

PERSPECTIVES on Science and Christian Faith

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Relating Body and Soul: Insights from Development and Neurobiology

Darwinian Theological Insights: Toward an Intellectually Fulfilled Christian Theism—Part I: Divine Creative Action and Intelligent Design in Nature

The Human Person in Contemporary Science and Theology

*"The fear of the Lord
is the beginning of Wisdom."*

Psalm 111:10

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James C. Peterson

Anomalies Welcome

There is satisfaction in a theory that predicts future outcomes accurately and the most assured theories do. There is beauty in discovering how what seemed to be disparate parts actually work together. We find ourselves enjoying with wonder what we have come to know, as much as wondering at what we do not know yet. How many times have I found myself humming the doxology at the lab bench in response to what I am seeing or while reading about a new discovery in another field?

When data does not follow expectations, we first look for annoying noise from imperfect measurement or from a sideshow distracting from the phenomenon under study. When it persists, we report it honestly, because it is, and because we realize that the stubborn piece that refuses to fit may turn out to be a key. Such an anomaly may be the clue, the observation leading to an insight, that we have not understood what we were looking at as well as we thought we did. Part of what I love about science is the tradition of being fearlessly intrigued by such anomalies. When anomalies occur, they are often disruptive. They may be perceived as undermining other careful work, maybe even a career. Yet they may be golden. They may present an opportunity to understand better—which is, after all, the point.

I think of intricate mathematical models that predicted exactly where a particular light would be in the sky at a given time on a future night. They were precise, accurate, and geocentric. The anomaly of retrograde motion in the wandering stars (the planets) was one of the clues that led Copernicus to a heliocentric model. I think of Marcion, selecting only the holy books that supported his view that any god who created the material world would be hateful and inferior to the true God. In response, churches across the world of their day had to reflect

on their experience of God's anointing certain books and what they knew of who authored those books until they agreed on a particular list of books that God had given as trustworthy scripture. The Christian canon was recognized in response to the anomaly of a false canon. Anomalies challenge us to think in new ways that may lead to a better apprehension of the truth.

Anomalies have triggered articles in this issue:

- Jim Bradley thinks about apparently random phenomena that are commonplace in the natural sciences. What is to be made of these for those who perceive God as sovereignly choosing to control everything?
- Rodney Scott and Raymond Phinney find what we have learned of embryo twinning, mosaics, and widespread observations of neurobiology to be challenges to common assumptions about the soul.
- Denis Lamoureux finds the exhaustively studied Charles Darwin to be often misrepresented. Citing Darwin's letters to his friends, diary entries, and even his most public books, Lamoureux finds Darwin referring to how nature shows the design of its Creator. Lamoureux thinks that if Darwin is accurately understood, these citations are not inconsistencies in Darwin's thought; rather, a point of encouragement for a consistent approach that encourages intellectually fulfilling Christian reflection.
- In his book review essay, Patrick Franklin distills down to four major issues the anomalies most prominent in recent studies of what it is to be a person. For example, as we observe chimpanzees making tools, the self-awareness seen in an elephant recognizing itself in a mirror, or a pod of killer whales planning and coordinating a complicated series of steps to capture prey, what is left to be distinctive about being human?

Editorial

Anomalies Welcome

Then our book reviewers bring to our attention ten books each bringing its own challenge. They address new discoveries and questions in cosmology, origins, maths, ethics, history, philosophy, theology, and the environment.

The articles and book reviews of this issue do not just note or address anomalies. They may themselves function as anomalies for those who have seen the subject matter differently. In that case the articles may be a spur to change perspective or at least to improve upon it. Carefully taking into account how new data fit one's paradigm either strengthens the paradigm or calls for a new one. The role of this journal, as of any academic journal, is not merely to repeat what is already commonplace. It is, in part, to direct us to notice anomalies and to help us to develop our understanding from addressing them. That is not always comfortable, but it should be compelling. Those who publish this journal hold to the historic and life-giving Christian faith, not because they always have, but because it continues to make the most sense. Challenges and implications are welcome and can be fruitful.

I hope that as you read this issue and those in the future that you will delight not only in supportive evidence for what has convinced you before, but also in the highlighted anomalies; that you will find here some ideas, or ways of description, that enrich and reinforce what you already think, and other ideas that lead to fresh perspectives; that, as in your scientific study, you will test and evaluate surprising concepts and ideas with rigorous fairness. If you find a new proposal here persuasive, you will have learned something. If you do not find a colleague's proposal here persuasive, please write up a better reading for the journal's blind peer review process and potential publication. We would all be better for it.

Thank God for all that we have learned and for the anomalies that remain. What does not initially seem to fit can be an opportunity to understand better science and theology and their interaction.

James C. Peterson, *Editor*

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put off falsehood and
speak truthfully to your neighbor,
for we are all members of one body
(Ephesians 4:25, NIV).*

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Randomness and God's Nature

James Bradley



James Bradley

Observations of apparently random phenomena are commonplace in science. However, randomness and Christian belief are often seen as incompatible, both by naturalists and by theists. This article argues that the scientific concept of randomness and the historic Christian understanding of God's nature are compatible. It argues that the existence of randomness cannot be settled scientifically; nevertheless, it clarifies randomness as a mathematical concept, argues that it provides a plausible interpretation of scientific data, and argues that its existence is consistent with God's nature as it is commonly understood by systematic theologians.

1. The Problem

Observations of apparently random phenomena are commonplace in the natural sciences. But randomness is often seen as incompatible with the historic Christian understanding of God's nature both by naturalists and theists.

Some naturalists accept the existence of chance but deny God; for example,

The more we understand of the workings of nature, the more we realize that the forces that shape it are those of blind, purposeless chance. Across a universe encompassing billions of light years, through scales of magnitude extending from subnuclear particles to immense galaxies colliding like a clash of cymbals, there is no hint of plan or purpose.¹

Some theologians affirm God's existence but deny chance; R. C. Sproul writes,

The mere existence of chance is enough to rip God from his cosmic throne. Chance does not need to rule; it does not need to be sovereign. If it exists as a mere, impotent humble servant, it leaves God not only out of date but out of a job. If chance exists in its frailest possible form, God is finished.²

In this article, I argue that the scientific concept of randomness and the historic

Christian understanding of God's nature are compatible. I will not provide a conclusive demonstration of the existence of randomness—in fact, I will argue that its existence cannot be settled scientifically; rather I will argue that it provides a plausible interpretation of scientific data and its existence is consistent with God's attributes.

The argument proceeds as follows. In Section 2, I examine several exemplars of randomness. This is to place the subsequent philosophical and theological discussion of randomness within the actual practice of probability, statistics, and the natural sciences. Section 3 explores the concepts these exemplars are used to convey and presents two interpretations of nondeterministic models—instrumentalism and realism. I argue that it is impossible to choose between them on scientific grounds alone; hence the study

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of randomness necessarily involves metaphysical and/or theological reflection. Section 4 explains how randomness can plausibly be viewed as a key feature of the physical world. Section 5 presents the classical perspective on God's attributes as studied in systematic theology. It argues that most of God's attributes do not pose a consistency problem with realism about randomness; nevertheless, four issues—purpose, control, foreknowledge, and causality—do pose potential conflicts. Sections 6 through 9 address each of these, showing how the apparent conflict can be resolved. Section 10 discusses how a realist interpretation of randomness might influence our understanding of God's relational attributes.

2. Exemplars of Randomness

A popular conceptualization of randomness is not having a governing design, method, or purpose; unsystematic; without cause. But this concept is not how randomness is actually used in mathematics, statistics, and the sciences. In *The Structure of Scientific Revolutions*, Thomas Kuhn drew on the notion of *exemplar*, those examples in a discipline that transmit its key concepts from one generation to the next. He wrote,

By [exemplar] I mean, initially, the concrete problem-solutions that students encounter from the start of their scientific education, whether in laboratories, on examinations, or at the ends of chapters in science texts ... All physicists, for example, begin by learning the same exemplars: problems such as the inclined plane, the conical pendulum, and Keplerian orbits; instruments such as the vernier, the calorimeter, and the Wheatstone bridge.³

I begin with nine exemplars of randomness that show how the term is used in mathematics, statistics, and the sciences; they will illustrate key ideas later in this article.

Exemplar 1: Games of chance

"Games of chance" employ playing cards, dice, coin flips, and roulette wheels; frequently, these introduce probability to students.⁴ Textbooks pack many concepts into the discussion of these games. Each involves a small, finite number of equally probable outcomes; for coin flips, if the coin is "fair," the outcomes are equally likely. The probabilities of all outcomes must total one, so each has probability $\frac{1}{2}$. Thus the fairness assumption introduces a method to cal-

culate probabilities. The frequentist interpretation of probability is also introduced here—that the $\frac{1}{2}$ should be understood in terms of the law of large numbers⁵—that with many flips the relative frequency of each outcome will approach $\frac{1}{2}$. A flipped coin could land on edge or fall into a drain. The assumption that there are only two outcomes (heads and tails) introduces the idea that probabilistic representations are *models*, simplifying and idealizing a more complex reality.

Exemplar 2: Pseudorandom numbers

Computer games and simulations often depend on pseudorandom numbers. These are generated by an algorithm but appear random in that they are uniformly distributed over some range (say 0 to 1) if the algorithm works as intended; this provides a kind of "fairness" in games and simulations. Typically such algorithms start by selecting a number (called a *seed*), entering it into a formula that generates a next number, then using that as the seed for the next, and so forth. If one knew the initial seed and the formula, one could compute all the numbers. But the seed is often chosen so as to make the numbers unpredictable in practice, such as selecting digits from the time given by the computer clock at the instant the number is requested. Nevertheless, John von Neumann once joked, "Anyone who considers arithmetical methods [as] producing random digits is, of course, in a state of sin."⁶

Exemplar 3: Random sampling

This is the basis of statistical investigations. It is typically done by numbering the members of a population, then using a computer or a table to generate pseudorandom numbers that are used to select a sample of the population. Statisticians view such samples as having the best chance of being unbiased—that is, being representative of the population. Random sampling is so widespread that it provides a particularly familiar example of how randomness can be used purposefully.

Exemplar 4: Radioactive decay

If we take a sample of Carbon-14, for example, it will gradually decay into Nitrogen-14 through emission of beta particles—electrons or positrons. The rate of emission is constant, making it possible to calculate a half-life—the time it takes for half of the radioactive material in a sample to decay; in Carbon-14's case, the half-life is $5,730 \pm 40$ years. Nevertheless, there is

no known way to predict when any particular atom in the sample will emit such a particle. Thus the time of emission serves as an exemplar of a continuous random variable (in contrast to the discrete random variables of the previous three examples); our inability to identify a determinate process that would enable prediction of the time of a particular emission is often used to introduce the notion that indeterminacy may be an inherent property of processes and not simply a matter of our ignorance.

Exemplar 5: Poisson processes

Time-dependent events such as the arrivals of customers at a check-out counter in a store, of cosmic rays at a detector, or of telephone calls at a hub are often modeled using Poisson processes. In such processes, arrivals occur randomly at a constant rate over a time interval and are equally likely to occur at any time in that interval. These assumptions guarantee that inter-arrival times will follow an exponential pattern; if the frequency of arrivals in a fixed time interval is counted for many such intervals (all having the same arrival rate), the frequencies will follow a pattern known as a Poisson distribution. Poisson processes illustrate the fact that randomness may arise by aggregating events that are individually not random—the coincidence of large numbers of independent events, each determined by its own (possibly deterministic) causes, produces behavior consistent with an assumption of randomness.

Exemplar 6: Quantum uncertainty

We cannot see electrons but we can represent them mathematically. “Spin” is a property of electrons even though (as far as we know) electrons do not spin in the same sense as large objects such as baseballs and planets. Electron spin can occur in one of two states: spin-up or spin-down. But this does not mean that electrons exist in one state or the other; rather, they are mathematically represented as a probability distribution over the possible spin states (and other properties). However, when electrons pass through a device called a *beam splitter*, a transition (called the *collapse of the wave function*) occurs in such a way that the path of the electron shows it to be in either the up or down state with each state having probability one-half. In the *Copenhagen interpretation* of this phenomenon,⁷ the collapse is precisely what it appears to be—nondeterministic; the Copenhagen interpretation is held by most physicists and is commonly taught. In the *Bohmian interpretation*,⁸ the collapse is

viewed as deterministic and depends on the existence of currently undiscovered *hidden variables*. The hope of finding such variables received a major setback in 1964, however, with the publication of Bell’s Theorem. This provides an empirical test for whether quantum uncertainty can be accounted for by local hidden variables (ones that respect the velocity of light as a maximum velocity); such testing has demonstrated that the answer is no.⁹ Nevertheless, the issue of how to interpret the collapse of the wave function is far from settled; two other interpretations are *decoherence*, focusing on the interaction of the electron with its environment, and *many-worlds*. In the latter, the collapse is deterministic—the waveform representation of the electron is seen as real but its collapse is denied. Rather, reality is seen as a multibranched tree in which all possible alternative histories of the electron and all possible future states are real.

Exemplar 7: Mendel’s peas

Gregor Mendel (1822–1884), an Austrian Augustinian monk, is known as the “father of modern genetics.” Working with peas grown in his monastery’s experimental garden, he discovered the laws of inheritance that govern the transmission of traits from parents to children. For instance, some traits of peas (color, texture, etc.) occur in two genetic forms (or *alleles*) that can be denoted “A” for the dominant form and “a” for the recessive form. The genotypes governing the expression of such a trait occur as pairs—AA, Aa, or aa. Using careful records, Mendel demonstrated that the offspring of hybrids (those with the form Aa) occur randomly with $\frac{1}{4}$ taking the form AA, $\frac{1}{2}$ Aa, and $\frac{1}{4}$ aa. Mendel’s work preceded the discovery of genes; however, their subsequent discovery provided an understanding of the mechanisms underlying Mendel’s laws. Random transmission of genetic information to offspring is a key component of the theoretical framework of modern evolutionary theory.

Exemplar 8: Diffusion

Consider a cell in the human body. It needs nutrients and oxygen delivered to it from its exterior and has waste products in its interior of which it needs to dispose. Water can pass through the semipermeable cell membrane taking dissolved substances with it and balancing the concentration of these substances on either side of the membrane. This process is called *osmosis* and is a form of *diffusion*, the random movement of particles from regions of higher concentra-

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tion to those of lower concentration. This random motion is the result of the heat energy of molecules, each moving independently, and occurs continually in all liquids and gases. Life as we know it would not be sustainable without osmosis.

Exemplar 9: Chaos theory

“Chaos” is the popular name of *deterministic non-periodicity*.¹⁰ It characterizes nonlinear systems such as global atmospheric pressure. Such systems are extremely sensitive to their initial conditions. They are deterministic in the sense that if one knew their governing equations and initial state precisely, their entire future behavior would be predictable. However, it is impossible to measure their initial state with full precision; furthermore, the system amplifies tiny variations in the initial state so that two systems that start out close together become farther apart over time. Thus, future states are, in practice, unpredictable even though in principle they are predictable. These systems are deterministic but their long-term behavior appears random.

3. Randomness

The popular conception of randomness mentioned earlier—not having a governing design, method, or purpose; unsystematic; without cause—is misleading. For example, rolling a fair die produces six possible outcomes, each with probability 1/6. Both scientists and lay people regard that outcome as random, but the die is carefully designed and purposeful, is far from being unsystematic, and its outcome has a clear (arguably nondeterministic) cause.

Nevertheless, even among specialists, “random” does not enjoy a widely agreed upon univocal definition. The nine exemplars involve indeterminate processes—characterized by multiple possible outcomes and the impossibility of predicting which will occur. However, the term “indeterminate” is ambiguous. Physicists, for example, often think of randomness in terms of causation or lack thereof. Thus an event is determinate if it is “determined,” i.e., caused; it is indeterminate if it is uncaused. Mathematicians and statisticians typically avoid the causality question by focusing on unpredictability.

“Random” can also refer to outcomes as well as processes.¹¹ An idealized process (assuming perfect repeatability) can produce an arbitrarily long

sequence of outcomes. *Algorithmic information theory* (AIT) studies infinite strings of bits; these provide a mathematical model of sequences of outcomes. AIT has introduced several concepts of randomness. For example, for *Martin-Löf randomness* a string of bits is random if it passes all reasonable statistical tests for randomness. Another approach uses incompressibility—a string is compressible if it can be described by a string shorter than itself;¹² random strings are incompressible. These concepts have yielded powerful results such as methods to decide whether one string is more random than another. The underlying intuition linking all of AIT’s formulations of randomness is that a random string lacks a discernible pattern. But AIT makes the notion of “lacking a pattern” precise by giving it the meaning of incomputable—there is no algorithm that can take the first n bits of a random string and compute the $(n+1)^{\text{st}}$.¹³

The process definition (in terms of unpredictability) and product definition (the absence of pattern in lists of outcomes) are similar but not equivalent—an infinite bit string that lacks a pattern represents multiple outcomes and its terms are unpredictable. However, a real world process is never perfectly repeatable, nor can it produce an infinite sequence of outputs. Also, its outputs may truly be unpredictable but for any finite set of outputs there is a nonzero probability that they possess a discernible pattern. Furthermore, AIT offers several nonequivalent definitions. So randomness can be viewed as a collection of concepts that bear a “family resemblance” incorporating the notions of multiple outcomes, unpredictability, and the absence of pattern in idealized sequences of outputs. I will simply use “indeterminacy” and “indeterminate” to refer to this family. This will suffice for the consistency argument given here.

An *epistemically random* sequence is one that appears random but, in fact, possesses a pattern that can be computed by an algorithm. An *ontologically random* sequence has no algorithm that can compute its members. Thus these represent two very different types of randomness; ontological randomness (if it exists in the natural world) is a property of the very nature of things; epistemic randomness is apparent randomness—it is a function of human perception of things but not their nature.¹⁴ *Determinism* is the philosophical position that ontological randomness

does not exist in the physical world; *nondeterminism* is the assertion that it does exist. There are two principal interpretations of models that include randomness. For *instrumentalism*, randomness is a useful tool when we have limited knowledge; for *realism*, it corresponds to a deeper nondeterministic reality.

Some Christian thinkers have argued for realism regarding randomness; some against it. John Byl rejects ontological randomness in physics; he argues that a preference for nondeterministic interpretations of quantum mechanics "... is motivated largely by philosophical and theological commitments."¹⁵ R. C. Sproul, quoted earlier, also denies that randomness could be real. Hans Gregersen sees all natural laws including any that involve randomness, as human expressions of patterns. He writes,

... laws of nature simply pick out the regularities of nature in so far as these can be identified by empirical investigations. Laws of nature, on this account, are a metaphor or shorthand for general descriptions of regularities; ontological assumptions are deemed unnecessary.¹⁶

Other Christian writers argue that the apparent nondeterminacy in quantum mechanics indicates a more fundamental nondeterminate reality. John Polkinghorne justifies this inference on grounds he calls *critical realism*. He starts from realism, the idea that things are the way they appear to be; critical realism, however, acknowledges that our perceptions can be fooled by things such as optical illusions. It also acknowledges that very small things (at the quantum level) and very large things (at the galactic level) are outside our normal experience. So while realism is basically sound, we need to apply it cautiously. Polkinghorne argues for the Copenhagen interpretation on grounds that when something such as quantum uncertainty has been studied by a large number of people over many years producing powerful and consistent results, a move from "*x* appears this way" to "*x* is this way" is warranted.¹⁷

Keith Ward argues that nondeterministic laws allow creative freedom room to exist and to operate.¹⁸ David Bartholomew argues that God uses chance.¹⁹ His book is subtitled "Can God Have It Both Ways?," referring to the existence of both randomness and order; he answers yes.

I claim that it is impossible to decide on scientific grounds alone whether ontological randomness

exists (although I will argue in the next section that evidence in favor of it is stronger than evidence against it). Either claim would require complete knowledge of the universe. That is, suppose Professor A is a nondeterminist. Consider any particular example he believes to be nondeterministic. Professor A can never exclude the possibility that some future discovery will show it to be deterministic. Now suppose Professor B is a determinist. In lieu of complete knowledge of the universe, she can never show that deterministic causes can be found for all physical events. So neither position can be scientifically established; metaphysical and/or theological reflections are necessary if we are to explore the concept of randomness. Randomness is a scientific concept that cannot be completely investigated by science.

There is no inconsistency with historic Christian theology if we adopt the instrumental interpretation—this interpretation makes no ontological claims. However, the realist interpretation is controversial. In the remaining sections of this article, I will argue for the consistency of the realist interpretation with classical Christian views of God's nature.

4. Arguments for the Existence of Ontological Randomness

Even if we could construct a sound argument for the consistency of the realist interpretation of randomness and God's attributes, it would be of little importance without a plausible case for ontological randomness.

On one hand, a theist could argue for the consistency of randomness and God's attributes on the grounds of God's infinitude—algorithms are necessarily finite, human understanding is limited; thus, unpredictability and the creation of patterns that cannot be detected by finitistic means are consistent with God's infinitude. On the other hand, a different theist could assert that the physical world is finite and hence be skeptical that any physical process could produce outcomes that lack a discernible pattern even though God created that process. This section presents three arguments based on observations of the natural world that support the plausibility of ontological randomness.

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1. Recent work on “quantum coin tossing” uses quantum indeterminacy to generate sequences of bits that exhibit strong evidence of being random.²⁰ AIT has shown that there are random numbers; however, this could simply be an abstract mathematical curiosity. Quantum coin tossing demonstrates that it is plausible that such numbers correspond in a meaningful way to entities in the physical world. Through both the long-standing durability of the Copenhagen interpretation and this recent work on quantum coin tossing, quantum indeterminacy provides a powerful argument for ontological randomness; it does not prove its existence, but it shifts the burden of proof to those who deny its existence.

Some physicists have used quantum indeterminacy to argue for indeterminacy in the natural world well beyond the quantum level. In this argument, quantum indeterminacy feeds indeterminate initial states into chaotic systems, and that indeterminacy is subsequently amplified many fold. The argument, however, possesses a serious weakness: differential equations that exhibit chaotic behavior (such as those describing global weather) approximate states of the macro world; they may not be applicable at the quantum level.²¹ Of course, the cumulative effect of the enormous number of small particle interactions may be sufficiently large that it affects macro systems. But the argument is weaker than is sometimes assumed.

2. A different argument for widespread randomness begins with Poisson processes. These illustrate that the coincidence of multiple independent events, each of which may be deterministic, can produce a composite effect consistent with an assumption of randomness. Furthermore, the natural world is extremely complex—the number of elementary particles has been estimated as on the order of 10^{89} , almost all of which are constantly interacting with other particles. Also, the differential equations used to model many natural systems exhibit extreme sensitivity to initial conditions.²² Considering these three factors together—independence, complexity, and chaos—it is easy to see how the world could appear random on a broad scale.

A determinist could argue that the world appears random to finite human beings but need not to an infinite, omniscient God. However, this assertion does not seem consistent with God's omni-

science, although it is easy to reconcile it with his omnipotence. Consider this thought experiment: an engineer is designing a system to keep a ball in place. He could place it on the peak of a mountain, and with sufficient resources and vigilance, he could maintain it there. Or he could put it in a valley. In the first case, he might be called omnipotent, but he would not be called omniscient. Managing this world given its nonlinearity, complexity, and sensitivity to initial conditions in a deterministic manner would be like placing the ball at the top of the hill; managing it via indeterminacy would be like placing it in the valley. That is, an omniscient engineer would know that a deterministic system that incorporates such a high degree of instability is not an optimal design.

This argument is an application of inference to the best explanation and depends on an analogy between God's thoughts and those of an engineer. Since the existence of ontological randomness cannot be settled scientifically, such arguments are our only option. Nevertheless, this argument does not address the origin of randomness in the physical world. This is a mystery which is probably impenetrable. The presence of mystery should not be surprising, however; if God is infinite, we would expect that much of his nature and actions will remain mysterious to finite creatures.

3. A third argument starts from free will. If a person's decision is a function of many inputs, including genetic and environmental factors, is such a function deterministic? There are two principal perspectives. *Compatibilism* consists of the assertions that it is deterministic and that such a position can be reconciled with the intuition that we have free will. *Incompatibilism* is the assertion that such decisions are not deterministic. The free will argument for randomness assumes incompatibilism.

Incompatibilist free will implies that ontological randomness exists, but the converse need not hold. Consider, for example, flipping a coin. Conceivably an engineer could design a “coin flip predictor,” a machine that detects the initial position of the coin, its initial upward and rotational velocities, and the position where it will land, and predicts its outcome. Thus once the coin is released, the outcome is deterministic. But if the flipper has incompatibilist free will, the exact moment and the manner of that release are inherently unpredict-

able; in fact, they are not fully under the flipper's control. So before the coin is released, the outcome is ontologically indeterminate. Since incompatibilist free will necessitates ontological randomness, denying ontological randomness necessitates compatibilism.

Some scientists have argued that the Copenhagen interpretation of quantum indeterminacy, if correct, allows for an account of incompatibilist free will. They argue the plausibility of the converse—that ontological randomness can account for free will. However, it is difficult to see how to carry out such an argument. For example, one form of this argument starts from quantum indeterminacy of elementary particles in a person's brain. However, to account for free will, the argument needs to "connect the dots" between that indeterminacy and particular free choices. It is far from clear that that can be done.²³

Note that if incompatibilist free will exists, games of chance can exhibit ontological randomness since they are under the control of an agent acting indeterminately. Furthermore, so do pseudorandom numbers and random sampling—an ontologically indeterminate choice can start the random number generator.

The arguments from physical processes make a stronger claim about randomness than the argument from free will—the former locate randomness in the structure of the physical world, giving it a time frame of billions of years and independence from human activity.

An assertion that the physical world is extensively indeterminate may seem incredible given the orderliness and predictability of the physical world. Furthermore, to many people, such an assertion seems inconsistent with God's nature. Sections five through ten address this issue.

5. God's Nature

To say whether randomness is consistent with God's nature, we need to understand that nature. Systematic theologians have written extensively about it; some scholars have balked on grounds that finite human beings cannot understand a transcendent, infinite God. However, the consensus of historic Christian thought is that we can make accurate, if

necessarily incomplete, statements about God's nature because God has revealed himself in scripture.

The prototypical approach presents a list of divine attributes and then expands on each. For example, Thomas Oden presents sets of divine attributes organized around four themes:

- The divine being (primary and essential attributes of God: sufficiency, underived existence, unity, infinity, immeasurability, eternity, life)
- The divine majesty (the relational attributes of God: all-present, all-knowing, almighty)
- The divine person (free, congruent, interactive Spirit)
- The divine goodness (holy, constant, compassionate)²⁴

"Congruent" means that God acts in ways consistent with his being and character—he "cannot deny himself"; "relational" refers to God's relationship with the entirety of creation.

Herman Bavinck discusses God's attributes using the names of God revealed in scripture.²⁵ His list is similar to Oden's; he also presents a thorough discussion of the history of Christian thought about the attributes. Many other theologians, notably Thomas Aquinas in his *Summa Theologica* and John Calvin with his *Institutes of the Christian Religion* have presented systematic treatments of God's attributes. Oden's four sets of attributes provide a representative summary.

The essential attributes have no relationship with randomness since they deal with what God is apart from creation.²⁶ Also, attributes of the divine person and of the divine goodness do not involve God's relationship with physical processes. Hence, in terms of Oden's list, the potential problems reconciling randomness with God's nature all arise with the relational attributes—omnipotence, omniscience, and omnipresence.

Omnipotence

Oden offers a succinct definition of omnipotence: God's "perfect ability to do all things that are consistent with the divine character." Bavinck explains omnipotence in several ways. The most explicit are the following:

- "He has absolute power over all things so that nothing can resist him."

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- “Nothing is too hard for God: for him all things are possible.”
- “He does whatever he pleases and no one can call him to account.”
- “This power of God, finally, is also the source of all power and authority, ability and strength, in creatures.”²⁷

In discussing nominalism, Bavinck also explains what omnipotence does *not* mean.

... the nominalists defined the omnipotence of God not only as his power to do whatever he wills, but also as his power to will anything. Differentiating between God's “absolute” and his “ordained” power, they judged that in accordance with the former God could also sin, err, suffer, die, become a stone or an animal, change bread into the body of Christ, do contradictory things, undo the past, make false what was true and true what was false, and so forth. According to his absolute power, therefore, God is pure arbitrariness, absolute potency without any content, which *is* nothing but can *become* anything.²⁸

Nevertheless, Bavinck does not limit God's omnipotence beyond excluding things that are contradictory or inconsistent with his nature. He adds, “What is possible extends much further than what is real.” That is, he rejects the position of Abelard that God cannot do anything beyond that which he does. Bavinck also adds,

Calvin did not deny that God can do more than he actually did, but only opposed a concept of “absolute power” that was not bound to his nature and therefore could do all sorts of contradictory things. Conceived along the lines of Augustine and Thomas, this distinction was generally endorsed by Reformed theologians, and so understood, it is worthy of endorsement.²⁹

Bavinck exposes one potential problem in reconciling randomness with God's nature: While randomness is not inconsistent with God's character, it appears to involve processes outside of God's control—without pattern or predictability, there seems to be no control—so it seems inconsistent with divine omnipotence. This issue will be addressed in Section 7.

