



Charles Darwin: Friend or Foe?

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Arthur Peacocke is a science-savvy theologian who, like a number of Christian theologians of various denominations, has developed an evolutionary theology of creation. In a book dedicated to the evolution/theology discourse, Peacocke titled his contribution “Biological Evolution: A Positive Appraisal” and quoted, as his epigraph, Aubrey Moore’s famous statement of 1891: “Darwinism appeared, and under the guise of a foe, did the work of a friend. It has conferred upon philosophy and religion an inestimable benefit, by shewing us that we must choose between two alternatives. Either God is everywhere present in nature, or He is nowhere.”¹ Two points are made by Peacocke, one negative as it were, the other positive. The first point concerns the opposition to, or at best reluctant acceptance of, evolution by Christian theologians, which needs urgently to be corrected. The credibility and even the viability of Christian theology, Peacocke asserts, are at stake:

[W]hat I find even more surprising, and less understandable, is the way in which the “disguised friend” of Darwinism, and more generally of evolutionary ideas, has been admitted (if at all) only grudgingly...into the parlors of Christian theology. I believe it is vital for this churlishness to be rectified...if the

¹Aubrey Moore, “The Christian Doctrine of God,” in *Lux Mundi: A Series of Studies in the Religion of the Incarnation* (New York: John W. Lovell, 1889) 73. Cited by Arthur R. Peacocke, “Biological Evolution: A Positive Appraisal,” in *Evolutionary and Molecular Biology: Scientific Perspectives on Divine Action*, ed. Robert John Russell, William R. Stoeger, and Francisco J. Ayala (Vatican City State: Vatican Observatory Press, and Berkeley, CA: Center for Theology and the Natural Sciences, 1998) 357–376.

Far from being theology’s foe, natural selection becomes its friend by removing from the shoulders of believers the burden imposed by the notion that the design of organisms, including their flaws and failures, with all the concomitant pain and suffering, must be attributed to the immediate agency of the Creator.

Christian religion (indeed any religion) is to be believable and have intellectual integrity.²

The second point is Peacocke's conviction that evolution has changed how God's creation and presence in the world need to be assessed, leading to a continuous engagement of God in the creative process: "Any static conception of the way in which God sustains and holds the cosmos in being is therefore precluded, for new entities, structures, and processes appear in the course of time, so that God's action as Creator is both past and present: it is continuous."³ Creation should not be seen as an event of the past: "The traditional notion of God *sustaining* the world in its general order and structure now has to be enriched by a dynamic and creative dimension."⁴

Peacocke uses a musical analogy that is particularly illuminating while seeking to understand the participation of the evolutionary process in God's creative action: "The model of musical composition for God's activity in creation is...particularly helpful here. There is no doubt of the 'transcendence' of the composer in relation to the music he or she creates—the composer gives it existence and without the composer it would not be at all." But the music, the composer's creation, is being played by the musicians. Peacocke refers to a Beethoven composition as it is being played: "[I]f anyone were to ask at that moment, 'Where is Beethoven now?'—we could only reply that Beethoven-*qua*-composer was to be found only in the music itself."⁵

DARWIN'S GIFT

In my recent book, *Darwin's Gift to Science and Religion*, I sought to convey a similar message, namely, that science and religious faith need not be in contradiction.⁶ If they are properly understood, they *cannot* be in contradiction because science and religion concern different matters. Science concerns the processes that account for the natural world: how the planets move, the composition of matter and the atmosphere, the origin and function of organisms. Religion concerns the meaning and purpose of the world and of human life, the proper relation of people to their Creator and to each other, the moral values that inspire and govern people's lives.

The proper relationship between science and religion can be, in my view, mutually motivating and inspiring. Science may inspire religious beliefs and religious behavior, as we respond with awe to the immensity of the universe, the wondrous

²Peacocke, "Biological Evolution," 358.

³Ibid., 359.

⁴Ibid. Peacocke's italics.

⁵Ibid., 360.

