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Keeping Faith: Evolution and Theology

Since 1859, with the publication of Charles Darwin's *Origin of Species*, biology has increasingly challenged comfortable theological assumptions. Being convinced, however, that evolutionary biology and theology have in common the desire to know truth, we have used Ian Barbour's models of interaction in order to investigate ways in which evolutionary biology and theology conflict, are independent, can be in dialogue, or might even be integrated in light of the quest for truth, goodness, and beauty. In our conversations (one of us is a biologist and the other a theologian), we have sought to uphold scientific rigor and reasoned faith, even though differences in methods and assumptions complicate the effort. In spite of these differences, meaningful conversation can take place between biology and theology if theologians do not question the data of scientific discovery but remain free to question the data's interpretation at the theological level. Likewise, biologists should not restrict themselves to hegemonic and reductionist interpretations which leave little or no room for non-biological reality.

The Biological Framework

Although theology and biology seek to understand truth, the scientific drive for truth focuses on the natural world, gathering evidence, designing hypotheses, and experimenting in order to test truth claims. One of the basic principles of evolution is that individuals within a population are variable based upon random differences in their genotype, and these variations are heritable and can be passed on to future generations. Because of these heritable differences, some individuals are better suited, or naturally selected, to survive and reproduce in a particular environment.

What is it about these observations of nature, about how the diversity of life is generated, that can be so threatening to faith? Probably the single greatest issue is that the process seems random, mindless, and undirected. Why would God "play at dice?"Yet while randomness is an important part of the evolutionary process, randomness does not mean utter lawlessness. While randomness occurs by individual variation within a population, the outcome of that variation is not random, but rather, is increased adaptation to a particular environment. On the other hand, evolution is not clairvoyant; it does not look to the future in order to "plan" what trait will be best served in the future generation. As a result, evolution yields adaptations, not perfections.

However, if the embodied, biological being of *Homo sapiens* is subject to the same laws of random variation and niche seeking as all other species, can human distinctiveness be maintained? Can we still believe that we are made in the image of God? DNA comparisons of humans and other primates that were unavailable to Darwin confirm, as Darwin predicted, large areas of commonality. Learning that we have evolved from "lesser" animals can come as quite a shock. If we are a biological development of a "lower" organism, are we really special in the eyes of God?

Each organism, from the smallest bacterium to the largest elephant, is subject to the same evolutionary laws. All organisms, in-

cluding human beings, are subject to the same rules: changes in genotype beget changes in phenotype that may or may not be adaptive in a certain environment. There may be more than materialism in human life, but there is no human life lived apart from material laws. Biologically, we are subject to the material form of DNA that contains genetic information that drives our phenotype.

Our knowledge of evolution did not arise through luck, and it is not an invention of a darkened mind; to the contrary, knowledge of evolution has arisen from a disciplined search for truth. As such, people of faith ought not lightly dismiss evolution. Biology must focus on the physical realm; it cannot form hypotheses and design testable experiments to answer questions about faith. Nonetheless, biologists are more than the work that they do. They are also human beings who can and do ask questions that go beyond their discipline. They too must accept or reject the idea of being made in the image of God. The questions of the discipline, and the questions a person asks who studies that discipline, need not be an identical set.

Before Biology: Physics and Chemistry

The biological realm is so vast, and so much new understanding is constantly being brought forth from it, that it is tempting to see it as a law unto itself. That temptation, however, should be resisted; for biology is a middle phenomenon; it cannot be the beginning of its own story. Instead, the story's origin must be traced to T=0, the putative moment of the big bang; and in this expanded chronological and cosmological picture, we can gain a clearer focus of biology as a whole.

Terrestrial, biological evolution has about a 3.45 billion year history, but this history in turn rests upon another ten billion years of non-biological activity from the big bang to the beginning of biology on earth. Many mysteries of this pre-biological history of the universe have been progressively unlocked by rational inquiry, especially mathematical inquiry into the universe's patterns and structures. Thus John Polkinghorne notes the "remarkable congruence

between the experienced rationality of our minds and the perceived rationality of the world around us."[1] Were such pattern and structure not present, then reason would have nothing to be reasonable about, and nothing like science could ever take place. Moreover, it is highly instructive that not every human thought about the world is experienced as congruent with the world. Many of our thoughts turn out to be wrong. By contrast, those thoughts and statements that turn out to be true are only true because they conform to the given world, that is, they have made "contact with reality."[2] This contact with the real world in which we live and think must be demonstrable beyond our own subjectivity; it must be repeatable by others. Repeatability is thus one of the first requirements of science. Only because biology is part of a greater context of pattern and structure can anything at all be taught about biology.