Omniscience

Oden defines divine omniscience as “God's complete knowledge of the world and time.”³⁰ One biblical source is Heb. 4:13, “Nothing in all creation is hidden from God's sight. Everything is uncovered and laid

bare before the eyes of him to whom we must give account.” Oden says,

God's knowing is said to be (a) eternally actual, not merely possible; (b) eternally perfect, as distinguished from a knowledge that begins, increases, decreases, or ends; (c) complete instead of partial; and (d) both direct and immediate, instead of indirectly reflected or mediated.³¹

For Oden, omniscience is wisdom as well as factual knowledge:

The wisdom of God is God's incomparable ability to order all things in the light of good, to adjust causes to effects, and means to ends; so that the divine purposes are firm and never thwarted.³²

Two issues arise from omniscience. The first problem is that, in the popular concept, chance has no governing design, method, or purpose. The existence of chance, then, would contradict the position that God has a purpose for all of creation and orders all things in light of that purpose. For example, Isaiah presents God as saying, “I will accomplish that I please” (Isa. 46:10b, NEB).

Section 6 addresses our second problem—reconciling randomness with God's purposefulness. One could argue that even if a process appears random, God knows what will happen, so the outcomes are predictable to God. If predictable to God, then perhaps they are predictable to human beings. This contradicts the unpredictability that characterizes randomness. Bavinck supports this position, quoting Cicero: “... if he [God] knows it, it will certainly take place, but if it is bound to take place, no such thing as chance exists.”³³ Section 8 addresses this issue.

Omnipresence

Oden defines omnipresence as “God's mode of being present to all aspects of both space and time. Although God is present in all space and time, God is not locally limited to any particular time or space.”³⁴

Aquinas writes,

God is in all things by his power, insofar as all are subject to his power. God is in all things by his presence, insofar as everything is naked and open to his eyes. God is in all things by his essence, insofar as God stands to all things as the cause of their being ...³⁵

The *Stanford Encyclopedia of Philosophy* raises a philosophical question about omnipresence: “How can an

immaterial being be present at or located in space?" It explains Aquinas' answer:

This way of understanding God's presence by reference to his power and his knowledge treats the predicate 'is present' as applied to God as *analogical* with its application to ordinary physical things. It is neither univocal (used with the same meaning as in ordinary contexts) nor equivocal (used with an unrelated meaning). Rather, its meaning can be explained by reference to its ordinary sense: God is present at a place just in case there is a physical object that is at that place and God has power over that object, knows what is going on in that object, and God is the cause of that object's existence.³⁶

Omnipresence in the sense of being present to all things in space and time is not inconsistent with randomness. However, God's presence at every act of causality raises a fourth problem: In *deterministic causation*, if A occurs, B necessarily follows and either A is the mechanism producing B or it triggers such a mechanism.³⁷ In *probabilistic causation*, if A occurs, the probability of B increases. For instance, smoking causes lung cancer, but not everyone who smokes gets lung cancer; neither is every lung cancer sufferer a smoker. But smoking increases the probability of lung cancer. Deterministically caused processes (such as discussed in Exemplar 9) can exhibit epistemological randomness, but probabilistically caused processes (if they are more than simply an expression of human limitations) can exhibit ontological randomness. However, because God is omniscient, he completely understands the mechanisms by which all physical processes operate. This casts doubt on the existence of probabilistic causation, thereby casting doubt on randomness. Section 9 addresses this issue.

6. Purpose

People use randomness purposefully in many ways, for example, games of chance, pseudorandom numbers, and random sampling. In this section, I argue that God uses randomness to fulfill his purposes, and thus objections to randomness based on God's purposefulness are unfounded. I assume the examples of randomness discussed in this section are ontological and argue for the consistency of that assumption with God's nature.

Robert Bishop articulates several of God's purposes for creation: (1) to exhibit his glory, (2) to serve as his temple, (3) "to become uniquely what it is called to be in Christ," (4) to populate creation with life, and (5) "to be an arena for comprehensive redemption."³⁸ Randomness contributes to achieving (at least) the first and fourth of these by maintaining dynamic equilibria in complex systems. Consider these examples.

- Every cell in living organisms needs to transport nutrients to its interior and to dispose of waste. These operations are carried out by osmosis that involves the random motion of molecules as discussed in Section 2.
- More generally, diffusion is an ubiquitous phenomenon that operates to equalize temperature and air pressure distributions. For instance, diffusion makes the uniform shape of a balloon possible in spite of the random motion of air molecules within it.
- Genetic diversity allows populations to adapt to changing environmental conditions.³⁹ For example, based on skeletal remains, ornithologists have estimated that before Polynesians migrated to Hawaii sometime in the first millennium AD, over one hundred species of honeycreeper inhabited the Hawaiian Islands. Ornithologists consider them a subfamily, *Drepanidinae*, of *Fringillidae*, the finch family. Finches are seed eaters. Hawaiian honeycreepers include not only seed eaters but also insectivores, nectivores, fruit eaters, and even snail eaters, as well as birds that probe decaying wood for insects. Ornithologists account for the uniqueness and diversity of Hawaiian honeycreepers by positing that at one time, a pair (or more) of finches was blown onto the islands. Given the lack of competition they encountered, Hawaiian honeycreepers evolved to exploit the rich resources available in ecological niches that finches do not normally inhabit. Genetic randomness enabled this diversity to arise. It provided for good use of resources, but it also produced an amazing variety of beautiful birds.⁴⁰

Further examples of purposeful roles for randomness from artificial intelligence, hierarchy theory, game theory, and quantum mechanics could be cited, but these will suffice. Thus randomness, often seen as synonymous with disorder and instability, is the mechanism that brings about order, stability,

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and diversity in physical situations on which life depends. So we can reason like this: God is Creator of all things, and we have articulated some of his purposes for that creation. We see how randomness supports the achievement of these purposes. Therefore we can reason analogically from how purposes function for us, to how they might function for God, and conclude that God has created randomness to accomplish his ends.

While the above examples are well understood, some authors have advanced additional speculative ideas as to how God might use randomness.

- In his chapter, *Order out of Chaos*, David Bartholomew cites examples of how unanticipated orderly structures arise out of chaotic arrangements of entities such as light bulbs and buttons. He writes, "Randomness achieves easily that which, by design, might have been very difficult."⁴¹ Bartholomew uses this as an analogy for how God can have both randomness and order.
- Speaking of scientific law, John Polkinghorne writes, "Chance ... is the means for the exploration and realization of inherent possibility, through continually changing (and therefore at any time contingent) individual circumstances."⁴² That is, Polkinghorne views God as endowing the creation with possibilities; randomness provides the means for exploring them, thereby enabling creativity in the physical world.
- William Pollard, a well-known physicist and an Episcopal priest, argued for quantum indeterminacy. But he also argued that macrolevel randomness provides room for providential action not easily recognizable as extraordinary.⁴³ Thus, Pollard suggests, the world is not deterministic, and continual divine action takes place in the form of God's providential care. However, randomness makes it possible for God to hide such actions. Hence, God ensures that the interpretation of events as providential depends on faith; it is not forced on anyone.

So randomness need not contradict God's purposefulness.

7. Sovereignty

Our second potential problem is that randomness appears to involve processes outside of God's con-

trol, so randomness appears to conflict with divine omnipotence. Oden writes,

God's power is not bound always to exercise every conceivable form of power in every situation ... God even allows wills contrary to the divine will to act and express influence within fleeting temporal limits.⁴⁴

Aquinas regarded God as empowering and sustaining nature rather than controlling it; creatures can be causative agents in and of themselves.⁴⁵ For Aquinas, God is not just another cause or being in the universe but endows all else with being, order, and the capacity to be a secondary cause. This section will explore the perspective that Aquinas and Oden represent in more detail.

First, randomness can involve order. If one rolls a fair die, apart from a drastically unusual event such as the family dog swallowing the die, there are only six possible outcomes and each has probability 1/6. The situation is closer to deterministic order than to complete chaos. But all order originates in God and that includes the order in randomness. As Michael Heller points out, the laws of probability are still laws.⁴⁶

David Bartholomew argues that God "can have it both ways" — have both randomness and order — by introducing the concept of level. At the level of individual entities, a situation can be random, but at an aggregate level, it can be orderly.⁴⁷ For example,

- Globally, about 106 male children are born for each 100 female children. However, males have a slightly higher rate of childhood mortality, so that when both genders reach adulthood, the numbers of males and females are almost equal. Thus the gender of an individual birth can be non-determinate while the aggregate produces a simple order.
- The ideal gas law was first stated by Émile Clapeyron in 1834. For gas in a closed container, $PV = NRT$ where P denotes pressure; V , volume; N , the amount of gas present; R , the gas constant; and T , temperature. A gas consists of enormous numbers of molecules moving randomly in the container; the gas law describes its aggregate behavior in a simple, orderly way.

Figure 1 presents a probability distribution. Note its erratic, uneven quality. Using a computer, I selected

10,000 random samples of size 30 from a population so distributed. Figure 2 presents the distribution of the means of these samples. It is similar to the familiar bell-shaped curve. The central limit theorem tells us that for any probability distribution, if we take independent random samples of size n from that population, the distribution of means of those samples approaches a normal distribution as n gets larger. Processes that average together large number of similar items are common. For example, temperature is the average motion of molecules. Thus, the central limit theorem provides a powerful explanation for why normal distributions arise so frequently in nature. It demonstrates how aggregation transforms disorder at one level to order at a higher level.

Bartholomew argues that God's sovereignty operates differently at different levels. A believer can easily affirm that the order and structure at aggregate levels expresses God's orderliness and goodness.

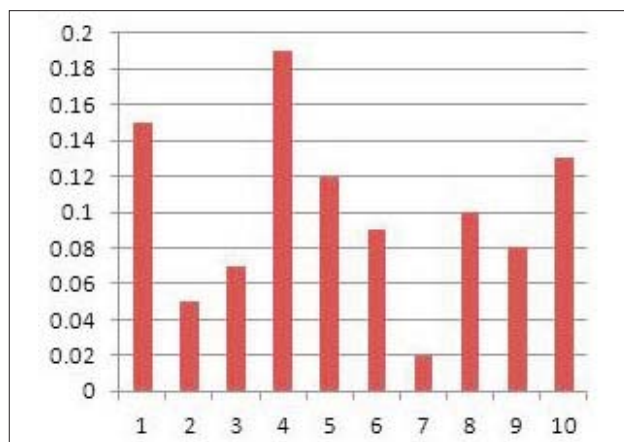


Figure 1. A Probability Distribution

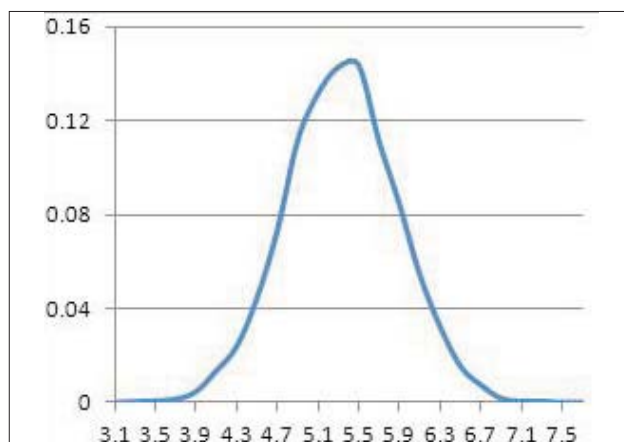


Figure 2. The Distribution of Averages of Random Samples from Figure 1.

But, says Bartholomew, randomness at low levels also expresses God's sovereignty. Nevertheless, while Bartholomew's discussion of levels is helpful in seeing how "God can have it both ways," viewed in isolation, it can oversimplify the complexities of reality. Creation cannot be neatly divided into two levels—a lower one where God operates via randomness and an upper one where deterministic laws prevail.

Robert Bishop's notion of contingent rationality—the order and structure that God has freely given creation—helps here. He writes, "... creation has its own rationality, its own particular order, structure and functionality, which are at least partially intelligible to us."⁴⁸ God works through that rationality and that includes the laws of probability and the orderliness of random processes. Randomness does not mean arbitrariness. Rather, random phenomena are constrained to act within boundaries according to their nature. Molecules can vibrate in any direction in three-dimensional space, but that is all they can do; a smooth-skinned pea may nondeterministically produce offspring that are smooth or rough, but it cannot produce a gorilla. God's sovereign control over randomness is expressed in both types of probabilistic laws—those that operate at the level of the individual entity and those that govern aggregation.

8. Foreknowledge

Reconciling randomness with divine foreknowledge is a generalization of the classical problem of reconciling human free will with divine foreknowledge—all of the same questions arise. In *On Free Choice of the Will*, Augustine formulates the problem in the words of his interlocutor, Evodius:

I very much wonder how God can have foreknowledge of everything in the future and yet we do not sin by necessity. It would be an irreligious and completely insane attack on God's foreknowledge to say that something could happen otherwise than as God foreknew. So suppose that God foreknew that the first human being was going to sin. Anyone who admits, as I do, that God foreknows everything in the future will have to grant me that. Now ... since God foreknew that he was going to sin, his sin necessarily had to happen. How then is the will free when such inescapable necessity is found in it?⁴⁹

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Replace sinning by random events and free will by processes that produced them and we have the problem of reconciling randomness with God's foreknowledge. Three ways to reconcile God's foreknowledge and human free will apply to randomness in the natural world as well.⁵⁰

1. *Open theists* assert that the future does not exist. They affirm that God has knowledge of many future events—he knows his plans for the future; he knows the laws of nature fully, so he can predict the future evolution of all objects under the control of those laws. He also knows the aggregate behaviors of nondeterministic systems. But he does not have knowledge obtainable by observing a future event—if I plan to flip a coin in the next five minutes, open theists would argue, God cannot say whether that coin will come up heads or tails. Advocates of this approach argue that it does not violate God's omniscience—God knows all that is knowable, but because indeterminate future events do not exist, they are not knowable. They also present numerous biblical texts referring to God regretting actions, changing his mind, and so forth, that they interpret as providing support for an open future.
2. Another approach is *simple foreknowledge*—God's complete and infallible knowledge of the future "... uncomplicated by exceptions, additions, qualifications, et cetera ..." ⁵¹ Arguments for simple foreknowledge argue that foreknowledge does not constrain events. Consider any particular event that one might want to regard as random—say observing the measurement of the spin of a particular electron. Imagine that God, in spite of his omniscience, chooses to ignore this particular event. (Perhaps he cannot, but let's accept it as a hypothesis for the sake of this argument.) God has no foreknowledge of whether this electron will be measured as spin-up or spin-down, and so the randomness of that outcome does not conflict with his foreknowledge. But the event is exactly the same whether God knows about it or not. So the randomness of the event is independent of God's foreknowledge.
3. A third approach is *Molinism*, after the Jesuit scholar Luis de Molina of the late sixteenth century. Imagine God contemplating all possible worlds he could create. Molinists call the knowledge of these worlds *God's natural knowledge*. Now

imagine God after he has chosen the one we live in ("after" is used here in a logical rather than a temporal sense); his knowledge of this is his *free knowledge* (since he has freely chosen which one to create). In between these, Molinists argue, is God's *middle knowledge*, knowledge of events (which may be random) in each possible world. Molinists argue that in choosing the particular world God chose to create, he took this middle knowledge into account. Thus he is able to create randomness, to foreknow its outcomes, and to ensure that his will is accomplished—not in spite of randomness, but as we saw in Section 6, because randomness is one of the means of accomplishing his will.

Scholars are far from a consensus on which of these accounts is the most compelling. Open theism contradicts classical Christian theology's affirmation that God's omniscience includes knowledge of the future; given the extent of classical unity on this question, it would require a very compelling case to reject it. To my mind, the case for open theism, however, does not seem that compelling. Simple foreknowledge affirms free will (and by inference randomness), but it has not provided a clear account of the relationship between God's knowledge and that freedom. Molinism has been critiqued on various grounds, notably the question of why God, knowing his creatures' free choices in advance, would create souls that are lost.

I lean toward Molinism—it provides a powerful account of how God's foreknowledge and ontological randomness can be reconciled; it also seems that God's omniscience would include middle knowledge and that God would use that knowledge in creation. The matter is far from settled, but the three approaches demonstrate that compelling arguments can be presented to reconcile randomness and God's foreknowledge.

9. Causality

Oden writes that God's omnipresence means (among other things) that God is present in every act of causation. Historically, Christian thinkers identify God as the first cause of all actions, although observed events may have secondary causes. Physicists who endorse the Copenhagen interpretation of quantum mechanics typically associate quantum

indeterminacy with causelessness; many Christian thinkers object. For example, John Byl argues against quantum randomness:

Indeed, a basic principle of rational enquiry is that everything has a sufficient reason. The Principle of Sufficient Reason implies the Principle of Causality, which affirms that every event has a sufficient cause. To say that a quantum choice is made by chance is to say that “nothing” makes and actuates the choice. This contradicts the Principle of Sufficient Reason. To say that an event has no cause is to give up on science and to invoke magic, in this case magic without even a magician.⁵²

In contrast, Robert Kane distinguishes the principle of sufficient reason and the axiom of sufficient reason. The first says that if p, then there is a sufficient reason for p. The second is its converse; it says that if there is a sufficient reason for p, then p. Kane writes,

... it will be logically possible that something be the case (e.g., a chance event) which does not have a sufficient cause or explanation for its existence.

... We may say that the axiom of sufficient reason defines the *sufficiency* of a sufficient reason. By contrast, it does not seem that one can derive from the definition of a sufficient reason that everything existing must have one, which is what the principle of sufficient reason requires.⁵³

Byl seems to raise the principle of sufficient reason to the level of an axiom. The principle assumes determinism; an argument against chance based on it begs the question.

Consider this thought experiment. A male bear walks through the woods in mating season to liaison with a female. A deer steps on a stick which snaps. The bear stops, listens, and moves on. During that hesitation, his sperm swim around so that the genetic material he passes on differs from what it would have been. In explaining his cub's genetic makeup, the stick would not appear in a causative explanation. Now suppose the deer had stepped a half inch further and missed the stick. That non-event would also not appear in the explanation. That is, one could construct a causative explanation for the cub's DNA makeup and yet, indeterminacy would still be present. In fact, arbitrarily many such counterfactuals could alter the cub's DNA. But none would appear in a causative account. As another example, a puff of wind could cause a bee in Mendel's

garden to move slightly; the pollen grains on its back would differ and his peas would receive different genetic material than they would have received without the wind.

By considering counterfactuals, we can see how probabilistic causation can exist without violating God's presence to the causation.

10. Conclusions

How might the existence of ontological randomness in the physical world influence how we see God?

First, the apostle Paul writes,

Oh, the depths of the riches of the wisdom and knowledge of God!

How unsearchable his judgments,

And his paths beyond tracing out! (Rom. 11:33, NIV)

Randomness can be viewed as a subtle expression of God's wisdom—numbers consist of bits that cannot be generated by any algorithmic process, enormously complex systems have components that act independently according to their own laws yet aggregate to produce a simple order, dynamically stable systems depend on randomness for their stability, God's sovereignty is expressed in dramatically different ways at different levels, and probabilistic laws define how order can exist in the midst of apparent disorder. Such factors expand our understanding of Paul's words and can lead to richer worship.

Secondly, Calvin writes,

Suppose a man falls among thieves, or wild beasts; is shipwrecked at sea by a sudden gale; is killed by a falling house or tree. Suppose another man wandering through the desert finds help in his straits; having been tossed by the waves, reaches harbor; miraculously escapes death by a finger's breadth. Carnal reason ascribes all such happenings, whether prosperous or adverse, to fortune. But anyone who has been taught by Christ's lips that all the hairs of his head are numbered [Matt. 10:30] will look further afield for a cause, and will consider that all events are governed by God's secret plan.⁵⁴

The view of randomness presented here can nuance Calvin's statement. We need not set “fortune” against Christ by associating it with “carnal reason.” Rather, randomness suggests we should look at the events

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Calvin cites systemically—God has ordained that such events occur but, rather than seeing each event as God's particular will, we see the broad system in which such events occur randomly as God's will. A nondeterministic world provides an arena in which God can demonstrate providential care.⁵⁵

Thirdly, Isaac Newton saw his theory of gravitation as explaining God's work in the physical universe. But subsequent scholars used his laws to undergird deism. The use of nondeterministic processes to account for events in the physical world could also lead to deism. But it need not. Rather, along the lines that Aquinas suggests, nondeterminism can enhance respect for the freedom God gives his creation and recognition of God's providential care.

And lastly, randomness offers the potential of a more nuanced theodicy than does determinism. But this will require development beyond this article. *

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Notes

¹David Stover and Erika Erdmann, *A Mind for Tomorrow: Facts, Values, and the Future* (Westport, CT: Praeger Publishers, 2000), 37.

²R. C. Sproul, *Not a Chance: The Myth of Chance in Modern Science and Cosmology* (Grand Rapids, MI: Baker Books, 1994), 3.

³This quotation appears in a postscript to the second edition of Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago, IL: University of Chicago Press, 1970).

⁴The modern concept of probability was formulated by Andrey Nikolaevich Kolmogorov in the 1930s. The earliest widely used textbooks were written in 1950 by William Feller in the United States and Boris Gnedenko in the Soviet Union. Feller mentions all of the games of chance discussed here as well as other examples in chapter 1. Gnedenko uses dice and cards as his principal examples.

⁵In the *Bayesian interpretation*, probabilities refer to subjective degrees of belief.

⁶John von Neumann, "Various Techniques Used in Connection with Random Digits," *Applied Mathematics Series*, no. 12 (1951): 36–8.

⁷Developed by Niels Bohr and Werner Heisenberg in 1924–1927.

⁸Articulated by Louis de Broglie in 1927 and rediscovered by David Bohm in 1952.

⁹Nancey Murphy argues that God is such a nonlocal variable in "Divine Action in the Natural Order: Buridan's Ass and Schrödinger's Cat," in *Chaos and Complexity: Scientific Perspectives on Divine Action*, 2nd ed., ed. Robert John Russell et al. (Rome: Vatican Observatory Publications, 2000), 325–58.

¹⁰The name was popularized in James Gleick, *Chaos: Making a New Science* (New York: Viking Penguin, 1987).

¹¹In the *Stanford Encyclopedia of Philosophy* article on chance, Antony Eagle applies *chance* to processes and *random* to data.

¹²For instance, the string 010101010 ... can be finitely described as an infinite repetition of 01 even though the string itself is infinite.

¹³AIT removes any remaining ambiguity in the idea of computability by defining it with Turing machines—an abstract model of computation that serves as the theoretical foundation for computer science.

¹⁴Ontological randomness, as defined here, is not merely a limitation in human knowledge. If there is no algorithm for computing a pattern, God cannot compute it either. Of course, it is conceivable that God could know the list of outcomes in another way, for example, by possessing timeless knowledge that encompasses all past, present, and future outcomes of a process. Whether such knowledge can exist is controversial; I will return to this question in Section 8.

¹⁵John Byl, "Indeterminacy, Divine Action and Human Freedom," *Science and Christian Belief* 15, no. 2 (October 2003).

¹⁶Niels Henrik Gregersen, "Laws of Physics, Principles of Self-Organization, and Natural Capacities: On Explaining a Self-Organizing World," in *Creation: Law and Probability*, ed. Fraser Watts (Minneapolis, MN: Fortress Press, 2008), 81.

¹⁷John Polkinghorne, "The Metaphysics of Divine Action," in *Chaos and Complexity: Scientific Perspectives on Divine Action*, ed. Robert John Russell, Nancey Murphy, and Arthur R. Peacocke (Berkeley, CA: The Center for Theology and the Natural Sciences, 1996).

¹⁸Keith Ward, "Why God Must Exist," *Science and Christian Belief* 11, no. 1 (April 1999): 5–13.

¹⁹David Bartholomew, *God, Chance, and Purpose: Can God Have It Both Ways?* (Cambridge: Cambridge University Press, 2008).

²⁰See, for example, "Random Numbers Certified by Bell's Theorem," *Nature* 464 (April 15, 2010): 1021–4. Also see Cristian S. Calude, Michael J. Dinneen, Monica Dumitrescu, and Karl Svozil, "Experimental Evidence of Quantum Randomness Incomputability," *Physical Review A* 82, 022102 (2010), <http://tph.tuwien.ac.at/~svozil/publ/2010-qrat-j.pdf>.

²¹John Polkinghorne, *Science and Providence: God's Interaction with the World*, 2nd ed. (West Conshohocken, PA: Templeton Foundation Press, 2005), xii.

²²There are several excellent articles on this phenomenon in Russell et al., *Chaos and Complexity*. Crutchfield et al. in an article simply titled "Chaos," pp. 35–48, mention several natural systems including the atmosphere, dripping faucets, turbulence in fluid mechanics, and the heart.

- ²³See Harald Atmanspacher, "Quantum Approaches to Consciousness," *Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta (Summer 2011), <http://plato.stanford.edu/archives/sum2011/entries/qt-consciousness/>.
- ²⁴Thomas C. Oden, *Classic Christianity: A Systematic Theology* (New York: HarperOne, 1992), 35ff.
- ²⁵Herman Bavinck, *Reformed Dogmatics, Volume 2: God and Creation* (Grand Rapids, MI: Baker Academic, 2004).
- ²⁶Some writers speak of God's attributes "prior to" creation. But time, too, is usually seen as part of the created order. So "prior to creation," in the sense of time, has no meaning. Nevertheless, these writers use the term not in a temporal way but in the sense of creation being dependent on God and not the reverse. I prefer to avoid the ambiguity by using "apart from" to refer to those attributes that would characterize God even if there had been no creation.
- ²⁷Bavinck, *God and Creation*, 246.
- ²⁸Ibid., 247.
- ²⁹Ibid., 249.
- ³⁰Oden, *Classic Christianity*, 46.
- ³¹Ibid., 49.
- ³²Ibid.
- ³³Bavinck, *God and Creation*, 202.
- ³⁴Oden, *Classic Christianity*, 43.
- ³⁵Thomas Aquinas, *The Treatise on the Divine Nature, Summa Theologiae* 1, trans. Brian Shanley (Indianapolis, IN: O.P. Hackett Publishing, 2006), 1-13.
- ³⁶Edward Wierenga, "Omnipresence," *Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta (2009), <http://plato.stanford.edu/entries/omnipresence/>.
- ³⁷The clause about mechanism is essential. For instance, if A is the fact that the air pressure in a certain location drops and B is the fact that a storm occurs, B necessarily follows A, but A does not cause B.
- ³⁸Robert C. Bishop, "Recovering the Doctrine of Creation: A Theological View of Science," http://biologos.org/uploads/static-content/bishop_white_paper.pdf.
- ³⁹This bulleted item also appears in James Bradley and Russell Howell, *Mathematics through the Eyes of Faith* (New York: HarperOne, 2011), 108. Copyright 2011 by the Council for Christian Colleges and Universities. Reprinted by permission of HarperOne.
- ⁴⁰Another clear example of this phenomenon can be found in Jonathan Weiner, *The Beak of the Finch: A Story of Evolution in Our Time* (New York: Alfred A. Knopf, 1994).
- ⁴¹Bartholomew, *God, Chance, and Purpose*, 49.
- ⁴²Polkinghorne, *Science and Providence*, 46.
- ⁴³William Pollard, *Chance and Providence: God's Action in a World Governed by Scientific Law* (New York: Scribner, 1958).
- ⁴⁴Oden, *Classic Christianity*, 53.
- ⁴⁵I am grateful to William Stoeger, S.J. for explaining Aquinas's thought on this matter to me.
- ⁴⁶Michael Heller, *Creative Tension: Essays on Science and Religion* (West Conshohocken, PA: John Templeton Foundation Press, 2003), chap. 11.
- ⁴⁷Much of the material in this section also appears in Bradley and Howell, *Mathematics through the Eyes of Faith*, 105-6.
- ⁴⁸Bishop, "Recovering the Doctrine of Creation."
- ⁴⁹Augustine, *On Free Choice of the Will*, trans. Thomas Williams (Indianapolis, IN: Hackett, 1993), 73.
- ⁵⁰All three are clearly presented in *Divine Foreknowledge: Four Views*, ed. James K. Beilby and Paul R. Eddy (Downers

Grove, IL: InterVarsity Press, 2001). It also presents the case for determinism; because my goal here is to show that ontological randomness is consistent with historic views of God's nature, I will not address that case.

⁵¹David Hunt in *Divine Foreknowledge: Four Views*, 67.

⁵²Byl, "Indeterminacy, Divine Action and Human Freedom," 102-3.

⁵³Robert Kane, "Principles of Reason," *Erkenntnis* 24 (1986): 117.

⁵⁴*Institutes*, I, XVI, 2.

⁵⁵For a further exploration of these ideas, see Paul Ewart, "The Necessity of Chance: Randomness, Purpose, and the Sovereignty of God," *Science and Christian Belief* 21, no. 2 (October 2009).

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Rodney J. Scott

Article

Relating Body and Soul: Insights from Development and Neurobiology

Rodney J. Scott and Raymond E. Phinney Jr.



Raymond E. Phinney Jr.

