DARWIN, SOCIAL THEORY, AND THE SOCIOLOGY OF SCIENTIFIC KNOWLEDGE

by Nancey Murphy

Abstract. This essay considers ways in which Darwin's account of natural processes was influenced by economic, ethical, and natural-theological theories in his own day. It argues that the Anabaptist concept of "the gospel of all creatures" calls into question alliances between evolutionary theory and social policy that are based on the dominance of conflictual images such as "the survival of the fittest" and questions the negative images of both nature and God that Darwinism has been taken to sponsor. The essay also considers developments in biology that have called into question dualist accounts of human nature as body and soul, thus reminding us that we are fully a part of the natural world and thus contributing, in turn, to a better theological grasp of God's relation to nature.

Keywords: Charles Darwin; Thomas Malthus; nonreductive physicalism; religion and science; social Darwinism.

It is somewhat ironic that my work should be profiled in *Zygon,* since I never intended to contribute to the field of theology and science. My original interest was the philosophy of science. However, I decided near the end of my doctoral program to change fields, because I judged that I did not know enough about science itself to make a significant contribution there. Instead I chose to work in philosophy of religion and studied theology at the Graduate Theological Union in Berkeley with the expectation that I would then be able to speak authoritatively on that subject. I encountered two scholars there who have had a great impact on my intellectual journey. One was Robert J. Russell, founder of the Center for Theology and the Natural Sciences. He invited me to participate in the

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Center's work, and I have been doing so for the past seventeen years—my limited knowledge of science notwithstanding.

The other significant influence was James William McClendon Jr. McClendon was then professor of theology at the Church Divinity School of the Pacific and was assigned as my doctoral advisor. He later resigned that role so we could be married. Much of what I know about theology and church history I have learned from him. In particular, he introduced me to the tradition of the radical reformation. This tradition appealed to me because of its pacifism, which is but a part of its generally this-worldly understanding of Christianity. That is, if one asks what Christianity is basically all about, a variety of short answers is possible: forgiveness of sin and eternal life; liberation of the oppressed; authentic human existence. A radical or Anabaptist answer is nicely summed up in the motto of the Church of the Brethren: "continuing the work of Jesus, peacefully, simply, together." This is not to deny the forgiveness of sins and the afterlife; it includes working for the liberation of the oppressed; it gives one's life meaning. But none of these is the focus of radical-reformation church life.

A pressing question for me has been what these two scholarly interests have to do with one another. Does the science-theology dialogue have anything to offer to radical-reformation theology? Does the radical tradition contribute anything unique to the theology-science dialogue? This is the question George Ellis and I set out to answer in our book, *On the Moral Nature of the Universe: Theology, Cosmology, and Ethics* (Murphy and Ellis 1996; see also Murphy 1997b). The book focused on what we call Cosmology (with a capital *C*), meaning an attempt to give an account of reality as a whole. (It has been suggested that a suitable title would have been "All about Everything.") We claimed that *morality* is an important aspect of reality, and therefore no account of science and religion that leaves it out can be adequate. We went on to argue in favor of a particular *kenotic* ethic—one that sees the purpose of human life to be the imitation of the self-giving character of God. This kenotic ethic includes the radical reformation's emphasis on self-renunciation as opposed to violent self-defense.

This article represents a further step toward bringing a radical-reformation perspective into dialogue with science. It was written as a chapter to be included in the third volume of James McClendon's systematic theology, a volume on theology and culture written from the perspective of the radical reformation (McClendon in press; see also McClendon 1986 and 1994). I argue here that there has been a complex interaction among Darwinian theory, Christianity, and social ethics. While it is well known that ethical views have been (and continue to be) derived from evolutionary biology, what is not always appreciated is the extent to which Darwin's account of natural processes was a *product* of the economic, ethical, and natural-theological theories of his own day. My claim, further, is that the Anabaptist concept of "the gospel of all creatures" calls into question alli-

ances between evolutionary theory and social policy that are based on the dominance of conflictual images such as the struggle for existence and the survival of the fittest. On that basis I question the negative images of both nature and God that Darwinism has been taken to sponsor. And, as it turns out, biologists themselves have moved toward a more "pacifist" account of the natural world.

This paper embodies a philosophical standpoint shared by McClendon and myself, namely, that all intellectual work—even natural science—is done from a convictional location (see McClendon and Smith 1994). It illustrates Paul Feyerabend's claim that such convictional plurality is not all bad (Feyerabend 1975): from this minority (Anabaptist, pacifist) perspective, facts show up that have gone unnoticed from the dominant perspective.

Thus, I present a theological critique of science and its worldly alliances. However, this critique needs to be balanced by the general point that as a means of searching for truth, science is one way to fulfill a divine mandate. To illustrate this point I close the essay by reflecting on one of the many ways in which scientific developments have called Christians back to a more authentic understanding of their own teachings: developments in biology (both evolutionary biology and, more recently, neurobiology) have called into question dualist accounts of human nature as body and soul, thus reminding us that we are fully a part of the natural world and thus contributing, in turn, to a better theological grasp of God's relation to nature.

To explain why it is appropriate to publish this article here is to respond to the editor's request "to reflect on what one has achieved and what one's intentions are" regarding the religion-science interface. I would describe my concerns with respect to the science-theology dialogue under three headings. The first is the cross-fertilization between theology-and-science and the radical tradition, as already described. The second is the closely related emphasis on ethics.

My third concern is to explore and perhaps promote a two-way interaction between theology and science. That is, we are well acquainted with episodes in which theology has changed under the impact of scientific developments. But I am inclined to expect theology to have a reciprocal impact on science. I expect this on the basis of two theses, one theological and the other epistemological. My theological thesis has to do with the very nature of theology. I take it that theology is about the whole of reality, not just human religious awareness. Thus, theology is in a position to contribute to our knowledge of the natural world. I have attempted to buttress this position by means of my work on the epistemological status of theology. It is well and good to claim (as the critical realists do) that theology provides knowledge of reality. But this is nothing but an assertion without an investigation of the means by which theology's claims are

justified. My earlier contribution to the science-theology dialogue took the form of an argument, based on current philosophy of science, to the effect that theology is epistemologically comparable to science (see Murphy 1990).

My second reason for expecting theology to contribute to science is based on an appreciation for the sociology of science (I am especially indebted to the work of David Bloor [1976] 1991). Knowledge in general—and science in particular—has been described as a "web" of beliefs (Quine 1951). I have suggested that a more illuminating model is knowledge as a crossword puzzle (Murphy 1989). In science the clues come from observation and experiment; the crossing of the words represents the need for one theory to be consistent with others. A third element of the analogy is the language that is used for solving the puzzle. In an American newspaper, answers are supposed to be in English unless otherwise specified. In a somewhat similar manner, science makes use of a common language or conceptual scheme shared with the rest of culture. Thomas Kuhn and other philosophers of science have made us aware that scientific revolutions involve a change in the language and concepts available as the raw materials for scientific thinking. To revert again to the image of knowledge as a web or net, culturally available conceptual resources provide the materials from which the web can be woven.

Thus, a full account of the development of science needs to include the sociology of science, which considers the cultural sources of the raw materials that go into scientific theories. I show here that Darwin's culture was pervaded by materials from William Paley's natural theology, as well as from the population theory of Thomas Malthus—the latter tainted by its use in justifying the suffering and further oppression of the poor. I find it appalling that so many of my fellow Christians have squandered their moral capital attacking evolutionary biologists for doing their proper job—explaining biological processes—while ignoring the blatant conflicts between social Darwinism and the social program of Jesus. Here we are back to the three-way interaction among theology, science, and ethics.