⁶Francisco J. Ayala, *Darwin's Gift to Science and Religion* (Washington, DC: Joseph Henry, 2007). Material in this section of the present essay closely parallels the preface to my book, and other sections similarly sometimes borrow from the book.

diversity of organisms, and the marvels of the human brain and the human mind. Religion promotes reverence for the creation, for humankind as well as the environment. Religion may be a motivating force and source of inspiration for scientific research and may move scientists to investigate the marvelous world of the creation and to solve the puzzles with which it confronts us.

In this essay, I will belabor two points addressed to people of faith. The first point is that science is here to stay. No matter what flaws or unknowns religious believers may see in scientific knowledge, science will continue its relentless advance toward solving the puzzles of the world of nature. The condemnation of Galileo by the Catholic Church in the seventeenth century did not bring astronomy to a halt. Rather, we marvel at the immensity of our galaxy and the myriad galaxies beyond. Those who see fault with the theory of evolution may seek to keep it out of the school curriculum or to belittle its accomplishments, but the thousands of scientists who in hundreds of universities and other institutions pursue evolutionary research will persist in their endeavors and continue the advance of knowledge. Universities, foundations, and governments will continue investing millions of dollars in evolutionary research, and thousands of research papers will continue being published yearly in scientific journals.

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My second point may come as a surprise to people of faith and scientists alike. I assert that scientific knowledge, the theory of evolution in particular, is consistent with a religious belief in God, whereas creationism and intelligent design are not. This point depends on a particular view of God—shared by many people of faith—as omniscient, omnipotent, and benevolent. This point also depends on our knowledge of the natural world and, particularly, of the living world. The natural world abounds in catastrophes, disasters, imperfections, dysfunctions, suffering, and cruelty. Tsunamis bring destruction and death; volcanic eruptions erased Pompeii and Herculaneum, killing all their citizens; floods and droughts bring ruin to farmers. The human jaw is poorly designed, lions devour their prey, malaria parasites kill millions of humans every year and make 500 million sick. I do not attribute all this misery, cruelty, and destruction to the specific design of the Creator. About 20 percent of all human pregnancies end in spontaneous abortion during the first two months. That is 20 million natural abortions every year. The proponents of intelligent design implicitly attribute this calamity to the Creator's faulty design. I rather see it as a consequence of the clumsy ways of the evolutionary process. The God of revelation and faith is a God of love and mercy and wisdom. Consequently, I argue in *Darwin's Gift* that Darwin's theory of evolution is a gift to science, and to religion as well.

SCIENCE AND RELIGION

The notion that science and religious beliefs need not be in contradiction has a long Christian tradition that extends from the time of Augustine in the fourth century (and even earlier) to Pope John Paul II and other religious authorities of the present. It seems to me unfortunate that there are many believers in the United States and elsewhere who think that science, particularly the theory of evolution, is contrary to the teachings of the Bible and to religious beliefs, such as creation by God.

Science has demonstrated again and again, beyond reasonable doubt, that living organisms evolve and diversify over time and that their features have come about by natural selection, a process that accounts for their “design.” We may accept this scientific knowledge without denying the existence of God or God’s presence in the universe and all natural phenomena. Science can neither endorse nor reject religious beliefs. Conversely, we should not interpret the Bible as an authoritative textbook on astronomy, geology, or biology.

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According to Augustine (354–430), in his commentary on the book of Genesis, Christians should not seek to settle scientific matters with sacred Scripture: “Such subjects are of no profit for those who seek beatitude....In the matter of the shape of heaven, the sacred writers did not wish to teach men facts that could be of no avail for their salvation.”⁷ Augustine added: “If it happens that the authority of Sacred Scripture is set in opposition to clear and certain reasoning, this must mean that the person who interprets Scripture does not understand it correctly.”⁸

Thomas Aquinas (1224–1274), following a long Christian tradition that extends back at least to Augustine, distinguished two sources of knowledge: reason and divine revelation. The incarnation and the Trinity are theological truths that can only be known through revelation. By means of experience and logical reasoning, human beings can acquire valid knowledge and construct a science of the natural world. In public disputations at the University of Paris, Thomas famously argued that rational truth and revelation cannot be incompatible. Contradictions can only be apparent as a result of erroneous interpretation of Scripture or faulty reasoning.