Various models of personhood exist within Christianity. These often involve a particular understanding of the human soul. We believe that three common assumptions about the soul are incorrect and may lead to errors in Christian praxis. These assumptions are that the soul (1) is instantaneously created at the moment of fertilization, (2) is immaterial and pure and somehow better than the body, and (3) is the “real person.” Using insights from biology, we suggest a new perspective that we call “developing hominization.” Our model is open regarding anthropological monism or dualism. However, we seek to clarify Christian anthropology by stipulating that models employing the foregoing beliefs must be changed or eliminated since they do not meet philosophical, scriptural, and practical qualification to properly inform our understanding of personhood and all its ramifications in theology and science. We examine, through examples, how our model would better inform Christian praxis.

In the current era of biotechnological advances, there is a critical need for Christians to better understand what it means to be a human person. Many recent biotechnological innovations—such as IVF with the potential for embryo reduction, genetic testing for the selection of embryos, some forms of birth control, and the use of embryonic stem

cells—may be considered either life-destroying or life-enhancing depending on one’s view of what it means to be a person. New knowledge in biology has provided insights that should help to answer this ancient question.

But the importance of understanding what it means to be a person goes beyond issues related to biology. Specifically, we believe that several assumptions about what has traditionally been called “the soul” and its relationship to the human body have been a source of error in Christian practice. We believe that there are three common assumptions about the soul that seem incorrect and, if unquestioningly accepted, may lead to errors in practice.

1. The soul is instantaneously created at the moment of fertilization. We label this belief “immediate ensoulment.” Although this is often taken as a core belief that supports many Christians’ commitment to “sanctity of life” issues,

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we believe it may actually provide an inadequate motivation for this commitment.

2. The soul is immaterial and pure and somehow better than material things (including the human body); we label this view “hierarchicalism.” We think that this perspective has led to an inappropriate devaluing of the physical nature of humanity, and ultimately, among other things, to Christian practices that have subjugated women and unwittingly encouraged pathological lifestyle choices among women.

3. The soul is the “real person.” We label this view “discorporealism” and distinguish it from hierarchicalism by virtue of the errors in practice that it perpetuates. These errors relate to an unbiblical interpretation of the gospel that focuses almost exclusively on spiritual salvation at the expense of meeting the physical needs of a broken world.

Our ultimate goal in this article will be to assess the validity of these assumptions and to develop different perspectives that can better support the mission of the church. We begin by considering options for a Christian understanding of what it means to be a person. We first survey what scripture does and does not say about this topic, and then explore five models of personhood suggested by different Christian thinkers. Next, we discuss how insights from current thinking in biology might inform our appraisals of the five models. These insights lead us to propose an alternative pedagogical model for understanding personhood. Finally, we apply our model to three problems (each related to one of the three assumptions described above) that require a specific Christian response.

Insights from Scripture

We begin this section by disclosing our purpose for it—we wish to demonstrate that the Bible does not provide an explicit anthropology that supports a dualistic perspective. We agree with theologian Joel Green who has written in support of a monistic perspective of personhood, and who concludes that biblical word studies related to this concept can provide “only limited and primarily negative results.”¹ While a review of Green’s work would support our purpose, to avoid the impression of selectively citing antidualist authors, we have chosen instead for this

cursorial overview to rely on the writings of theologian John Cooper who holds a position he calls “holistic dualism.”² Cooper, too, concedes that in biblical word studies, “the variety and interchangeability of terminology simply do not provide a footing for a clearly dualistic reading.”³

Old Testament Biblical Anthropology

Cooper states,

There is little question that traditional exegetes have viewed the Old Testament picture of human nature through the lenses of Christian Platonism ... a material body and an immaterial soul or spirit was simply taken for granted.⁴

He then notes that more recently “the pendulum has swung to the opposite side.” Current scholars have “become highly suspicious—almost paranoid—of the presence of Platonic dualism in the traditional interpretations of Scripture.”⁵ Cooper explains that the Hebrew people of the Old Testament era “viewed human nature as a ‘unity’ of personal and bodily existence.” And “the Old Testament is resoundingly this-worldly.”⁶

We present five key Old Testament terms used to describe aspects of persons.⁷

1. *Nephesh* is frequently translated as “soul,” but it can also mean “throat,” “neck,” or “stomach”—even “corpse” or “dead person”⁸ (Num. 19:11, 13, NIV⁹). It “is used of animals as well as people in the sense of ‘living creature.’” It has bodily desires, and it is “the seat of emotions and moral dispositions.” Cooper concludes that, in many contexts, it might well be translated as simply “person,” “self,” “I,” or “myself.”

2. *Ruach* means “wind or moving air” and, by extension, “breath.” It is also translated as “spirit,” more often as the spirit of God rather than that of humans. Cooper sees it as “a vital force ... which animates living creatures” but not as an “immaterial substantial soul.” It is also the “seat of various conscious dispositions and activities. The spirit can reason, deliberate, choose, will, rebel against God ...” Cooper concludes that none of the Old Testament uses indicates an “immaterial subsistent self.”

3. *Basar* is frequently translated as “flesh.” It is often used to describe muscle tissue or the human body itself. Cooper notes that it is never used in such a

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way as to “imply a metaphysical distinction between living physical matter and nonphysical substantial spirit.”

4. *Qereb* is often translated as “inner parts” of the body or “bowels” and sometimes has direct reference to specific organs. The Old Testament Hebrews did not seem concerned with the physiological properties of the human organs, but emphasized their association with spiritual and/or ethical awareness.

5. *Leb* is the heart. Cooper explains that this meant the “hidden control-center of the whole human being.” He further notes, “The entire range of conscious and perhaps even unconscious activity of the person is located in and emanates from the heart.” Along with *nephesh* and *ruach*, *leb* overlaps considerably with current concepts of the person or self.

The Old Testament Hebrews did not see any one of these terms as equivalent to the current concept of the soul. Rather, the terms are often used to refer to various aspects of the person, or even to the whole being. *Nephesh* and *ruach* most frequently “seem either to refer to the whole psychophysical person or otherwise to the energizing life-force given by God. Neither use refers to an immaterial entity.”¹⁰

Intertestamental and New Testament Anthropology

During this period, there was an expansion of ideas regarding the afterlife and immortality. Views ranged from materialistic such as those of the Sadducees, to extremely dualistic, as expressed in several books of the apocrypha which suggest that body and soul are permanently separated at death. The words *nephesh* and *ruach* (soul and spirit, respectively) were given additional meanings and “could now refer to the discarnate dead as well as to the whole person, life-force, and the breath.” Cooper acknowledges that there was some influence of Greek thinking in various strains of intertestamental writings, but he contends, “there is little evidence of the principle antibody, antimaterial bias of Greek idealism or Gnosticism.”¹¹

Generally, Old Testament categories are retained in the New Testament through the use of approximately equivalent Greek terminology. For example, *sarx* becomes the equivalent of flesh (*basar*), *soma* takes the meaning of body (as a whole), *psychē* is the

word for soul (*nephesh*), and *pneuma* is the word for spirit (*ruach*). However, in the two cases of the words translated as soul and spirit, there are new meanings that correspond to the additional (discarnate) meanings added in the intertestamental period. Though Cooper himself ultimately favors a dualistic perspective, he notes that the anthropological terms and usages do not require any dualistic anthropological interpretation of scripture.

While space limitations prevent us from assessing in detail more subtle considerations regarding possible biblical anthropologies, we have indicated that the Bible does not, as some assume it does, offer a straightforward teaching on this matter.¹²

Models of Personhood

We now consider five models of personhood suggested by different Christian thinkers. The first three are historical and propose dualistic relationships between an immaterial soul and a material body. The fourth and fifth examples are recent proposals that attempt to incorporate modern science as it relates to the nature of personhood. The fourth posits a dualistic relationship that is based on an “emergent” spiritual soul, while the fifth posits that humans are totally material beings capable of relating to others and to God both in this life and in a life to come.

1. Substance Dualism as Conceived by Plato and Neoplatonism as Adapted by Augustine

Plato (428–347 BCE) proposed that humans are composed of two distinct parts: a mortal body and an immortal, eternal soul. The soul preexists and outlives the body; during earthly life, the soul is “imprisoned” in the body. Nancey Murphy comments concerning Platonic dualism, “The soul’s true home is a transcendental realm of ‘ideas.’”¹³ Augustine (CE 354–430) adapted Plato’s ideas for use within a Christian worldview. Augustine’s view, neoplatonism, carefully modified two of Plato’s positions that would have been seen as heretical—that the soul is preexistent, and that it is “imprisoned” in the body, being freed in death.

2. Aquinas’s Compound Dualism

Neoplatonism dominated Christian theology for almost 1,000 years but was eventually superseded

by the teachings of Thomas Aquinas (CE 1225–1274). Aquinas used many ideas about matter and spirit that originated with Plato's student Aristotle, after the reintroduction of Aristotle to Europe via Arab scholars. Aquinas (per Aristotle) viewed matter as passive, but also as multipotent, that is, it could "become all sorts of things"¹⁴ when activated by a spiritual substance that Aristotle called a "form." Some types of forms, which Aquinas called "souls," provided the capacities for living things to grow, reproduce, and do things characteristic of only living things. In Aquinas's view, the human soul is a form—it determines the body's growth and development. It also activates the body and provides what we conceive as consciousness. According to compound dualism, the human person is both body and soul (matter and form)—neither constitutes a complete person without the other.

Aquinas believed that all living things have "souls," but that different types of organisms have different types of souls. Plants have "vegetative" souls, allowing them to grow and reproduce. Animal souls have additional capacities, allowing them "to perceive things and move around."¹⁵ Finally, humans have rational souls, allowing for cognitive capacities beyond those of animals, such as the capacity to be attracted to goodness, including attraction to the ultimate good—God himself.

Aquinas believed that the rational soul is infused by God into the body at 40 days for males and 90 days for females.¹⁶ But, if the soul guides bodily development, how can it not be present until 40 or 90 days? The answer is multiple souls. Aquinas believed that human fetal development was caused by the action of successive "types" of souls. The vegetative soul is stimulated to develop by the action of the semen during intercourse. It organizes the mother's menstrual blood to begin forming the body. Following this, a sensitive soul is generated which further refines the body for reception of the rational soul which God directly infuses.

Christian philosopher J. P. Moreland is a current-day advocate of Thomistic substance dualism.¹⁷ His views will be considered later when we consider how current biology may inform our view of the soul.

3. Cartesian Dualism

René Descartes (CE 1596–1650) was a highly influential Christian philosopher whose dualism gave primacy to the soul as the "real" person. Descartes's formulation resulted from an argument meant to convince those "without faith" (i.e., outside the church) that God and a human soul that is distinct from the body exist.¹⁸ He claimed to have arrived at a conviction regarding the spiritual nature of the "mind" or "soul" by using a radical form of reasoning based on doubting everything he had previously accepted on authority or by virtue of common agreement. He ultimately concluded that the body and the mind are two separate substances and that the mind is the true basis for what it means to be a person. That Descartes conceived of the soul (or mind) as the basis for the "real" person is illustrated by his famous pronouncement "*Cogito, ergo sum*" ("I am thinking, therefore I exist").

... I knew that I was a substance, the whole essence or nature of which is to think, and that for its existence there is no need of any place, nor does it depend on any material thing; so that this "me," ... the soul by which I am what I am, is entirely distinct from body ... and even if body were not, the soul would not cease to be what it is.¹⁹

Richard Swinburne is a well-known contemporary dualist who arrives at his position by reasoning that is similar to Descartes's,²⁰ but whose concept of the soul differs in several striking ways that have been affected by current biological insights. For example, while Descartes famously denied that animals have souls or even consciousness, Swinburne recognizes animal consciousness and concludes that animals, as well as humans, have a type of soul.²¹ Swinburne also takes a developmental approach to the soul that would have been quite foreign to Descartes, believing that the operation of the soul is linked to that of the brain (during life) and that the soul therefore must not function until about 20 weeks after conception (though he leaves room for the possibility that a nonfunctioning soul may exist at an earlier time).²²

4. Emergent Dualism

In emergent dualism, the mind, or soul, develops naturally from the highly complex structures and interactions of the human nervous system. As in the models above, the soul is a nonphysical, spiritual entity, but this entity naturally emerges as a new

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property, directly from the organic substrate of the human body. William Hasker states that the soul could emerge from the body in a manner similar to the way certain physical properties emerge (or are believed to emerge).

The core idea of emergence is that, when elements of a certain sort are assembled in the right way, something new comes into being, something that was not there before. This new thing is not just a rearrangement of what was there before, but neither is it something dropped into the situation from the outside. It “emerges,” comes into being, through the operation of the constituent elements, yet the new thing is something different and often surprising; we would not have expected it before it appeared.²³

Hasker provides examples of emergent phenomena. He notes that when a certain type of simple mathematical formula is plotted “onto a set of coordinates, a fractal pattern appears—complex, unexpected and sometimes stunningly beautiful.” He describes crystals that sometimes “emerge” when certain molecules are dissolved in water. He also depicts life in the form of a cell composed of “the right number and kind of chemical molecules ... arranged in a particular complex structure,”²⁴ and even depicts conditions associated with consciousness as possible examples of emergence.

The emergence of a nonphysical soul from a physical body would require the action of as-yet-unknown “new laws, new systems of interactions between the atoms, and so on.” These new laws would then bestow upon the brain “*emergent causal powers*.” The net result would be the development of “a new entity, the mind” which is itself immaterial and constitutes “an *emergent individual*.”²⁵

For Hasker, the benefit of emergent dualism is the view of the body as equal to the soul in value and importance. He says,

It prevents the splitting of the person into two distinct entities and cuts off the implication (sometimes found in “Platonic” theories of the soul) that everything of true worth is to be found in the spiritual dimension and that the body is at best a tool, at worst an encumbrance for the soul.²⁶

5. Monistic Views of the Human Person

We now address two different ideas that describe persons as entirely physical or material, but that use

different approaches to reach this conclusion. We treat them together because each appears, to us, somewhat incomplete for the purpose to which we apply them. However, taken together, they suggest a coherent whole that is highly applicable to our purposes. Since the person, in both views, is entirely physical, personhood is not the possession of some spiritual component, but, rather, it is the possession of abilities to reason and to act in uniquely human ways.²⁷

Nonreductive physicalism, as championed by Murphy, relies primarily on findings of current science to attribute personhood to mental states.²⁸ The second view, emergent materialism, argues for the existence of a new type of property (an emergent property) to account for human consciousness.

Nonreductive Physicalism

Murphy prefers the term “physicalism” over “materialism” because the latter has been associated with a worldview stipulating “denial of the existence of God.”²⁹ Murphy claims that humans do not have immaterial souls. We are wholly material or physical beings. The term “nonreductive” indicates that one need not view this entirely physical person as causally reducible to low-level quantum physics. We also prefer the term physicalism as it encompasses things that are entirely physical, yet are not matter (e.g., energy, gravity, or other “nonmaterial” physical forces).

Murphy states that for dualists the soul “serves the purpose of explaining what we might call humans’ higher capacities:” rationality greater than that of animals, morality, and “a relationship with God.”³⁰ The reductionist, she says, would argue that humans without souls must “not be truly rational, moral or religious,” but, instead, these capacities must all be “really nothing but brain processes.” Murphy states her view as follows:

... if there is no soul, then these higher human capacities must be explained in a different manner. *In part* they are explainable as brain functions, but their full explanation requires attention to human social relations, to cultural factors, and most importantly, to God’s action in our lives.³¹

As her terminology suggests, Murphy is concerned that her view not be taken as a standard reductionist view of persons. She is apprehensive that her critics may ask, “If humans are purely physical ... then how

can it not be the case that all human thought and behavior are simply determined by the laws of neurobiology?"³² Murphy's response rests on the concept of "downward causation," in which mental states have top-down causal power on the physical processes that make up a person. She asserts that most humans think in Newtonian terms in which all causal powers are invested at the lowest level of reduction and that any complex systems are mere aggregates of more elementary constituents (e.g., marbles in a bag) or mechanisms. The Newtonian understanding of mechanism says that the parts of a mechanism are inert, and act upon one another in specified ways but are not themselves affected by their relationships to the whole or the other parts of the mechanism. She wishes to redress this causal reductionism by discussing how one might also conceive of the actions within a mechanism as acting "downward" on the parts.³³

Emergent Materialism

Timothy O'Connor suggests consciousness is an emergent property of a human body (like Hasker), but the soul or mind exists "without there being any substance distinct from the body ..." ³⁴ Hasker's emergence is a version of substance dualism; O'Connor's is a version of materialism. Thus, although the soul is eventually able to exist independently of the body in emergent dualism, the soul always depends on the body in substance monism. O'Connor calls this the *causal unity thesis*: "macro-level phenomena" (such as human free will) are assumed to arise "through entirely natural micro-physical causal processes" and their existence "continues to causally depend on processes of this kind."³⁵ This could, at first blush, seem to pose problems for accommodating the Christian doctrines of eternal life and resurrection of the dead. However, such problems are common, to some extent, to every model presented in this analysis, as we will discuss in the next section. Notice, however, that the causal unity thesis specifies both bottom-up causality and top-down causality. The complexity of the physical organism produces the emergent soul, which then has causal influence on the body. This is why it is called causal unity. It is not simply a bottom-up causal flow even though the macrolevel phenomena continue to depend on the microlevel phenomena. Though the former depend on the latter, they can, in turn, influence the next state of the latter.

The Problems of Immortality and Various Models Relating Body and Soul

Though many see the issue of immortality as a particularly hard question for the physicalist views of Murphy and O'Connor, in fact, every Christian view of the person is faced with similar difficulties. Although modern dualists consider their models superior in accounting for the afterlife, traditionally, the church fathers (all substance dualists) were very concerned that they could not well explain a bodily resurrection. They expended considerable effort trying to explain it.³⁶ Since the doctrine of the resurrection is nonnegotiable for orthodox Christians, all face problems in explaining how a body can die and decompose, but yet eventually be resurrected. Also, monists are not without philosophical resources to account for a vigorous intermediate state.³⁷ Thus, although most rank-and-file Christians are dualists, and believe this dualism is a more faithful anthropology, there is actually no simple philosophical advantage to a dualist or monist anthropology in explaining the biblical implications of eschatology and the afterlife. Kevin Corcoran discusses this at some length.³⁸

There are at least three significant questions that obtain regardless of which explanation of personhood one embraces. How is the actual person maintained in the transition from life, through death, to the afterlife? What happens to the person during the intermediate period between death and resurrection? And what exactly is involved in bodily resurrection? While these are significant questions, they are not of central importance for the purposes of this article. Therefore, to show that answers can be developed, we will merely sketch some of the responses made to these questions by dualists and monists.

Dualists generally contend that, because the soul is spiritual and is the essence of the person, there is no difficulty imagining how the actual person is maintained after death. The real person simply continues to exist apart from the body as a disembodied soul. Regarding the intermediate period between death and resurrection, dualists generally settle on one of two alternatives—either the soul "sleeps" during this period, or it remains conscious while awaiting the resurrection.³⁹ A greater difficulty is encountered for the dualist in the matter of the resurrection of the body.

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A common dualist view is that the soul “remembers” the form of the body and that God miraculously restores the physical body. A prime example is Aquinas’s compound dualism in which the soul is the form of the body. Therefore it makes perfect sense that God can recreate the body based on the existence of the soul. The problems that arise in this view have to do primarily with whether the new body must, in fact, be “the same” as the old body. If the answer is yes, then it becomes difficult to explain how even God can reassemble matter for one individual’s new body when that matter may well have gone on to become incorporated into other bodies that belong to other individuals. Some refer to this as the “cannibal problem,” in that cannibalism is the most direct way for one’s matter to become part of another’s body.

Monists are faced with problems that appear more daunting due to their wholly physical accounting of the human person. The Christian monist’s basic response to questions about immortality is that human life is supposed to be embodied life. God must ultimately save our physical bodies in eternity. One way of envisioning this is to assume that God “simply,” miraculously restores our physical beings at the time of the resurrection and due to our personhood being entirely physical, we now exist again, complete with our past experience (encoded in our brains, genomes, and epigenomes).⁴⁰

Another more significant criticism of monists is explaining an intermediate state between one’s death and the general resurrection. The primary text used is 2 Cor. 5:8, in which Paul expresses a preference to be “away from the body and at home with the Lord” (TNIV). First, it should be noted that this is one of the few passages in scripture that seems to make concrete statements about the divisibility of body and soul. Cooper, a biblical scholar and a dualist, concludes that the simplest interpretation is that Paul really believed that there could be a period of disembodied but animated existence after death.⁴¹ Pauline experts such as Murray Harris, Linda Belleville, Scott Hafemann, and Jerry Sumney note that Paul was never clear on this point and made numerous statements that better support anthropological monism and immediate transformation upon death to receive a spiritual body.⁴²

We agree with Belleville that this passage seems to be redressing Greek dualism and Christian Gnostic beliefs.⁴³ The text itself is about the “earthly tent” (our present body) versus the “building from God” (our resurrection body). This passage is not about the intermediate state but about one’s final, eternal state as embodied rather than disembodied. Paul was radically confronting Gnostic teachings that death frees the soul from bodily imprisonment. Paul stipulates in verse 4, “we do not wish to be unclothed but to be clothed with our heavenly dwelling.” He is endorsing the Christian hope of re-embodiment and “repudiating the Greek idea that disembodiment is desirable.”⁴⁴

While Christian physicalists often are skeptical of biblical warrant for a robust intermediate state, they are not without possible explanation for such a state. Also, deep-thinking dualists are not unaware that their view, too, is complicated. The fact that souls are usually considered, by their nature, to persist after death, allows one to model how personal survival may occur without *explaining* it. In fact, even the most impassioned of dualists, Cooper, acquiesces that perhaps one may need to exist as a “quasi-bodily person” in the intermediate state to fit the biblical data.⁴⁵ Monists typically believe that one simply does not exist during the intermediate period. They also note that we still have a poor understanding of the material universe and that we should not foreclose on the possibility that one might persist in a physical sense after one’s body is referred to as a corpse. Corcoran specifically asserts that while people are entirely physical in his view, they are not logically identical with their bodies. He goes to great lengths to demonstrate that a corpse’s mere presence does not *logically require* that the person has ceased to exist, even for materialists.⁴⁶ There is no evidence offered that this does actually occur (neither does the dualist have what science would call evidence of the afterlife), but the logical possibility opens up realms for monist thought on how a robust intermediate state may be possible.

To summarize, as we consider these complexities associated with eternal life and resurrection, we should recognize that *all* the models face difficulties in explaining how we may die, then live again, and how the new person would genuinely be ourselves and not simply a copy.

Insights from Developmental Biology

Having surveyed various scriptural and philosophical considerations related to the nature of persons, we now turn to insights from biological science. First we discuss insights from developmental biology that may be inconsistent with perspectives that endorse the three beliefs from the introduction (immediate ensoulment, hierarchicalism, and discorporealism).

Unique Soul Identity and the Problem of Embryo Twinning

The generation of monozygotic twins (i.e., two individuals derived from a single embryo) may pose problems for the concept of the soul.⁴⁷ One of the earliest references may be that of Roman Catholic priest Joseph Donceel.⁴⁸ Arguing against immediate ensoulment, he correctly notes that “identical twins ... start life as one ovum, fecundated [i.e., fertilized] by one spermatozoon.”⁴⁹ The embryo developing from this single fertilized ovum later divides to generate two embryos that eventually form genetically identical twins. Donceel, referring to Aquinas’s view of the soul, finds this condition difficult to reconcile with immediate ensoulment.

Conversely, J. P. Moreland and Scott Rae, who argue from a dualistic perspective based on Aquinas, do not see embryo twinning as an impediment to accepting immediate ensoulment.⁵⁰ In their view, the unusual case (the development of two ensouled individuals from a single embryo) can be explained by substance dualism (both Cartesian and Thomistic forms) with reference to how God normally achieves this end for a single individual. In both cases, certain physical conditions must exist before a new individual takes shape (e.g., the union of sperm and egg or the division of a single embryo), and once those physical conditions are met, God chooses to create a new soul. Since this is how he acts in typical examples of reproduction, we should not be surprised that this also occurs in unusual cases. Moreland and Rae extend the same rationale to the potential creation of a human clone—when and if such an event occurs, God will create a soul for the clone once the necessary physical conditions for a new life exist.

While this explanation may seem adequate at first, further consideration of the complexities of monozygotic twinning suggests it is anything but

adequate. If we assume that all such twinning occurs at a very early stage, perhaps our objection is trivial. However, twinning occurs at different days post-fertilization and can result in either separate or shared extra-embryonic membranes (e.g., amnion and chorion).⁵¹ The majority of monozygotic twins (60–70%) develop from embryos that divide three to eight days following fertilization. The process can occur as late as 12–13 days postfertilization. These late divisions sometimes result in conjoined twins. Presumably at original fertilization, a soul was created. After the twinning division, which organism gets that primary soul and which gets the new one? Or are two new souls created, and the old one perishes? Or does God, knowing that twinning will occur, delay ensoulment until the division occurs, at which time he adds two souls?

On our reading, those advocating creationism credit God with a different kind of interaction in the universe during soul creation than during the rest of creation. This seems a bit of an interventionist model,⁵² literally *requiring* a special intervention of God in something that happens untold times every day. Such an explanation raises the same type of problem as when Isaac Newton suggested that God must occasionally intervene in the universe to keep it operating smoothly.⁵³

Unique Soul Identity and the Problem of Chimeras

Chimeras in mythology are individuals composed of parts from various different kinds of organisms. In biology, a chimera is a single creature with cells from two different individuals.⁵⁴ These cases result from spontaneous fusions of fraternal twins *in utero*. They are generally detected when the individual presents two normally incompatible phenotypes, such as having a mixture of two blood types, or evidence of hermaphroditism.

One recently discovered case involved a woman who needed an organ transplant.⁵⁵ Her family members were tissue typed to search for a compatible donor. Two of her three sons had genotypes indicating that they were not her biological offspring. Further investigation showed that the woman was a chimera. Her blood system (used to determine her immunological type) was derived entirely from one of the two original embryos. The woman possessed

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the immunological markers consistent with the two sons, but they simply were not carried in her blood.

What do such beings tell us about the soul? If we hold to immediate ensoulment, do such individuals actually have two souls—one from each embryo? Or perhaps the two original souls fuse to form a “chimeric soul.” Perhaps one soul “died” or was somehow subsumed by the other soul in order that there would be only one final soul remaining.

The first option, one person with two souls, seems a theologically complicated alternative. It seems incompatible with important features of many theories of the soul such as the soul as “the form” in compound dualism. Furthermore, if the soul is responsible for human reason, consciousness, ability to love, and other things, it seems that such a person would have an incredible problem with personal identity, perhaps exhibiting dissociative identity disorder or something worse. But this is not the case. Although some XX/XY chimeric hermaphrodites experience psychological and identity challenges, chimeras do not generally evidence more psychological distress than the general population.⁵⁶

The second and third options that involve either fusion of two souls or the disappearance of one at the expense of the other also seem theologically unsound. In most dualist formulations, the soul is an essential substance, not something that could reasonably be merged with another such substance. If instead, one soul was somehow destroyed or “voluntarily” disappeared, this calls into question God’s good will for that soul. Of course, the natural world is fallen, and one could argue that chimeric humans occur as a result of the Fall. Of the three options, this last one seems least objectionable to us on theological grounds; however, theories involving delayed ensoulment, emergentism, or monism largely avoid this problem.

Insights from Animal Consciousness and Neurobiology

We now address implications from studies of animal consciousness and from neurobiology. Much information from these areas suggests that humans may not have immaterial souls, thus negating dualistic views associated with immediate ensoulment, hierarchicalism, and discorporealism.

There is increasing evidence to suggest at least some animals have a form of consciousness. Donald Griffin and Gayle Speck review the literature this way:

Although no single piece of evidence provides a “smoking gun” [that demonstrates animal consciousness] ... the data ... renders it far more likely than not that animal consciousness is real and significant.⁵⁷

They survey the literature on brain structure and find that “the basic nature of the central nervous system function is much the same in all animals with central nervous systems ...” and that “no uniquely human correlate of consciousness [with regard to brain structure] has been discovered.”⁵⁸ They also describe several recent behavioral studies in which animals’ responses to novel challenges “provide suggestive evidence of animal consciousness.”⁵⁹ They also consider animal communication and show that several types of observations can be “useful as evidence of conscious experiences.”⁶⁰

Joel Green makes similar observations and also addresses the existence of mirror neurons in some animals. Mirror neurons are neurons that fire both when an individual acts and when the individual observes another individual performing the same action. Green says that this attribute in animals

provides clear biological evidence that these animals are, like humans, characterized by a “theory of the mind”—that is by the ability to understand that others have beliefs and intentions.⁶¹

Though space constraints prohibit extensive consideration, we make two observations regarding how animal consciousness bears on the distinctiveness of the human soul. First, some definitions of the human soul (such as Descartes’s) state that the human soul is what allows us to have consciousness. Of course, it is possible to modify this element of a strong dualistic model in several ways. Some dualists, such as Hasker, would argue that the soul is not responsible for *all* conscious activity,⁶² while others, such as Swinburne, simply believe that animals do have souls.⁶³ Second, if human consciousness is not categorically different from animal consciousness, then it is not necessarily the possession of an immaterial soul that makes us “in God’s image,” but rather many aspects of our embodied existence, such as our responsibility to care for creation and to have relationships with other humans and with God.⁶⁴

Observations from neurobiology further suggest that a strong form of dualism is less tenable than once thought. There is a vast literature on this topic. We merely sketch the direction of current discussion by focusing primarily on some considerations of Malcolm Jeeves, a Christian neuroscientist who doubts the existence of an immaterial soul and whose thinking on this subject mirrors that of most neurobiologists.