The last section of this essay, on neuroscience, theories of human nature, and theology, represents an agenda for the future. This essay and the one that precedes it (Murphy 1999; see pp. 551–71 in this volume) represent work in progress; this work, in turn, represents a broad agenda for the future, namely, to appropriate resources from contemporary Anglo-American philosophy for furthering theology-science discussions. In this instance I borrow concepts from contemporary philosophy of mind to help clarify theological and scientific accounts of the nature of the human person. An important change in philosophy itself in the past generation makes it a more congenial discussion partner: this is the softening of disciplinary boundaries between philosophy and science—between the conceptual and the empirical. Thus, I can say that my agenda for the future is not merely

to promote a three-way discussion but to bring contemporary analytic philosophy into the mix as well (for some moves in this direction, see Murphy 1997a).

Economics, Darwin, and Social Policy

This section explores some of the complex interrelationships among Darwinian theory, economic and political theories of Darwin's day, and natural theology. It is common to consider the effect of evolutionary biology on both theology and social theories. More recent history concentrates as well on the dependence of Darwin's thought on both natural theology and economic theory, especially the economic theory of Thomas Malthus.

Darwin's Revolution. To perceive what was central to Darwin's "revolution" it is useful to note how many of his ideas were not new. The long age of the earth was already widely accepted, largely because of developments in geology. The idea that species can be transformed from one into another was proposed in ancient times and was given credence in Darwin's day by the fossil evidence of continuous change through geological ages. The idea that life could arise from inorganic matter was widespread in the Middle Ages (Dobzhansky, Ayala, Stebbins, and Valentine 1977, 9–12). It had even been proposed earlier that the human species must have evolved from other life forms under the governance of natural laws. In short, by the end of the eighteenth century and the beginning of the nineteenth, speculation on organic evolution, though not commonplace or widely accepted, was no longer particularly novel (Ruse 1979, 4f.). Two earlier evolutionists were Darwin's grandfather, Erasmus Darwin, and Jean Baptiste de Lamarck. Darwin had formulated his theory by 1844, but he went to press only in 1859, spurred by the discovery that Alfred Russel Wallace had arrived at nearly the same conclusions. Darwin wrote in a letter to Baden Powell in 1860:

> No educated person, not even the most ignorant, could suppose that I meant to arrogate to myself the origination of the doctrine that species had not been independently created. The only novelty in my work is the attempt to explain how species became modified, & to a certain extent how the theory of descent explains certain large classes of facts, & in these respects I received no assistance from my predecessors. (in Young 1985, 81)

Darwin's major contribution, then, was to postulate a viable mechanism for evolutionary change. Lamarck's theory had been based on a flawed account of the means of heredity. Lamarck believed that living organisms adapted themselves to their environments and that these adaptive changes could be passed along to their offspring. Darwin's own theory is encapsulated in the title of his book, *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life* ([1859] 1963). Darwin's mechanism was selective preservation of randomly occurring

variations among members of a species. The theory depended in part on an analogy between natural selection and the intentional selection breeders make in improving domestic livestock. Breeders make use of naturally occurring variations among individuals of a species and create population changes by breeding only those individuals that display the desired characteristics. A second source of evidence for Darwin was his observations made on the *Beagle* that showed significant differences between populations in isolated geographical regions. He also was influenced by the fossil evidence recorded, for example, in Charles Lyell's *Principles of Geology* (1830–33), and by evidence from comparative anatomy and embryology. So there was ample evidence of variation within populations, of change, and of continuity among species. The question was simply what *caused* the change if not the intentional selection of a breeder. The answer was natural selection by means of the survival of the fittest.

Our interest here is not with the scientific evidence for Darwin's theory but with the question of the sources of Darwin's language: "natural selection," "struggle for existence," and "survival of the fittest." A large role was played by Darwin's reading of Thomas R. Malthus, *An Essay on the Principle of Population* ([1798] 1970). But an important context for this reading was the natural theology Darwin had studied earlier in preparation for the ministry.

William Paley's *Natural Theology* (1802) was at that time the standard work. Paley argued that, just as a watch evidently must have a maker, so must there have been a Maker for biological organisms. He compiled massive amounts of data regarding the adaptation of organisms to their environments and the fitness of their organs to serve biological purposes. Paley was particularly interested in the bones and muscles of animals and the equivalent parts of insects, because their fitting together and effective operation best conformed to the analogy with mechanical design. He also gave great attention to the eye, claiming that the remarkable combination of its parts and their adaptation to function as an instrument of sight was alone sufficient to convince one of the existence of the divine intelligence that created it. Paley also drew conclusions about the character of the Creator. God's goodness was shown both by the fact that most contrivances are beneficial and by the fact that animals have been designed to feel pleasure.

Against the background of this optimistic view of the benignity of God and nature, Malthus's *Essay* appeared. Here Malthus proposed his principle of population: if unchecked, population will increase geometrically, but food supply can increase only arithmetically at best. Struggle, competition, and starvation are the natural result. The first edition was written against currently popular utopian views of the infinite perfectibility of the human race, transcending, through the use of reason, the limits of organic nature. Such writings "affronted Malthus's sense of reality" (Young 1985,

25). Against these writings Malthus provided an essential change in perspective, placing humankind squarely within nature once and for all.

Malthus was an Anglican clergyman writing, as was Paley, within the eighteenth-century heritage of natural theology. His book therefore represented a statement not only on the place of humankind in nature but also on the *divinely appointed* role of struggle, strife, and inequality. His work was a theodicy of sorts, justifying suffering and death as the natural outcome of the tendency toward overpopulation, but also as the result of divine providence, in that evil produces exertion, exertion produces mind, and mind produces progress. Because humans are sinful, inert, sluggish, and averse to labor, "had population and food increased in the same ratio, it is probable that man might never have emerged from the savage state" (quoted in Young 1985, 29). The one "happy" note in Malthus's views was that sexual restraint could provide an antidote to human overpopulation.

So Darwin set out on the *Beagle* expecting to find evidence of the adaptation of organisms to their environments, and he was not disappointed. Was divine design required to account for it? No. Adaptations could be accounted for as the result of two factors: variation and selective rates of reproduction. The selection would be the natural outcome of population pressure. Darwin came to the conclusion that selection was the principle of change from the study of domesticated productions; and then, reading Malthus, he saw how to extend this principle to the natural world: animals breed without "the moral restraint which in some small degree checks the increase in mankind" (Darwin 1844; quoted in Young 1985, 41). Therefore, "the pressure is always ready . . . a thousand wedges are being forced into the economy of nature. . . . The final cause of all this wedging, must be to sort out proper structure, and adapt it to change" (Darwin's notes, quoted in Young 1985, 41f.).

This newly found ability to account for biological facts in terms of laws of nature would have been no challenge, in itself, to Christian theology. In the wake of Newton's physics, many educated Christians had already concluded that a God who governs by natural law, not by "meddling," is a grander God. What Darwin, influenced by Malthus, produced, though, was a new perspective—a worldview changed from one of harmony to a scene of struggle and discord (Ospovat 1981, 60). Malthus's theory, now bolstered by Darwin's authority, came to dominate the perception of the *mood* of nature and society, and has done so up to the present (Young 1985, 192). The image of Paley's "myriads of happy beings" was replaced by Alfred Lord Tennyson's image of "nature red in tooth and claw." Thomas Henry Huxley wrote that "from the point of view of the moralist, the animal world is on about the same level as a gladiator's show" (quoted in Himmelfarb 1959, 404f.). Huxley went on to draw theological conclusions, condemning Christians for worshiping what was plainly unworthy of worship: a God who created evil and a humanity that was itself evil. "I

know no study which is so unutterably saddening as that of the evolution of humanity," he said. Humankind had acquired its leading position within nature by virtue of success in the struggle for existence and had excelled over the ape and the tiger in just those qualities that are commonly associated with these animals—cunning, ruthlessness, and ferocity. Pain and grief, crime and sin, remain to remind humans of their origins (Himmelfarb 1959, 405).

