: Lawrence Erlbaum.
- Laland, Kevin, John Odling-Smee, and Sean Myles. 2010. “How Culture Shaped the Human Genome: Bringing Genetics and the Human Sciences Together.” *Nature Reviews Genetics* 11:137–48.
- LeDoux, Joseph. 1996. *The Emotional Brain: The Mysterious Underpinnings of Emotional Life*. New York: Simon & Schuster.
- Linzey, Andrew. 1994. *Animal Theology*. Champaign: University of Illinois Press.
- Linzey, Andrew, and Tom Regan, eds. 1989. *Animals and Christianity: A Book of Readings*. London: SPCK.
- Margulis, Lynn. 1991. “Symbiogenesis and Symbioticism.” In *Symbiosis as a Source of Evolutionary Innovation: Speciation and Morphogenesis*, ed. Lynn Margulis and René Fester, 1–14. Cambridge, MA: MIT Press.
- Margulis, Lynn, and Dorion Sagan. 1986. *Microcosmos: Four Billion Years of Microbial Evolution*. Berkeley: University of California Press.
- . 2003. *Acquiring Genomes: A Theory of the Origins of Species*. New York: Basic Books.
- Marks, Isaac M., and Randolph M. Nesse. 1994. “Fear and Fitness: An Evolutionary Analysis of Anxiety Disorders.” *Ethology and Sociobiology* 15:247–61.
- Maye, Alexander, Chih-hoo Hsieh, George Sugihara, and Björn Brembs. 2007. “Order in Spontaneous Behavior.” *PLoS One* 2:5.

- McGhee, George. 2011. *Convergent Evolution: Limited Forms Most Beautiful*. Cambridge, MA: MIT Press.
- McGuckin, John. 2004. "Image of God." In *The Westminster Handbook to Origen*, ed. John Anthony McGuckin, 131–34. Louisville, KY: Westminster John Knox Press.
- Meyendorff, John. 1979. *Byzantine Theology: Historical Trends and Doctrinal Themes*. New York: Fordham University Press.
- Midgley, Mary. 1995. *Beast and Man: The Roots of Human Nature*. New York: Routledge.
- Moritz, Joshua M. 2008. "Evolutionary Evil and Dawkins' Black Box: Changing the Parameters of the Problem." In *The Evolution of Evil*, ed. Gaymond Bennett, Martinez J. Hewlett, Ted Peters, and Robert John Russell, 143–88. New York: Göttingen: Vandenhoeck and Ruprecht.
- . 2009. "Animals and the Image of God in the Bible and Beyond." *Dialog: A Journal of Theology* 48:134–46.
- . 2011. "Evolution, the End of Human Uniqueness, and the Election of the *Imago Dei*." *Theology and Science* 9:307–39.
- . 2012a. "Martin Luther and the Medieval Saints among the Animals." *Dialog: A Journal of Theology* 51:7–12.
- . 2012b. "Human Uniqueness, the Other Hominids, and 'Anthropocentrism of the Gaps' in the Religion and Science Dialogue." *Zygon: Journal of Religion and Science* 47:65–96.
- Morris, Paul, Christine Doe, and Emma Godsell. 2008. "Secondary Emotions in Non-Primate Species? Behavioural Reports and Subjective Claims by Animal Owners." *Cognition and Emotion* 22:3–20.
- Newman, Stuart, and Gerd Müller. 2000. "Epigenetic Mechanisms of Character Origination." *Journal of Experimental Zoology (Molecular and Developmental Evolution)* B288: 304–17.
- Osborn, Eric. 2001. *Irenaeus of Lyons*. Cambridge: Cambridge University Press.
- Panksepp, Jaak. 2004. *Affective Neuroscience: The Foundations of Human and Animal Emotions*. Oxford: Oxford University Press.
- Passmore, John. 1975. "The Treatment of Animals." *Journal of the History of Ideas* 36:195–218.
- Patterson, Francine. 1987. *Koko's Kitten*. New York: Scholastic.
- Peacocke, Arthur. 2001. "The Cost of New Life." In *The Work of Love: Creation as Kenosis*, ed. John Polkinghorne, 21–42. Grand Rapids, MI: Eerdmans.
- Pojman, Louis. 2009. *Philosophy of Religion*. Long Grove, IL: Waveland Press.
- Preece, Rod., and David Fraser. 2000. "The Status of Animals in Biblical and Christian Thought: A Study in Colliding Values." *Society and Animals* 8:245–63.
- Preston, Stephanie D., and Frans B.M. de Waal. 2000. "The Communication of Emotions and the Possibility of Empathy in Animals." In *Altruism and Altruistic Love: Science, Philosophy, and Religion in Dialogue*, ed. Stephen G. Post, Lynn G. Underwood, Jeffrey P. Schloss, and William B. Hurlburt, 284–308. New York: Oxford University Press.
- Procksch, Otto. 1924. *Die Genesis: Ubersetzt Unerklärt*, 3rd ed. Leipzig: Deichert.
- Reid, Robert. 2007. *Biological Emergences: Evolution by Natural Experiment*. Cambridge, MA: MIT Press.
- Richards, Robert. 1987. *Darwin and the Emergence of Evolutionary Theories of Mind and Behavior*. Chicago: University of Chicago Press.
- Rogers, Rick. 2000. *Theophilus of Antioch: The Life and Thought of a Second-Century Bishop*. Lanham, MD: Lexington Books.