Jeeves has written extensively on questions related to neuroscience and faith.⁶⁵ He describes several observations, both historic and recent, from what he calls a “bottom-up” perspective. In these instances, physical changes in the brain (caused by accidents, disease, or experiment) caused corresponding changes in behavior and/or cognition. He tells the compelling story of a schoolteacher who, seemingly beyond his control, began exhibiting “lewd behavior and pedophilia.”⁶⁶ The day before he was to be sentenced on child molestation charges, he complained of a severe headache. An MRI showed the presence of a large brain tumor. Once it was removed the man’s unusual behavior ceased. A year later, the lewd behavior began to recur. Another MRI showed that the tumor had regrown, and again, removing it caused the behaviors to cease. This clinical example, along with examples of experimental manipulations of the brain, show time and again that physical perturbation of the brain causes changes in a subject’s behavior and/or cognition. It seems clear from these examples that cognition is not associated with some nonphysical component that functions separately from the functions of the brain.

Jeeves also provides examples of “top-down” effects, which he says involve “cognition producing localized changes in the brain.”⁶⁷ For example, one MRI study compared London taxi drivers, “renowned for their extensive and detailed navigation experience and skills,” to normal controls. After two years of “intensive training in navigation,” the cabbies’ brains were found to have significantly larger anterior hippocampi.⁶⁸ Studies like this again show the close link between consciousness and the brain. What happens in our minds can somehow change the structures of our brains. Again, this does not seem consistent with a stronger form of dualism that claims a distinct separation of soul and body.

In considering the actual relationship between mind and body, Jeeves suggests that “brain events” and “mental events” may best be interpreted as “complementary descriptions.” In proposing “duality” without “dualism,” he notes,

We may regard mental activity and correlated brain activity as inner and outer aspects of one complex set of events that together constitute human agency. Two accounts can be written about such a complex set of events, the mental story and the brain story, and these demonstrate logical complementarity. In this way, the irreducible duality of human nature is given full weight, but it is a duality of aspect rather than a duality of substance.⁶⁹

Donald MacKay suggests from a similar neurobiological perspective that Christians should never endorse a view of the soul that would require any mental state that is not dependent upon brain activity. It is the ultimate God-of-the-gaps problem should we discover that all mental states are determined by (if not identical with) brain events.⁷⁰ Although Jeeves speaks for the vast majority of neurobiologists in skepticism of substance dualism, some neurobiologists do disagree, most notably Sir John Eccles.⁷¹

Developing Hominization— A Model of Personhood and Its Applications

A Model of Developing Hominization

In light of the difficulties posed by science against immediate ensoulment, hierarchicalism, and discorporealism, we present a model of “developing hominization” that should enhance our understanding of what it means to be a human person. The basic premises of this model are as follows. First, humans are different from other animals in such attributes as the extent of consciousness that we possess, and in other traits such as our ability to love, to relate to others of our kind and to God, to bear responsibility, and to act sacrificially. The substance or property (hereafter referred to as the “essence”) that enables these uniquely human attributes to exist may be material or immaterial, physical or spiritual. In whichever case, God is able to maintain this essence

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or precisely and uniquely recreate it in an inscrutable way that enables humans to survive after death. The essence that makes us uniquely human is not present in complete form at the moment of fertilization. This essence interacts so intimately with the entire person, that it is only the entire person that exhibits functional unity. And finally, this essence should not be considered somehow better or purer than any other part of the person, and it should not be considered to constitute the “real person.”

We have chosen the term “developing hominization” to emphasize that the model advocates a developmental view of the human person. It is not *specifically* monist or dualist, though it can accommodate either. There are three key aspects of this model. The model is (1) *open* to several possible interpretations of what it means to be a person. It is (2) *integrative* with regard to interpretations from both theology and science. And it is (3) *intentional* with regard to considerations of potential consequences of embracing the model itself.

Openness—The developing hominization model is unlike the five models presented above. It is more of a “metamodel” that can potentially incorporate ideas from several of the models and in some cases, can acknowledge the possible correctness of one or more of them. Given the conditions described above, the only models among the five presented earlier that would be explicitly rejected are a strong version of the Neoplatonic model and a substance dualism such as that advocated by Descartes.

Integrative—This model is based on input from both theology and science. Much of the input from theology is “negative” in that what scripture does *not* say has been taken seriously. Specifically, there seems to be no consistent scriptural articulation of the nature of the essence that makes humans unique, nor description of how or when the essence comes into being. An intermediate state for humans between death and the resurrection seems to suggest a requirement of disembodied existence, but monists have given explanations that would be faithful to scripture.⁷² Thus, the existence of an immaterial soul does not seem to be an absolute requirement for orthodoxy. Likewise our model neither requires nor restricts the existence of a soul. However, it does limit the degree to which the soul can be thought of as the “essence,” since we stipulate that this essence

is not in any part but only in the whole of a person. The model also responds to positive input from scripture and theology with its recognition that the material aspect of human beings is of great value. Furthermore, that this model also integrates input from science, leading to fruitful reduction in the number of tenable theories, is one of its chief strengths.

Intentional—The effectiveness of the church throughout history appears to have been hampered, in many cases, by unintended consequences of particular views of the human soul. For instance, a historical tendency toward asceticism in the early church has lingering effects today, including an associated devaluing of women (see below). This unfortunate example seems clearly linked to an overly negative view of the material world based in a strong dualistic perspective emphasizing the perspective we label hierarchicalism. The developing hominization model may serve to correct erroneous views of human personhood, thus avoiding this and other similarly based errors in praxis. This model also has at least one feature—its rejection of immediate ensoulment—that could itself generate errors of praxis if an intentional approach to application is not taken.

Application of a Model of Developing Hominization

What is at stake if, as we have suggested, several commonly held beliefs about the human soul are wrong? There are points of disagreement between believers on many theological concepts—why is this one so crucial? It is crucial because what we believe about the spiritual nature of humanness is foundational to so many other beliefs. It affects what we think about the very nature of the material world—is it good or is it evil? ... can we trust our senses? ... what is our relationship to the rest of the created order? It affects how we view and treat other humans. Are they fellow sojourners, sources of temptation, souls to be won for Christ, or individuals who need healing? Furthermore, what we think about our human nature is crucial because it is often divisive. Those who hold extreme views frequently discount the views of others and leave little room for compromise.

The model that we have proposed attempts to harmonize clear perspectives from theology and

science, seeking to establish a firmer basis for objective understanding. While it excludes some extreme theological positions, its openness creates more potential to unify different strains of thought than it does to divide them. We believe that our model can be applied to Christian scholarship in various ways. For example, perspectives derived from this model could inform discussion about topics such as human biotechnology, neuropsychology, or evolution. Each of these is too broad and nuanced to address here. However, to demonstrate the utility of our model, we will use it to consider briefly three topics that are more readily accessible, and which are directly related to the concepts of immediate ensoulment, hierarchicalism, and discorporealism.

Immediate Ensoulment and the Sanctity of Human Life

The developing hominization model rejects the assumption that our personal essence is present in complete form at the moment of fertilization. Because of the particular methods employed by many contemporary American Christians to defend human life, this aspect of the model may seem to undermine the “sanctity of life” position. Since this may be a legitimate concern, we should carefully consider this objection.⁷³

While the belief in immediate ensoulment may influence decisions about protecting early human life, it is not a necessary assertion for preserving a commitment to the sanctity of human life *in utero*. However, as this is often the only “pro-life” assertion made in our culture, some additional rationale is needed. Corcoran gives such additional justification by noting that destroying a developing human life is an action that is opposed to God’s good intention for that developing person.⁷⁴ It is difficult to see how destroying an organism that will become a human person and for whom God himself has that good intention is less problematic than destroying a soul. Besides, as Corcoran also notes, if one holds a strongly dualistic view, then “it is plausible to think that abortion never ends the existence of a person” since that person’s soul (their “real self”) continues to exist.⁷⁵

This last observation leads logically to a consideration of how nondualists (both within and outside

of Christianity) may view arguments related to the sanctity of human life. Some may disbelieve in the existence of a soul; for this reason, they disregard arguments for sanctity of life altogether.⁷⁶ Others may recognize the potential gravity of ending an early-stage human life, but they consider that this act is less grave because it really does not destroy the “real” person. We assert that someone’s personhood status is not the appropriate measure of whether they should be protected. It leaves vulnerable both the unborn and those who have suffered a loss of mental functions. For instance, up to 40% of people labeled as in persistent vegetative states are misdiagnosed.⁷⁷ If they do not possess reason, or cognitive ability, or cortical activity, are they to be euthanized or assisted in “suicide”?

One need not be a Christian, or even a theist, to follow an argument similar to God’s good will—regarding *potential*. No one disputes that the egg in an endangered eagle’s nest will one day be an eagle even though it is not currently “viable.” Thus, the egg is protected. Similarly, a human embryo is, in fact, human and deserving of respect and protection as a *potentially* valuable individual. While accepting the possibility that a fully formed, nonmaterial soul may not exist from fertilization onward may weaken one argument for preserving human life *in utero*, it may strengthen other arguments for it. These arguments may be more convincing to nondualists and non-Christians than the common argument of immediate ensoulment. Careful attention to these other justifications, such as God’s good intention and human potential, should provide equivalent (and possibly better) protection for the preborn and others at risk, since non-Christians and nondualists may be more swayed by them. And finally, if one believes the assertion that a fully developed soul is not present at fertilization, it is disingenuous to use the soul to argue in favor of the sanctity of preterm life.

Hierarchicalism, Asceticism, the Marginalization of Women, and Anorexia

Many factors have contributed to the historic phenomenon of gender inequality, and sadly, the influence of some forms of Christianity has often been cited.⁷⁸ This relationship is undoubtedly complex, but we believe that one contributing factor has been the influence of soul-body hierarchicalism. In this

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section, we consider the historical justification for this assertion and probe one current-day manifestation of gender-biased beliefs, the condition known as anorexia nervosa.

Elizabeth Hall notes that whenever hierarchical dualism is held, one of two results ensues: license or asceticism.⁷⁹ We contend that the ascetic movement of the early church, and that of later heresies, was linked to such hierarchicalism. The ascetic movement, which culminated in the fourth century, involved treating the body harshly in sexual restraint (even within marriage), in the consumption of food, and in other normal human activities.⁸⁰ The idea was that subjugating the body allowed the more important spiritual self to flourish. Though it is difficult to discern between legitimate spiritual practices and certain pathological behaviors, some documented behaviors were extreme and perhaps pathological. Whereas many practitioners were heretical (e.g., Gnostics), many were within orthodox Christianity. In fact, some well-known advocates of such practices were among the church fathers themselves, whose asceticism sadly often contained a somewhat misogynistic perspective, presumably motivated from a concern for safe-guarding sexual purity.⁸¹

By the Middle Ages, the most notable forms of asceticism were evident in the heretical sects.⁸² Within orthodoxy, however, asceticism was also quite pervasive.⁸³ It was during this era that extreme fasting became a common practice, especially among women seeking to live holy lives. Gail Corrington documents this trend, describing it, in part, as a response to male domination, and linking it to current-day patterns associated with anorexia. She describes both groups of women in their noneating practices as “resisting a male image of women (passive, lustful, with obvious feminine characteristics) in favor of an image men promote for themselves (stringent self-denial; slimness and fitness).”⁸⁴

Sabom also draws connections between the asceticism of the Middle Ages (as practiced by Gnostics) and current-day anorexia, noting that “the beliefs and practices of anorexics share common themes and theological errors with adherents of the ancient Christological heresy of Gnosticism.”⁸⁵ Sabom describes a form of asceticism in which “the body is treated as separate from the ‘real self’ or ‘soul,’

and becomes an object of capricious manipulation if not outright contempt.”⁸⁶ These beliefs include both hierarchicalism and discorporealism as we define them.

Caroline Giles Banks provides evidence from surveys, clinical records, and a case study to argue that some current-day cases of anorexia are partly rooted in poor Christian theology with an emphasis on asceticism.⁸⁷ She cites several sources to show that anorexia appears to be more common among people with conservative religious backgrounds than in the general population. She describes multiple interviews with a woman identified as “Margaret C.,” about ten years after Margaret was hospitalized for anorexia. Margaret spoke frequently and idealistically of her Christian faith, and Banks suggests that Margaret even rationalized some of her very strange eating habits (e.g., eating only between midnight and sunrise) with statements about her faith. One description related to Margaret’s view of death clearly demonstrates a dualist inclination:

When [the Bible] says, “Thou shalt never see death,” I believe it ... Well, the part of you that goes [to Heaven] is really yourself because the body is nothing ... Anybody who believes in the Bible would believe in that as a matter of fact.⁸⁸

Corrington also describes several published accounts of interviews with anorectic women that suggest their illnesses may have theological roots. She notes that “anorexia is described by anorectics themselves as a form of *askesis*, a discipline of the body for the sake of a ‘higher purpose.’”⁸⁹

Obviously, there are many sources of both practices that encourage gender inequality, and of conditions that promote the phenomenon of anorexia, but if one contributing factor is poor Christian theology, Christian scholars should work to correct this situation. We believe that rejecting soul-body hierarchicalism is one step that should be taken toward this goal.

Discorporealism, Evangelism, and Social Responsibility

The conference on world evangelization (Lausanne, Switzerland, 1974) was perhaps “the most strategic evangelical gathering in contemporary history.”⁹⁰ According to Tokunboh Adeyemo, it articulated

a vision that “positively expresses socio-political involvement as a Christian duty and places it on the same level as evangelism,” a perspective that has led to what is now called “holistic mission.”⁹¹ This perspective was at that time (and still is, in some circles) a matter of considerable debate. We believe that a disjunction between these two callings (social welfare and evangelism) is a relatively recent historical aberration and may have resulted, in part, from an erroneous view of human personhood, which we define as discorporealism.

Padilla strongly argues for holistic mission, pointing to the life and ministry of Jesus Christ himself as a model for this approach.

His earthly life and ministry ... came to be the model of the life and mission of the church. If that is the case, the proclamation of the good news to the poor, the preaching of freedom for captives, of the recovery of sight for the blind, and the liberation of the oppressed is a basic criterion by which to assess how far the mission of today’s church was really the continuation of the mission of Jesus of Nazareth.⁹²

Though the specific patterns varied throughout the history of the church, a strong sense of social responsibility was an early and enduring element of the mission of the church.⁹³ Bong Ro suggests that it was only during the twentieth century that evangelical Christians shifted in their emphasis away from social involvement and “laid increasing emphasis upon preaching the gospel with a view to saving individual souls.” Ro sees this shift as a reaction against twentieth-century theological liberalism and the “liberal associations of the ‘social gospel.’”⁹⁴

Vinay Samuel and Chris Sugden suggest an explanation for the evangelical retreat from social responsibility that goes to the central tenets of this article, namely a certain hierarchical dualism. They note,

We suggest that one reason why people assign this sort of priority to man’s vertical relationship is that they have a dualistic understanding of existence assuming that man lives in two realms, an inner realm and an outer realm. This dualism cannot be sustained either by biblical teaching or by philosophical reasoning.⁹⁵

Though Samuel and Sugden use the language of “inner” and “outer” realms, not “soul” and “body,”

they further clarify these terms with language that indicates one could label them such:

The inner realm is the locus of the vertical relationship with God. It is a realm of unchanging spiritual realities ... it is a realm of religion, ideas, concepts and language. This realm can be experienced only individually ...

[On the other hand,] the outer realm is the locus of horizontal relationships with man. It is the realm of physical and material existence.⁹⁶

Padilla agrees:

The reduction of the Christian mission to the oral communication of a message of otherworldly salvation grows out of a misunderstanding of God’s purpose and the nature of human beings. It is assumed that God wants to “save souls” rather than “to reconcile to himself all things, whether things on earth or things in heaven” (Col. 1:20) and that the human being only needs to be reconciled to God rather than to experience fullness of life. In the final analysis, this is a reduction related to ideas taken from Greek philosophy, not from Scripture.⁹⁷

If these authors are correct, it seems that gaining a corrected view of the nature of personhood is vital even to the ultimate mission of God’s church on earth.

Final Considerations

We have considered various views of what it means to be a human person, and have shown that many traditionally accepted views are not required by a faithful reading of scripture nor are they well supported by current science. We believe that some of these views have led to errors in praxis among Christians, and we have suggested an alternative model—developing hominization—that can be accepted by orthodox Christians and that should help to avoid the errors we have identified.

This model does not presume to provide a definitive explanation of the nature of personhood, but rather an overview of likely options. In this regard, it should not be considered a dogmatic pronouncement, but rather a pedagogical model for promoting teaching and learning and for stimulating consideration regarding the nature of personhood.

Perhaps the most contentious aspect of this model is its rejection of immediate ensoulment. For many

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Christians, the assumption of immediate ensoulment is equivalent to an article of faith, and we do not wish to provoke a spirit of disharmony within the Body. We may never have epistemic certainty as to whether or when a soul exists, or what it may be constituted of. We do not mean to advance this model as a weapon with which to bludgeon others. However, we do believe, based on current knowledge, that immediate ensoulment does not occur and that belief in immediate ensoulment can lead to errors in praxis. It is also worth reiterating that if one rejects the theory of immediate ensoulment, it is necessary to identify other justification (such as presented here) for preserving embryonic and fetal life when warranted. While this may seem like a weakness to the model, finding other justifications more understandable to nondualists and non-Christians may be just what is needed for more-productive political dialogue.

The assertions of this model, that the essence that makes us uniquely human should not be considered somehow better or purer than any other part of the person, and should not be considered to constitute the “real person,” are much less controversial. However, we believe that much harm has been done throughout history and into the present when Christians have failed to fully acknowledge these assertions. If our presentation of the model of developing hominization has any lasting effect, we hope that it will be to stimulate critical consideration of the importance of these assertions to the Christian worldview. *

Notes

¹Joel B. Green, *Body, Soul, and Human Life: The Nature of Humanity in the Bible* (Grand Rapids, MI: Baker Academic, 2008), 57.

²John W. Cooper, *Body, Soul, and Life Everlasting: Biblical Anthropology and the Monism-Dualism Debate* (Grand Rapids, MI: Eerdmans, 1989), 40. Cooper believes his construct, holistic dualism, allows for functional holism and substance dualism in explicating human anthropology.

³*Ibid.*, 47.

⁴*Ibid.*, 36.

⁵*Ibid.*, 37.

⁶*Ibid.*, 41.

⁷*Ibid.*, 42–7. All quotes in the five definitions are from these pages.

⁸*Ibid.*, 43. Cooper uses the term “dead person,” but many biblical translations, for instance, Today’s New International Version (TNIV), use “corpse.” The subtle difference

between “dead person” and “corpse” can play into whether one endorses a monistic or a dualistic anthropology. The TNIV uses “corpse” in Lev. 22:4 and in Num. 19:11, 13. The NIV uses it only in Leviticus. Those who emphasize that it means “corpse” do so to show that if one of the words translated “soul” can also mean “corpse” — which term most moderns understand to mean all of a person *except* the soul — then this terminology cannot be construed as support for a strong substance dualism.

⁹All scripture is quoted from the New International Version (NIV), unless noted otherwise.

¹⁰Cooper, *Body, Soul, and Life Everlasting*, 43.

¹¹*Ibid.*, 102.

¹²Green gives significant attention to these more subtle considerations that space limitations prevent us from addressing. In the second chapter of *Body, Soul, and Human Life*, he addresses three obstacles that challenge the development of a Christian anthropology from biblical data. The first obstacle (pp. 46–9) is that the biblical evidence is generally implicit rather than explicit. When the biblical authors wrote about the nature of the human being, it was not with the intent of presenting a cohesive model of the human person. The second obstacle (pp. 49–50) relates to the tendency of Western scholars to interpret writings from different times or cultures through the filter of a Western worldview. Green focuses primarily on how this tendency has played out in biblical interpretation with regard to the Cartesian understanding of the human mind. The third obstacle (pp. 51–61) relates to three separate methodological pitfalls that often accompany biblical studies aimed at articulating the nature of humanity. Firstly, that the relationship between Hebrew and Greek thinking is often much more complex than the investigator may realize. Secondly, that biblical terminology is more linguistically subtle than most investigators realize. And thirdly, many investigators have focused on eschatological questions (e.g., “What happens when we die?”) to answer anthropological questions. This approach concerns Green because ancient peoples had different perspectives on the afterlife than do current-day interpreters, and because this type of evidence is analogical and speculative.

¹³Nancey Murphy, *Reconciling Theology and Science: A Radical Reformation Perspective* (Kitchener, ON: Pandora Press, 1997), 48.

¹⁴*Ibid.*, 49.

¹⁵*Ibid.*

¹⁶John Haldane and Patrick Lee, “Aquinas on Human Ensoulment, Abortion and the Value of Life,” *Philosophy* 78 (2003): 255–8.

¹⁷See, for example, James P. Moreland, *The Recalcitrant Imago Dei: Human Persons and the Failure of Naturalism* (London: SCM Press, 2009); —, “The Physical Sciences, Neuroscience and Substance Dualism,” in *The Nature of Nature*, ed. William Dembski and Bruce Gordon (Wilmington, DE: ISI Books, 2011); —, “Substance Dualism and the Argument from Self-Awareness,” *Philosophia Christi* 13, no. 1 (January 1, 2011): 21–34; —, “Naturalism and the Crisis of the Soul,” *Faith & Mission* 24, no. 4 (2008): 50–60; James P. Moreland and Scott B. Rae, *Body and Soul: Human Nature and the Crisis in Ethics* (Downers Grove, IL: InterVarsity Press, 2000), 218–24.

- ¹⁸René Descartes, *Discourse on Method and Meditations*, trans. Lawrence J. Lafleur (Indianapolis, IN: Bobbs-Merrill, 1951), 61.
- ¹⁹René Descartes, *Discourse on Method and Meditations*, trans. Elizabeth Sanderson Haldane and G. R. T. Ross (Mineola, NY: Dover Philosophical Classics, 2003), 23.
- ²⁰Richard Swinburne, *The Evolution of the Soul* (Oxford: Oxford University Press, 1987), see especially chapter 8. Swinburne uses a complex thought experiment involving "a brain transplant" procedure in which the brain of one person is split into two separate hemispheres and both are transplanted into separate bodies from which brains have been removed to make the point that "however much we know in such a situation about what happens to the parts of a person's body, we would not know for certain what happens to the person." He assumes that both bodies (with new half-brains) survive and that each individual is now a separate person. Though he succeeds in making his point (that we do not know which person—if either—is the original person), it seems to us that this example does nothing to support the existence of an immaterial soul. If the essence of a person were linked to a material entity (e.g., the brain), the two individuals could develop into separate people by changes to the remaining brain material.
- ²¹*Ibid.*, 180–96.
- ²²*Ibid.*, 176–9.
- ²³William Hasker, "On Behalf of Emergent Dualism," in *In Search of the Soul: Four Views of the Mind-Body Problem*, ed. Joel Green and Stuart Palmer (Downers Grove, IL: InterVarsity Press, 2005), 76.
- ²⁴*Ibid.*
- ²⁵*Ibid.*, 76–8.
- ²⁶*Ibid.*, 78–9.
- ²⁷Most Christians wrongly believe that monism simply entails stripping away all spirituality, and the existence of God and angels, from one's account of life and the universe, leaving only the "material." Numerous atheists attempt to support or even prove their atheism with materialism, but this is a logical error. An atheist worldview cannot be confirmed or denied by scientific inquiry. However, although materialism does not require atheism, it does seem that atheism, as formulated by modern scientists, does require materialism. A lack of clear thinking about the one-way dependence leads many Christians to assume that no physicalist or materialist account of the world, or of humankind, can be properly Christian. For a documentation of this, see Karl Giberson and Mariano Artigas, *Oracles of Science: Celebrity Scientists versus God and Religion* (Oxford: Oxford University Press, 2007).
- ²⁸Nancey Murphy, "Nonreductive Physicalism," in *In Search of the Soul: Four Views of the Mind-Body Problem*, ed. Green and Palmer, 115–38.
- ²⁹*Ibid.*, 116.
- ³⁰*Ibid.*
- ³¹*Ibid.*
- ³²*Ibid.*, 132.
- ³³Nancey Murphy and Warren S. Brown, *Did My Neurons Make Me Do It?* (Oxford: Oxford University Press, 2007). See especially pages 8–10.
- ³⁴Timothy O'Connor, "Causality, Mind and Free Will," in *Soul, Body, and Survival: Essays on the Metaphysics of Human Persons*, ed. Kevin Corcoran (Ithaca: Cornell University Press, 2001), 51.
- ³⁵Timothy O'Connor, *Persons and Causes: The Metaphysics of Free Will* (New York: Oxford University Press, 2000), 110.
- ³⁶Kevin Corcoran, *Rethinking Human Nature: A Christian Materialist Alternative to the Soul* (Grand Rapids, MI: Baker Academic, 2006), 121–2.
- ³⁷Kevin Corcoran, "Physical Persons and Postmortem Survival without Temporal Gaps," in *Soul, Body, and Survival*, ed. Corcoran, 201–17.
- ³⁸Corcoran, *Rethinking Human Nature*, especially chapter 5, 119–34.
- ³⁹Cooper, *Body, Soul, and Life Everlasting*, 174–9.
- ⁴⁰Corcoran, *Rethinking Human Nature*, 119–34.
- ⁴¹Cooper, *Body, Soul, and Life Everlasting*, 155–63.
- ⁴²Linda L. Belleville, *2 Corinthians*, The IVP New Testament Commentary Series (Downers Grove, IL: InterVarsity Press, 1996), 129–44; Jerry Sumney, "Post-mortem Existence and Resurrection of the Body in Paul," *Horizons in Biblical Theology* 31, no. 1 (2009): 12–26; Murray Harris, "Resurrection and Immortality: Eight Theses," *Themelios* 1, no. 2 (1976): 50–5.
- ⁴³Belleville, *2 Corinthians*, 131. Belleville notes that Paul's language in 2 Cor. 5:1–10 suggests that
Paul is also combating some form of Greek dualism, where immortality is viewed as the shedding of the physical body at death and the persistence of the soul beyond the grave.
- ⁴⁴*Ibid.*, 134. Also, Hafemann notes that even scholars that argue Paul is referring to the intermediate state are split, with some believing that the "building from God" is a covering to keep one from being found naked in the intermediate state. Thus even some who believe in the intermediate state, believe humans will be embodied therein. See Scott J. Hafemann, *2 Corinthians*, The NIV Application Commentary (Grand Rapids, MI: Zondervan, 2000), 208.
- ⁴⁵Cooper, *Body, Soul, and Life Everlasting*, 220–1.
- ⁴⁶Corcoran, *Rethinking Human Nature*, 65–82.
- ⁴⁷For example, see J. J. Diamond, "Abortion, Animation and Biological Hominization," *Theological Studies* 36 (1975): 305–24; R. G. Edwards, "Test-Tube Babies: The Ethical Debate," *The Listener* 27 (1983): 12; both as cited in Norman Ford, *When Did I Begin? Conception of the Human Individual in History, Philosophy and Science* (Cambridge: Cambridge University Press, 1988), 111; C. Munthe, "Divisibility and the Moral Status of Embryos," *Bioethics* 15, no. 5–6 (2001): 382–97.
- ⁴⁸Joseph Donceel, "Immediate Animation and Delayed Animation," *Theological Studies* 31, no. 1 (1970): 76–105.
- ⁴⁹*Ibid.*, 98.
- ⁵⁰Moreland and Rae, *Body and Soul: Human Nature and the Crisis in Ethics*, 218–24.
- ⁵¹O. Bomsel-Helmreich and W. Al Mufti, "The Phenomenon of Monozygosity: Spontaneous Zygotic Splitting," in *Multiple Pregnancy: Epidemiology, Gestation, and Perinatal Outcome*, 2nd ed., ed. I. Blickstein and L. G. Keith (Boca Raton, FL: Taylor & Francis, 2006), 94–101.
- ⁵²In objecting to an interventionist model, we are not deists. We believe, however, that God ensouls a human being, that ensouling action is no more nor less miraculous, no more nor less a direct work of God, than a book falling under the influence of gravity when dropped. Thus we are objecting

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to how differently Moreland and Rae seem to regard God's ensouling work versus God's work in maintaining the physical universe (e.g., gravitation).

⁵³John Walton, *Genesis: From Biblical Text ... to Contemporary Life* (Grand Rapids, MI: Zondervan, 2001). Walton warns that one ought not think of the natural universe as running on principles and not the constant upholding power of God (p. 46). Thus, whenever one speaks of God "intervening" (e.g., to create a soul as a separate act from creating a person or a body), one is assuming a deist understanding of the "natural" world, but then supposing certain "supernatural" interventions.