Another of Darwin's contemporaries, George Romanes, vacillated between theism and skepticism. Would a merciful God have instigated such a tortuous, wasteful, bloodstained scheme? Romanes drew a poignant contrast between the personality of the deity as inferred from evolutionary biology and the qualities of love, mercy, and justice as proclaimed in religion. The two sets of qualities, he wrote with a sense of despair, were almost exact opposites (Brooke 1991, 316).

Darwin's Loaded Language. What accounts for the powerful cultural ramifications of Darwin's scientific achievements? The answer is that Darwin had drawn the language of his theory from his cultural context. That language was ideologically loaded in such a way as to color scientists' perceptions of nature. Not surprisingly, the resulting perception of nature was particularly effective in reinforcing cultural movements from which the language was originally drawn. I contend that Darwin's readers were primed to find in his account of nature a one-sided picture. In psychologists' terms, the cultural context provided a mental set likely to influence their readings. It is also important to ask if this same culturally induced expectation might have influenced scientists' own perceptions of nature, leading to a readiness to perceive conflict rather than cooperation, suffering rather than symbiosis. I turn to this issue below.

There are three crucial phrases in Darwin's account: "struggle for existence," "survival of the fittest," and "natural selection." The first two of these are conflictual in their connotations. Struggle in nature was not merely against the conditions of the organism's environment but also against other individuals of the same species and against members of other species. Darwin introduced the phrase "survival of the fittest" only in later editions of the *Origin*. "Fitness" referred to comparative rates of reproduction—the most fit are the ones that leave behind the most offspring—and he was careful to avoid attaching any other values to the term. But "fitness" was unlikely to be read as the neutral, technical term Darwin intended when paired with the conflictual image of struggle and when associated in the minds of his readers with issues of government or private support for the lower classes.

Whereas the Malthusian context of Darwin's revolution predisposed him and his followers to perceive a natural world "red in tooth and claw," the Paleyan context predisposed his readers to attribute this terrible state of

affairs to God. "Natural selection" is the most important term in Darwin's theory. It is a figure of speech, pairing terms whose literal meanings are mutually contradictory. The tension in the metaphor lies in its depiction of selection in nature as if it were by choice; selection presupposes a selector—a conscious agent doing the choosing. Yet, since the seventeenth century, the canons of scientific method had banned purposes, intentions, and anthropomorphic expressions from descriptions of nature.

Nevertheless, anthropomorphic and voluntarist descriptions of natural selection occur throughout Darwin's writings. It is not the anthropomorphism, however, that raises theological difficulties. Rather it is the attribution of selective power to nature combined with the tendency to speak of Nature, with a capital *N*. Darwin attempted to dismiss these readings:

> It has been said that I speak of natural selection as an active power or Deity; but who objects to an author speaking of the attraction of gravity as ruling the movements of the planets? Every one knows what is meant and is implied by such metaphorical expressions; and they are almost necessary for brevity. So again it is difficult to avoid personifying the word Nature; but I mean by Nature, only the aggregate action and product of many natural laws, and by laws the sequence of events as ascertained by us. With a little familiarity such superficial objections will be forgotten. (quoted in Young 1985, 96)

Darwin's last sentence turned out to be wrong, and this was for very good reasons. Although he had freed himself from belief in static, designed adaptations, which he had once found so appealing in Paley's writings, Darwin retained the *rhetoric* of design (Young 1985, 97).

The power of metaphors based on science to change a worldview is widely recognized. Newtonian physics provided the seventeenth century with the clockwork image of the universe, and the eighteenth-century Deists' image of God the Clockmaker lasted through the writings of Paley. In evolutionary biology, metaphors are not excess baggage to be left behind or carried by choice; as we have seen, the metaphor of natural selection and the image of the struggle for existence are part and parcel of Darwin's explanation of the mechanism of evolutionary change. Metaphors provide insight; they encourage us to see one system or aspect of reality in terms of another and thus highlight factors we might not otherwise have noticed. In addition, they carry a wealth of connotative meaning. So here we have at least a partial account of the power of Darwin's scientific theory to induce a new cultural mood regarding nature, society, and God.

If Malthus, Paley, Darwin, Lyell, Wallace, and others were part of a single debate (Young 1985, 24) it should come as no surprise that Darwin's science was cited as the source of what is most commonly labeled "social Darwinism." Malthus's own work was in the tradition of Adam Smith's laissez-faire economics. Smith participated in a movement to extend the concept of design through natural law from the natural world to the social order (Milbank 1990, 38). In *The Wealth of Nations* (1776) Smith argued

that the pursuit of self-interest will contribute to the general welfare because a "hidden hand" has providentially made it so. Smith's contemporaries already used such views of the providential ordering of society for the purposes of theodicy—at one stroke justifying both God's providence and human misery. Soame Jemyns had even argued that crime had an important social function (Milbank 1990, 38).

The difference between eighteenth-century political-economic views and those after Malthus is the loss of optimism. The limits placed on economic growth by the limits of food production meant that the growing population of urban poor was seen in terms of surplus mouths rather than as an economically beneficial surplus of labor. Thus, Malthus and his followers argued that relief to the poor should be restricted, since it only postponed the collapse of those who could not support themselves. Malthus argued that a law should be passed such that no child born from any marriage taking place more than a year after the law was passed should be entitled to parish assistance (Young 1985, 38). After Malthus, it was not uncommon for theologians to take up the cause. Thomas Chalmers, professor of divinity at the University of Edinburgh, emphasized the necessity of moral restraint (especially sexual restraint) if the poor were to avoid the miseries to which this principle of population would lead. The necessary connection between moral weakness and misery was a reflection of the very character of God:

> It is not the lesson of conscience, that God would, under the mere impulse of parental fondness for the creatures whom He had made, let down the high state and sovereignty which belong to Him; or that He would forbear the infliction of the penalty, because of any soft or timid shrinking from the pain it would give the objects of His displeasure. . . . [W]hen one looks to the disease and the agony of spirit, and above all the hideous and unsparing death, with its painful struggles and gloomy forebodings, which are spread universally over the face of the earth—we cannot but imagine of the God who presides over such an economy, that He is not a being who will falter from the imposition of any severity, which might serve the objects of a high administration. (Chalmers 1833, 292f.)

What role, then, does Darwin's own work play in the development of "social Darwinism"? Historian of science Robert Young argues that whereas the justification for the hierarchical division of labor in society was justified on the combined bases of divine ordinance and efficiency in the writings of Adam Smith, Paley, and Malthus, it acquired a new basis in the course of the nineteenth century. Now the basis of social stratification among rich and poor

> . . . changes from a theological theodicy to a biological one in which the so-called physiological division of labor provides a scientific guarantee of the rightness of the property and work relations of industrial society. . . .
>
> The famous controversy in the nineteenth century between science and theology was very heated indeed, and scholars have concentrated on this level of analysis. However, at another level, the protagonists in the debate were in fundamental

> agreement. They were fighting over the best ways of rationalizing the same set of assumptions about the existing order. An explicitly theological theodicy was being challenged by a secular one based on biological conceptions and the fundamental assumption of the uniformity of nature. (Young 1985, 191)

It is important to note that while Darwin's work was used to support laissez-faire economics and politics, with their justifications for the pursuit of self-interest and the disproportionate accumulation of wealth in the hands of the few, Darwinism was used at the same time to argue for the whole gamut of social programs—including the opposites or contraries of laissez-faire, both liberalism and socialism.