The congruence of reason in the human mind with reason in the observable universe is either a massive coincidence or a "signal of transcendence."[3] In fact, so many remarkable coincidences have been detected in the earliest moments of the cosmos that a debate has ensued whether the universe had to be in some manner mind-directed in order to be what it is, the so-called "anthropic principle."[4] Presenting a case for a "revived and revised natural theology," Polkinghorne points to the broadly accepted theories of the universe's first three minutes.[5] Immediately following the big bang, the universe had precisely the rate of expansion necessary to avoid either collapsing back onto itself or becoming so diffuse that no significant interaction would occur, and thus no stars or planets could form. The infinitesimally precise rate of expansion (a difference of one part in 10^{60} between the force of expansion and the force of gravity), the precisely structured balance of three-quarters hydrogen and one-quarter helium, the explosion of supernovae that release the carbon necessary for life as we know it, and the relatively slow burn of stars like our sun, a slow burn without which there could be no evolutionary process, all suggest either a universe magically lucky or one endowed with structure and pattern by mind.

And this latter inference is just the sort that we need, not to prove the existence of God, but to allow an interpretation of the universe that is consonant with the belief in a Creator God. Framing evolution within the larger context of astrophysics has a salutary effect when confronting the basic tenets of evolutionary biology. In the interdisciplinary no man's land between biology and theology, we cannot ask for much more than a reasonable consonance. However, when framed in the larger context from universe origins to the origin of life on earth, the evolutionary facts may be interpreted to be consistent with tenets that faith has, in a way quite different from biological science, come to hold.

Overlapping Terrain: Life and Creation

There are aspects of science, for example, experimental methodology, and aspects of theology, such as Christology, that are so idiosyncratic to each discipline that the other has little, if anything, to say about it. However, when we talk about life, we are on overlapping terrain, for here both theology and biology are directly involved. Theological debates about whether or not evolution has taken place are no longer interesting, for the point has been decided beyond a reasonable doubt. As John Paul II, famously wrote: "Evolution is more than a hypothesis."[6] Yet many Christians, perhaps most, are unaware that leaders of the Christian theological world have broadly accepted evolution. The fact that most theologians do not reject evolution is a first step in the current interdisciplinary conversation. Presenting models of the interaction of biology and theology that go beyond conflict or separation (see below) is an important additional step.

Scientific advances, both in astrophysics and biology, have certainly changed the way God is understood to have created, and even the way that God is understood. The rough-and-tumble biological realm implies that God requires more from us than a soft and easy-going life. However, the understanding that life includes

struggle, suffering, and death should not be threatening to a faith whose founder is beaten, scourged, and then crucified between two thieves.

One of the central principles of theology, from which much else is derived, is that God created the heavens and the earth. To claim that God created is to claim that the cosmos is tinged with purpose. There is life because someone wanted there to be life. Theology, in some manner or other, must maintain that the universe as a whole is purposive; otherwise, if the larger context of life is meaningless, then the personal consciousness that arises within that context is unlikely to have any lasting import.

Nonetheless, in the midst of the biological world of struggle for survival, personal consciousness appears as an anomaly. Personal consciousness is inherently purposive; its intellect and will operate freely, not only for purposes of success within nature, but also sometimes for purposes that far transcend nature. It is hard to believe that the already deaf Beethoven wrote his Ninth Symphony for any other reason than the pursuit of the beautiful and its joyful expression. Likewise, it is hard to believe that all the accomplishments of science are merely enhanced survival mechanisms.