Similarly, Pope John Paul II wrote: “The Bible itself speaks to us of the origin

⁷Augustine, *The Literal Meaning of Genesis (De Genesi ad Litteram)*, book 2, chap. 9, translated and annotated, John Hammond Taylor (New York: Newman Press, 1982) 58–59.

⁸Ibid.

of the universe and its make-up, not in order to provide us with a scientific treatise but in order to state the correct relationships of man with God and the universe.” Moreover, “sacred Scripture wishes simply to declare that the world was created by God, and in order to teach this truth it expresses itself *in the terms of the cosmology in use at the time of the writer.*”⁹

The Clergy Letter Project, signed by more than 10,000 Christian clergy members, makes the same point:

We the undersigned, Christian clergy from many different traditions, believe that the timeless truths of the Bible and the discoveries of modern science may comfortably coexist. We believe that the theory of evolution is a foundational scientific truth, one that has stood up to rigorous scrutiny and upon which much of human knowledge and achievement rests. To reject this truth or to treat it as “one theory among others” is to deliberately embrace scientific ignorance and transmit such ignorance to our children. We believe that among God’s good gifts are human minds capable of critical thought and that the failure to fully employ this gift is a rejection of the will of our Creator....We ask that science remain science and that religion remain religion, two very different, but complementary, forms of truth.¹⁰

INTELLIGENT DESIGN (ID)

The “argument-from-design” has a long history in Christianity, from Augustine through Thomas Aquinas to William Paley, who at the start of the nineteenth century argued that the eye and other adaptive features of organisms evince that they have been designed by an omniscient Creator.

William Paley’s *Natural Theology; or, Evidences of the Existence and Attributes of the Deity*, published in 1802, is a sustained argument-from-design, claiming that the living world provides compelling evidence of being designed by an omniscient and omnipotent Creator. Paley’s keystone claim is this: “There cannot be design without a designer; contrivance, without a contriver; order, without choice; ...means suitable to an end, and executing their office in accomplishing that end, without the end ever having been contemplated.”¹¹ Paley elaborated the argument-from-design with greater cogency and more extensive knowledge of biological detail than has ever been employed by any other author, before or since. Paley brings in all sorts of biological knowledge, from the geographic distribution of species to the interactions between predators and their prey, the interactions between the sexes, the camel’s stomach and the woodpecker’s tongue, the compound eyes of insects, and the spider’s web. *Natural Theology* has chapters dedicated to the complex design of the human eye; to the human frame, which displays a precise mechanical arrangement of bones, cartilage, and joints; to the circulation of the

⁹*Voices for Evolution*, ed. Molleen Matsumura (Berkeley, CA: National Center for Science Education, 1995) 97 (emphasis added). The volume contains a large collection of statements in support of evolution made by scientific, religious, educational, and civil liberties organizations.

¹⁰“The Clergy Letter Project,” <http://www.theclergyletterproject.net> (accessed 11 November 2008).

¹¹William Paley, *Natural Theology* (New York: American Tract Society, n.d.) 15–16.

blood and the disposition of blood vessels; to the comparative anatomy of humans and animals; to the digestive system, kidneys, urethra, and bladder; to the wings of birds and the fins of fish; and much more.

For 352 pages, *Natural Theology* conveys Paley's expertise: extensive and accurate biological knowledge, as detailed and precise as it was available in the year 1800. After detailing the precise organization and exquisite functionality of each biological object or process, Paley draws again and again the same conclusion, that only an Omniscient and Omnipotent Deity could account for these marvels of mechanical perfection, purpose, and functionality, and for the enormous diversity of inventions that they entail.

The argument-from-design was revived in the 1990s by several authors.¹² The call for an intelligent designer is predicated by ID proponents on the existence of irreducible complexity in organisms. An irreducibly complex system is defined by Behe as being "composed of several well-matched, interacting parts that contribute to the basic function, wherein the removal of any one of the parts causes the system to effectively cease functioning."¹³ Intelligent-design proponents have argued that irreducibly complex systems cannot be the outcome of evolution.