The ability of Darwin's theory to lend itself to a multiplicity of causes was due in part to tensions in his exposition that could be resolved in different directions. His account of human kinship with animals carried a humbling, egalitarian message, whereas the emphasis on development tended to promote a hierarchical view with "European man" at the apex. While his theory valued biological diversity, it also accorded value to compliance, in the sense that an organism had to conform to the demands of its environment. There was optimism in that natural selection invariably worked for the good of the species, but also pessimism in that nature was inevitably riven with struggle and strife (Brooke 1991, 289).

The position that is most commonly designated as social Darwinism was justified by exploiting the optimism in Darwin's exposition as regards the prosperous while using the pessimistic strand to justify the suffering of the "unfit." However, political liberals were among the first to use Darwin as a justification of their policies. They attacked the remaining areas of social and political privilege of the British aristocracy on the grounds that awarding status for reasons of birth rather than achievement protected the idle and unproductive and thus interfered with the evolutionary process. Walter Bagehot defended liberal democracy by emphasizing cultural rather than individual selection. The Darwinian theme of variation shows up in his emphasis on social variation—that is, modifications in forms of government, institutions, morality—and only societies with intellectual freedom would give rise to these variations. This emphasis on variation, however, is in tension with the theme of compliance, which shows up in his theory that the society most coherent in its customs would be superior (Jones 1980, 42; Himmelfarb 1959, 428).

Socialism has been called the third form of social Darwinism. The appeal of Darwin's theory to Marx and Engels was based on the fact that Darwin had abandoned traditional theological conceptions of teleology and transformed the history of life into one of the interplay of unconscious forces. This notion of unconscious forces in biology fit nicely with their views of the unconscious forces of history. However, Engels criticized the conclusion of earlier social Darwinists that poverty was an inevitable consequence of the struggle for existence by pointing out the circularity

involved in projecting Malthusian principles onto nature and then reversing the projection from nature to history (Brooke 1991, 293).

The eugenics movement was Francis Galton's program for raising the physical and mental level of the race. This program was based on two propositions: first, that desirable human qualities were unequally distributed throughout the race, and second, that those who had the desirable qualities could be encouraged to multiply faster than the others. Galton claimed that eugenics was practical Darwinism. However, his theory was in sharp tension with Darwin's: for eugenicists, the problem as they perceived it was that the "unfit" (the poor, especially) were leaving the most progeny; yet in Darwin's own theory the most "fit" are exactly those who leave the most progeny.

The fact that Darwinism has proven to be equally useful for supporting opposing social programs suggests that arguments for any one such program should be regarded with suspicion. Indeed, while ethics must take account of the facts of biology, no attempt to *derive* ethics from biology alone can hope to succeed (cf. McClendon 1986). Apart from an account of what human life (and the rest of life) is *for*—its *telos*—we have no interpreter's key to decipher the meaning of nature. For an account of nature's telos we must turn to theology (Murphy and Ellis 1996; Murphy 1997a, chaps. 9–10).

Critical Questions

The foregoing account of the entanglements of evolutionary biology, social policy debates, and natural theology raises a variety of questions. Some might inquire whether the exposure of the ideological rootage of Darwin's language should cast doubt on the credibility of his theory. A crude version of the sociology of knowledge would answer Yes. However, more sophisticated understandings of the relations between scientific theories and the social matrices out of which they emerge lead to a refusal to oppose truth and social utility. Early work in the sociology of scientific knowledge supposed that it is necessary to distinguish on epistemological grounds between true and false theories, between rational and irrational inferences. Causal (external) explanations are needed to explain irrationality and the tenacity of false beliefs, but logic, rationality, and truth serve as their own (internal) explanations.

It is now recognized, though, that all scientific knowledge is underdetermined. We see this in the case of sensory perception. Perceptions do not lead directly to belief; rather they impinge on a mind already stocked with beliefs and interact with those beliefs to form new beliefs (Bloor [1976] 1991, 31). Philosophers of science have made it clear that no amount of evidence ever amounts to proof of a scientific theory. There are usually competing theories in any field, each with a good amount of confirming

evidence to its credit and a handful of persistent anomalies to its discredit. Even when one theory is clearly ahead in the contest, it can never be known in advance that the loser will not someday be turned around by a genius with a brilliant insight, or that some undreamed-of theory might not be proposed in its place (Murphy 1990, chap. 3). So attention to so-called internal factors (empirical evidence, consistency, scope) never completely answers the questions of why a scientific theory has been accepted, and especially why it became the accepted theory when it did. Thus, sociological accounts are complementary to "internalist" accounts, not rivals.

Because all science—good science as well as bad—is in this measure underdetermined and partial, the falsification of Darwinian theory is not entailed by the recognition that its origins and transformations were the result not so much of an interaction *between* the scientist and nature as *among* the scientist, nature, and socially constructed conceptions of nature. Nature exists independently of human consciousness, but an exclusively contemplative relation to nature is out of the question. "It is in our practical behavior—encountering, suffering, struggling, laboring, and cooperating—that we come to know ourselves, one another, and things" (Young 1985, 241).

So while recognition of the social conditioning of Darwin's theory is no reason to reject it, recognition of the negative mood of the cultural milieu in which Darwin worked calls for a degree of suspicion. We need here to ask the following questions: (1) Does the conflictual language in which Darwin expressed his theory in any way prejudice or distort scientists' observations of nature itself? and (2) What corrections are needed in what have been taken to be the theological implications of evolutionary biology?

Good-natured Nature? The image of nature "red in tooth and claw" was not an adequate account of Darwin's own perceptions. Besides the "battle of life" of one organism against another, Darwin recognized additional, non-conflictual elements in the mechanisms driving the evolutionary process. One was "sexual selection," which refers to competition within the species for mates. This sometimes involves conflict, such as between male elk, but it sometimes involves only differences in appearance, such as tail displays of male peacocks.

The Russian naturalist and anarchist Petr Kropotkin recognized that in Darwin's *Descent of Man* (1871) the term "struggle for existence" was used broadly to include the evolution of social and moral faculties as well as the everyday battle for survival against the environment. He set out to elaborate these insights in depth and came to view sociality, rather than life-and-death struggle between individuals, as typifying the animal world (Heyer 1982, 156).

Textbook accounts of evolution have long been expressed in much less loaded language than were the theories of Darwin and Wallace. Natural

selection is defined simply as the differential reproduction of alternative genetic variants, that is, as higher rates of reproduction for individuals with certain useful characteristics. Commenting on the uses of Darwin's theory to justify war, aggression, classism, and unrestrained economic competition, the great synthesizer of evolutionary and genetic theory Theodosius Dobzhansky, with his coauthors, points out that in nature the struggle for life does not necessarily take the form of combat between individuals. Among higher animals combat is often ritualized, and victory may be achieved without inflicting physical harm. Plants "struggle" against aridity not by sucking water from one another but by developing devices to protect against water loss. Thus, "it is no paradox to say that under many circumstances the most effective 'struggle' for life is mutual help and cooperation" (Dobzhansky, Ayala, Stebbins, and Valentine 1977, 98).