⁵⁴For example, chimeric mice have been used for research purposes since first generated in a lab in the 1960s. The first human chimera was discovered in 1962, and over thirty cases have since been reported. See P. P. Tam and J. Rossant, "Mouse Embryonic Chimeras: Tools for Studying Mammalian Development," *Development* 130, no. 25 (2003): 6155–63; S. M. Gartler, S. H. Waxman, and E. Giblett, "An XX/XY Human Hermaphrodite Resulting from Double Fertilization," *Proceedings of the National Academy of Sciences of the United States of America* 48, no. 3 (1962): 332–5; For a description of other more recent discoveries of human chimeras, see V. Malan, M. Vekemans, and C. Turleau, "Chimera and Other Fertilization Errors," *Clinical Genetics* 70 (2006): 363–73.

⁵⁵Neng Yu, Margot S. Kruskall, Juan J. Yunis et al., "Disputed Maternity Leading to Identification of Tetragametic Chimerism," *New England Journal of Medicine* 346 (2002): 1545–52.

⁵⁶Malan, Vekemans, and Turleau, "Chimera and Other Fertilization Errors."

⁵⁷Donald R. Griffin and Gayle B. Speck, "New Evidence of Animal Consciousness," *Animal Cognition* 7 (2004): 5–18.

⁵⁸*Ibid.*

⁵⁹*Ibid.*

⁶⁰*Ibid.*, 12.

⁶¹Green, *Body, Soul, and Human Life*, 78.

⁶²See Hasker, "On Behalf of Emergent Dualism," in *In Search of the Soul: Four Views of the Mind-Body Problem*, ed. Green and Palmer, 75–114.

⁶³Swinburne, *The Evolution of the Soul*, 180–96.

⁶⁴For a persuasive argument from a different perspective that these qualities may be sufficient to qualify humans as being made in God's image, see H. D. Bouma, D. Diekema, E. Langerak, T. Rottman, and A. Verhey, "Imaging God in Sickness and in Health," in *Christian Faith, Health and Medical Practices* (Grand Rapids, MI: Eerdmans, 1989), 27–66. For a biblical studies perspective, see J. Richard Middleton, *The Liberating Image: The Imago Dei in Genesis 1* (Grand Rapids, MI: Brazos Press, 2005).

⁶⁵For example, see Malcolm Jeeves, "Brain, Mind, and Behavior," in *Whatever Happened to the Soul? Scientific and Theological Portraits of Human Nature*, ed. Warren Brown, Nancey Murphy, and H. Newton Malony (Minneapolis, MN: Fortress Press, 1998), 73–97; —, "Changing Portraits of Human Nature," *Science and Christian Belief* 14 (2002): 3–32; —, "Neuroscience, Evolutionary Psychology, and the Image of God," *Perspectives on Science and Christian Faith* 57, no. 3 (2005): 170–86.

⁶⁶Jeeves, "Neuroscience, Evolutionary Psychology, and the Image of God," 174.

⁶⁷*Ibid.*

⁶⁸*Ibid.*, 175.

⁶⁹*Ibid.*

⁷⁰Donald M. MacKay, "Brain Research and Human Responsibility," in *Psychology and the Christian Faith*, ed. Stanton L. Jones (Grand Rapids, MI: Baker, 1986), 38–45.

⁷¹For example, see John C. Eccles, *Evolution of the Brain: Creation of the Self* (London: Routledge, 1989).

⁷²Kevin J. Corcoran, *Rethinking Human Nature: A Christian Materialist Alternative to the Soul* (Grand Rapids, MI: Baker Academic, 2006), 70–3.

⁷³D. G. Williams, "Religion, Beliefs about Human Life, and the Abortion Decision," *Review of Religious Research* 24, no. 1 (1982): 40–8.

⁷⁴Kevin J. Corcoran, "The Constitution View of Persons," in *In Search of the Soul: Four Views of the Mind-Body Problem*, ed. Green and Palmer, 174. Also, Corcoran suggests that it is not the doctrine of the soul that protects sanctity of life, but the doctrines of creation, the incarnation, and resurrection that do so. See Corcoran, *Rethinking Human Nature*, 95–8.

⁷⁵Corcoran, "The Constitution View of Persons," 173.

⁷⁶Joshua D. Greene, "Social Neuroscience and the Soul's Last Stand," in *Social Neuroscience: Toward Understanding the Underpinnings of the Social Mind*, ed. A. Todorov, S. Fiske, and D. Prentice (New York: Oxford University Press, 2011), 263–73.

⁷⁷K. Andrews, L. Murphy, R. Munday, and C. Littlewood, "Misdiagnosis of the Vegetative State: Retrospective Study in a Rehabilitation Unit," *British Medical Journal* 313 (1996): 13–6.

⁷⁸Mary-Paula Walsh, *Feminism and Christian Tradition: An Annotated Bibliography and Critical Introduction to the Literature* (Westport, CT: Greenwood Press, 1999). This is a very detailed text with annotated references to several hundred sources on Christian feminism. Chapters 5, 6, and 7 provide historical overviews of different periods of the development of feminist theology (1968–1977, 1978–1985, and 1986–1996, respectively) and these chapters (among others) provide many annotated citations that clearly represent the feminist viewpoint that certain forms of Christian praxis, even some which are considered orthodox, bear much of the blame for gender inequality.

⁷⁹M. E. L. Hall, "What Are Bodies For? An Integrative Examination of Embodiment," *Christian Scholar's Review* 39, no. 2 (2010): 159–76.

⁸⁰Thomas Campbell, "Asceticism," in *The Catholic Encyclopedia*, vol. 1 (New York: Robert Appleton Company, 1907), <http://www.newadvent.org/cathen/01767c.htm>.

⁸¹One example from the early church fathers that suggests an overly harsh response to sensuality and a fear-based discrimination against women is found in the writings of Tertullian (ca. CE 160–225; as cited by Sarah Sumner, *Men and Women in the Church* [Downers Grove, IL: InterVarsity Press, 2003], 40–1):

And do you not know that you are (each) an Eve? The sentence of God on this sex of yours lives in this age: the guilt must of necessity live too. You are the devil's gateway: you are the unsealer of that (forbidden) tree: you are the first deserter of the divine law: you are she who persuaded him whom the devil was not valiant enough to attack. You

destroyed so easily God's image, man. On account of your desert—this is, death—even the Son of God had to die. And you think about adorning yourself over and above your "tunics of skin"?

Clark (E. A. Clark, "Reading Asceticism: Exegetical Strategies in the Early Christian Rhetoric of Renunciation," *Biblical Interpretation* 5, no. 1 [1997]: 82–104), in describing exegetical strategies of several church fathers, documents that Origen (ca. CE 185–254), John Chrysostom (ca. CE 347–407), and Jerome (ca. CE 347–420), though they differed from one another, all took a dim view of sexuality, even within marriage, and of women generally.

⁸²Clark, "Reading Asceticism: Exegetical Strategies in the Early Christian Rhetoric of Renunciation," 82–104.

⁸³*The Oxford Dictionary of the Christian Church*, ed. F. L. Cross and E. A. Livingstone (New York: Oxford University Press, 1997), s.v. "Asceticism," 113–4.

⁸⁴Gail Corrington, "Anorexia, Asceticism, and Autonomy: Self-Control as Liberation and Transcendence," *Journal of Feminist Studies in Religion* 2, no. 2 (1986): 51–61.

⁸⁵W. S. Sabom, "The Gnostic World of Anorexia Nervosa," *Journal of Psychology and Theology* 13, no. 4 (1985): 243.

⁸⁶*Ibid.*, 251.

⁸⁷Caroline Giles Banks, "'There is No Fat in Heaven': Religious Asceticism and the Meaning of Anorexia Nervosa," *Ethos* 24, no. 1 (1996): 107–35.

⁸⁸*Ibid.*, 120.

⁸⁹Corrington, "Anorexia, Asceticism, and Autonomy," 52.

⁹⁰Tokunboh Adeyemo, "A Critical Evaluation of Contemporary Perspectives," in *In Word and Deed*, ed. Bruce J. Nicholls (Grand Rapids, MI: Eerdmans, 1985), 47.

⁹¹*Ibid.*, 47.

⁹²C. René Padilla, "Holistic Mission," in *Lausanne Committee 2004 Forum for World Evangelization*, Occasional Paper 33 (2005): 16, http://www.lausanne.org/docs/2004forum/LOP33_IG4.pdf.

⁹³Bong R. Ro, "The Perspective of Church History from New Testament Times to 1960," in *In Word and Deed*, ed. Nicholls, 11–40.

⁹⁴*Ibid.*, 32.

⁹⁵Vinay Samuel and Chris Sugden, "Evangelism and Social Responsibility: A Biblical Study on Priorities," in *In Word and Deed*, ed. Nicholls, 195.

⁹⁶*Ibid.*

⁹⁷Padilla, "Holistic Mission," 15.

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CHRISTIANITY AND THE SCIENTIFIC REVOLUTION

A workshop preceding the 2012 ASA Annual Meeting

Featured Speaker: Edward B. ("Ted") Davis

Point Loma Nazarene University

San Diego, CA

Friday, July 20, 2012, 8:30 am–Noon

The workshop consists of two lectures given by Ted Davis. They cover key aspects of Christianity and the Scientific Revolution of the sixteenth and seventeenth centuries. Each lecture includes time for Q&A. Participants will receive digital copies of the slides. Register at www.asa3.org.

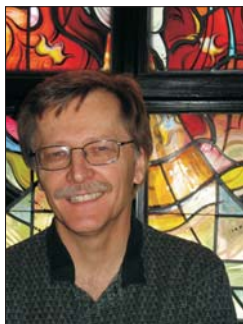
8:30–10:00 am: "Christianity, the New World Picture, and the New World View." Davis begins by explaining the new world picture of Copernicus, which put the earth into motion around the stationary sun. The acceptance of the new astronomy led to a new view of the relationship between science and religion. At the same time, religious attitudes and beliefs were important to the publication of Copernicus's work and its eager acceptance by Johannes Kepler. Another fundamental feature of the Scientific Revolution was a new world. Many came to see nature as a vast, impersonal machine—a view known as the mechanical philosophy. Although this new worldview challenged traditional views of divine action and is often associated with deism, its most outspoken advocate, Robert Boyle, was a deeply pious Christian. Boyle believed that the mechanical philosophy was both scientifically and theologically superior to the older worldview, in which "Nature" was equivalent to a pagan goddess.

10:30–noon: "Christianity and New Views of Knowledge." The Scientific Revolution also involved new views of scientific knowledge. Instead of coming from ancient books, knowledge should come directly from the divinely authored "book of nature." In addition, scientific knowledge is progressive, useful for improving the fallen human condition, and—above all—helpful for praising God. Modern scientists study nature using a combination of reason and experience, an approach that came together during the Scientific Revolution. Davis shows how this attitude toward nature was closely linked with Christian theological beliefs about God, nature, the Fall, and the human mind.



Ted Davis

Edward B. Davis (PhD, History and Philosophy of Science, Indiana University) is Professor of the History of Science at Messiah College, where he teaches courses on historical and contemporary aspects of Christianity and science. Best known for studies of Robert Boyle, Davis edited (with Michael Hunter) *The Works of Robert Boyle*, 14 vols. (Pickering & Chatto, 1999–2000), and a separate edition of Boyle's profound treatise on the mechanical philosophy and the doctrine of creation, *A Free Enquiry into the Vulgarly Received Notion of Nature* (Cambridge University Press, 1996). His current research, supported by the National Science Foundation and the John Templeton Foundation, examines the religious lives and beliefs of prominent American scientists in the 1920s. He has published several articles about this project, including one in *American Scientist* (May–June 2005) and a 3-part study of Nobel laureate Arthur Holly Compton in *PSCF* from June to December 2009.



Denis O. Lamoureux

Article

Darwinian Theological Insights: Toward an Intellectually Fulfilled Christian Theism—Part I

Divine Creative Action and Intelligent Design in Nature

Denis O. Lamoureux

*According to famed atheist Richard Dawkins, “Darwin made it possible to be an intellectually fulfilled atheist.” Many people today, both inside and outside of the church, follow Dawkins and assume that Charles Darwin ushered in a dysteleological view of nature with no ultimate plan or purpose and no place for God. However, an examination of the primary historical literature—Darwin’s private Notebooks on Transmutation (1837–1839), his two most important books, *Origin of Species* (1859) and *The Descent of Man* (1871), and his personal correspondence with colleagues—reveals that the father of evolutionary theory thought deeply about the religious implications of his science.*

In this two-part article, I will glean theological insights from Darwin’s writings to challenge Dawkins’s belief, and I will propose the provocative anti-thesis that Darwin made it possible to be an intellectually fulfilled Christian theist. Here in Part I, we will examine Darwin’s views on (1) divine creative action and (2) his experience with and understanding of intelligent design in nature. In Part II, to be published in September, we will review Darwin’s thoughts on (3) theodicy and his personal wrestling with the problem of evil and suffering, and his views on (4) the origin of religion and morality in the light of evolutionary psychology.

Few have provoked as many extreme reactions regarding the relationship between science and religion as has Charles Darwin. The Darwin Correspondence Project at Cambridge University observes, “Darwin is

celebrated as a secular saint, and vilified as Satan’s agent in the corruption of the human spirit.”¹ For example, the father of modern young earth creationism, Henry M. Morris, contends that “Satan himself is the originator of the concept of evolution,” and that Darwin’s theory of natural selection led to racism, Nazism, Marxism, and numerous other social evils.² On the other hand, the inimitable Richard Dawkins, in his acclaimed bestseller *The Blind Watchmaker*, asserts that “Darwin made it possible to be an intellectually fulfilled atheist.”³ In answer to these opposing claims, the Correspondence Project is quick to note that Darwin “is misquoted in order to

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support a particular position.”⁴ Notably, “the popular view of Darwin as purely secularist, or even atheist, is based on a highly selective reading of the sources.”⁵

In this article, I will swim against the Dawkinsian tide in order to defend the provocative thesis that Charles Darwin made it possible to be an intellectually fulfilled *Christian theist*. Not to be misunderstood, let me say it is clear that Darwin gradually came to reject Christianity during the middle of his life, and this is no attempt to “Christianize” him. Instead, employing a method quite different from that of Dawkins, I will submit to the authorial intentionality of Darwinian historical literature so as to glean theological insights that I believe inspire a conservative Christian approach to evolution. Often labeled “theistic evolution” but more accurately termed “evolutionary creation,” this view of origins claims that the Father, Son, and Holy Spirit created the universe and life, including human life, through an ordained, sustained, and design-reflecting evolutionary process.⁶ In this first of two parts, I will draw theological insights from Darwin that deal with (1) divine creative action and (2) intelligent design in nature.⁷ In the second part, to be published in September, I will examine Darwinian insights related to (3) evolutionary theodicy and (4) evolutionary psychology.⁸

A few preliminary comments are in order. First, Darwin was at best a nominal Christian as a young adult. After returning from the *HMS Beagle* voyage (27 Dec. 1831 to 2 Oct. 1836), he entered a period of religious reflection and “gradually came to disbelieve in Christianity as a divine revelation.”⁹ Darwin had four critical arguments: (1) the opening chapters of the Bible were a “manifestly false history of the world”;¹⁰ (2) the God of the Old Testament was “a revengeful tyrant”; (3) “the more we know of the fixed laws of nature the more incredible do miracles become”; and (4) “the Gospels cannot be proved to have been written simultaneously with the events,—that they differ in many important details, far too important it seems to me, to be admitted as the usual inaccuracies of eyewitnesses.”¹¹ Darwin also had an emotive complaint against the notion of eternal damnation, which he called “a damnable doctrine,” since he assumed that “my Father, Brother and almost all my best friends, will be everlastingly punished.”¹² His rejection of Christianity remained

resolute until his death on 19 Apr. 1882. Responding in 1880 to whether he believed in the New Testament, Darwin writes back to F. A. McDermott, “I am sorry to have to inform you that I do not believe in the Bible as a divine revelation, & therefore not in Jesus Christ as the son of God.”¹³

Second, it is important to underline that Darwin was never an atheist. In a letter dated 1879, three years before his death, in response to another query about his religious beliefs, he reveals to John Fordyce,

I may state that my judgment often fluctuates ... In my most extreme fluctuations *I have never been an Atheist in the sense of denying the existence of a God*. I think that generally (& more and more so as I grow older) but not always, that an Agnostic would be the more correct description of my state of mind.¹⁴

Darwin’s scientific colleague Thomas Henry Huxley coined the term “agnosticism” in 1869, and the first evidence of Darwin embracing this view appears in his 1876 *Autobiography*.¹⁵ In a section entitled “Religious Belief,” Darwin concludes, “The mystery of the beginning of all things is insoluble by us; and I for one must be content to remain an Agnostic.”¹⁶ Though he had gradually rejected Christianity, roughly over a period between the late 1830s and the late 1840s, Darwin continued to believe in a God prior to his acceptance of agnosticism.¹⁷ In an 1878 letter to H. N. Ridley, he recalls, “[M]any years ago when I was collecting facts for the *Origin [of Species]*, my belief in what is called a *personal* God was as firm as that of [the Reverend] Dr Pusey himself.”¹⁸ This statement aligns with Darwin’s claim in the *Autobiography* that he was a “theist” and that this belief “was strong in my mind” as he wrote the famed *Origin of Species* (1859), a book which included seven affirming references to the “Creator.”¹⁹ In recent years, much has been written about the impact of the death of Darwin’s beloved daughter Annie in 1851 on his religious views.²⁰ But given his rejection of Christian faith by the late 1840s, and his acceptance of theism in the late 1850s, it is apparent that Darwin firmly embraced some generalized form of theism not connected to Christianity or to any other religious tradition even after her passing.²¹

Finally, my justification to pursue such a provocative thesis—and what may seem to some, a perilous thesis—comes from Charles Darwin himself. In the aforementioned correspondence to Fordyce in 1879,

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Darwin opens with a blunt indictment. “It seems to me absurd to doubt that a man may be an ardent theist & an evolutionist.”²² He then offers the examples of Charles Kingsley, a self-described “orthodox priest of the Church of England,” and Asa Gray, an evangelical Christian and Harvard botanist who promoted Darwin in America with his pamphlet *Natural Selection Not Inconsistent with Natural Theology* (1861).²³ In other words, I feel comfortable speculating that rather than incurring the wrath of Charles Darwin for this two-part article, I may well receive his support.

Insights into Divine Creative Action

Upon returning to England from his five-year circumnavigation aboard the *HMS Beagle*, Darwin entered a period that he describes as “the most active which I ever spent.”²⁴ Between October 1836 and January 1839, he outlined his theory of evolution by natural selection, and alongside his scientific hypothesizing, he admits, “I was led to think much about religion.”²⁵ Indeed, biological evolution has significant theological ramifications.

This two-year period is marked by Darwin’s stern rejection of any interventions by the Creator in origins. Commonly known as the “god-of-the-gaps,” this view of creative action assumes that a divine being entered the world at different points in time either to add missing parts or creatures, or to modify those already in existence.²⁶ For Darwin, the loss of dramatic divine acts in nature first began in Brazil, where he viewed geological evidence through the lens of the first volume of Charles Lyell’s *Principles of Geology* (1830). Lyell’s uniformitarianism quickly overthrew catastrophism, the geological paradigm of the early nineteenth century which held that features on the surface of the earth were caused by numerous diluvian events, with the Noahic Flood being the last.²⁷ However, Darwin did not immediately extend the Lyellian natural-laws-only view of geology to biology, and late in the voyage he still held a progressive creationist understanding of the origin of life.²⁸ Noting the similarity between ant lion pitfalls (traps) in both England and Australia, he argues in a diary entry dated January 1836,

Would any two workmen ever hit on so beautiful, so simple, & yet so artificial a contrivance [pitfall]?

It cannot be thought so. The one hand has surely worked throughout the universe. A Geologist perhaps would suggest that the periods of Creation have been distinct & remote the one from the other; that the Creator rested in his labor.²⁹

Clearly, an interventionistic god-of-the-gaps was still front and center in Darwin’s biological science late into his voyage onboard the *HMS Beagle*.

But dramatic divine creative acts were soon to be eliminated after landing in England. In the B Notebook of the famed *Notebooks on Transmutation* (1837–1839), Darwin draws an analogy between astronomy and biological evolution. Appealing to the history of science, he observes,

Astronomers might formerly have said that God ordered [i.e., intervened], each planet to move in its particular destiny [e.g., retrograde planetary motion]—In the same manner God orders each animal with certain form in certain country [progressive creation]. But how much more simple & sublime power [to] let attraction act according to certain law; such are inevitable consequences; let animals be created, then by the fixed laws of generation.³⁰

In other words, Darwin contended that since astronomers no longer appeal to divine interventionistic acts to move planets around, biologists need not require dramatic creative acts in the origin of living organisms.³¹ Natural processes alone could explain the data of astronomy and biology. In the D Notebook, he adds that creating life through natural processes was

far grander than [the] idea from cramped imagination that God created (warring against those very laws he established in all organic nature) the Rhinoceros of Java & Sumatra, that since the time of the Silurian he has made a long succession of vile molluscos animals.³²

Such a micromanager view of divine creative action, concludes Darwin, is “beneath the dignity of him, who is supposed to have said let there be light and there was light.”³³

Darwin then extended this rejection of the god-of-the-gaps to his evolutionary theorizing on the origin of humanity. “Man in his arrogance,” writes Darwin in the C Notebook, “thinks himself a great work worthy of the interposition [i.e., intervention] of a deity, more humble & I believe truer to consider him created from animals.”³⁴ Though this passage is

ambiguous about God's activity, Darwin places him firmly as the Creator of the evolutionary process.

In the M Notebook, Darwin asserts that a scientist is mistaken if he

says the innate knowledge of creator is has been implanted in us (by ? individually or in race?) by a separate act of God, & not as a necessary integrant part of *his* most magnificent laws, of which we profane degree in thinking not capable to ~~de~~ produce every effect, of every kind which surrounds us.³⁵

It is important to underline that this view of evolution is not the dysteleological process assumed by Richard Dawkins. For Darwin, biological evolution is clearly teleological, and ultimately rooted in God. Moreover, he acknowledges the reality of natural (or general) revelation as an innate characteristic of human beings.³⁶ And by declaring evolutionary laws "most magnificent," Darwin certainly alludes to their having been intelligently designed.

Darwin's rejection of the god-of-the-gaps models, and his acceptance of a teleological evolutionary process ordained by the Creator, appear openly in his seminal book, *Origin of Species* (1859). The first epigraph of the book comes from William Whewell's *Bridgewater Treatise* (1833), and it sets the tone of his approach to divine action:

But with regard to the material world, we can at least go so far as this — we can perceive that events are brought about not by insulated interpositions [i.e., interventions] of Divine power, exerted in each particular case, but by the establishment of general laws.³⁷

Applying this understanding of God's activity to the evolution of life, Darwin contends,

Authors of the highest eminence [i.e., progressive creationists] seem to be fully satisfied with the view that each species has been independently created. To my mind it accords better with what we know of the laws impressed on matter by the Creator, that the production and extinction of the past and present inhabitants of the world should have been due to secondary causes like those determining the birth and death of the individual.³⁸

The analogy between developmental biology and evolutionary biology is powerful. No one today believes that God intervenes in the womb to attach fins, wings, or limbs during the creation of individual creatures. Instead, we know that living organisms

arise through natural embryological processes. So too, argues Darwin, with the origin of all creatures that have ever lived on earth — they were created through natural evolutionary processes ordained by God.³⁹

The embryology-evolution analogy is also found in Darwin's second most well-known book, *The Descent of Man, and Selection in Relation to Sex* (1871). As noted earlier, he embraced human evolution in the late 1830s. But sensitivity to Victorian society led him to make only one thinly veiled remark on the topic in the *Origin of Species*.⁴⁰ *The Descent of Man* was a complete and uncompromising treatise on human evolution; but still mindful of cultural sensitivities, Darwin offered assistance to those struggling with evolution.

I am aware that the conclusions arrived at in this work will be denounced by some as highly irreligious; but he who denounces them is bound to shew why it is more irreligious to explain the origin of man as a distinct species by descent from some lower form, through the laws of variation and natural selection, than to explain the birth of the individual through the laws of ordinary reproduction. The birth both of the species and of the individual are equally parts of that grand sequence of events, which our minds refuse to accept as the result of blind chance.⁴¹

Once again, Darwin provides a view of evolution that is clearly not dysteleological, as assumed by Dawkins. For that matter, it could be argued from this passage that embryological and evolutionary processes are both natural revelations that reflect intelligent design. And Darwin's significant epistemological claim that the human mind refuses to embrace a world run by blind chance offers an argument that God ordained the evolution of our brain in order to lead us to that very conclusion. Some implications of this conclusion will be explored in Part II of this article.

Finally, a comment is in order regarding Darwin's famed evolutionary mechanism of natural selection and the notion of survival of the fittest. Theories of biological evolution were being discussed for at least one hundred years before the *Origin of Species*. For example, Charles's grandfather Erasmus Darwin outlined a deistic and "Lamarckian" model of evolution in *Zoonomia, or the Laws of Organic Life* (1794–1796).⁴² But it was the discovery of a scientific mechanism — natural selection — that captured the imagination and respect of the scientific community

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in Darwin's day. Of course, dysteleological polemicists such as Dawkins focus on this rather unsavory aspect of evolutionary theory along with the idea of the survival of the fittest in order to justify their disbelief. However, rarely do they reveal that Darwin later mitigated both of these concepts. In the *Descent of Man*, he confesses, "In the earlier editions of my 'Origin of Species' I perhaps attributed too much to the action of natural selection or the survival of the fittest."⁴³ His "excuse" for "having exaggerated its [natural selection] power" was for rhetorical purposes so as "to overthrow the dogma of separate creations."⁴⁴ Darwin then adds, "We know not what produces the numberless slight differences between the individuals of each species."⁴⁵

Indeed, evolution features two pivotal concepts: (1) the production of biological variability, and (2) the natural selection of the fittest variants. Yet Darwin had no idea about the mechanisms behind the former, and late in life he even postulated what could be seen as a teleological factor in evolution. In an 1878 letter to H. N. Ridley, he observes that "there is almost complete unanimity amongst Biologists about Evolution," but he qualifies that "there is still considerable difference as to the means, such as how far natural selection has acted & how far external conditions, or whether there exists some mysterious innate tendency to perfectibility."⁴⁶ Once again, such a view of biological evolution is far from that of Dawkins, which assumes that the process is driven by irrational necessity and blind chance.

To summarize, Charles Darwin offers some valuable insights to Christian theists regarding divine creative action. His appeal to the history of astronomy and his own experience with geological catastrophism shows that god-of-the-gaps models have always failed. The purported gaps in nature are not indicative of divine intervention, but rather, they are gaps in human knowledge later filled by scientific discoveries. Thanks to Darwin, it is clear that evolution is not necessarily atheistic or dysteleological.⁴⁷ From the writing of his *Notebooks on Transmutation* in the late 1830s to the publication of *Origin of Species* in 1859, he viewed the evolutionary process as God's method of creation. Finally, Darwin's embryology-evolution analogy, appearing in his two most important books, remains a powerful argument to assist Christians today in coming to terms with the evolution of life.

Insights into Intelligent Design

Regrettably, the term intelligent design has been co-opted and muddled by proponents of the so-called "Intelligent Design (ID) Movement."⁴⁸ Purporting to detect design *scientifically*, ID theorists only entrench in the minds of the public a false dichotomy – biological evolution vs. intelligent design. ID theory is a narrow view of design in which design is connected to miraculous interventions in the origin of life. In other words, it is just another god-of-the-gaps model. For example, parts of the cell like the flagellum are said to be "irreducibly complex"; as a result, they could not have evolved through natural processes.⁴⁹ Since this is the case, ID theory should be more accurately termed *interventionistic* design theory.

Ironically, it is a famed atheist who has a more cogent grasp of the biblical and traditional understanding of intelligent design than the evangelical Christians who form the core of the ID movement. In *The Blind Watchmaker* (1986), Richard Dawkins declares,

The problem is that of complex design ... The complexity of living organisms is matched by the elegant efficiency of the *apparent* design. If anyone doesn't agree that this amount of complex design cries out for an explanation, I give up ... Our world is dominated by [1] feats of engineering and [2] works of art. We are entirely accustomed to the idea that complex elegance is an indicator of premeditated, crafted design. This is probably the most powerful reason for *the belief*, held by the vast majority of people that have ever lived, in some kind of supernatural deity ... It is as if the human brain were specifically designed to misunderstand Darwinism, and find it hard to believe.⁵⁰

Note that design has nothing to do with purported gaps in nature, or so-called "irreducible complexity." Moreover, intelligent design is not limited to complexity alone (a prejudice so typical of the engineering mentality of ID theorists), but also includes beauty as a significant indicator. And finally, though Dawkins dismisses design as merely "apparent," he correctly asserts that design is a powerful argument, not a proof, experienced by everyone throughout history. These tenets are in alignment with Ps. 19:1–6, Rom. 1:18–23, and the apocryphal text Wisd. of Sol. 13:1–9.⁵¹ In the light of Dawkins and scripture, I define intelligent design as *the belief* that beauty, complexity, and functionality in nature point to an Intelligent Designer.