For all the usefulness of science, its medical gains, personal comforts, and the like, science is inherently about *truth*. It is both an endeavor and an attitude—the attitude that the way things *are* is more important than a subjective fantasy or initial impression about them. Because the material world unfailingly gives impartial feedback to those who inquire about it, science is a technique of seeking truth. The feedback is not always welcome. Examples might include the genetic laws of DNA mutations that, at times, lead to the sorrow of birth defects or the chemical and physical laws that led to the explosion of the Columbia spacecraft. However, the patterns are reliable. They do not occur because the gods are unhappy with us; they occur because the universe in which we live has laws: it is structured and patterned, which is just what a theologian would expect from creation through *logos* (Jn 1:3).[7] Without a basis of structure and

pattern, we could neither begin to think nor improve upon what we have thought. The conversation between biology and theology is just such an opportunity for this type of improvement.

Whatever role God plays in the creation of life, the process of evolution, like the process of solar formation that precedes it, must have its own integrity and independence. Divine beings cannot rush to our aid every time we are about to experience trauma in interaction with the biological and material world. As myriad species and phenotypes undertake their various paths to nourishment, maintenance, and procreation, they often meet with competition, danger, and death. *Learning* to survive is no small feat. Firmly planted within the biological realm that we never leave, human beings, like every other biological creature, have also had to deal with nature and its environmental contingencies. But having benefited from the many achievements of our predecessors, those of us who now inhabit civilizations as well as biological niches can do more than merely survive. Having reached this point of seeking more than survival, personal consciousness may begin to seek the realization of an entirely new kind of purpose: the pursuit of the "transcendentals," that is, the true, good, and beautiful. Thus Jacques Maritain exhorts us "to feed upon the transcendentals."[8] Such is the predilection of those beings made in the image and likeness of God. Once biological survival becomes assured, as it has for much of the human race, a new order of evolution can take place, as the transcendentals become the guide and purpose of human activity. As Anthony O'Hear observes: "For even though we and our capacities may have evolved in Darwinian ways, once evolved we and our capacities take off in quite un-Darwinian ways."[9]

Squirrels have a natural purpose—to live, to feed, to nest, to procreate—and human beings fully share those biological imperatives. However, a human life that could be fully described in terms of eating, inhabiting suitable shelter, and successfully procreating would be thought to be less than fully human, and, if practiced with sufficient disregard for, or brutality toward, other humans, might

even be characterized as "inhuman."[10] We expect something more from a human life well lived, for we have dual ends or purposes: successful coping in the biological environment, as well as some exploration of our final end, our *telos* of the true, good, and beautiful, of being made in the image and likeness of God. Theology has long held that humanity is ordered to God, the infinite of truth, goodness, and beauty, as its final end. Yet the neo-Darwinian understanding of evolution raises some hard questions for those who often feel caught between the discoveries of biology and the faith with which they would like to live. Let us now turn to those questions.

To What Extent Does Evolution Demand a Materialist Interpretation?

One of the great contributions to the dialogue between science and theology has been Ian Barbour's four models of relating the two.[11] Barbour's typology—conflict, independence, dialogue, and integration—allows people of faith to confront the sometimes dissonant claims of evolutionary biology and Christianity with something beyond "either evolution or faith, but not both." It allows a nuanced and more precise interpretation of given data, principles, and theories, as we locate ourselves at different points along the spectrum of possibilities. Moreover, we can be located at different points on different issues. The flexibility of the models encourages honest exploration and dialogue.[12] Let us now approach our question through the lens of each of Barbour's four types.

Conflict

From Darwin's original writings to the more recent coupling of Darwin with genetics, the neo-Darwinian synthesis, evolution has been seen by many as a challenge that cuts to the very heart of theology, and even of belief in God. The idea of random variations of species adapted by a process of natural selection that is both blind and indifferent certainly upset the traditional belief in which God

was conceived as the designer of fixed species. In evolutionary understanding, divine design is obviated by a more mechanical explanation. Furthermore, the fact that all species may have common ancestry, which has been confirmed by studies of DNA sequence, seems, as noted above, to rock the boat of human uniqueness. Finally, the increasingly clear picture that nature is "red in tooth and claw," that the entire biological realm is bristling with a life and death struggle, has called into question the very goodness of the creation. If everywhere we look we can see signs of suffering and death, of biological winners and losers, then how can we continue to believe in a good creation given by a God of love? One thing is clear: an overly sentimental view of God is called into question by evolution. By raising these challenges (and the list could be extended), Darwin, although moderated in his own public claims, unleashed the most severe kind of conflict with theology.