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According to Behe, "Since natural selection can only choose systems that are already working, then if a biological system cannot be produced gradually it would have to arise as an integrated unit, in one fell swoop, for natural selection to have anything to act on."¹⁴ In other words, unless all parts of the eye come simultaneously into existence, the eye cannot function; it does not benefit a precursor organism to have just a retina, or a lens, if the other parts are lacking. The human eye, according to this argument, could not have evolved one small step at a time, in the piecemeal manner by which natural selection works.

But evolutionists have pointed out, again and again, with supporting evidence, that organs and other components of living beings are not irreducibly complex. Evolutionists have shown that the organs and systems claimed by intelligent design theorists to be irreducibly complex—such as the eye or the bacterial flagellum (see below)—are not irreducible at all; rather, less complex versions of the same systems can be found in today's organisms.

The human eye did not appear suddenly in all its present complexity. Its for-

¹²William Dembski, *The Design Inference: Eliminating Chance through Small Probabilities* (Cambridge, UK: Cambridge University Press, 1998); Michael Behe, *Darwin's Black Box: The Biochemical Challenge to Evolution* (New York: The Free Press, 1996); Phillip Johnson, *The Wedge of Truth: Splitting the Foundations of Naturalism* (Downers Grove, IL: InterVarsity Press, 2000).

¹³Behe, *Darwin's Black Box*, 39.

¹⁴Ibid.

mation required the integration of many genetic units, each improving the performance of preexisting, functionally less perfect eyes. About 700 million years ago, the ancestors of today's vertebrates already had light-sensitive organs. Mere perception of light and, later, various levels of vision were beneficial to these organisms living in environments pervaded by sunlight. Different kinds of eyes, which exhibit a full range of complexities and patterns, have independently evolved at least forty times in animals. Sunlight is a pervasive feature of earth's environment; it is not surprising that organs have evolved that take advantage of it.

Some animals exhibit simple light-sensitive spots on their epidermis, as in the case of limpets. Further steps—deposition of pigment around the spot, configuration of cells into a cuplike shape, thickening of the epidermis leading to the development of a lens, development of muscles to move the eyes and nerves to transmit optical signals to the brain—gradually led to the highly developed eyes of vertebrates and cephalopods (octopuses and squids) and to the compound eyes of insects.

The gradual process of natural selection, adapting organs to functions, occurs in a variety of ways, reflecting the haphazard component of evolution due to mutation, past history, and the vagaries of environments. In some cases the changes of an organ amount to a shift of function, as in the evolution of the forelimbs of vertebrates, originally adapted for walking, which are used in birds for flying, in whales for swimming, and in humans for handling objects. Other cases, as the evolution of eyes, exemplify gradual advancement of the same function—such as seeing. In all cases, however, the process is impelled by natural selection's favoring through time individuals exhibiting functional advantages over others of the same species.

A favorite example of alleged irreducible complexity is the bacterial flagellum. The bacterial flagellum is, according to Behe, irreducibly complex because it consists of several parts so that, if any part is missing, the flagellum will not function. It could not, therefore, says Behe, have evolved gradually, one part at a time, because the function belongs to the whole, the separate parts cannot function by themselves. "Because the bacterial flagellum is necessarily composed of at least three parts—a paddle, a rotor, and a motor—it is irreducibly complex."¹⁵

But scientists have shown that in different species of bacteria there are different kinds of flagella, some simpler than the one described by Behe, others just different. Biochemists have shown that some flagellum components have evolved from secretory systems, which are very similar to the flagellum but lack some of the flagellum's components. The flagellum described by Behe has essentially the same structure as type-III secretory systems, although these lack the motor protein.