Darwin began his academic career by being entrenched in a view of design similar to that of the ID Movement. William Paley's *Natural Theology: or, Evidence of the Existence and Attributes of the Deity, Collected from the Appearances of Nature* (1802) was required reading at Cambridge University in the early nineteenth century, and, interestingly, Darwin admits that this was the best part of his education.⁵² However, later in life, he recognizes,

I did not at that time trouble myself about Paley's premises; and taking these on trust I was charmed and convinced by the long line of argumentation ... I was not able to annul the influence of my former belief, then almost universal, that *each* species had been purposely created; and this led to my tacit assumption that *every detail* of structure, excepting rudiments, was of some special, though unrecognized, service."⁵³

Three of Paley's premises of nature included (1) intelligent design, (2) perfect adaptation, and (3) beneficence.⁵⁴ But these categories were unnecessarily conflated together. Therefore, Darwin's notion of design *by necessity* had perfect adaptation and beneficence built into it. In particular, according to Paley, each and every detail of every living organism fitted together flawlessly; as a result, each species was by definition *static*.⁵⁵ Darwin would eventually propose his *dynamic* theory of evolution, and in doing so, he came to reject Paley's immutability of species along with Paley's concept of intelligent design. However, observations in nature impacted Darwin deeply throughout his life, and it drove him back to the belief that the world reflected intelligent design. In other words, at a tacit intellectual level, Darwin assumed that design necessitated Paley's perfect adaptation, but, at an experiential level, he encountered what Christian theology has long recognized as a nonverbal divine revelation inscribed deeply into the creation. And as is always the case, conflation leads to conflict.

Immediately following the publication of the *Origin of Species*, Darwin entered a second two-year period of intense theological reflection. The central issue was intelligent design, and since he had uncritically accepted Paley's conflation of design with perfect adaptation, he experienced conflict, frustration, and fluctuation. Numerous letters dated between 1860 and 1861 reveal Darwin's confusion on design, and the following three passages, written to leading scientific colleagues of the day, depict his

view and state of mind. On 26 Nov. 1860, he admits to Asa Gray,

I grieve to say that I cannot honestly go as far as you do about Design. I am conscious that I am in an utterly hopeless muddle. I cannot think that the world, as we see it, is the result of chance; and yet I cannot look at *each* separate thing as the result of Design ... Again, I say I am, and shall ever remain, in a hopeless muddle.⁵⁶

To the famed astronomer John F. Herschel, Darwin writes on 23 May 1861,

The point which you raise on intelligent design has perplexed me beyond measure. I am in a complete jumble on the point. One cannot look at this Universe with all living productions & man without believing that all has been intelligently designed; yet when I look to *each* individual organism I can see no evidence of this.⁵⁷

And to show that Darwin's confusion about intelligent design extended beyond the early 1860s, he confesses to botanist J. D. Hooker on 12 July 1870,

[B]ut how difficult not to speculate! My theology is a simple muddle; I cannot look at the universe as the result of blind chance, yet I can see no evidence of *beneficent design*, or indeed of design of any kind, *in the details*. As for *each* variation that has ever occurred having been preordained for a special end, I can no more believe in it than that the spot on which each drop of rain falls has been specially ordained.⁵⁸

These passages reveal both Darwin's wonderful candor with his correspondents and his confusion regarding design. He is trapped between (1) his experience of the creation which leads him to the belief the world is "intelligently designed" and not "the result of blind chance," and (2) his tacit Paleyan understanding of design featuring perfect adaptation as reflected in his use of the terminology "each separate thing," "each individual organism," "beneficent design," "design of any kind, in the details," and "each variation."

But Darwin's confusion and frustration over intelligent design disappeared completely in his 1876 *Autobiography*. As noted previously, T. H. Huxley coined the term "agnosticism" in 1869, and Darwin embraces it in the section on "Religious Belief." He arrives at this position by offering arguments both *pro* and *contra* God, and in each case

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concludes with a rebuttal. Consequently, the stalemate leads him to an agnostic position. Notably, the issue of intelligent design is once more central to his views on religion. Employing what might be called an “emotional” or “psychological” design argument, Darwin observes,

At the present day the most usual argument for the existence of an intelligent God is drawn from the deep inward conviction and *feelings* which are experienced by most persons ... Formerly I was led by *feelings* such as those referred to, (although I do not think that the religious sentiment was ever strongly developed in me) to the firm conviction of the existence of God, and of the immortality of the soul. In my Journal I wrote that whilst standing in the midst of the grandeur of a Brazilian forest, “it is not possible to give an adequate idea of the higher feelings of wonder, astonishment, and devotion, which fill and elevate the mind.” I well remember my conviction that there is more in man than the mere breath of his body.⁵⁹

However, Darwin is quick to rebut, “But now the grandest scenes would not cause any such convictions and *feelings* to rise in my mind. It may be truly said that I am like a man who has become color-blind.”⁶⁰ Indeed, the question must be asked, can one become “color-blind” to design in nature? As we shall see, Darwin will offer a different answer in the last year of his life.

Darwin then offers a second design argument in the *Autobiography*, one which he finds more compelling and could be termed a “rational” design argument.

Another source of conviction in the existence of God, connected with *the reason* and not with *the feelings*, impresses me as having much more weight. This follows from the extreme difficulty or rather impossibility of conceiving this immense and wondrous universe, including man with his capacity of looking backwards and far into futurity, as a result of blind chance or necessity. When thus reflecting I *feel* compelled to look to a First Cause having an intelligent mind in some degree analogous to that of man; and I *deserve* to be called a Theist.⁶¹

It is important to recognize that here in 1876, Darwin employs the present tense for the verbs “feel” and “deserve.” In other words, late in life Darwin had periods of theistic belief amidst his agnosticism, and the source of this belief was design in nature. Also

worth pointing out is that immediately following this passage, Darwin reveals, “This conclusion was strong in my mind about the time, as far as I can remember, when I wrote the *Origin of Species*; and it is since that time that it has very gradually with many fluctuations become weaker.”⁶² To the surprise of most people today, and I suspect Dawkins as well, Darwin was a theist who embraced intelligent design when he wrote his most famed book!⁶³

Yet consistent with the agnostic argument pattern of the *Autobiography*, Darwin rebuts his rational argument for design. He immediately adds,

But then arises the horrid doubt—can the mind of man, which has, as I fully believe, been developed from a mind as low as that possessed by the lowest animal, be trusted when it draws such grand conclusions?⁶⁴

The problem with this rebuttal is quite obvious. What has Darwin just done to make his argument? He trusted his own mind, developed from the lowest animal! In other words, his argument is circular; more specifically, it suffers from self-referential incoherence.⁶⁵ This problem, which I term “Darwin’s epistemological dilemma on design,” results in Darwin not offering a sound rebuttal to his rational argument against design.⁶⁶ Therefore, the “impossibility of conceiving this immense and wondrous universe, including man with his capacity of looking backwards and far into futurity, as a result of blind chance or necessity” remains steadfast as a powerful argument for “a First Cause having an intelligent mind in some degree analogous to that of man.”⁶⁷

Finally, in the last year of Darwin’s life, the Duke of Argyll engaged him directly on the topic of intelligent design by appealing to some of Darwin’s extraordinary research. Recalls the Duke,

In the course of that conversation I said to Dr. Darwin, with reference to some of his own remarkable works on the “Fertilization of Orchids” and upon “The Earthworms,” and various other observations he made of the wonderful contrivances for certain purposes in nature—I said it was impossible to look at these without seeing that they were the effect and the expression of mind. I shall never forget Mr. Darwin’s answer. He looked at me very hard and said, “Well, that often comes over me with overwhelming force; but at other times,” and he shook his head vaguely, adding, “it seems to go away.”⁶⁸

In the light of this passage, it is obvious that Darwin miswrote in the *Autobiography* when he claimed to be “color-blind” with regard to design in nature. This passage also adds clarity to his religious beliefs mentioned in the 1879 letter to Fordyce in which he stated,

I have never been an Atheist in the sense of denying the existence of a God. I think that generally (& more and more so as I grow older) *but not always*, that an Agnostic would be the more correct description of my state of mind.⁶⁹

Since Darwin was never an atheist, and since most of the time he was an agnostic, it follows that, during his “not always” periods, he was either a deist or theist. These periods were most likely the result of “effect and the expression of mind” in nature striking him “with overwhelming force.”

To conclude, Charles Darwin offers valuable insights concerning intelligent design. It is evident that throughout his life, beauty, complexity, and functionality in nature impacted him often and powerfully. This is consistent with the theological notion of natural revelation and the well-known biblical verse, “The heavens declare the glory of God, and the firmament proclaims the works of his hands” (Ps. 19:1). Unfortunately, popular culture today is led astray by a cacophony of views on intelligent design—from the intolerant atheism of Richard Dawkins, who sees design as a delusion, to the equally intolerant anti-evolutionism of the intelligent design movement that proclaims design in purportedly irreducibly complex molecular structures. Interestingly, Darwin sits between these two extremes. *Contra* Dawkins, he is “compelled to look to a First Cause having an intelligent mind” because of “the impossibility of conceiving this immense and wondrous universe ... as a result of blind chance or necessity.”⁷⁰ *Contra* the ID Movement, he rejects Paley’s belief in the immutability of species and the perfect adaptation of “every detail of structure.”⁷¹ Instead, Darwin opens our minds to a *viva media*, featuring a divinely ordained evolutionary process that reflects God-glorifying intelligent design.

* * *

Now equipped with Darwinian theological insights on divine creative action and intelligent design in nature, the second part of this article will attempt to draw other helpful concepts from the Darwin

literature in order to offer Christian approaches to evolutionary theodicy and evolutionary psychology. It will be published in the September 2012 issue of this journal. **

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I am grateful to Paul Fayter for his incisive review of this article. His encyclopedic knowledge of the Darwin literature never ceases to amaze me. I am also thankful to an anonymous reviewer at *Christian Scholar’s Review* for introducing me to valuable literature on nineteenth-century biology. And I am always appreciative of my assistant Anna-Lisa Ptolemy for her editorial work, as well as that of Lyn Berg, Esther Martin, Nancy Rosenzweig, Karen Spivey, and Chelsea Murray.

Notes

¹“Belief,” Darwin Correspondence Project, accessed January 11, 2011, <http://www.darwinproject.ac.uk/content/view/106/100>. Hereafter cited as DCP.

²Henry M. Morris, *The Troubled Waters of Evolution* (San Diego, CA: Creation-Life Publishers, 1982), 75.

³Richard Dawkins, *The Blind Watchmaker* (London: Penguin Books, 1991 [1986]), 6.

⁴“Darwin and Religion,” DCP, accessed January 11, 2011, <http://www.darwinproject.ac.uk/content/blogcategory/36/63/>.

⁵“Belief,” DCP.

⁶See Denis O. Lamoureux, *Evolutionary Creation: A Christian Approach to Evolution* (Eugene, OR: Wipf & Stock, 2009), xiii, 29–35. Hereafter cited as EC; Denis O. Lamoureux, “Evolutionary Creation: Moving beyond the Evolution versus Creation Debate,” *Christian Higher Education* 9 (2010): 28–48.

⁷Regrettably, in recent years the term “intelligent design” has been stripped of its traditional meaning and conflated with antievolutionism by so-called intelligent design theorists. See page 112 for my definition of design.

⁸The second part of this article will be published in the September 2012 issue of this journal, *PSCF*.

⁹Charles Darwin, *The Autobiography of Charles Darwin, 1809–1882*, ed. Nora Barlow (London: Collins, 1958), 86. My italics. Hereafter cited as ACD. This loss of faith appears to have occurred over a period of time, from the late 1830s to the late 1840s. In an interview with Edward B. Aveling in 1881, Darwin states, “I never gave up Christianity until I was forty years of age [i.e., in 1849]” (Aveling, *The Religious Views of Charles Darwin* [London: Freethought Publishing, 1883], 5, 7). This is consistent with Darwin’s assertion in the *Autobiography*,

Thus disbelief crept over me at a very slow rate, but was at last complete. The rate was so slow that I felt no distress, and I have never since doubted for a single second that my conclusion was correct. (ACD, 87)

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Regarding Darwin's Christian faith, Michael Ruse notes that there is no evidence of "burning religious zeal" at any point in his life (Ruse, *The Darwinian Revolution: Science Red in Tooth and Claw* [Chicago: University of Chicago Press, 1979], 182). Though Darwin studied theology at Cambridge, this decision reflects his father Robert Darwin's "worldly wisdom more than piety" in that "it might at least save him [Charles] from dissolution and prodigality" (Frank Burch Brown, *The Evolution of Darwin's Religious Views* [Macon, GA: Mercer University Press, 1986], 8–9).

¹⁰In a letter to his sister Caroline in 1837, it is evident that Darwin was reassessing the assumed concordist interpretation of the early chapters of Genesis.

You tell me you do not see what is new in Sir J. Herschel's idea about the chronology of the Old Testament being wrong.—I have used the word chronology in a dubious manner, it is not to the days of Creation which he refers, but to the lapse of years since the first man made his wonderful appearance on this world—As far as I know everyone has yet thought that the six thousand odd years had been the right period but Sir J. thinks that a far greater number must have passed since the Chinese [space left in copy] the Caucasian languages separated from one stock. (Darwin to Caroline S. Darwin, 27 Feb. 1837, DCP Letter 346)

¹¹ACD, 85–6. Clearly, Darwin assumed that a concordist hermeneutic was essential to Genesis 1–11. As well, he does not seem to be aware that the gospels went through an oral phase before being written down and later redacted. Concordism is not possible in the early chapters of scripture since they feature recycled and reinterpreted ancient Near Eastern motifs (ancient scientific/historical paradigms of the day); and sharp contradictions between some New Testament events are expected with eyewitness accounts and their oral transmission. In fact, the latter argues for the authenticity of the accounts. Moreover, I wonder what Darwin would have said if he knew that 40% of American scientists believe in a personal God who answers prayer that is "more than the subjective psychological effect of prayer" (Edward J. Larson and Larry Witham, "Scientists Are Still Keeping the Faith," *Nature* 386 [3 Apr. 1997]: 436).

¹²ACD, 87.

¹³Darwin to F. A. McDermott, 24 Nov. 1880, DCP Letter 12851. Similarly, in 1879 Darwin wrote to a German student, "For myself, I do not believe that there ever has been any Revelation. As for a future life, every man must judge for himself between conflicting vague possibilities" (Francis Darwin, ed., *The Life and Letters of Charles Darwin*, 3 vols. [London: John Murray, 1887], I:307). Hereafter cited as LLD.

¹⁴Darwin to J. Fordyce, 7 May 1879, DCP Letter 12041. My italics. Also in LLD, I:304.

¹⁵Adrian Desmond, *Huxley: From Devil's Disciple to Evolution's High Priest* (Reading, MA: Helix Books, 1994), 374.

¹⁶ACD, 94. Darwin immediately follows this concluding sentence with what could be deemed as his definition of agnosticism: "A man who has no assured and ever present belief in the existence of a personal God or of a future existence with retribution and reward" (ACD, 94).

¹⁷See endnote 9.

¹⁸Darwin to H. N. Ridley, 28 Nov. 1878, DCP Letter 11766. My italics. This letter is a response to Pusey's sermon criticizing Darwin's *Origin of Species*.

¹⁹ACD, 93. See Charles R. Darwin, *On the Origin of Species. A Facsimile of the First Edition*, introduction by Ernst Mayr (1859; reprint, Cambridge, MA: Harvard University Press, 1964), 186, 188, 189, 413 (twice), 435, 488. Hereafter cited as OS.

²⁰Adrian Desmond and James Moore assert that Annie's painful death "chimed the final death-knell for his [Darwin's] Christianity, even if it had been a long, drawn-out process of decay" (Desmond and Moore, *Darwin* [New York: Warner Books, 1991], 387). The suffering endured by his father Robert ("for days he lay writhing on a sofa, 'groaning & grumbling' plagued by bursting boils" [Ibid., 350]) before dying in November 1848, was undoubtedly a contributing factor as well.

²¹There is a challenge in understanding how Darwin employed the term "theist." The traditional definition is someone who believes in a personal God, "transcendent from the world, who is omnipotent, omniscient, and perfectly good" (Michael Peterson, William Hasker, Bruce Reichenbach, and David Basigner, *Reason and Religious Belief* [New York: Oxford University Press, 1991], 9). Historians have offered a variety of categories to describe Darwin's religious belief.

- Michael Ruse calls him "a deist of a kind" when he wrote *Origin of Species* (Ruse, *Darwinian Revolution*, 181).
- John Hedley Brooke refers to "a nonbiblical deism" during this same period (Brooke, "Darwin and Religion: Correcting the Caricatures," *Science and Education* 19 [2010]: 393).
- James D. Loy and Kent M. Loy suggest that "Charles's Christianity would fade into a generalized theism" (Loy and Loy, *Emma Darwin: A Victorian Life* [Gainesville, FL: University Press of Florida, 2010], 86).
- And James R. Moore contends that "Darwin indeed gave up Christianity long before he wrote *Origin* but he remained a muddled theist to the end" (Moore, "Darwin of Down: The Evolutionist as Squarson-Naturalist," in *The Darwinian Heritage*, ed. David Kohn [Princeton, NJ: Princeton University Press, 1985], 438).

Moore also emphasizes the need to differentiate Darwin's rejection of Christianity from his acceptance of a general theism. He incisively notes, "[E]ven those [Darwin historians] who carefully distinguish Christianity from natural religion in Darwin's religious outlook have tended to conflate his growing doubts about the latter with his disbelief in the former" (Moore, "Of Love and Death: Why Darwin 'Gave Up Christianity'" in *History, Humanity and Evolution: Essays for John C. Greene*, ed. James R. Moore [Cambridge: Cambridge University Press, 1989], 197).

It is worth adding that Darwin was aware of the term "deist" and used it in an 1862 letter to Asa Gray. Commenting on Clémence Royer, the French translator of *Origin of Species*, he writes that she "is [an] ardent deist & hates Christianity, & declares that natural selection & the struggle for life will explain all morality, nature of man, politicks Etc Etc!!!" (Darwin to Asa Gray, 20 June 1862, DCP Letter 3595). I suspect that Darwin's distaste for controversy, especially anti-religious polemic like that expressed by Royer, might have

kept him away from using the term “deist.” Nevertheless, Darwin did employ the word “theist,” and he often referred to the omnipotence and omniscience of God. And since he was aware of the word “deist,” I will suggest that he embraced a generalized or nonreligious (meaning not associated with traditional religions, such as Christianity) form of theism.

²²Darwin to Fordyce, 7 May 1879, DCP Letter 12041; *LLD*, I:304. Agnostic and famed paleontologist Stephen Jay Gould holds a similar view. He claims, “Evolution [is] both true and entirely compatible with Christian belief—a position I hold sincerely” (Gould, “Non-overlapping Magisteria,” *Natural History* 106 [1997]: 16). Of course, Richard Dawkins is not enamored with Gould. Writes Dawkins, “The belief that religion and science occupy separate magisteria is dishonest” (Dawkins, “Snake Oil & Holy Water: Illogical Thinking Is the Only Thing Joining Science & Religion Together,” *Forbes* ASAP [4 Oct. 1999]: 237).

²³James R. Moore, *The Post-Darwinian Controversies: A Study of the Protestant Struggle to Come to Terms with Darwin in Great Britain and America, 1870–1900* (Cambridge: Cambridge University Press, 1979), 306. For the views of Asa Gray, see David N. Livingstone, *Darwin’s Forgotten Defenders: The Encounter between Evangelical Theology and Evolutionary Thought* (Grand Rapids, MI: Eerdmans, 1987), 60–4.

²⁴ACD, 82.

²⁵*Ibid.*, 85.

²⁶I am not philosophically opposed to this view of divine action, but history reveals that it has consistently failed. Purported gaps in nature are, in reality, gaps in scientific knowledge. Instead of widening the gaps with the advance of science indicative of direct divine action, the gaps always close with the discovery of new natural processes. See *EC*, 60–2.

²⁷On early nineteenth-century catastrophism, see Davis A. Young, *The Biblical Flood: A Case Study of the Church’s Response to Extrabiblical Evidence* (Grand Rapids, MI: Eerdmans, 1995), 99–117. See also Henslow’s caution to Darwin regarding Lyell’s geology in *ACD*, 101.

²⁸Progressive creation asserts that the earth is old and that God created different living organisms intermittently across the eons of time.

²⁹Charles Darwin, *Diary of the Voyage of H.M.S. Beagle in The Works of Charles Darwin*, ed. Nora Barlow (London: William Pickering, 1986), I:348. Dated 18 Jan. 1836.

³⁰Charles Darwin, B Notebook (February 1837 to January 1838), 101. See the Complete Work of Charles Darwin, accessed January 11, 2011, <http://www.darwin-online.org.uk>. Hereafter cited as CWCD. The clause “such are inevitable consequences” certainly aligns well with a teleological evolution envisioned by Simon Conway Morris. “[T]he constraints of evolution and the ubiquity of convergence make the emergence of something like ourselves a near-inevitability” (Conway Morris, *Life’s Solution: Inevitable Humans in a Lonely Universe* [Cambridge: Cambridge University Press, 2003], 328). Frank Burch Brown notes examples throughout Darwin’s career of a teleological or progressive element in his view of evolution (Brown, “Darwin’s Religious Views,” 43–5).

³¹In a similar historical argument, Darwin notes that attacks against evolution “will be as powerless to retard by a day the belief in evolution as were the virulent attacks made by divines fifty years ago against Geology, & the still older ones of the Catholic Church against Galileo” (Darwin to H. N. Ridley, 28 Nov. 1878, DCP Letter 11766).

³²D Notebook (July 1838 to October 1838), 36–7. CWCD.

³³*Ibid.*, 37.

³⁴C Notebook (February 1838 to July 1938), 196–7. CWCD.

³⁵M Notebook (July 1838 to October 1838), 136. CWCD. My italics.

³⁶Bruce A. Demarest defines general revelation as humanity’s awareness “that there is a God and in broad outline what He is like,” and that this knowledge is “mediated through [1] nature, [2] conscience, and [3] the providential ordering of history” (Demarest, *General Revelation: Historical Views and Contemporary Issues* [Grand Rapids, MI: Zondervan, 1982], 14). For this two-part article, I will employ the term “natural revelation” and limit it to Demarest’s first two mediating factors.

³⁷William Whewell, *Astronomy and General Physics Considered with Reference to Natural Theology* (London: William Pickering, 1833), 356.

³⁸OS, 488. Interestingly, Galileo’s view of nature is remarkably similar to Darwin’s.

For the Holy Scripture and nature derive equally from the Godhead, the former as the dictation of the Holy Spirit and the latter as the most obedient executrix of God’s orders ... [N]ature is inexorable and immutable, [and] never violates the terms of the laws imposed on her. (Galileo Galilei, “Letter to the Grand Duchess Christina,” in *The Galileo Affair: A Documentary History*, ed. and trans. M. A. Finocchiaro [Berkeley, CA: University of California Press, 1989], 93)

³⁹In his so-called “long version” of the *Origin of Species*, Darwin writes, “By nature, I mean the laws ordained by God to govern the Universe” (Charles Darwin, *Darwin’s Natural Selection, Being the Second of his Big Species Book Written from 1856 to 1858*, ed. R. C. Stauffer [Cambridge: Cambridge University Press, 1975], 224).

⁴⁰Darwin writes,

In the distant future I see open fields for far more important researches. Psychology will be based on a new foundation, that of the necessary acquirement of each mental power and capacity by gradation. Light will be thrown on the origin of man and his history. (OS, 488)

To Wallace he comments,

I think I shall avoid [the] whole subject [human evolution], as [it is] so surrounded with prejudices, though I fully admit that it is the highest & most interesting problem for the naturalist. (Darwin to A.R. Wallace, 22 Dec 1857, DCP Letter 2192)

⁴¹Charles Darwin, *The Descent of Man, and Selection in Relation to Sex*, 2nd ed. (London: John Murray, 1874 [1871]), 613. Hereafter cited as *DM*.

⁴²I am grateful to an anonymous reviewer of the journal *Christian Scholar’s Review* for pointing out that “it’s a bit problematic to describe Erasmus Darwin’s views as ‘Lamarckian,’ though technically they were in a scientific

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sense almost identical views. Historically, Lamarck almost certainly did not influence the elder Darwin, however, since his works post-date those of Erasmus Darwin." It is for this reason that I have added quotation marks to Lamarckian in the text.

⁴³DM, 61.

⁴⁴Ibid.

⁴⁵Ibid.

⁴⁶Darwin to H. N. Ridley, 28 Nov. 1878, DCP Letter 11766.

⁴⁷Commenting on *Origin of Species*, Darwin states, "I had no intention to write atheistically ... Certainly I agree with you [Gray] that my views are not at all necessarily atheistical" (Darwin to Asa Gray, 22 May 1860, DCP Letter 2814).

⁴⁸My debate, or more accurately my nondebate, with the father of the ID movement, Phillip E. Johnson, is indicative of how little this debate deals with scientific issues. Phillip E. Johnson and Denis O. Lamoureux, *Darwinism Defeated? The Johnson-Lamoureux Debate on Biological Origins* (Vancouver, BC: Regent College Publishing, 1999).

⁴⁹Interventionism in origins is clearly evident in the work of leading ID theorist Michael Behe, who coined the term "irreducible complexity." He argues,

An irreducibly complex system cannot be produced directly (that is, by continuously improving the initial function, which continues to work by the same mechanism) by slight, successive modifications of a precursor system, because any precursor to an irreducibly complex system that is missing a part is by definition nonfunctional ... [I]f 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." (Michael J. Behe, *Darwin's Black Box: The Biochemical Challenge to Evolution* [New York: Free Press, 1996], 39. My italics.)

See my "A Box or a Black Hole? A Response to Michael J. Behe," *Canadian Catholic Review* 17, no. 3 (July 1999): 67–73.

⁵⁰Dawkins, *Blind Watchmaker*, xiii, xvi, xv. My italics.

⁵¹Based on these passages, intelligent design in nature is a divine revelation that has the following features: (1) the creation powerfully impacts humans, (2) the revelation in nature is intelligible, (3) natural revelation is incessant, (4) similar to music, everyone "hears" the nonverbal revelation in nature, (5) the creation reveals some attributes of the Creator, (6) humans are free to reject natural revelation, but (7) they are accountable and "without excuse" if they do (EC, 65–9).

⁵²ACD, 59.

⁵³ACD, 59; DM, 61. My italics.

⁵⁴For the sake of argument, I present only these three premises. Walter F. Cannon notes that Darwin had actually absorbed ten of these. "The Bases of Darwin's Achievement: A Revaluation," *Victorian Studies* (December 1961): 128. Dov Ospovat underlines the importance of the concept of perfect adaptation in biology at that time. He observes, "Naturalists in the mid-nineteenth century commonly believed that adaptation is perfect. In this they were guided by a number of considerations, not the least of which was their respect for the opinion of the greatest biologist of the first third of the

century, Georges Cuvier. Cuvier held that every type of organism is perfect, in that its parts are functionally coordinated and the whole and all its parts are constructed in the best possible manner for the functions they are to perform and for the situation in which the organism is to live. The idea of perfect adaptation, in Great Britain especially, was a cornerstone not only of biology, but of natural theology as well. The perfect adaptation of structure to function and of the whole organism to its environment was evidence of purposeful design and hence of an Intelligent Creator. (Dov Ospovat, "Perfect Adaptation and Teleological Explanation: Approaches to the Problem of the History of Life in the Mid-Nineteenth Century," in Coleman and Limoges, eds., *Studies in the History of Biology* 2 [1978]: 33)

I am grateful to an anonymous reviewer at *Christian Scholar's Review* for introducing me to this valuable paper.

⁵⁵For the impact of perfect adaptation on Darwin's biology, see Dov Ospovat, *The Development of Darwin's Theory: Natural History, Natural Theology, and Natural Selection, 1838–1859* (Cambridge: Cambridge University Press, 1981), 33–40; John Hedley Brooke, "The Relations between Darwin's Science and His Religion," in John Durant, ed., *Darwinism and Divinity* (Oxford: Basil Blackwell, 1985), 43–4, 57–8.

⁵⁶Darwin to Gray, 26 Nov. 1860, DCP Letter 2998; LLD, II:353. My italics.

⁵⁷Darwin to J. F. Herschel, 23 May 1861, DCP Letter 3154. My italics. These thoughts are repeated to Julia Wedgwood in a letter dated 11 July 1861. "The mind refuses to look at this universe, being what it is without having been designed; yet, where one would most expect design, viz. in the structure of a sentient being, the more I think on the subject, the less I see proof of design" (LLD, I:313–4). My italics.

⁵⁸Darwin to Hooker, 12 July 1870, in Francis Darwin, ed., *More Life and Letters of Charles Darwin*, 2 vols. (London: John Murray, 1888), I:321. My italics. In a letter three years later to a Dutch student, Darwin's confusion on design seems to give way to resignation.

But I may say that the impossibility of conceiving this grand and wondrous universe, with our conscious selves, arose through chance, seems to me the chief argument for the existence of God; but whether this is an argument of real value, I have never been able to decide." (Darwin to N. D. Doedes, 2 Apr. 1873, DCP Letter 8837; LLD, I:306)

⁵⁹ACD, 90–1. My italics. The journal passage that is mentioned comes from Charles Darwin, *Journal of Researches* (London: John Murray, 1845), 26. It is dated 18 Apr. 1832. In the final entry of the *Beagle Diary*, 25 Sept. 1836, Darwin records similar thoughts of the impact of nature upon him.