In fact, "altruism" among animals has become an important topic of research. "Altruism" here means any behavior that puts the individual at risk or disadvantage but favors the survival of other members of its species, such as a bird's warning call when predators approach. This is not altruism in a moral sense, of course, but it is a far cry from the old image of intraspecific conflict.

A recent book by ethologist Frans de Waal, *Good Natured* (1996), nicely illustrates current reactions against images of nature that overemphasize conflict:

> In biology, the very same principle of natural selection that mercilessly plays off life forms and individuals against one another has led to symbiosis and mutualism among different organisms, to sensitivity of one individual to the needs of another, and to joint action toward a common goal. We are facing the profound paradox that genetic self-advancement at the expense of others—which is the basic thrust of evolution—has given rise to remarkable capacities for caring and sympathy. (1996, 5)

De Waal is convinced that Malthusian influences have biased scientists' perceptions of animal behavior. In the minds of many, he says, natural selection has become synonymous with open, unrestrained competition. This raises the question of how such a harsh principle could ever explain the concern for others and the benevolence that humans display. Thus, there has developed the subdiscipline of sociobiology—the study of animal (and human) behavior in an evolutionary perspective. The core explanation of altruistic behavior is kin selection. It is hypothesized that behavior patterns favoring the survival of kin, even at cost to the individual, could have been selected because the survival of kin results in the survival of close approximations to the individual's genes. So, for example, if an individual animal possesses a gene that predisposes it to bring food to its offspring, this will contribute to the survival of the offspring, who are likely to carry the same gene, and as a result that gene will spread. So sociobiologists such as Richard Dawkins find themselves explaining apparently altruistic

behavior as a result of the operation of "selfish genes." De Waal sees this paradox (selfish altruism) as the result of an unfortunate refusal to countenance genuine sympathy and care in the natural world; he attributes it to the influence of the nineteenth-century clergyman and economist Thomas Malthus and his principle of population.

De Waal notes that even the language used by most ethologists to describe animal behavior is negatively biased:

> . . . as a corollary to the belief in a natural world red in tooth and claw, there remains tremendous resistance, both inside and outside biology, to a terminology acknowledging beauty in the beast. . . . The current scientific literature routinely depicts animals as suckers, grudgers, and cheaters, who act spitefully, greedily, and murderously.

Yet, if animals show tolerance or altruism, these terms are placed in quotation marks lest their author be judged hopelessly romantic or naive. Alternatively, positive inclinations are given negative labels, such as when preferential treatment for kin is called not love for kin but nepotism (de Waal 1996, 18).

De Waal is careful not to go to the other extreme of providing romantic characterizations of animals. He shows due caution in asking whether terms used to describe desirable human traits can legitimately be applied to similar traits in animals, asking, for example, if animals should be described as displaying "sympathy," or merely "caring behavior." His wealth of descriptions of animal behavior, drawn from his own and others' observations, includes a series of increasingly complex abilities that go into caring behavior. The most basic is mutual attachment, which occurs among pack animals, such as wolves, and sea mammals, such as dolphins and whales, who will beach themselves collectively out of reluctance to leave a disoriented group mate. He reports a striking example of attachment observed in a dwarf mongoose colony.

> A British ethologist, Anne Rasa, followed the final days of a low-ranking adult male dying of chronic kidney disease. The male lived in a captive group consisting of a pair and its offspring. Two adjustments took place. First, the sick male was allowed to eat much earlier in the rank order than previously. . . . Second, the rest of the group changed from sleeping on elevated objects, such as boxes, to sleeping on the floor once the sick male had lost the ability to climb onto the boxes. They stayed in contact with him, grooming him much more than usual. After the male's death, the group slept with the cadaver until its decay made removal necessary. (de Waal 1996, 80)

Another element involved in caring behavior is emotional contagion—vicarious arousal by the emotions of others. Human babies display this trait—crying at the sound of another's cries—and so do a variety of animals. When infant rhesus monkeys scream, other infants rush to them to make physical contact.

The example of the mongoose above illustrates yet another element of caring behavior: learned adjustment to others' disabilities. A further example is the case of Azalea, a rhesus monkey born with a condition comparable to Down's syndrome in humans. She was slow to learn climbing and jumping and also slow in social development. Her troupe adjusted to her handicaps; for example, an elder sister carried her long beyond the age for such sisterly care, often pulled her out of physical entanglements, and defended her against attacks by other monkeys (1996, 49).

Finally, de Waal gives examples of caring behavior among higher primates. Chimpanzees excel at "so-called *consolation*." For example, after a fight, bystanders hug and touch the combatants, pat them on the back, and groom them. It is interesting that their attentions focus more on the losers than the winners. If such behavior does not occur quickly enough, loser chimpanzees resort to a repertoire of gestures—pouting, whimpering, begging with outstretched hands—so that the others will provide the needed calming contact.

In some cases animals act as if they recognize what their caring means to the other:

> The Arnhem chimpanzees spend the winters indoors. Each morning, after cleaning the hall and before releasing the colony, the keeper hoses out all the rubber tires in the enclosure and hangs them one by one on a horizontal log extending from the climbing frame. One day Krom was interested in a tire in which the water had been retained. Unfortunately, this particular tire was at the end of the row, with six or more heavy tires hanging in front of it. Krom pulled and pulled at the one she wanted but could not move it off the log. . . . Krom worked in vain on this problem for over ten minutes, ignored by everyone except Otto Adang, my successor in Arnhem, and Jakie, a seven-year-old male chimpanzee to whom Krom used to be the "aunt" (a caretaker other than the mother) when he was younger.
>
> Immediately after Krom gave up and walked away from the scene Jakie approached. Without hesitation he pushed the tires off the log one by one, as any sensible chimpanzee would. . . . When he reached the last tire, he carefully removed it so that no water was lost and carried the tire straight to his aunt, where he placed it upright in front of her. (1996, 83)

So is nature better captured in Paley's "myriads of happy beings" or in Tennyson's "red in tooth and claw"? Obviously both are natural, and the picture is complex: the same animals that comfort one another and share food also cooperate in hunting and killing prey. De Waal points out that animals that share food tend to do it when the foodstuff is highly valued, prone to decay, too much for individual consumption, procured by skill or strength, and most effectively procured through collaboration—in short, the food most likely to be shared is meat killed in a hunt. He speculates that this tendency, shaped among social animals by evolutionary necessity, creates a predisposition among humans for sharing. While a natural tendency among animals to share food is not equivalent to human generosity, human morals cannot be entirely independent of our evolutionary past:

> Of our own design are neither the tools of morality nor the basic needs and desires that form the substance with which it works. Natural tendencies may not amount to moral imperatives, but they do figure in our decision-making. Thus, while some [human] moral rules reinforce species-typical predispositions and others suppress them, none blithely ignore them. (de Waal 1996, 39; cf. McClendon 1986, chap. 3)

This point aptly illustrates de Waal's "profound paradox," noted above, that genetic self-advancement at the expense of others has given rise to remarkable capacities for caring and sympathy. He concludes:

> If carnivory was indeed the catalyst for the evolution of sharing, it is hard to escape the conclusion that human morality is steeped in animal blood. When we give money to begging strangers, ship food to starving people, or vote for measures that benefit the poor, we follow impulses shaped since the time our ancestors began to cluster around meat possessors. (de Waal 1996, 146)

An Anabaptist Theology of Nature. If both Paley's and Tennyson's accounts of the biological world have turned out to be simplistic, perhaps the account of God associated with each is equally simplistic—both Paley's benevolent designer and Chalmers's sovereign God who will not "falter from the imposition of any severity, which might serve the objects of a high administration." In this section I pursue an image of God both more complex and more Christian than either of these alternatives. I hope to show that it is consistent with, even if not entailed by, the more complex and balanced accounts of nature presented by recent biologists such as de Waal. To show this it may be helpful to review the summary of Christian narrative introduced in McClendon's *Ethics* (1986).