NATURAL SELECTION

Charles Darwin (1809–1882) occupies an exalted place in the history of West-

¹⁵Ibid., 72.

ern thought, deservedly receiving credit for the theory of evolution. In *On the Origin of Species*, published in 1859, he accumulated evidence demonstrating the evolution of organisms. But accumulating evidence for common descent with diversification was a subsidiary objective of Darwin's masterpiece. Darwin's *Origin of Species* is, first and foremost, a sustained effort to solve William Paley's conundrum of how to account scientifically for the design of organisms, but also for their imperfections, dysfunctions, oddities, and cruelties.

This is how Darwin summarizes the process of natural selection:

Can it, then, be thought improbable, seeing that variations useful to man have undoubtedly occurred, that other variations useful in some way to each being in the great and complex battle of life, should sometimes occur in the course of thousands of generations? If such do occur, can we doubt (remembering that more individuals are born than can possibly survive) that individuals having any advantage, however slight, over others, would have the best chance of surviving and of procreating their kind? On the other hand, we may feel sure that any variation in the least degree injurious would be rigidly destroyed. This preservation of favorable variations and the rejection of injurious variations, I call Natural Selection.¹⁶

Darwin addresses the same issues as Paley did: how to account for the adaptive configuration of organisms, the obvious design of their parts to fulfill certain functions. Darwin's argument starts with the existence of adaptive variations ("variations useful in some way to each being"). Experience with animal husbandry and plant breeding had demonstrated to Darwin that variations occur that are "useful" to humankind. So, he reasoned, variations must occur in nature that are favorable or useful in some way to the organisms themselves in the struggle for existence. (Genetics would eventually explain, several decades later, how hereditary variations arise.) Favorable variations are those that increase chances for survival and procreation. The advantageous variations are preserved and multiplied from generation to generation at the expense of less advantageous ones. This is the process of natural selection. The outcomes of the process are organisms that are well adapted to their habitats; evolution occurs as a consequence.

Natural selection, then, can be defined as the "differential reproduction of alternative hereditary variations," but we need to add: "determined by the fact that some variations increase the likelihood that the organisms having them will survive and reproduce more successfully than will organisms carrying alternative variations."

Behind this simple definition there is an enormous amount of knowledge: mathematical, conceptual, and experimental. The definition I have given is comparable to defining the molecular theory of matter by saying that all matter is composed of molecules, or defining plate tectonics as the motion of the continental plates around the earth. Similarly as in these cases, or even more so, there are many

¹⁶Charles Darwin, *On the Origin of Species* (1859; New York: Atheneum, 1967) 80–81.

books and innumerable scientific papers in which the complexities and variations of the process of natural selection are investigated, appropriate mathematical models and equations are developed that account for the process of natural selection, and the results of laboratory experiments and investigations of natural selection in nature are reported.

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Darwin and other nineteenth-century biologists found compelling evidence for biological evolution in the comparative study of living organisms, in their geographic distribution, and in the fossil remains of extinct organisms. Since Darwin's time, the evidence from these sources has become stronger and more comprehensive, while biological disciplines that have emerged recently—genetics, biochemistry, physiology, ecology, animal behavior (ethology), and especially molecular biology—have supplied powerful additional evidence and detailed confirmation. The evidence for evolution is so overwhelming that evolutionists no longer are concerned with obtaining additional evidence to support the fact of evolution but rather are concerned with understanding the details of the process. Nevertheless, evidence for evolution continues to accumulate, even if not directly sought, emerging from all biological disciplines, from genetics to molecular biology and from paleontology to ecology. Among the immensity of new evidence acquired since Darwin's time, it is worth pointing out the discovery of thousands of hominid fossils representing the gradual evolution from nonhuman ancestors to modern humans.

Molecular biology, a discipline that emerged in the second half of the twentieth century, nearly one hundred years after the publication of the *Origin of Species*, has provided the strongest evidence yet of the evolution of organisms. Molecular biology proves evolution in two ways: first, by showing the unity of life in the nature of DNA and the workings of organisms at the level of enzymes and other protein molecules; second, and most important for evolutionists, by making it possible to reconstruct evolutionary relationships that were previously unknown, and to confirm, refine, and time all evolutionary relationships from the universal common ancestor up to all living organisms. The precision with which these events can be reconstructed is one reason why the evidence from molecular biology is so useful to evolutionists and so compelling.