In addition to the conflict brought about by defenders of a narrow understanding of divine design, biblical literalists have also denied that *any* part of the Bible is either inaccurate or irrelevant. If biological science offers an account that opposes the biblical account, then the biological account is wrong and must be opposed. From the Scopes (Monkey) Trial of 1925 to the present, the issue has several times been fought in American courtrooms.

On the other side of things, *interpretations* of the biological data can slide into overtly metaphysical claims, claims that have too often become a sort of anti-theology, which then prompts an interdisciplinary conflict. By way of example, Stephen Jay Gould contends that Darwin's understanding of evolution has neither purpose nor direction: "If the world displays any harmony and order, it arises only as an incidental result of individuals seeking their own advantage." In this relatively early work, Gould lays out a decidedly materialistic understanding: "Matter is the ground of all existence; mind, spirit and God as well, are just words that express the wondrous results of neuronal complexity."[13] Claiming to know "the ground of all existence," a phrase often used by theologians, is the point at

which biology ends and metaphysics or theology begins. While his later work allows that Darwinism can be compatible with religious belief, here Gould has both reduced theology to biology and inflated biology beyond its capabilities.

Likewise, conflict arises from the pronouncements of Michael Ruse and E. O. Wilson about the nature of morality:

> Morality, or more strictly our belief in morality, is merely an adaptation put in place to further our reproductive ends. Hence the basis of ethics does not lie in God's will . . . or any other part of the framework of the Universe. In an important sense, ethics . . . is an illusion fobbed off on us by our genes to get us to cooperate . . . ethics is a *shared* illusion of the human race.[14]

These kinds of pronouncements, "the basis of ethics does not lie in God's will," step far beyond the biological evidence and once again enter the realm of interpretive metaphysics. Ruse and Wilson would at once eliminate theology and expand biology to account for what seems to be higher aspects of humanity. Yet it is no more likely that ethics can be reduced to biology than could all biological truth be reduced to physics and chemistry. Presuming that reality is flat, that it has no levels, is a metaphysical position against which there is overwhelming evidence.

Holmes Rolston offers a sarcastic response to Ruse and Wilson's theory that ethics is a form of useful illusion or deception:

> The Good Samaritan is operating with an "ideal" that one ought to aid neighbors, but this is his delusion, his hidden reputation seeking. The Good Samaritan (a half-breed himself, part Jew, part Gentile) really assisted the luckless victim on the Jericho road in order to leave more genes in the next generation. What a hypocrite! That selfish bastard![15]

Ruse and Wilson must undergo some real contortions in order to hold the deception theory. In their view, the altruist must first deceive

himself in order to think it right to help a neighbor in distress, and then, once self-deceived, he can best deceive others into thinking that his intentions are not actually selfish. Occam's razor would have us take the simpler explanation: the altruistic act is quite often what it appears to be; it is done for the sake of the one who needs it, not the one who does it. Rather than so unpersuasively conflating all levels into the biological, as do Ruse and Wilson, recognizing the validity of separate orders of reality would be preferable as a minimum.

Christianity has always been a religion of rationality as well as faith, as witnessed in its Greek term to refer to Jesus' preexistence: "In the beginning was the *Logos*, and the *Logos* was with God and was God. . . . All things came into being through him, and without him not one thing came into being" (Jn 1:1–3). This term *Logos*, which has usually been translated as "Word," signifies as well "the intelligibility of the cosmos," a meaning which the Greeks had held for some centuries before its biblical use. Because *logos* has always been part of the Christian understanding of truth, it is often said that science was a natural outgrowth where Christianity was practiced. But in Darwinism, it seems that the child has attacked the parent.

The transformation of the relationship between theology and science can be observed in the rapid decline of clergy participation in scientific societies after the publication of Darwin's *On the Origin of Species* in 1859. As John Hedley Brooke records,

> When the British Association for the Advancement of Science had been founded in the early 1830s, clerics had constituted some thirty percent of its membership. In the period 1831–65 no fewer than forty-one Anglican clergymen had presided over its various sections. Between 1866 and 1900 the number was three.[16]

Scientists were increasingly being perceived as the new high priests of an advancing civilization, one in which outright hostility to long-held theological beliefs was more and more common. Throughout

the middle ages, theology had been known as the "queen of the sciences." Darwinism, which became scientific orthodoxy within twenty years of its debut, contributed to theology's dethronement.