Among the scenes which are deeply impressed on my mind, none exceed in sublimity the primeval forests, undefaced by the hand of man, whether those of Brazil, where the powers of life are predominant, or those of Tierra del Fuego, where death & decay prevail. Both are temples filled with the varied productions of the God of Nature:—No one can

stand unmoved in these solitudes, without feeling that there is more in man than the mere breath of his body." (Charles Darwin, *Beagle Diary*, 773)

⁶⁰ACD, 91. My italics.

⁶¹ACD, 92–3. My italics. See my previous comments regarding Darwin's use of the term "theist" in endnote 21.

⁶²ACD, 93.

⁶³In an admitted act of bad behavior, when I came to this passage in my presentation of this paper at the 150-year anniversary of Darwin's *Origin of Species* at the University of Toronto on 23 Nov. 2009, I stepped away from the podium and said, "Well, there you have it ladies and gentlemen. Tomorrow night at the gala when we toast the man and his book, we will be toasting an intelligent design theorist." For some reason no one was amused by my comment. It seems that presenting the Darwin of history instead of the skewed Darwin concocted by positivists offends academic sensibilities.

⁶⁴Ibid. This argument appears in comments on William Graham's *Creed of Science* (1881). Writes Darwin, "Nevertheless you have expressed my inward conviction, though far more vividly and clearly than I could have done, that the Universe is not the result of chance. But then with me the horrid doubt always arises whether the convictions of man's mind, which

has been developed from the mind of lower animals, are of any value or at all trustworthy. Would any one trust in the convictions of a monkey's mind, if there are any convictions in such a mind?" (Darwin to William Graham, 3 July 1881, DCP Letter 13230)

Similarly, see Darwin to Grant James, 11 Mar. 1878, DCP Letter 11416.

⁶⁵I am grateful to philosopher Gary Colwell for introducing me to this fallacy.

⁶⁶Alvin Plantinga recognizes this problem in *Warrant and Proper Function* (New York: Oxford University Press, 1993), 216–37. Robin Attfield contends that his criticism only applies to "deterministic versions of Darwinism." Recoiling from positing "a nonmaterialist concept of free-will," he proposes a secular nondeterministic model of evolution. "Darwin's Doubt, Non-deterministic Darwinism and the Cognitive Science of Religion," *Philosophy* 85 (2010): 471.

⁶⁷ACD, 92–3.

⁶⁸LLD, I:316.

⁶⁹Darwin to J. Fordyce, 7 May 1879, DCP Letter 12041; LLD, I:304. My italics.

⁷⁰ACD, 92.

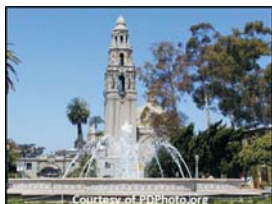
⁷¹DM, 61.

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Patrick S. Franklin

Essay Book Review

The Human Person in Contemporary Science and Theology

Patrick S. Franklin

Questioning what it means to be human is perennial, going back millennia. The Psalm often quoted is, "What is mankind that you are mindful of them, human beings that you care for them?" (Ps. 8:4, NIV). It is an analytical as well as an existential question, with implications for understanding not only what we are (descriptively) but also what we are to become (ethically) in light of our purpose.¹ In this article, I interact with four recent books that are part of the interdisciplinary discussion of human personhood in contemporary science and theology. My goal is to highlight some of the key issues currently being addressed, identify important points of consensus and disagreement therein, and offer brief theological reflection on the significance of these issues for Christian believers. I will begin with a concise introduction to each book and then identify and discuss four prominent issues concerning human personhood currently being addressed in the literature.

Four Recent Books on the Human Person in Science and Theology

IN SEARCH OF SELF: Interdisciplinary Perspectives on Personhood by J. Wentzel van Huyssteen and Erik P. Wiebe, eds. Grand Rapids, MI: Eerdmans, 2011. xi + 387 pages. Paperback; \$45.00. ISBN: 9780802863867.

In Search of Self: Interdisciplinary Perspectives on Personhood (hereafter designated ISS), edited by J. Wentzel van Huyssteen and Erik P. Wiebe, is a volume comprising eighteen essays (plus introduction) written by scholars across the scientific disciplines. In their introduction, van

Huyssteen and Wiebe point out that the general thrust of the book has been shaped by the work of Paul Ricoeur, especially his writings on time, memory, imagination, and narrative. A major theme of the book is that "personal identity, or 'self,' is both articulated *and* constructed solely through the temporal and relational dimensions of our embodied existence" (ISS, 5). The book is divided into four major sections: The Self and Origins (five essays), the Self and Multiplicity (five essays), the Self and Identity (four essays), and the Self and Emergence (four essays).

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RETHINKING HUMAN NATURE: A Multidisciplinary Approach by Malcolm Jeeves, ed. Grand Rapids, MI: Eerdmans, 2011. xi + 337 pages. Paperback; \$45.00. ISBN: 978-0802865571.

Rethinking Human Nature: A Multidisciplinary Approach (hereafter designated RHN), edited by Malcolm Jeeves, is com-

posed of twelve essays plus an introduction and an afterword by the editor. It is divided into six parts: History (two essays); Philosophical Analyses (three essays); Human Distinctiveness—Clues from Science (four essays); Archaeology and Paleoanthropology (one essay); and Theological Accounts of Human Distinctiveness: The *Imago Dei* (two essays). The impetus for this book began with a multidisciplinary working group, sponsored by the Templeton Foundation, which convened at the Pontifical Academy of Sciences at the Vatican in 2006 to discuss the question: “What is our real knowledge about the human being?” The editor compiled many of the essays presented there and elicited contributions from other scientists and one biblical scholar to create the present volume.

HUMAN IDENTITY AT THE INTERSECTION OF SCIENCE, TECHNOLOGY, AND RELIGION by Nancey Murphy and Christopher C. Knight, eds. Burlington, VT: Ashgate, 2010. ix + 243 pages. Hardcover; \$99.95. ISBN: 9781409410508.

Human Identity at the Intersection of Science, Technology, and Religion (hereafter designated HI), edited by Nancey Murphy and Christopher C. Knight, includes twelve chapters plus an introduction and is divided into three major sections: The Limits of Religion, the Limits of Science (three essays); The Emergence of the Distinctively Human (four essays); and The Future of Human Identity (five essays). In the introduction, Murphy highlights the significance of the book’s use of the term “human identity” rather than “human nature.” This shift in terminology is meant to acknowledge the now widely endorsed move away from essentialism and inwardness (following Augustine) toward the current stress on openness/becoming and relationship/sociality (following Wittgenstein and the linguistic turn). Murphy also explains that the book addresses themes that have been profoundly impacted by four major intellectual developments: (1) the historicity of concepts of “human nature,” (2) the changing nature of religion/theology, (3) postmodern influences in epistemology that have challenged various forms of reductionism (including scientism), and (4) developments in science and technology that point toward possibilities for radical revisions of our current understanding of “human.”

HUMAN SIGNIFICANCE IN THEOLOGY AND THE NATURAL SCIENCES: An Ecumenical Perspective with Reference to Pannenberg, Rahner, and Zizioulas by Christopher L. Fisher. Eugene, OR: Pickwick, 2010. xvi + 351 pages. Paperback; \$40.00. ISBN: 9781606080535.

Human Significance in Theology and the Natural Sciences (hereafter designated HSTS), by Christopher L. Fisher, is a reworked edition of the author’s doctoral dissertation. Fisher argues in favor of what he calls “critical anthropocentrism,” a position that advocates a high view of human significance in the cosmos on the basis of recent scientific and theological developments. The book comprises two sections. The first section, Human Significance in Theology, engages the thought of three modern theologians (Wolfhart Pannenberg, Karl Rahner, and John Zizioulas) whose theological proposals resonate with trends in contemporary science and whose theology is “critically anthropocentric.” In the second section, Human Significance in the Natural Sciences, Fisher discusses human uniqueness and the question of divine providence in cosmic evolution, and addresses ecological concerns that his “critically anthropocentric” thesis might raise for his critics.

Prominent Issues in Scientific and Theological Considerations of Human Personhood

1. The Human Self: Identity vs. Multiplicity
One prominent theme in contemporary social scientific discussions of the human self is the question of “identity” versus “multiplicity.” On the one hand, proponents of multiplicity emphasize the outward-openness and malleability of the self and criticize theorists that overemphasize the centeredness of the self. For example, Léon Turner (ISS, 125–40) criticizes the tendency of some theologians to depict all forms of self-multiplicity as pathological, charging them with a failure to distinguish between pathological and nonpathological forms of multiplicity. In contrast, Turner argues that self-multiplicity is both necessary and desirable (though some forms can become pathological). Without it, people would not be able to respond creatively and effectively to novel situations. Turner proposes that the goal of a healthy self is not self-unity, but learning to surrender one’s angst for unity and to cope with multiplicity. In place

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of an essentialist self, Turner supports the notion of narrative identity, which “provides a means of understanding how individual persons can remain continuous despite the structural plurality of self and the diversity of self-experiences over time” (ISS, 129).²

Pamela Cooper-White (ISS, 141–62) suggests that humans possess a kind of “core self,” but not one that is a constitutional, inherent essence. Instead, she offers the image of “braided selves,” which depicts multiple parts of the self as being interwoven into a single (nonessential) braid. Strands of the braid include such things as embodied life, relationships, spirituality, and ethical practices.

Other writers emphasize the relational underpinnings of the multiple self. Hetty Zock (ISS, 163–81) employs Hubert Herman’s theory of the dialogical self to describe the self as characterized by conflict, tension, and power. Helene Tallon Russell and Marjorie Hewitt Suchocki (ISS, 182–97) reject settled notions of personhood in favor of continual openness to the richness of interpersonal relations. Drawing on Kierkegaard and Whitehead, they argue that the “self” is not a thing but a relation that precedes, evokes, and creates subjectivity.

On the other hand, those emphasizing identity aim to preserve a greater emphasis on the individuality and continuity of the self. Calvin O. Schrag (ISS, 223–42) revisits Kant’s account of the transcendental unity of apperception and agrees that the transcendental ego plays a decisive role in providing the origin and source of knowledge claims. However, he thinks Kant’s account needs to be modified in light of hermeneutical theory, historicity, embodiment, and sociality. Prior to the formalization of time and space as abstract, transcendental conditions for perceiving experience, time and space must themselves be seen as situated *within* experience (as *lived* time, *lived* space). As a result, the transcendental ego as the unifying principle of self-identity itself undergoes change. This unified self is dynamic in that it is conditioned by its immersion in space and time, history, the body, and the social realm of relationships. It is a unity that holistically synthesizes multiplicity.

Jan-Olav Henriksen focuses on the crucial role that relationships play in shaping and defining the self (ISS, 256–72). He argues that love is the most important factor in the shaping of the self and high-

lights the role of desire in directing the self outward in openness to others and to God.

Reflection

While some contemporary scholars are emphasizing multiplicity and others identity, virtually all agree that essentialist views of human self and personhood must be rejected. As Cooper-White (arguing for multiplicity) suggests, we may hold to some notion of a “core self,” but we should envision this as a “braided self” rather than as an inherent essence (ISS, 141–62). The rejection of essentialist views of the human self or personhood is an important and positive emphasis, with historical precedents in both philosophy and theology. In philosophy, a radical rejection of essentialism developed from Nietzsche’s critique of metaphysics³ and then from Sartre’s critique of idealism.⁴ The writings of Nietzsche and Sartre helpfully exposed and discarded the myth of the essentialist self. Unfortunately, however, their proposals tended to erode any sense of continuity or “groundedness” concerning human identity. Moreover, they promoted an individualist conception of selfhood, one which prized the individual’s will-to-power and free choice for self-actualization but downplayed the role that relationships play in healthy identity construction.

A mediating philosophical position is what might be called “narrative philosophy,” represented by thinkers such as Alasdair MacIntyre and Charles Taylor. Narrative philosophy conceives of human personhood and identity within the context of formative relationships, communities, and cultural contexts, which impart to individuals (perhaps explicitly but often implicitly) a value-laden view of the world. This includes both *conceptual* content (basic convictions and value distinctions, which Taylor refers to as “frameworks”) and *affective or motivational* content (Taylor’s “social imaginary”). The latter fosters and shapes the desires and passions of individuals through their immersion in the stories, rituals, and practices of their communities and cultures.⁵ It is important to note that it is not just religious communities that are shaped by such stories, rituals, and practices. Rather, all human communities and traditions of inquiry are so formed, since all human worldviews or “rationalities” are embedded in social narratives.⁶ Narrative philosophy promotes the continuity of the self without falling prey to essentialism. The self has continuity

not because it is predetermined exclusively by some “essence,” but because it exists within a narrative that is oriented by a conception of what is good and true.⁷

Christian theology also has rich resources for maintaining the continuity of the self without falling into essentialism. One example can be found in the writings of Søren Kierkegaard, as Helene Tallon Russell and Marjorie Hewitt Suchocki rightly point out (ISS, 182–97). For Kierkegaard, the human self is a *relation*; the human self is a self relating to itself.⁸ In other words, the human self is a synthesis in which a subject (I) relates to itself as an object (me). This means that human self-identity is both dialectical (actively and passively being and becoming) and temporal (oriented to past, present, and future). It is both a gift to be received and a goal to be attained. Thus, the human being is characterized by what Wolfhart Pannenberg calls “exocentricity,” a term which defines the self’s relational constitution as being both centered and other-oriented (in openness to the world and to the future).⁹ This means that humans are by nature constituted as relational beings that gain their identity through a continual, dialectical negotiation of the self with itself, the world, and other human selves—a process which Miroslav Volf calls “differentiation.”¹⁰ This relational, other-oriented view of the human self as a person-in-relation has many historical precedents in Christian theology, some of which include modern theologians such as Karl Barth and Dietrich Bonhoeffer, the Reformers Martin Luther and John Calvin, medieval writers such as Richard of St. Victor, and the patristic writers¹¹ (especially the Cappadocians¹²). Its roots ultimately go back to the Bible (e.g., Paul’s depiction of the church as the Body of Christ). As Joel Green argues, the biblical narrative holds being and becoming together in creative tension. Its view is neither essentialist nor existentialist, but relational and holistic (RHN, 276).

2. Human Uniqueness or Distinctiveness

Many contemporary writers prefer to speak of human distinctiveness rather than uniqueness, because they wish to emphasize the biological continuity of human beings with other animals (especially other primates). For such writers, “distinctiveness” indicates a quantitatively higher degree of human complexity

relative to other species rather than a qualitative difference. For example, Felipe Fernández-Armesto places greater weight on the similarities shared by humans and other animals and argues that differences are in degree, not in kind (RHN, 18ff; see also Barbara J. King’s article, “Are Apes and Elephants Persons?” in ISS, 70–82). Other writers prefer to retain the term “uniqueness,” because they believe that the uniquely human capacities that have emerged from lower systems and levels of biological existence are qualitatively different (e.g., HSTS, 204–15). Such capacities differ in kind, not just in degree, from their lesser counterparts. For instance, human language is qualitatively different from various forms of prelinguistic communication observed among apes, specifically in its use of systems of symbols to communicate abstract concepts. Still other writers use both terms, employing “distinctive” to describe the biological roots of human capacities shared with other animals (DNA, subsystems, etc.) while reserving the term “unique” for the specifically emergent human capacities that are qualitatively superior (e.g., HI, 97–115).

Scientists propose different lists of distinctive human capacities. For example, Alison Brooks (RHN, 227–68) provides one of the most comprehensive lists, which includes six capacities: abstract thinking; planning depth; problem solving through behavioral, economic, and technological innovation; imagined communities (recognizing kin or community with others never met); symbolic thinking (language, ritual, culture); and a theory of mind (awareness of and empathy for the thoughts and feelings of others). Other writers prefer to focus on a smaller subset of differences (e.g., Fisher, HSTS, 204–23; Haag, HI, 131–43; Brown, HI, 97–115). Still others focus on the uniqueness or distinctiveness of human relationships (David G. Myers, RHN, 206–33; Malcolm Jeeves, RHN, 176–205; and Warren S. Brown, HI, 97–115). As Brown puts it, “What is unique about humankind emerges from the characteristics of our brains, but only as we are embedded within social relationships and interactions with human culture” (HI, 114).

Reflection

Most contemporary scholars, both scientists and theologians, affirm that human beings are special in some distinct way(s) and yet are also interconnected

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with all of life. There is consensus in affirming that humans are part of the global ecosystem even while playing a special role within it. Present disagreement pertains to just how unique human beings are with respect to the rest of creation. Underlying this scientific discussion of human uniqueness is the ethical question of how human beings ought to relate to and interact responsibly with the natural world, particularly nonhuman creatures and the environment. I suspect that a major concern of those urging us to see greater continuity between humans and other nonhuman creatures is the (not wholly unfounded) fear that an emphasis on human uniqueness leads to a sense of human superiority, which then encourages various abuses of creation.

Fernández-Armesto (RHN, 11–29) hints at this when he states that our current definition of humanity is inadequate because it excludes nonhuman animals from our moral community. More disparagingly, Lynn White famously accused the Genesis creation narrative of being responsible for the world's current ecological crisis, because it depicts human beings as having dominion over the earth.¹³ Despite his argument being unpersuasive both exegetically and historically, it does raise an important question about what adherents of human uniqueness *mean ethically* by the term “unique.” For example, is being unique a privilege, a responsibility, or both?

Unfortunately, the biblical notion of human dominion has, at times, been distorted and exploited by those with malevolent and greedy ends, which, of course, can happen to any doctrine or moral position.¹⁴ However, one must read the Genesis passage in context, and thus notice that it does not give humans *carte blanche* to treat creation any way they desire, whether with benevolent or with self-serving and destructive intentions. Very specifically, Genesis 1 portrays human beings as uniquely created in God's image to be steward-priests of God's creation.¹⁵ In their *stewardship*, they are to honor the true King (Yahweh, the one they were created to mirror) and to administer God's creation in ways that accord with God's good character, purposes, and explicit commands. In its historical-narrative context, Genesis envisions creation as God's palace-temple and human beings as God's steward-priests. This has significant and far-reaching implications for creation care.¹⁶

Both groups identified above want to emphasize the importance of caring for creation. The question thus arises: Which view of human beings better grounds and motivates the duty or responsibility to care for the earth—the human being as unique steward-priest, or the human being as one animal among fellow animals? I am not arguing that ethical utility can or should determine ontology; I am simply recognizing that in ethics both the nature of reality and the basis for motivation are important and interrelated. It seems to me that the notion of a common fellowship or family among all creatures is too vague to ground human responsibility and takes too much for granted morally. It is vague because it offers little more than biological similarity (with some added human complexity) as the ground and motivation for care.

But why, on a strictly biological basis, should care be normative? Is this what nature tells us? We do not see the animal kingdom demonstrating this kind of care, especially at an interspecies level. Why should tooth-and-claw survival of the fittest not be considered normative? Moreover, it seems that advocates of this view cannot finally avoid depending upon an (implicit) assumption that human beings are unique in some sense in order to make their moral argument. Specifically, they view humans as having a greater moral responsibility than other species, since humans alone have the capacity to recognize other animals as brothers and sisters and could thus be morally required to treat them as such (or, to put it another way, they do not expect other animals to reciprocate this benevolence).

If this is the case, why downplay human uniqueness? This would seem only to undermine rather than promote human responsibility toward creation. As Fisher argues, “Such a leveling ethical principle is ‘ecopathy,’ because it has destroyed its own moral underpinnings” (HSTS, 291). To frame the question theologically, is moral responsibility toward creation something that we confer upon ourselves or is it something we receive as a charge from God? If it is something self-conferred, why assume benevolence? Why not argue, with Nietzsche, that we should be strong and employ our willpower to achieve dominance? Conversely, it is precisely humanity's significance and uniqueness *as God's stewards* that grounds a proper sense of respect toward and responsibility for the cosmos (HSTS, 278–93). As God's stewards,

human beings are to cultivate and care for the creation that God has entrusted to them, thus bringing glory to God and serving God's creative purposes.

3. The Evolution of Self or Personhood

Another major theme in contemporary literature about the human person in science and theology is the biological evolution of human beings as selves or persons. Helpful surveys of human origins are provided by Ian Tattersall, Ian Hodder, and Alison Brooks. Tattersall (ISS, 33–49) tracks the use of tools and technology to demonstrate that the human sense of self has arisen from the distinctly human capacity for symbolism, which makes advanced communication possible.¹⁷ Hodder (ISS, 50–69) focuses his attention on the correlation of human evolution with the establishments of settlements and farming. Surveying the archaeological evidence of ancient settlements throughout his account, Hodder argues that humans attained a greater, more precise sense of self over against the things they possessed as they gained a stronger sense of ownership. Brooks (RHN, 227–68) traces the emergence of modern human capacities by drawing inferences from the archaeological evidence of evolutionary changes.¹⁸ Utilizing her archaeological method, Brooks examines the emergence of six distinctly human capacities.

Fernández-Armesto (RHN, 11–29) provides a historical account of the development of the recognition of universal human personhood. He points out, "For most people, in most societies, for most of the past, the limits of humankind were narrow" (p. 11). Contemporary people tend to take for granted modern notions of universal human recognition, global human kinship, or a common humanity (with accompanying human rights). However, historically, humans did not normally recognize the co-humanity of other groups. Typically, members of one human group acknowledged no kinship with others. The notion of a common, universal humanity is a relatively recent development.

Reflection

One of the things that immediately struck me (as a conservative theologian in the evangelical tradition) was the high level of consensus, unanimous in the books surveyed, in affirming the biological evolution

of human beings from lower ancestral forms. Of course, such consensus is not surprising in the world of scientific scholarship, even among those who identify themselves as conservative Christians.¹⁹ However, in many conservative Protestant circles, the debate over human origins is still highly controversial, even serving as a litmus test of orthodoxy in some cases.²⁰ The British evangelical theologian Alister McGrath, himself a supporter of evolutionary theism, reports that old earth creationism has a long history in the Christian tradition and is probably the majority view within conservative Protestant circles.²¹

Why is biological evolution so controversial for conservative Christians? Aside from the politics and cultural wars in late modern America, what deeper issues are at stake? First, the Bible clearly teaches that human beings are unique in that they alone are created to reflect God's image. The evolution of human beings from lower primates seems to blur the distinction between humans and animals and is perceived as a threat to human uniqueness. The challenge then, for Christians in the sciences and theologians alike who affirm evolution, is to demonstrate how evolution is compatible with the Christian affirmation that humans are uniquely created in the *imago Dei* (see Fisher, HSTS, 246–77).²² One fruitful response to this problem is the contemporary discussion of emergence theory, addressed in the next section.

A second issue this raises for conservative Christians is whether evolution contradicts the creation accounts provided in Genesis 1–2 and thus threatens the inspiration of the Bible. Most of the heated arguments are taking place around this question. In response, several evangelical theologians have attempted to demonstrate that evolutionary theory does not contradict Genesis, usually by considering what the Ancient Near Eastern context of Genesis implies about the purpose and implications of the creation account.²³

A third issue that evolution raises for conservative Christians is that it threatens some theological persuasions concerning the creation and Fall of humanity. For example, it contradicts the belief that physical death originated with the Fall of humanity into sin. Such problems are not insurmountable, but they do undermine overly literalistic interpretations of the Genesis creation narratives.²⁴

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One of the challenges this poses for Christians in the sciences and theology is to clarify an epistemology that does justice to the truth questions being asked and to employ an accompanying hermeneutic that does justice to the biblical texts. Many recent proposals have been helpful in this regard, but they have not yet had a significant impact on popular conservative Christian subculture. Many conservative Christians would be surprised (perhaps disturbed) to know what the scientists in their own midst believe. Part of the problem is the hurtful rhetoric of fundamentalists, whether religious or atheistic, which serves only to elevate emotions, confuse the real questions, and ridicule and alienate those who hold opposing views. We need more examples of those who break the stereotypes (Denis Lamoureux's book *I Love Jesus & I Accept Evolution* is a good example of this). In terms of epistemology, the question needs to be asked forthrightly: what evidence counts for and against evolution and who are the right people to adjudicate that evidence? I suggest the following guideline: *the nature of the question posed must determine the methodology employed to answer it*. Science can neither prove nor disprove the Trinity. The Bible can neither prove nor disprove the law of gravity. These are different kinds of truth questions with different criteria for answering them, belonging to corresponding traditions of inquiry. What kind of truth question is evolution? I am not sure that we have even agreed on that *clearly* yet, at least not in evangelical circles.

4. Emergence Theory

Emergence theory attempts to explain how uniquely human capacities and qualities "emerge" from their biological rootedness in complex systems (e.g., language and self-consciousness emerging from the prefrontal cortex), which have in turn "emerged" from lower-level biological systems and parts (e.g., those observed in nonhuman animals). Such unique, emergent human capacities are greater than the sum of their constituent parts. They are qualitatively distinct from those parts, amounting to changes of kind and not just incremental advances of degree.²⁵ Some examples of emergent capacities in human beings include consciousness, language, the forming of interpersonal relationships, morality, spirituality, abstract thinking, art, music, and culture.²⁶ Emergence theory combines observations and discoveries in evolu-

tionary biology and neurophysiology with insights gained from information systems theory to depict human development.²⁷

Reflection

One of the contributions of emergence theory is that it provides a way for us to talk about the biological rootedness of human beings and their evolution from less complex forms of life without falling into various types of reductionism. For example, it avoids the biological reductionisms of sociobiologists such as Edward O. Wilson and Richard Dawkins, in which human beings are depicted basically as gene-reproducing biological machines with no greater transcendent purposes (see HI, pp. 152–6). It also debunks the common twentieth-century portrait of the human being as merely a "cerebral subject," which fosters the idea that we simply *are* our brains (see Fernando Vidal's historical narrative and critique of this development in RHN, 30–57).²⁸

A second major contribution of emergence theory is that many are employing it to "resolve" the age-old problem of the relation of body to soul—or, in modern terms, mind to brain (or in extreme materialist-reductionist conceptions of the "cerebral subject," body to brain).²⁹ I use the term "resolve" somewhat loosely and tentatively, because many recognize that while emergence theory contributes to a more comprehensive understanding of the *whole* human person, it also leaves some important questions and criticisms unanswered.

While emergence theory is helpful in some respects it does not completely close the gap between scientific and religious descriptions of reality (ISS, 338–56).³⁰ Restricted to physical description, scientific vocabulary ends up speaking rather vaguely about what precisely is an emergent capacity: what precisely *is* consciousness? what precisely *is* the "soulish thing" we call the soul?³¹ Physical description, even of the nonreductive sort, also seems to fall short when explaining transcendent experiences. For example, Fisher points out that physical approaches lacking reference to the soul have difficulty explaining accounts given by people who have endured near-death experiences, especially those resuscitated from clinical death (HSTS, 232–6). Nevertheless, emergence theory provides categories of understanding that allow both "soft" dualists

and nonreductive physicalists (or holistic monists) to find common ground.

Theorists advocating or leaning toward monism or nonreductive physicalism can still speak of human beings possessing “souliness” (e.g., see HI, 115). Conversely, dualists can now speak in a more nuanced way about the body-soul relation. Malcolm Jeeves (RHN, 176–205) suggests that we can speak of duality without substance dualism and argues in favor of “irreducible intrinsic interdependence” between the mental/spiritual and the physical. Along these lines, Roger Scruton argues that what is needed is a theory of the soul that detaches the concept from the outdated “inner self” idea (ISS, 349). Martinez Hewlett endorses Aquinas’s view that body and soul form one substance (HI, 147–63), and Catherine Keller suggests that the human person emerges as a “pneumatic complex” (ISS, 318).

In sum, emergence theory takes human biological rootedness seriously while preserving an important emphasis on mystery and transcendence, or what might be called the realm of spirit. Those inclined to stress the biological nature of human existence require something like emergence theory in order to have a holistic account of human consciousness, knowledge of God, and morality. Those inclined to stress the spiritual dimension of human existence require something like emergence theory to explain how their spiritual life affects and is affected by their daily existence in the world. As one recent example, Paul Markham has convincingly employed emergence theory to demonstrate the importance of the spiritual disciplines for “hard-wiring the brain” for spiritual growth and character transformation.³²

5. Conclusion

I have explored some of the prominent issues currently being discussed in the sciences and theology concerning human personhood. Throughout the essay, I have suggested areas of consensus and disagreement, and have attempted to probe beneath the surface of the factual details of the debate in order to bring to light some of the theological and ethical assumptions and implications at stake. One important theme discussed in this essay is whether the human self should be conceived in terms of “identity” or of “multiplicity.” The underlying concern of

the proponents of both positions is that we reject essentialism but retain some measure of continuity of the self. Theologically, the Christian tradition has described the human being, in terms analogous to the Trinity, as a person-in-relationship.

A second pertinent issue concerns the uniqueness of human beings relative to other animals. The underlying concern here is how best to account for and motivate human responsibility toward the environment and toward nonhuman creatures. I suggested that a theological conception, grounded in the narrative of scripture, of human beings as steward-priests of creation who are accountable to God, does the job better than a vague conception of all creatures being in a universal-ethical animal family.

A third prominent issue is the evolution of human beings, which has raised theological concerns for many conservative Christians. I suggested that we need to follow an epistemology that does justice to the nature of the truth question(s) being posed and employ a hermeneutic that does justice to the purpose of the biblical texts being interpreted.