- Rolston, Holmes, III. 1992. "Disvalues in Nature." *The Monist* 75:250–78.
- . 1994. "Does Nature Need to be Redeemed?" *Zygon: Journal of Religion and Science* 29:205–29.
- . 2003. "Naturalizing and Systematizing Evil." In *Is Nature Ever Evil? Religion, Science, and Value*, ed. Willem B. Drees, 67–86. London: Routledge.
- . 2012. *Environmental Ethics*. Philadelphia, PA: Temple University Press.
- Rowlands, Mark. 2012. *Can Animals Be Moral?* Oxford: Oxford University Press.
- Ruse, Michael. 2001. *Can a Darwinian Be a Christian? The Relationship between Science and Religion*. Cambridge: Cambridge University Press.
- . 2008. "Darwinism and Christianity: Does Evil Spoil a Beautiful Friendship?" In *The Evolution of Evil*, ed. Gaymond Bennett, Martinez J. Hewlett, Ted Peters, and Robert John Russell, 86–98. Göttingen: Vandenhoeck and Ruprecht.
- Russell, Robert John. 1984. "Entropy and Evil." *Zygon: Journal of Religion and Science* 19:449–68.

- . 1990. "The Thermodynamics of 'Natural Evil'." *CTNS Bulletin* 10:20–25.
- . 1998. "The Theological Consequences of the Thermodynamics of a Moral Universe: An Appreciative Critique and Extension of the Murphy/Ellis Project." *CTNS Bulletin* 18:19–24.
- . 2008. *Cosmology from Alpha to Omega: The Creative Mutual Interaction of Theology and Science*. Minneapolis, MN: Fortress.
- Ryder, Richard. 2000. *Animal Revolution: Changing Attitudes towards Speciesism*, rev. and updated ed. Oxford: Berg.
- Sailhamer, John. 1990. *The Expositor's Bible Commentary: Vol. 2: Genesis*, ed. Frank E. Gaebelien. Grand Rapids, MI: Zondervan.
- Schloss, Jeffrey. 2012. "Evolution, Creation, and The Sting of Death: A Response to John Laing." BioLogos Forum. Available at <http://biologos.org/blog/evolution-creation-and-the-sting-of-death-part-1>. August 10, 2012.
- Schochet, Elijah Judah. 1984. *Animal Life in Jewish Tradition: Attitudes and Relationships*. New York: Ktav Publishing House.
- Sergerie, Karine, and Jorge Armony. 2006. "Interactions between Emotion and Cognition: A Neurobiological Perspective." In *Psychoanalysis and Neuroscience*, ed. Mauro Mancia, 125–49. Milan: Springer-Verlag.
- Sherwin, Christopher M. 2001. "Can Invertebrates Suffer? Or, How Robust is Argument-by-Analogy?" *Animal Welfare* 10:103–18.
- Smith, Jane. 1991. "A Question of Pain in Invertebrates." *Institute for Laboratory Animals Journal* 33:1–2.
- Sorabji, Richard. 1995. *Animal Minds and Human Morals: The Origins of the Western Debate*. Ithaca, NY: Cornell University Press.
- Southgate, Christopher. 2008. *The Groaning of Creation: God, Evolution, and the Problem of Evil*. Louisville, KY: Westminster John Knox Press.
- . 2011. "Re-Reading Genesis, John, and Job: A Christian Response to Darwinism." *Zygon: Journal of Religion and Science* 46:370–95.
- St. John of the Cross. 1989. "Beautifying the Creatures." In *Animals and Christianity: A Book of Readings*, ed. Andrew Linzey and Tom Regan, 93. London: SPCK.
- Stone, Lawson. 1999. "The Soul: Possession, Part, or Person? The Genesis of Human Nature in Genesis 2:7." In *What about the Soul?: Neuroscience and Christian Anthropology*, ed. Joel Green, 47–61. Nashville, TN: Abingdon Press.
- Theophilus. 2007. "To Autolytus." In *The Ante-Nicene Fathers: The Writings of the Fathers Down to A.D. 325: Fathers of the Second Century—Hermas, Tatian, Theophilus, Athenagoras, Clement of Alexandria*, ed. Alexander Roberts and Sir James Donaldson. New York: Cosimo.
- Waldau, Paul. 2002. *The Spectre of Speciesism: Buddhist and Christian Views of Animals*. Oxford: Oxford University Press.
- Watanabe, Shigeru, and Ludwig Huber. 2006. "Animal Logics: Decisions in the Absence of Human Language." *Animal Cognition* 9:235–45.
- Weber, Bruce. 2013. "Complex Systems Dynamics in Evolution and Emergent Processes." In *Beyond Mechanism: Putting Life Back Into Biology*, ed. Brian G. Henning and Adam Scarfe, 67–74. Lanham, MD: Lexington Books.
- West-Eberhard, Mary Jane. 2003. *Developmental Plasticity and Evolution*. New York: Oxford University Press.
- Williams, Patricia. 2008. "How Evil Entered the World: An Exploration Through Deep Time." In *The Evolution of Evil*, ed. Gaymond Bennett, Martinez J. Hewlett, Ted Peters, and Robert John Russell, 203–17. Göttingen: Vandenhoeck and Ruprecht.
- Wong, Kate. 2005. "Brainy Bees Think Abstractly." *Scientific American*, 1347–55.
- Vermeij, Geerat. 1987. *Evolution and Escalation: An Ecological History of Life*. Princeton, NJ: Princeton University Press.