Darwinism, bolstered by later advances in genetics, could now present such a highly persuasive weltanschauung, at least to academics, that Daniel Dennett can assert: "science has won and religion has lost." Dennett attributes the "victory" to Darwinian evolution because "it pulls the rug out from under the best argument for the existence of God that any theologian or philosopher has ever devised: the Argument from Design."[17] Similarly, Richard Dawkins sums up the conflict model well: "Darwin made it possible to be an intellectually fulfilled atheist."[18] Although most theologians have either ignored Darwinism or found ways to accommodate it, there certainly has been reaction against it among Catholics as well as Protestant fundamentalists and evangelicals. Responses have varied from, Darwin cannot possibly be right (e.g., Michael Behe's analogy between mousetraps and the human blood-clotting mechanism), to the Bible cannot possibly be wrong, even when its ancient account seems troglodytic in the face of recent science.[19]

As an alternative to Darwinism, the so-called "intelligent design" movement has recently arisen. Claims within this movement range from simply contending that God is somehow involved in the overall mechanism of evolution to claims that the earth is young and the entire Darwinian picture is false. In each case the attempt is to ward off the perceived threat of evolution as the vanguard of atheism. Whatever the flaws of its proponents, "intelligent design" is a great title. After all, everyone who believes that God created the heavens and the earth must hold the correlative beliefs that the God who created is intelligent and had some design or other for the creation. Hence, what "intelligent design" means needs clarification. The "design" in evolution need not be directly from the hand of God. The design may be more like a beta-testing mechanism. Although God may not design rabbits, God may in fact design a rabbit-making process.[20] This explanation is much more congruent with evolutionary

thought, but it already moves the discussion from conflict to conversation (see the Dialogue model below).

While conflict on specific issues may from time to time be inevitable between the disciplines, and perhaps helpful in demarcating the issues, there is otherwise not much to be gained in our conversation from this conflict model. Quarreling vehemently from the confines of our own disciplines suggests more of a fear of truth than a devoted search for it.

Independence

In this model of relating evolution and theology, apparently less strident positions are articulated by the basic claim that each discipline is addressing issues that do not directly affect the other. For example, some theologians, without looking too closely at the details, have simply argued that evolution is the way that God creates. Others have pointed out that the Bible was never intended to be a science text and that making it into one misses the point of what the Bible is supposed to do. In this affable but non-interactive model, biologists can have their evolution and theologians can have their Bible. Essentially, this position tries to minimize the overlap in the "overlapping terrain."

The independence model has a commonsense validity and appeal. Its insight is that much of what a biologist or a theologian does is governed by intramural concerns. For example, theologians do not typically get involved in issues of laboratory technique, and biologists do not devise experiments that would settle disputes about the meaning of the Eucharist.

One of the dangers of the independence model is the tendency to think that one's own discipline is all that really matters. Above, in considering the conflict model, we saw some instances where famous biologists have attempted to understand everything in terms of biology. Similarly, Christian history has included movements in which believers have taught that only the spiritual is real. Of direct interest for our present concerns, such one-sided believers,

the Gnostics, were declared heretics. Gnosticism is really an extreme form of the independence model, one which the Church has rejected since the second century. Instead, Church teachings have fostered a more unified, interactive understanding of reality, including the biological.

On the down side, the independence model is a minimalist option, the easy way out of the biology/theology conversation. In the pursuit of truth, we want and need to do more. This position, which is often the actual state of affairs on Christian campuses, is confusing to students. It leaves big questions unanswered and unexplored. Independence encourages compartmentalization, which is often worse than outright conflict. The independence model is not in itself intellectually dishonest, but its all too neat and glib solution can be used to avoid the challenging questions of disciplines in interaction. Independence as insulation from the other discipline is more of a self-protective strategy than academic testing, conversation, and thought in search of truth. A nuanced assessment is in order, one that recognizes areas of independence without insulating the overall meaning of the two disciplines.