The Christian story tells of a God who is the very Ground of Adventure, the Weaver of society's web, the Holy Source of nature in its concreteness—the one and only God, who, when time began, began to be God for a world that in its orderly constitution finally came by divine will and choice to include also ourselves. We human beings, having our natural frame and basis (in the evolutionary process), with our own (it seemed our own) penchant for community, and (it seemed) our own hankerings after adventure, found ourselves, before long, in trouble. Our very adventurousness led us astray; our drive to cohesion fostered monstrous imperial alternatives to the adventure and sociality of the Way God had intended, while our continuity with nature became an excuse to despise ourselves and whatever was the cause of us. We sinned. In loving concern God set among us, by every means infinite wisdom could propose, the foundations of a new human society; in patience God sent messengers to recall the people of the Way to their way; in the first bright glimmers of opportunity he sent himself, incognito, without splendor and fanfare, the Maker amid the things made, the fundamental Weaver as if a single fiber, the Ground of Adventure risking everything in this adventure. His purpose, sheer love; his means, pure faith; his promise, unquenchable hope. In that love he

lived a life of love; by that faith he died a faithful death; from that death he rose to fructify hope for the people of the Way, newly gathered, newly equipped (1986, 147).

Here risk, adventure, and suffering unto death are ineliminable parts of the story, not only the divine risk and suffering on behalf of humankind but as the intended model for all human faithfulness. In radical-reformation thought the suffering of Christians is seen not so often as punishment for sin but as costly participation with Christ in the likely consequences of such obedience to God in the midst of a sinful world. Anabaptist leader Hans Hut proclaimed "the Gospel of Christ crucified, how He suffered for our sake and was obedient to the Father even unto death. In the same way we should walk after Christ, suffering for his sake all that is laid upon us, even unto death." It is interesting to note that several Anabaptist writers extended this account of human suffering to include "the gospel of all creatures." Hut himself taught that the suffering of animals and the destruction of other living things conforms to the pattern of redemption through suffering, and in its own way preaches the gospel of Christ crucified (quotations from Armour 1966, 78–82).

Chapter 4 of McClendon's *Doctrine* (1994) describes creation itself as travail. The theme of God's own struggle in creation is found in Old Testament and New, from Isaiah's likening creation to a woman giving birth (Isaiah 42:5,14) to the claim that the suffering Messiah is the very one through whom all things came into being. Paul, in Romans, asserts that the Christian's sufferings are but a part of the groaning of the whole created universe in all its parts (8:22) and all of this is associated with the labor of God to bring forth something "we do not yet see" (8:25; cf. McClendon 1994, 160–76).

Philosopher of religion Holmes Rolston, III has developed similar insights with particular reference to the suffering inherent in the evolutionary process. Rolston emphasizes our continuity with the rest of the biological world and at the same time reconciles the suffering in nature with a Christian concept of God. Both in the life Christians are called to live as followers of Jesus and in the biological realm there is an analogy with the self-sacrificing character of God. The key to his interpretation of nature is his recognition that God identifies not with the predator but with the prey. I quote his beautiful prose at length.

> The Earth is a divine creation and scene of providence. The whole natural history is somehow contained in God, God's doing, and that includes even suffering, which, if it is difficult to say simply that it is immediately from God, is not ultimately outside of God's plan and redemptive control. God absorbs suffering and transforms it into goodness. . . . [N]ature is . . . cruciform. The world is not a paradise of hedonistic ease, but a theater where life is learned and earned by labor, a drama where even the evils drive us to make sense of things. Life is advanced not only by thought and action, but by suffering, not only by logic but by pathos. . . . This pathetic element in nature is seen in faith to be at the deepest logical level the

pathos in God. God is not in a simple way the Benevolent Architect, but is rather the Suffering Redeemer. The whole of the earthen metabolism needs to be understood as having this character. The God met in physics as the divine wellspring from which matter-energy bubbles up . . . is in biology the suffering and resurrecting power that redeems life out of chaos. . . .

The secret of life is seen now to lie not so much in the heredity molecules, not so much in natural selection and the survival of the fittest, not so much in life's informational, cybernetic learning. The secret of life is that it is a passion play. Things perish in tragedy. The religions knew that full well, before biology arose to reconfirm it. But things perish with a passing over in which the sacrificed individual also flows in the river of life. Each of the suffering creatures is delivered over as an innocent sacrificed to preserve a line, a blood sacrifice perishing that others may live. We have a kind of "slaughter of the innocents," a nonmoral, naturalistic harbinger of the slaughter of the innocents at the birth of the Christ, all perhaps vignettes hinting of the innocent lamb slain from the foundation of the world. They share the labor of the divinity. In their lives, beautiful, tragic, and perpetually incomplete, they speak for God; they prophesy as they participate in the divine pathos. All have "borne our griefs and carried our sorrows."

The abundant life that Jesus exemplifies and offers to his disciples is that of a sacrificial suffering through to something higher. There is something divine about the power to suffer through to something higher. The Spirit of God is the genius that makes alive, that redeems life from its evils. The cruciform creation is, in the end, deiform, godly, just because of this element of struggle, not in spite of it. There is a great divine "yes" hidden behind and within every "no" of crushing nature. God, who is the lure toward rationality and sentience in the upcurrents of the biological pyramid, is also the compassionate lure in, with, and under all purchasing of life at the cost of sacrifice. God rescues from suffering, but the Judeo-Christian faith never teaches that God eschews suffering in the achievement of the divine purposes. To the contrary, seen in the paradigm of the cross, God too suffers, not less than his creatures, in order to gain for his creatures a more abundant life. (Rolston 1994, 218–20 passim)

So here in the writings of Hut, McClendon, and Rolston is an account of the moral character of a God who participates with creatures in a world where suffering is inevitable, and who brings good out of evil in all imaginable ways—even creating the capacity for sharing in the midst of "carnivory." My central thesis here is that biology not only is a potential shaper of theology but in fact has been shaped by the alliance between the (misguided) natural theology of Darwin's day and Malthusian justifications for the suffering of the poor. Here, very briefly, is an alternative view of God and of God's relation to those who suffer, a view that more nearly reflects the gospel of Jesus Christ than does Chalmers's (merely) sovereign God. Happily, it can be shown as well to better reflect the character of the biological world as it has come to be known in our own day. If Rolston's account of God was shaped by biologists' accounts of nature, it is not farfetched to say that some current biologists' views of nature have been shaped by theology as well; de Waal's critique of sociobiology is in a section whose title is "Calvinist Sociobiology," and he speculates that the dark mood in which nature has been perceived since Darwin's day goes back not only to

Malthus but, before him, to (certain Dutch) Calvinist doctrines of original sin (de Waal 1996, 17).