The reconstruction of evolutionary history accomplished with DNA and protein molecules follows the same logic used in comparative anatomy and other traditional methods: the degree of similarity reflects the recency of common ancestry. In paleontology, the time sequence of fossils is determined by the age of the rocks

in which they are embedded. The inferences from comparative anatomy, paleontology, and other disciplines pertaining to evolutionary history can be tested in molecular studies of DNA and proteins by examining the sequences of nucleotides and amino acids. Each of the thousands of genes and thousands of proteins contained in an organism provides an independent test of that organism's evolutionary history. Many thousands of tests have been done (and thousands more are published every year); not one has given evidence contrary to evolution. There is probably no other notion in any field of science that has been as extensively tested and as thoroughly corroborated as the evolutionary origin of living organisms.

CODA

One difficulty with attributing the design of organisms to the Creator is that imperfections and defects pervade the living world. Consider the human eye. The visual nerve fibers in the eye converge to form the optic nerve, which crosses the retina (in order to reach the brain) and thus creates a blind spot, a minor imperfection, but an imperfection of design, nevertheless; squids and octopuses do not have this defect. Did the Designer have greater love for squids than for humans and, thus, exhibit greater care in designing their eyes than ours? Consider now the human jaw. We have too many teeth for the jaw's size, so that wisdom teeth need to be removed and orthodontists can make a decent living straightening the others. Would we want to blame God for this blunder? A human engineer would have done better. Evolution gives a good account of these imperfections.

Religious scholars in the past had struggled with imperfection, dysfunction, and cruelty in the living world, which are difficult to explain if they are the outcome of God's design. The philosopher David Hume set the problem succinctly with brutal directness: "Is he [God] willing to prevent evil, but not able? Then he is impotent. Is he able, but not willing? Then he is malevolent. Is he both able and willing? Whence then evil?"¹⁷ Evolution came to the rescue. As Aubrey Moore put it in 1891, "Darwinism appeared, and, under the guise of a foe, did the work of a friend."¹⁸ The theory of evolution, which at first had seemed to remove the need for God in the world, now has convincingly removed the need to explain the world's imperfections as failed outcomes of God's design.

¹⁷David Hume, *Dialogues Concerning Natural Religion*, ed. N. K. Smith (Oxford: Oxford University Press, 1935) 244. This formulation of the problem of evil in God's world seems to be due to the philosopher of classical Greece, Epicurus (341–270 B.C.). Voltaire in his dictionary article on *Bien* ("Goodness") quotes Epicurus, according to Lactantius: "Either God can remove evil from the world and will not; or being willing to do so, cannot....If he is willing and cannot, he is not omnipotent. If he can but will not, he is not benevolent....If he both wants and can, whence comes evil over the face of the earth?" See François-Marie Arouet de Voltaire, in *The Encyclopedia of Philosophy* (London: Macmillan, 1967) 8:262–270. The eminent evolutionist Dobzhansky wrote: "If the universe was designed to advance toward some state of absolute beauty and goodness, the design was incredibly faulty....Why so many false starts, extinctions, disasters, misery, anguish, and finally the greatest of evils—death? The God of love and mercy could not have planned all this. Any doctrine which regards evolution as predetermined or guided collides head-on with the ineluctable fact of the existence of evil." *The Biology of Ultimate Concern* (New York: New American Library, 1967) 120.

¹⁸Moore, "The Christian Doctrine of God," 73.

Indeed, a major burden was removed from the shoulders of believers when convincing evidence was advanced that the design of organisms need not be attributed to the immediate agency of the Creator, but rather is an outcome of natural processes. If we claim that organisms and their parts have been specifically designed by God, we have to account for the incompetent design of the human jaw, the narrowness of the birth canal, and our poorly designed backbone, less than fittingly suited for walking upright. People of faith would do well to acknowledge Darwin's revolution and accept natural selection as the process that accounts for the design of organisms, as well as for the dysfunctions, oddities, cruelties, and sadism that pervade the world of life. ⊕

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