Dialogue

Rather than the conflicting choices of a front-loaded divine design, where God architects and plans every species, or the atheism of an utterly random and purposeless process, a third possibility arises in dialogue between evolution and theology. The problem for the divine front-loading (besides the considerable biological evidence against it) is that an utter fixity of species would not be very interesting. It would certainly not be very dynamic. Stability would come at the price of novelty and adventure. Although it is hard to conceive such a world, it is even harder to conceive what *learning* would mean in it, for learning, whether for an individual or for the human race, is always about what is new. In fact, every act of learning is an act of integrating something new. Without engaging the new and unknown, without learning, the meaning of human life would

be emptied. Rather than a completely front-loaded divine design or atheism as the only options, we might look at evolution as an indicator that "the universe is *still* being created."[21] In this alternative vision, God is not rigidly imposing a design, but is instead allowing the creation its independence and integrity. In this guise, Arthur Peacocke, the British biologist and Anglican priest has written: "it is as if chance is the search radar of God, sweeping through all the possible targets available to its probing."[22] In the unfolding evolutionary drama, the entire biosphere can be said to be participating in its own creation. Theologically, this freedom of the creation is an indicator of divine generosity, of grace. As Peacocke develops the argument, the kind of chance that we encounter in evolution is not a threat to a theistic understanding of nature; rather, it is virtually a prerequisite of it, for the presence of randomness as well as law is just what the operation of human intellect and will requires for meaningful functioning.

Like "intelligent design," the Darwinian understanding of chance or randomness needs clarification. "Below" what biologists see as chance or random, there are, as we have earlier discussed, unchanging and dependable laws of physics and chemistry, and randomness leads to new, observable pattern and structure, without which life could not function at all, let alone be studied by biologists. Randomness can only be studied within a contextual presupposition of order.

Similarly, evolution depicts a world of struggle and suffering, but long before 1859 the Bible depicted the suffering of Israel and its prophets. Intensively for Christian thought, suffering has been a central focus since the beheading of John the Baptist and the Crucifixion of Jesus. When the Gnostics denied that Jesus really suffered, they were declared the first heretics. The religious point is that the struggle and sorrow of earthly life functions as a training ground for the soul, a position suggested by Irenaeus in the second century A.D. Finally, the claim that natural selection is blind, impersonal, and thus often cruel does not differ in kind from the way gravity functions, yet no one is complaining about the laws of gravity.[23]

Of course suffering, waste, and death, which have long required special explanation (theodicy) by theologians of the heavily front-loaded variety, are integral to the Darwinist process. Asa Gray (1810–1888), one of the earliest proponents of Darwinism in America, saw a way to capitalize on the inclusion of these negatives:

> Darwinian teleology has the special advantage of accounting for the imperfections and failures as well as the successes. It not only accounts for them, but turns them to practical account. It explains the seeming waste as being part and parcel of a great economical process. Without the competing multitude, no struggle for life; and, without this, no natural selection and the survival of the fittest, no continuous adaptation to changing surroundings, no diversifications, and improvements, *leading from lower up to higher and nobler forms*.[24]

If we consider the cosmos from its big bang to the present, it is hard not to see directionality "from lower to higher and nobler forms." This movement is by no means uniform, and if it were, we would be right back at a front-loaded, predetermined result that would nullify the adventure and creativity of the process. We need not be too cheerful about mosquitoes and other parasites that have carved out a niche in the process. But the key point is not uniform directionality, only that a directionality can be discovered, one that includes greater and greater diversification and, from our perspective, increasing beauty.

The composite picture that the sciences paint is one of both order and disorder, achievement of form and its subsequent disruption, law and chance. Either pole of these pairs alone would lack the creativity and dynamic beauty of the process in which we find ourselves. Continuing creation (*creatio continua*) in association with creation out of nothing (*creatio ex nihilo*) is a great opening for theological inquiry. The greatly expanded understanding of macrocosm and microcosm that science has given us lets us praise with renewed vigor the God who creates the kind of universe that science can study.

While Darwinian science has rather systematically avoided grand schemes of final causality or purpose, it has not been able to avoid the language of purposiveness in its explanations of actual biological behavior. From the theological side of the net, the question is: Is it likely that there be purpose in all the small activities, but none in the whole?