Embodied Selfhood

McClendon suggested in *Ethics* that one reason why the biblical standpoint has become difficult to grasp in our day is that while the *embodied* character of human life was assumed by the biblical writers, it has lost its self-evidence in intervening centuries. A long history of dualism in Christian thought has often allowed Christians to leave out of account the drives, needs, capacities—and delights—of organic existence; in extreme cases the body has been seen as the enemy of the spirit. This alienation from our own embodied selfhood has been accompanied by a denigration of the organic and natural world of which we are a part. McClendon described our latter-day difficulty this way: "we simply do not believe that the God we know will have to do with *things*. Yet this biblical materialism is the very fiber of which the first strand of ethics is formed" (1986, 91). This section will review some of the ways in which developments in biology point contemporary Christians back to an appreciation of the body and of the materialism of the Bible.

Darwin and Dualism. Already in Darwin's day the theory of evolution raised the possibility that humanity and all its works, including society and culture, could be explained in purely biological terms. If so, free will and responsibility seemed to be in jeopardy. To protect the dignity of humans, many relied on the mind-body (or body-soul) dualism that had been employed since the rise of modern physics to attempt to exempt human freedom and intelligence from the blind determination of natural laws. It became a common strategy among Christians to reconcile theological and biological accounts of human nature by granting that the human *body* may well have evolved from animals but insisting that human distinctiveness is a function of the *soul*, specially created by God.

The origin of the modern concept of the soul is complex. It was common fifty years ago to count body-soul dualism as the Greek view and to distinguish it from the physicalist and holist view of the Bible (or at least the Old Testament). Later Christian accounts of human nature were certainly influenced by a variety of Greek philosophical views. A modified Platonic account of body and soul predominated from Augustine until the High Middle Ages, when the reintroduction of Aristotelian thought provided a much different competitor. Aristotelians saw the soul as the immanent form of the body, and because the soul is the life principle, animals and plants as well as humans must have their own appropriate sorts of souls.

Modern views of body and soul owe as much to René Descartes as to Plato. Early modern physics rejected Aristotelian hylomorphism in favor

of a view of matter more closely akin to Democritus's atomism. Galileo and his followers developed from this atomist conception of matter a purely mechanical view of the natural world. Descartes accepted this picture of nature: animals, he believed, were automata, and so were human bodies. In addition, though, to account for human freedom and intellect, he devised an account of soul or mind that was closer to Plato's account than to Aristotle's. (Note that while *mind* and *soul* have different connotations today, the terms can be used interchangeably with regard to Descartes's views.) Descartes defined the mind as "thinking substance." Along with this very significant shift in conceptions of the relation of mind and matter, Descartes's account also represents a shift regarding the human attributes or capacities that were attributed to soul and body. For Thomas Aquinas, the human soul accounts for the rational faculties of intellect and will, but also for sensation, emotion, and appetites. Descartes considered sensations and passions to be "emotions of the soul," yet he believed them to be caused by the body. Since Descartes, then, accounts of mind have focused on the cognitive capacities, whereas emotions have been judged an interference in the intellectual life.

It may have been reasonable in Darwin's day to imagine that there was some point in evolutionary history when the first human body was conceived, and that God began at that point to create human souls. That is, humans were said to have evolved from apes, and it made sense to assume that humans had souls but (post-Descartes) apes did not. (However, this image cannot be pressed too far: was this first human infant borne by a soulless ape?) Current accounts of the evolution of humans make this notion of "soul insertion" even less plausible.

We can now trace human origins to an extinct common ancestor of both humans and apes, a creature that lived 5 to 7 million years ago (Mya). Between then and now there have been a variety of hominid species. The first known hominid, *Ardipithecus ramidus*, lived 4.4 Mya, but it is not clear whether it is in the direct line of descent to modern humans. Those known to be our ancestors include *Australopithecus anamensis*, *Australopithecus afarensis*, *Homo habilis*, and *Homo erectus*. Other hominids not in the direct line of descent to modern humans (*Homo sapiens*) include *Australopithecus africanus, Paranthropus aethiopicus, Paranthropus boisei,* and *Paranthropus robustus*. Between 3 and 1 Mya, three or four hominid species lived contemporaneously in the African continent. More recently, Neanderthal hominids, with brains as large as ours, lived contemporaneously (approximately 100,000 to 40,000 years ago) with modern humans (Ayala in Brown, Murphy, and Malony 1998, 33). The burial practices and cave drawings of Neanderthals are often taken to show religious awareness.

So did all hominids have souls, or only those in the direct line of descent of *Homo sapiens*? What about the Neanderthals? Or was it only modern

humans? The very oddity of these questions may lead to a suspicion that evolution and dualism are odd bedfellows.

Neuroscience. It is said that Darwin completed the Copernican revolution, bringing living things within the purview of the natural sciences (Ayala in Russell, Ayala, and Stoeger 1998, 101). If this is the case, then one might add that contemporary neuroscience is now completing the Darwinian revolution, bringing the mind within the purview of biology. In short, all of the human capacities once attributed to the immaterial mind or soul are now yielding to the insights of neurobiology. The development of new brain-imaging techniques, along with new techniques for computer modeling of cognitive processes, has made the 1990s the "decade of the brain."

One of the most elaborate and perceptive accounts of the functions of the soul was that of Thomas Aquinas. He followed Aristotle in recognizing three levels of functioning: that which we share with both animals and plants, that which we share only with the animals, and that which is distinctive of humans. The faculties attributed to the lowest aspect of the soul—nutrition, growth, and reproduction—have long fallen within the sphere of biological explanation.

A number of the faculties we share with animals have also been understood biologically for some time: locomotion and sense perception. In addition to the five external senses, Thomas postulated four "interior senses." One of these is the sensory imagination (*phantasia*). It is now possible to study visual imagination using positron emission tomography (PET), which shows the level of activity in various regions of the brain by recording the amount of blood flow. These scans show that during an exercise in visual imagination the visual cortex is active, but not to the same extent as when the visual object is actually present. Another of Thomas's interior senses was the capacity to collate the inputs from the various external senses in order to associate them with the same object (*sensus communis*). This is now studied by neuroscientists as the "binding problem." The third of Thomas's interior senses was the ability to judge something as friendly or unfriendly, useful or useless (*vis aestimativa*). One instance of this faculty in humans is the ability to recognize others' emotions. Although it has not been possible to determine the exact regions of the brain involved, some victims of strokes or tumors do lose this capacity.

The fourth of Thomas's interior senses is the ability to conserve memories of friend or foe, of what has given pleasure and what has caused injury (*vis memorativa*). Neuroscientists now distinguish at least a dozen memory systems, and brain structures have been associated with many of them. The sort of memory Thomas refers to here is an aspect of episodic memory, and it has been shown that such memories cannot be formed without the part of the brain called the hippocampus. We also share with animals the

sensitive appetite, that is, the ability to be attracted to the objects of sensation, such as food or mates. Neuroscience has made contributions here as well, for instance in beginning to understand the role of neurotransmitters (the chemicals that conduct electrical impulses in the brain) in producing feelings of hunger or satiation. The emotions, according to Thomas, are a product of both the *vis aestimativa* and the sensory appetite. Emotions, too, are now known to be mediated by physical processes, with the involvement of neurotransmitters.

Among the rational faculties, distinctive of humans, Thomas distinguished the active and passive intellects. The passive intellect is another sort of memory, closely resembling what current neuroscientists call declarative memory, and this has been found to be dependent on the medial temporal lobe of the brain. Active intellect is responsible for abstracting concepts from sensory experience and for reasoning and judging. These latter capacities are less well understood in neurobiological terms. However, they all involve the use of language, and language use and acquisition are an important area of current study. Two regions of the brain, Wernicke's area and Broca's area, have long been known to be involved in language. Language memory involves a variety of regions; selective damage due to strokes or tumors shows that access to common nouns, proper names, verbs, and even color terms depends on separate regions. Furthermore, syntactic and semantic capacities depend on different regions of the brain.