For theologians and believers generally, the dialogue with evolutionary biology has never been easy. When William James became acquainted with Darwinism in the 1860s, he was simply shattered. James felt real dread because he saw Darwinism as undermining the very foundations of morality as he had known it. Finally, however, "By April 1870 James had snapped out of his despair. 'My first act of free will,' he told himself, 'shall be to believe in free will.'"[25] James and his fellow pragmatists generally sought to avoid metaphysical questions in favor of whatever worked well, and to no small degree the pragmatist movement was a response to Darwinism. James recognized a place for both science and religion because they answer different human needs. While he was sure of religion's pragmatic value, James did at least consider the metaphysical possibility that could correspond to human need. As Brooke paraphrases him, "And if human needs outrun the visible universe, why, he asked, may not that be a sign that an invisible universe is there?"[26]

Integration

Although theology has often been in the position of responding to the burgeoning field of evolutionary biology, the very origin of evolutionary theory is in an important sense a derivative of the biblical perspective of time.[27] This biblical sense of time runs counter to the cyclical notion found in Plato and much of the ancient world. The Bible portrays a vital sense of community memory, one that remembers what God has done, for example, the repeated references to the Exodus from Egypt, as well as the oft repeated identification of God as the God of Abraham, Isaac, and Jacob, an identification that serves to link present generations with those of the past through

the constancy of that same God. But the biblical perspective of time not only has a sense of continuity, but also one of expectation, so that in Isaiah, the God identified with the past is very much present and active: "I am about to do a new thing; now it springs forth, do you not perceive it?" (Is 43:15). Beyond the sense of original creation in Genesis 1 and 2, the Old Testament also portrays the freshness of continuing creation (*creatio continua*). The sense of new and greater possibility is likewise seen in the promise to Abraham that has meant so much to both Jews and Christians: "in you all the families of the earth shall be blessed" (Gn 12:3). A promise, which is always oriented toward the future, requires a sustained personal consciousness, whether within an individual or a community. In this sense, promise binds past, present, and future.

Without the established directionality and irreversibility of time, a concept of evolution is most unlikely to have appeared. It is helpful to remember that a younger Darwin had thought of becoming a member of the Anglican clergy, that he was no stranger to the Bible or Christian theology.

As early as Gregory of Nazianzus (329–389 C. E.), Christian theology recognized that a revelation of an infinite God could not be given to finite creatures in one fell swoop. Instead, from Gregory until more recent writers such as Karl Rahner, progressive revelation has been, not always front and center, but certainly an implication of the most basic Christian understanding of the relation to God. Progressive revelation is a good partner of the evolutionary view of the world. Like evolution, it seizes upon the irreversible directionality of time; it depends upon the past, yet is oriented toward something new, something more than is now the case.

Evolution, which tells a story of order, the disruption of order, and ever new forms of order, may have first appeared as more of a threat than an instructor to theology, but that theology can benefit from pondering evolution is clear. Because Christians have long believed Jesus' saying that truth makes us free (Jn 8:32), it would be a strange business for Christians to fear biological truth. On the over-

lapping terrain of creation and evolutionary biology, evolution challenges some Christian doctrines, but in so doing orients the faith toward something new. The freshness of the creation, its continuing creativity, suggests that the best is not over. Realizing that we ourselves are participants and potential contributors in this ongoing creativity is a strong theological gain, one that comes from integrating the insights of our colleagues in biology. While evolution forces some aspects of *creatio ex nihilo* to be revised, the addition of *creatio continua* is a fertile stimulus for Christian thought. All religions tend to be conservative, for they ask community members to remember and remain loyal to the common heritage, the past. But the conservative tendency becomes ossifying without new injections of truth. The problem is that before it can be assimilated, truth often unsettles and disturbs.

Evolution doubly fits this disruption of the established order. First, its material claims from 1859 to the present have certainly troubled a certain staid theological picture of divine design. But let us reiterate the good that has come from that disturbance in the theological locus of *creatio continua*. Second, evolution, as the detailed narrative of the biological creation, more generally warns us not to get too easily settled into theological forms of belief and practice. Evolution is, like the irreversible directionality of time, future-oriented. Our current search for the true, good, and beautiful is rooted in the communal memory of predecessors who have received and experienced revelation. But the greatest among these predecessors did not just repeat formulae and practices from the past. They offered something new, something quite often so troubling in their times that they were persecuted and even killed.

The value of the integration model is clear, although the actual achievement of integration may require more than most scholars can attempt in one career. In spite of the difficulties, both biologists and theologians have much to gain from undertaking the kind of interdisciplinary conversation that might lead to incorporating the discoveries of the other discipline into their own.

Notes

1. John Polkinghorne, "More to the World Than Meets the Eye." In *Religion and the Natural Sciences: The Range of Engagement*, ed. James E. Huchingson, (Fort Worth: Harcourt, Brace, Jovanovich, 1993), 236.
2. Michael Polanyi, *Personal Knowledge: Towards a Post-Critical Philosophy* (Chicago: University of Chicago Press, 1958), 64.
3. John Polkinghorne, *Serious Talk: Science and Religion in Dialogue* (Harrisburg, Pennsylvania: Trinity Press, International, 1995), 38, 40.
4. John D Barrow and Frank J. Tipler, *The Anthropic Cosmological Principle* (New York: Oxford University Press, 1988).
5. Polkinghorne, "More to the World Than Meets the Eye," 237–240.
6. There has been some controversy because of a recent letter of Cardinal Schönborn to the New York Times, "Finding Design in Nature," July 7, 2005. Schönborn attacks the neo-Darwinian notion that chance and necessity alone could bring about the human species, and cites John Paul II's support of final causality as a softening of his oft-cited support for evolution.
7. We should stress that the patterning and structures are not as tight as once held in the Newtonian worldview. Instead, the discoveries of quantum mechanics have overturned the earlier, more deterministic view. Fortunately, the "looseness" of this view (in the sense that a neat algorithmic calculus is not available to us) is nicely consonant with the presence of free will. A universe that was rigidly law-governed would also be highly deterministic.
8. Jacques Maritain, *The Person and the Common Good* (Notre Dame, IN: University of Notre Dame Press, 1966), 64.
9. Anthony O'Hear, *Beyond Evolution: Human Nature and the Limits of Evolutionary Explanation* (Oxford: Clarendon Press, 1999), 214.
10. Robert Spaemann, *Personen: Versuche über den Unterschied zwischen ,etwas' und ,jemand'* (Stuttgart: Klett-Cotta, 1996), 16.
11. Ian G. Barbour, *Religion and Science: Historical and Contemporary Issues* (San Francisco: Harper, 1997), 77–105.
12. Using models similar to Barbour's, John Haught, one of the pioneers of the evolution/theology discussion, has contributed a very useful textbook. See John F. Haught, *Science and Religion: From Conflict to Conversation* (New York: Paulist Press, 1995). For Haught's in depth theological reflections on evolution, see *God After Darwin: A Theology of Evolution* (Boulder, Colorado: Westview Press, 2000); and *Deeper Than Darwin: Prospects for Religion in the Age of Evolution* (Boulder, Colorado: Westview Press, 2003). We are indebted to Haught.
13. Stephen Jay Gould, *Ever Since Darwin* (New York: W. W. Norton, 1977), 12–13.
14. Michael Ruse and Edward O. Wilson, "The Evolution of Ethics," *New Scientist* 108, no. 1478 (17 October, 1985.): 50–52.

15. Holmes Rolston, III, *Genes, Genesis, and God: Values and Their Origins in Natural and Human History* (Cambridge: Cambridge University Press, 1999), 253.
16. John Hedley Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge: Cambridge University Press, 1999), 50.
17. Daniel Dennett, as interviewed in John Brockman, *The Third Culture* (New York: Touchstone Books, 1996), 187.
18. Richard Dawkins, *The Blind Watchmaker* (New York: W.W. Norton and Co, 1986), 6.
19. Michael Behe, *Darwin's Black Box* (New York: The Free Press, 1996), 187–253.
20. Homes Rolston, III, *Science and Religion: A Critical Survey* (Philadelphia: Temple University Press, 1987), 116.
21. Haught, *God After Darwin*, 6.
22. Arthur Peacocke, *Theology for a Scientific Age* (Minneapolis: Fortress Press, 1993), 120–121.
23. Haught, *Science and Religion*, 59–60.
24. Quoted in Brooke, *Science and Religion* , 317, emphases added.
25. Brooke, *Science and Religion*, 317.
26. Brooke, *Science and Religion*, 319.
27. Haught, *Science and Religion*, 70.