The third of Thomas's rational faculties was the will. This he defined as the capacity to be attracted to goods of a nonsensory sort. Along with intellect, the will is the seat of moral capacities. Furthermore, because God is the ultimate good, the will also accounts for the capacity to be attracted to God. Neuroscience now contributes to our understanding of both morality and religious experience. Antonio Damasio has studied the neural processes that go into practical reasoning, that is, the ability to make both moral and prudential judgments. In his book *Descartes' Error* (1994), he reports the case of a nineteenth-century railway worker, Phineas Gage, whose brain was pierced by a metal rod. Gage recovered physically, and his cognitive functions (attention, perception, memory, reasoning, language) were all intact. Yet he suffered a dramatic character change after the accident. The doctor who treated him noted that he had become "fitful, irreverent, indulging at times in the grossest profanity which was not previously his custom, manifesting but little deference for his fellows, impatient of restraint or advice when it conflicts with his desires, at times pertinaciously obstinate, yet capricious and vacillating, devising many plans of future operation, which are no sooner arranged than they are abandoned" (quoted by Damasio 1994, 8). Damasio's wife Hanna was able to determine from the damage to Gage's skull exactly which parts of the brain would have been destroyed in the accident—selected areas of his prefrontal cortices. Damasio concludes from this and other similar cases that this area of the

brain is "concerned specifically with unique human properties, among them the ability to anticipate the future and plan accordingly within a complex social environment; the sense of responsibility toward the self and others; and the ability to orchestrate one's survival deliberately, at the command of one's free will" (Damasio 1994, 10). In short, what Thomas described as the "appetite for the good" appears to depend directly on localizable brain functions.

A number of neuroscientists have begun to study the role of the brain in religious experience. For example, patients with temporal lobe epilepsy often develop strong interests in religion, and this has led to speculation that the temporal lobes are involved in certain sorts of normal religious experiences as well.

What are we to make of all this? It is important to note that no such accumulation of data can ever amount to a proof that there is no nonmaterial mind or soul in addition to the body. But if we recall that the soul was originally introduced into Western thought not from Hebraic Scripture but as an *explanation* for capacities that appeared not to be explainable in biological terms, then we can certainly say that for scientific purposes the hypothesis has been shown to be unnecessary.

A second caution is in order. It would be easy at this point to fall into the reductionist's error of claiming that morality or religious experience is *nothing but* a brain process. However, the fact that acting according to an ethical principle requires the participation of brain circuitry, Damasio points out, does not cheapen the ethical principle. The edifice of ethics does not collapse (Damasio 1994, xiv). Furthermore,

> To discover that a particular feeling [including any feeling involved in responding to God] depends on activity in a number of specific brain systems interacting with a number of body organs does not diminish the status of that feeling as a human phenomenon. Neither anguish nor the elation that love or art can bring about [is] devalued by understanding some of the myriad biological processes that make them what they are. Precisely the opposite should be true: Our sense of wonder should increase before the intricate mechanisms that make such magic possible. (1994, xvi)

The point, then, of this survey of scientific findings bearing on human nature, from both evolutionary biology and current neuroscience, is to see the way they point Western Christians back to what is now widely recognized as a more biblical view of the human race—one that recognizes that, as is the case for the other animals, God formed humans from the dust of the ground. In English we lose the Hebrew pun in calling the first human *adam* because he is formed from *adamah*, dust or ground (Genesis 2:7). We can recapture the imagery if we think of ourselves as *humans*, made from *humus*. In the Genesis stories of creation the only clear difference between the human animal and the others is that "this creature is *addressed* by the creator." And again, "Our life as Christians *is* our life as organic constituents of the crust of this planet" (McClendon 1986, 93, 89).

One might ask why this recognition of our physicality is important from a gospel perspective. One reason has been spelled out at length in McClendon's *Ethics* (1986): no account of Christian morality that neglects our embodied selfhood can do justice to gospel ethics. A second reason is spelled out in McClendon's *Doctrine* (1994): it is impossible to do justice to God's relation to the natural world without an appreciation of humans' role in nature. The whole of modern theology has suffered from a tendency toward the anthropocentric. Whereas earlier generations had perceived a *living* universe in which spirit and matter were closely intertwined, not only in plants and animals but in stars, mountains, and rivers, the scientists of the seventeenth century, as we have seen, adopted a *mechanical* model of the universe. This not only created problems for theologians in understanding human nature but also affected their accounts of the role of God in nature. Many modern theologians relegated nature to the realm of the secular. According to Rudolf Bultmann, nature is an object, entirely governed by natural laws; the religious value of creation is strictly limited because the authentic dependence and freedom that humans can feel must face not nature, but God only. Ironically, while the architects of this anthropocentric doctrine of creation believed they were protecting faith from alien elements, the unhappy outcome was the banishing of God from nature (McClendon 1994, 151).

Yet this separation of humankind from its organic family can legitimately be maintained, after Darwin, only by associating our essential humanness with something other than the body, and, as shown above, it is becoming increasingly difficult to conceive of what this other element might be. All of the functions originally assigned to the immaterial soul or mind are now clearly bodily functions. And this conclusion is not to be lamented: when humans are seen as part and parcel of nature, then and only then can communion with God be seen as the *telos* of the whole evolutionary (and cosmic) process, and nature's trials, too, can be taken up into divine reconciliation. "Creation, the whole of it, has a goal, and that goal lies in God" (McClendon 1994, 149).

Jesuit theologian Edward Oakes speaks of humans as the "priests of the universe." Humans' ability "to offer thanks to God recapitulates and makes conscious the praise the universe already makes for its own being, as the Psalmist implicitly (Psalm 148), and Paul explicitly (Romans 8:18–27), recognized" (Oakes 1998).

Praise the LORD from the heavens;
praise him in the heights above . . .
Praise him, sun and moon;
praise him, all you shining stars! . . .
Praise the LORD from the earth . . .
all mountains and hills,
all fruit trees and cedars;

Wild animals and all cattle,
creeping creatures and winged birds.
Let kings and all commoners,
princes and rulers over the whole earth,
Youths and girls,
old and young together,
Let them praise the name of the LORD . . .
Praise the LORD! (Psalm 148 REB)

CONCLUSION

Science is a "powerful practice" (cf. McClendon 1986, chap. 6). It is a socially established cooperative human activity with its own appropriate goals and standards of excellence. Science at its best not only aims at its own internal goods but also fulfills a divine mandate to seek truth. The human creature is special in God's creation because it alone is addressed by the Creator and is able to know, albeit dimly, the character of that Creator. Scientists, from Kepler to contemporary physicist Paul Davies, have understood science as a means of discovering the mind of God (Davies 1992).

Yet social practices, like all human activity, are capable of falling short of the glory of God. Science is not immune from the impulses that distort human goods of all sorts. We have seen how self-interested attempts to justify rather than combat poverty influenced Darwin's culture and Darwin's science as well. But we also have seen how scientific practice itself can work to correct such distortions. Thus, no simple account of science in conflict with Christianity is appropriate—or even possible.

But neither can theology be insulated from science, or vice versa. Sometimes science calls theology to account, as in its potential criticisms of theology distorted by the related tendencies toward dualism and anthropomorphism. Sometimes theology raises critical questions for science, as we have done in seeking the source of Darwinism's negative view of nature. Always the gospel must call the whole of human culture to account when it loses sight of the lordship of Christ in the social realm.

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