Finally, the last pertinent issue I identified is emergence theory. I suggested that emergence theory helps us to take seriously the biological rootedness of human beings even while preserving an appropriate emphasis on the mystery of human existence. Similarly, emergence theory helps us to account for transcendence and the realm of spirit without falling prey to substance dualism. **

Notes

¹Ellen Wondra puts the relevance of theological anthropology to ethics well:

How theologians speak of persons is crucial to Christian ethics and the Christian life. How persons understand themselves deeply shapes how they approach others, how they cherish and judge their relationships, and how they go about being faithful to the truth of the gospel proclamation that God’s work of creation, providence, and salvation is carried out in part through human life with its various structures, groupings, and modes of reflection and expression. (Ellen K. Wondra, “Participating Persons: Reciprocity and Asymmetry,” *Anglican Theological Review* 86 [Winter 2004]: 58–9)

²Bergemann, Siegel, Eichenstein, and Streit propose that one of the functions of spirituality is to foster a sense of interconnectedness, which can help people integrate the strands of their fragmented lives (ISS, 96).

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³Nietzsche rejected metaphysics as a starting point for philosophy and as a valid source of knowledge for human existence. He especially disliked all forms of Platonism, which he believed prioritized the beyond over present existence, the universal over the particular, and the absolute over the concrete (his immediate targets were Enlightenment thinkers such as Kant who attempted to construct philosophical and ethical systems on the basis of *a priori* universal truths). He also rejected Christianity, regarding it to be a form of "Platonism for the people." See Friedrich Nietzsche, *Beyond Good and Evil: Prelude to a Philosophy of the Future* (Mineola, NY: Dover, 1997).

⁴Jean-Paul Sartre, *Existentialism and Human Emotions* (New York: Philosophical Library, 1957).

⁵See Charles Taylor, *Modern Social Imaginaries* (Durham, NC: Duke University Press, 2004) and *Sources of the Self: The Making of the Modern Identity* (Cambridge, MA: Harvard University Press, 1989).

⁶See Alasdair MacIntyre, *Whose Justice? Which Rationality?* (Notre Dame, IN: University of Notre Dame Press, 1988). James K. A. Smith goes so far as to identify and analyze the "secular liturgies" that shape the desires and capture the imaginations of people in contemporary postmodern Western culture. See his *Desiring the Kingdom: Worship, Worldview, and Cultural Formation* (Grand Rapids, MI: Baker Academic, 2009), 89–129.

⁷Thus, a human life directed toward the human *telos* is characterized by both continuity and development, which are held together in what MacIntyre calls "the unity of a narrative quest" (Alasdair MacIntyre, *After Virtue: A Study in Moral Theory* [Notre Dame, IN: University of Notre Dame Press, 1984], 219).

⁸Søren Kierkegaard, *The Sickness unto Death: A Christian Psychological Exposition of Edification and Awakening*, trans. Alastair Hannay (London: Penguin Books, 1989), 43.

⁹Wolfhart Pannenberg, *Anthropology in Theological Perspective*, trans. Matthew J. O'Connell (Edinburgh: T&T Clark, 1999), 43–79.

¹⁰Miroslav Volf, *Exclusion and Embrace: A Theological Explanation of Identity, Otherness, and Reconciliation* (Nashville, TN: Abingdon, 1996), 64–6.

¹¹Karl Barth, *The Doctrine of Creation: Church Dogmatics III*, no. 1 (London: T&T Clark, 2009); Dietrich Bonhoeffer, *Creation and Fall: A Theological Exposition of Genesis 1–3*, vol. 3 of *Dietrich Bonhoeffer Works*, ed. John W. de Gruchy, trans. Douglas Stephen Bax (Minneapolis, MN: Fortress, 1997); Oswald Bayer, *Martin Luther's Theology: A Contemporary Interpretation*, trans. Thomas H. Trapp (Grand Rapids, MI: Eerdmans, 2008); Richard of St. Victor, *Book Three of the Trinity*, trans. Grover A. Zinn (Mahwah, NJ: Paulist, 2002); Thomas F. Torrance, *Calvin's Doctrine of Man* (London: Lutterworth, 1949); —, *The Christian Doctrine of God: One Being Three Persons* (New York: T&T Clark, 1996); John Zizioulas, *Being as Communion: Studies in Personhood and the Church* (Crestwood, NY: St. Vladimir's Seminary Press, 2002).

¹²A key development in the Christian understanding of personhood took place when the Cappadocian fathers (Basil the Great, Gregory of Nyssa, and Gregory of Nazianzus) reflected on the nature of God's triune personhood. By admitting the category of "relation" into the concept of

"being," the Cappadocians reconceived being itself (*ousia*) in dynamic and relational terms, a major development from classical Greek ontology. See Torrance, *The Christian Doctrine of God*, 88–102 and Zizioulas, *Being as Communion*, 27–46.

¹³Lynn White Jr., "The Historical Roots of Our Ecological Crisis," *Science* 155, no. 3767 (March 10, 1967): 1203–7.

¹⁴Michael S. Northcott, "The Dominion Lie: How Millennial Theology Erodes Creation Care," in *Diversity and Dominion: Dialogues in Ecology, Ethics, and Theology*, ed. Kyle S. Van Houtan and Michael S. Northcott (Eugene, OR: Cascade, 2010), 89–108. Cited in James C. Peterson, *Changing Human Nature: Ecology, Ethics, Genes, and God* (Grand Rapids, MI: Eerdmans, 2010), 23.

¹⁵See John Walton, *The Lost World of Genesis One: Ancient Cosmology and the Origins Debate* (Downers Grove, IL: InterVarsity Press, 2009).

¹⁶As Watts puts it,

If this creation is Yahweh's palace-temple, then we had best take good care of it ... God's anger against violators of the earth is perfectly understandable. It is his palace-temple they are defiling, whereas he is committed to renewing it. (Rikki E. Watts, "Making Sense of Genesis 1," <http://www.asa3.org/ASA/topics/Bible-Science/6-02Watts.html>, third last paragraph, no page numbers)

¹⁷Tattersall's narrative tracks the use of the first stone tools appearing 2.5 million years ago (mya), to the hand axe appearing 1.5 mya, to the controlled use of fire in hearths 800 thousand years ago (kya), to the deliberate construction of shelters and the use of wooden spears appearing 400 kya, to the appearance of clearly symbolic artefacts (i.e., Blombos Cave, Africa, 77 kya), and finally to the full flowering of the symbolic capacity approximately 40 kya (e.g., cave wall images, carvings, engravings, clay figures, and notational systems appearing 35 kya).

¹⁸Brooks explains the validity of her approach as follows:

For example, one cannot recover fossil languages, at least not until the development of writing, although dead languages can be reconstructed up to a point from words preserved in living languages. But one can recover traces of symbolic behavior (D'Errico et al., 2003), or morphological traces of changes in brain or vocal tract morphology, that suggest an ability for language. Ideologies or the capacity for abstract thought are not preserved, but one can recover traces of practices that seem to conform to ideas about spirituality—burial of the dead and cave art. Problem solving and innovativeness cannot be directly observed in the past, but one can document increases in technological sophistication and rates of innovation ... (RHN, 236)

¹⁹For example, a recent survey of the members of the American Scientific Affiliation found that 65.9% of respondents believed that the following statement is supported by credible scientific evidence: "Biologically, *Homo sapiens* evolved through natural processes from ancestral forms in common with primates." And 65.1% affirmed the statement: "Plants and animals developed through evolutionary processes with natural causes from ancestral forms." Richard Blin, *ASA Origins Survey with Correction*,

<http://www.asa3online.org/Voices/2010/07/16/asa-origins-survey-with-correction/>.

²⁰For the historical roots and developments of this cultural debate, see Mark A. Noll, *The Scandal of the Evangelical Mind* (Grand Rapids, MI: Eerdmans, 1994), 178–208.

²¹Alister McGrath, *Christian Theology: An Introduction* (Oxford: Wiley-Blackwell, 2011), 373.

²²R. J. Berry suggests that God planted his image into an existing animal (our most recent human ancestor), thus transforming *Homo sapiens* into *Homo divinus*. He writes,

If this is accepted, the species *Homo sapiens* whose fossil history we know and whose genetic history we can infer, could be described as being transformed into *Homo divinus*, a distinction apparently made first by John Stott. (RHN, 173)

For the Stott reference, see J. R. W. Stott, *Understanding the Bible* (London: Scripture Union, 1972), 63. For an alternative reading of how the image of God relates to being *Homo sapiens*, see James C. Peterson, “*Homo Sapiens* as *Homo Dei*: Paleoanthropology, Human Uniqueness, and the Image of God,” *Toronto Journal of Theology* 27, no. 1 (2011): 17–26.

²³See, for example, Walton, *The Lost World of Genesis One* and Denis O. Lamoureux, *Evolutionary Creation: A Christian Approach to Evolution* (Eugene, OR: Wipf and Stock, 2008).

²⁴See, for example, the answers proposed on the BioLogos website, <http://biologos.org/questions>.

²⁵For instance, F. LeRon Shults (HI, 39–55), in dialogue with C. S. Peirce and Terrence Deacon, argues that human beings are distinct from other biological life forms because they have reached a “symbolic threshold” leading to a qualitatively different state (following Deacon, a human being is thus *homo symbolicus*).

²⁶Nancey Murphy (HI, 79–96) provides a lucid discussion of emergence theory by answering two crucial questions. First, how do downward causes happen? For example, when one reaches for a cup of coffee, one’s mind causes one’s neurons to fire, leading to the anatomical mechanics of raising an arm, grasping, and then lifting the cup. But how is this possible when the mind is itself an emergent quality arising out of and depending upon lower neural systems and processes? Second, then, how do complex systems come into existence in the first place? The problem is that one must explain how a complex system as a whole can be the cause of its own behavior, even (in a sense) the creator of its own components. Murphy explains that the system acts as its own self-cause by *constraining* the behavior of its components. It is able to do this because it interacts with and is impacted by its environmental context and relationships. To elucidate this process further, she distinguishes between context-free constraints and context-sensitive constraints. See also Haag, Deacon, and Ogilvy (ISS, 319–37).

²⁷Information theory has described the emergence of complex systems through feedback loops that utilize new information gained from external input (in the case of biological systems, environmental influences) to provide constraints on lower processes. These processes, in turn, redirect the flow of information leading to greater system complexity.

²⁸Roger Scruton dismisses such reductionist accounts as “neurononsense,” because they attribute what properly

belongs to the whole emergent person to some elemental part or process, for instance self-consciousness to the prefrontal cortex (ISS, 346).

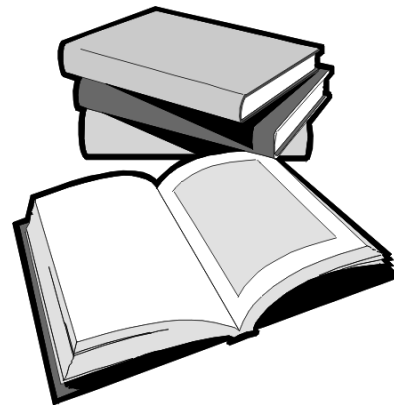
²⁹Catherine Keller argues that emergence theory effectively counters both naturalistic reductionism and supernatural inflationism (substance dualism). Consequently, the human person emerges as a “pneumatic complex,” not as something simple and unitary but as a result of the vast multiplicity encountered in its embedded relations (ISS, 301–18).

³⁰Roger Scruton employs the analogy of a painting to explain this. A theory of pigments (corresponding to scientific description) belongs to another level of pictorial analysis than iconography (corresponding to the personal-religious description). Applying the analogy, emergence theory helps to describe the development of increasingly complex physical systems that give rise to the human capacity for transcendence, but it cannot help science *as science* describe the transcendent realm.

³¹See Dallas Willard’s essay “Non-reductive and Non-eliminative Physicalism?” <http://www.dwillard.org/articles/artview.asp?artID=48>.

³²Paul N. Markham, *Rewired: Exploring Religious Conversion* (Eugene, OR: Pickwick, 2007).

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Book Reviews



ENVIRONMENT

ENVIRONMENTAL SCIENCE AND THEOLOGY IN DIALOGUE by Russell A. Butkus and Steven A. Kolmes. Maryknoll, NY: Orbis Books, 2011. vii + 244 pages. Paperback; \$26.00. ISBN: 9781570759123.

A cursory glance at the cover of this book might lead a casual reader to believe that it consists of a dialogue between two authors who are trying to understand each other better. It is not. Rather, Butkus and Kolmes write with one voice to try to persuade readers that “ecologically unsustainable human conduct threatens future human and non-human generations” (p. 3), but “broken relationships [namely, human/human, human/Earth, human/God] can be healed and restored and that a sustainable future is achievable *if* we are willing to engage in the practice of right relationships required for the planet and all its inhabitants to flourish” (p. 4, emphasis in original). They proceed to describe how they think science and theology should play roles in this process of healing and restoring the global ecosystem. Their book is not the first to present theological views on environmental issues, but in contrast to anthologies of primary documents or essays that focus on one discipline or the other, it attempts to present science and theology as allies in the pursuit of sustainability. To the extent that it facilitates dialogue, the book presents the scientific content in a way that theologians can understand and the theological content in a way that scientists can understand.

Butkus, a Roman Catholic who is associate professor of theology and environmental studies at the University of Portland, Oregon, and Kolmes, an Episcopalian who holds the Molter Chair in Science (biology) at the University of Portland, have organized their book into eight chapters, each of which consists of text, questions for discussion, active learning exercises, and recommended reading. The book also has a companion website. Endnotes for the chapters are compiled in the back of the book, along with a glossary and index. These features are intended to facilitate its adoption for college courses.

The content includes an overview of Christian theology’s engagement with culture in general and with environmental issues in particular (chapter one), twentieth-century developments (chapter two), ecological processes in relation to environmental science (chapter three), the impact of people on ecological processes (chapter four), the effects of toxins on children (chapter five), what ecology tells us about God (chapter six), what God tells us about ecology (chapter seven), and sustainability (chapter eight). The authors’ accounts of these topics are not intended to be exhaustive but are intended to be sufficiently comprehensive to familiarize the reader with the topics and some of the leading resources surrounding them. The authors mostly accomplished their goal. They also effectively described a cyclic “iterative-praxiological” method for addressing complex problems (pp. 42–5).

Not surprisingly, given the authors’ backgrounds, the theological reflections presented in the book come from the Christian tradition, albeit only from those perspectives that offer support for their thesis (neither Francis Schaeffer

nor Calvin DeWitt makes an appearance, for instance). A particular strength of the book is how the authors describe the selected theological contributions to the dialogue over environmental issues within the context of process theology. On the other hand, many Christians would regard process theology, as well as liberation theology and feminist theology, as outside the realm of orthodoxy. Furthermore, the focus of chapter seven is on the models of Jay McDaniel, Sallie McFague, and Denis Edwards, all of which the authors identify as panentheistic models.

One of the weaknesses of the book stems from the very approach of the book itself. The authors make the case that the field of environmental studies is not merely multidisciplinary or interdisciplinary, but transdisciplinary. They, however, then emphasize only two disciplines. I wholeheartedly agree that theology needs to be part of the conversation if meaningful solutions to environmental problems are to be reached. The omission of such disciplines as economics and political science, though, causes some of the authors’ proposals to appear simplistic or naïve. For example, their discussion of sustainability in chapter eight does not address the differences between enacting public policy in a constitutional republic versus in a parliamentary democracy or under an authoritarian regime.

Another weakness of the book is that the authors do not explicitly define what they mean by the terms “ecojustice” or “social justice.” Unfortunately, such terms mean different things to different people and are not self-evident. The implication is that ecojustice will obtain when sustainability is achieved. Sustainability, however, is an inherently anthropocentric idea. Must ecojustice accommodate anthropocentric goals? Are ecojustice and social justice necessarily mutually compatible? It would be enormously helpful if the authors would define these terms in future editions.

With respect to the coverage of scientific information in chapter four, the authors mention the difference in potency between methane and carbon dioxide (p. 76), but they do not mention the difference in longevity in the atmosphere between those greenhouse gases or the concept of carbon dioxide equivalents. I found their description of the feedback loop involving decreased albedo and increased water evaporation (p. 77) to be over simplified. Their decision to relabel such positive feedback loops as “destructive” (and corresponding negative feedback loops as “constructive”) is helpful, however. Later in the chapter, they charge that “climate change ‘skeptics’ funded by corporate entities ... have spread misinformation” (p. 82). Honesty and fairness would seem to demand an acknowledgment that climate change “heralds” also have powerful financial incentives to promote their findings. Skeptics do not have a monopoly on sinful behavior. The authors do not in any way address the so-called “Climategate” emails. No mention is made of developments in the areas of either green chemistry or green engineering.

The writing style is appropriate for undergraduate students and other nonspecialists. The editing of the book is very good. I counted only five errors, and none of the errors obscures or distorts the intended meaning.

Because of the process theology and panentheistic models presented, I cannot recommend this book for Christians who are just beginning to shape their views on environmental issues. I do recommend that instructors in environmental studies programs at the college or university level consider adopting this book for their courses.

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ETHICS

MERCHANTS OF DOUBT: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming by Naomi Oreskes and Erik M. Conway. New York: Bloomsbury Press, 2010. 355 pages, notes, index. Hardcover; \$27.00. ISBN: 9781596916104.

Merchants of Doubt affected me more than most books. Everyone who cares about truth and public policy should read it, but especially people like me who are naïve enough to think (or now, to have thought!) that prominent scientists will not use their credentials to mislead people on scientific questions. Over the last thirty or so years, the counterexamples to such a high view of prominent scientists have been few, but the scientific stature, political skills, and financial resources available to the subjects of this book have compensated for their small numbers.

Oreskes, a professor of history and science studies at the University of California San Diego, and Conway, a science journalist, matter-of-factly document (with over one thousand endnotes) and analyze how four prominent scientists have helped to counter reliable scientific results and confuse the public on six important issues, beginning with the connection between cigarette smoke and lung disease. The other issues are acid rain, the ozone problem, second-hand smoke, the Strategic Defense Initiative (Star Wars), and human-caused (anthropogenic) climate change. What follows is a brief review, which barely scratches the surface of the four's activities.

The central character in this drama until he died in 2008 was Frederick Seitz. Others who worked with Seitz and played prominent rolls in the story included former Director of Scripps Institution of Oceanography William Nierenberg, astrophysicist and one-time American Association for the Advancement of Science (AAAS) President Robert Jastrow, and physicist and science administrator Fred Singer.

I have personal connections to the story. As a physics graduate student at the University of Illinois in 1983 (a department Seitz once chaired), I heard that people dated modern solid state physics to Seitz and three colleagues (the group won three Nobel prizes). Seitz was highly regarded by other scientists, evidenced by his election as president of the National Academy of Sciences. This impacted me. Because I was aware of his outsized scientific accomplishments, Seitz's public skepticism of the evidence for climate change (known then as global warming) in the 1990s caused me to doubt, to some degree, my best-informed colleagues' opinions and what was, even then, scientific consensus concerning the reality and risks of climate change.

But Seitz had a darker side, unknown to me. From Oreskes and Conway, I learned that in 1979, upon retirement, he went to work for R. J. Reynolds where he supported the tobacco industry's efforts to challenge the connection between smoking and lung disease. He dispensed \$45 million in research grants over six years to scientists who, in the words of tobacco industry documents, "produced a number of authorities upon whom the industry could draw for expert testimony in court suits and hearings by government bodies" (p. 29). Later, in 1989, Seitz advised them on how to fight evidence of secondhand smoke's harm, coordinating an internal report which acknowledged the abundant evidence of harm, but advised the industry on how to fight regulation (p. 142).

The tobacco industry's (and Seitz's) effort to subvert science was a precursor to how Seitz and his colleagues would assist other industries for which scientific results threatened regulation. A tobacco executive's apt summary, "Doubt is our product since it is the best means of competing with the 'body of fact' that exists in the minds of the general public" (p. 34), also summarized later efforts.

The Doubt Strategy

The strategy that Seitz and others followed in supporting these questionable causes was to avoid the practice of science. Science's backbone is the practice of presenting empirical results to a competent community which has the skills to understand, assess, and challenge the results. In contrast, Seitz and the company's game plan was to have eminent scientists (themselves) bypass the scientific community's competent scrutiny and go directly to the public, creating the appearance of science while avoiding its practice. Too often, the game plan included deceit. The "go to the public strategy" involved multiple approaches (more than can be documented in a short review).

The first approach, practiced most effectively by Singer, was to make broad general claims of "bad science" or "junk science," or to allege political influence in op-eds or press releases in which evidence to support their claims was unnecessary. Such actions were effective. They received immediate press and left the layperson with the hard-to-overcome impression that the scientific community was significantly divided. Furthermore, in contrast to specific claims that science investigates (e.g., historical CO₂ concentrations, temperature changes, etc.), general claims of "bad science" are essentially impossible to refute, particularly when made in a public medium.

At issue here is the effort to avoid a competent audience. When the tobacco industry argued that the public should "be allowed to make its own decisions based on the evidence" (p. 32), what they really sought was to have the issue decided, but not by people who understood enough science to be competent judges.

A second approach to bypass science was to author privately produced articles, not subject to peer review, but still widely cited because of the authors' impressive scientific credentials. One article, notable for what it revealed about Seitz, Nierenberg, and Jastrow, was produced by the George C. Marshall Institute in 1989. The

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article's central claim was that the warming that climate scientist James Hansen and others had found did not track the historical increase in CO₂, and thus the observed warming "must have been caused by the Sun" (p. 186). Their conclusion was wrong—warming does track CO₂ as well as other factors, including the sun. But what is most striking was the ham-handed way these eminent scientists supported their position. Like a dishonest student, they reproduced a Hansen figure with five of the figure's six plots edited out to give the misleading impression that Hansen's data supported them (p. 187).

Seitz also used the private article approach in a letter he wrote inviting recipients to sign a petition opposing the Kyoto Protocol. The letter enclosed an "article" published by a chemist, Arthur Robinson, and formatted to look like a reprint from the *Proceedings of the National Academy of Sciences*, asserting that there was no global warming.

Seitz's letter emphasized his connection with the National Academy of Sciences, giving the impression that the whole thing—the letter, the article, and the petition—was sanctioned by the Academy. (p. 245)

The ruse was apparently well done; the National Academy held a press conference to disclaim the mailing and distance itself from its former president.

A third approach, mentioned too briefly here, was character assault, an odd activity from the men of character who once helped the tobacco industry produce a deadly product. Ben Santer was the lead author of chapter eight of the Intergovernmental Panel on Climate Change's *Second Assessment Report*, which stated, "Nevertheless, the balance of evidence suggests that there is a discernible human influence on global climate" (p. 205). This was compromise wording, worked out after Saudi Arabia and Kuwait objected to stronger language. Partly on the basis of this change to softer language (and partly on events that seemed to have existed only in his head), Seitz charged Santer with fraud in the June 12, 1996 *Wall Street Journal*, followed shortly after by charges in multiple venues from his seeming tag-team partner Fred Singer. After numerous scientists came to Santer's defense, Singer even alleged that Seitz was the victim. Oreskes and Conway efficiently deconstruct this affair (pp. 198–215).

The Legacy of the *Merchants of Doubt*

Merchants of Doubt is disturbing—so disturbing, that it makes one hope that the adage, "The only thing necessary for evil to succeed is for the good to do nothing" [Edmund Burke], is true, and that there are enough good people who will do something.

The doubt strategy has been effective, delaying action on all issues it has touched, but it has been particularly effective with regard to preventing action on climate change. Action appeared imminent in 1989 after President George H. W. Bush campaigned with a promise to counter the "greenhouse effect with the White House effect." But Nierenberg presented the Marshall Institute paper, mentioned above, to the Bush administration, reversing the momentum toward legislation (p. 190), a change which twenty years of increasingly dire data has not reversed. Can good people stop the doubt strategy by doing something? I hope so.

Merchants of Doubt "does something," revealing how deceit has affected public policy. In addition, few who read the book will doubt the reality and danger of human-caused climate change. The spectacle of exceptional scientists resorting to deceit that would embarrass a student portrays unambiguously the weakness of these scientists' case. Simply put, most readers will recognize that Seitz, Nierenberg, Jastrow, and Singer thought deceit was necessary because the facts contradicted what they wished to be true.

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A GLASS DARKLY: Medicine and Theology in Further Dialogue by D. Gareth Jones and R. John Elford, eds. New York: Peter Lang, 2010. viii + 246 pages. Paperback; \$59.95. ISBN: 9783039119363.

How should faith inform the cutting edge of reproductive technologies? When science and medicine intervene to overcome infertility, is this intruding into God's sovereignty over human existence? How can the concept of God's love be discerned and used to shape our moral responsibilities in science and medicine? As technology marches forward, can Christians overcome the default impulse to respond negatively toward novel and new things? These are all very important questions that D. Gareth Jones and R. John Elford ask ethicists and theologians from Roman Catholic and evangelical perspectives to discuss. Their goal is to create a dialogue of "serious listening to perspectives and insights of others."

Jones, a Christian, scientist, and ethicist, begins the dialogue by laying the groundwork of science and technology of human reproduction. Since there is "no virtue in Christians either attacking or dismissing figments of ... imagination," the dialogue must begin with good facts. The key case study question is the following: Is there a difference between the artificiality and technological intrusion needed to care for a two-pound baby born prematurely versus a fragile embryo in a petri dish destined for a womb? Jones takes aim at conceptual framings such as "artificial," "natural," "technology," and "modifying individuals" that can obscure the real underlying concerns and thorough consideration of the issues. Elford finishes framing the discussion by outlying the theological resources available to help us think about science and medicine. What distinguishes the Jewish, Christian, and Muslim understanding of morality from those found in eastern religions is that there can be no spirituality that does not embrace morality. Elford asserts that putting Christian ethics and traditions into action in the midst of life's uncertainties is the real mark of faithfulness.

What follows are two sections that cover diverse Roman Catholic and evangelical responses respectively. The official Roman Catholic response holds the embryo as equivalent in moral status to other persons and maintains a strong resistance against any intervention in the link between sexual acts between husband and wife and procreation. Celia Deane-Drummond explores whether the recovery of prudence, an understanding of wisdom rooted

in charity, can guide us further in considering the common good. For example, she argues that evaluating whether *in vitro* fertilization (IVF) should be used to create embryos should not be reduced to viewing the procedure as an “artificial” intrusion into nature. Rather, the intrusion of the “artificial” into relationships may be more troubling; therefore considerations should explore whether or not IVF harms our social concept of humans, of relationships in marriage and family, and of community.

Gerard Mannion discusses the character and form of Roman Catholic moral interventions in pluralist societies and public moral discourse. His concern is that religious arrogance and certitude create a barrier, and he calls for the church to work alongside the wider world instead of preaching down to it. Ann Marie Mealey critiques the *Dignitas Personae* (the 2008 Congregation for the Doctrine of the Faith doctrinal positions on embryonic issues). She is concerned that the arguments put forth breed too narrow an understanding of natural law, based in physicalism, which can overlook the inclusion of reason and experience.

Andrew Goddard reviews ways the Bible is used to articulate an ethical standpoint. He appeals to Allen Verhey’s essentials for Christian interpretation, namely reading the scriptures humbly and within the context of Christian community. J. Stephen Bellamy bemoans absolutist arguments that an embryo should be regarded as a fully protectable human life from the time of fertilization, as commonly used in public debates by various evangelical advocacy groups. His concern is that such a rigid interpretation negates contributions from other thoughtful Christian voices and disenfranchises those caught in the complex decision making on these issues. Adam Hood points to the need for examining the underlying metaphysical assumptions that shape these debates.

Jones concludes the book with a call for more dialogue. Society needs a coalition of voices with different experiences, wisdom, and expertise. Dialogue will help us fearlessly examine our reasons for our faith and how our underlying metaphysical assumptions, religious traditions, and ethical frameworks influence our stand. He rightly states that it is unfair to expect precise answers, but tells us, rather, that the expectation should be guidance. Dialogue is needed because Christians “lack definitive guidance from the biblical writers and from most church traditions ... on how best to value some embryos when faced with having a child with a particularly distressing genetic disease or when confronted by infertility.”

However, in reading *A Glass Darkly*, one finds much dialogical exchange, but no clear guidance emerges. The dialogue is very academic, highly geared toward ethicists and theologians. While serious students of theology and ethics will be challenged to think deeply by reading this dialogue, a further step is needed to compile the different experiences, wisdom, and expertise in such a way that guidance is accessible for nonexpert practitioners who are seeking to act in accordance with their faith.

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HISTORY OF SCIENCE

THE DARK SIDE OF CHARLES DARWIN: A Critical Analysis of an Icon of Science by Jerry Bergman. Green Forest, AR: Master Books, 2011. 270 pages. Paperback; \$13.99. ISBN: 9780890516058.

Two mistakes that amateur historians often make are these: interpreting and evaluating past events in terms of current knowledge (doing “Whig History”), and interpreting or selectively choosing historical documents/books to support a current position (doing “eisegesis”). Bergman’s book is replete with both types of errors. In addition, there are numerous logical inconsistencies in the argumentation and many evidences of poor editing. The result is a book that tells us what Bergman has found to bolster what he apparently believed before he began his research, but it is not a book that can justify those beliefs to anyone who demands good scholarship.

Bergman’s thesis seems to be this: the academic/scholarly community has engaged in a conspiracy to suppress the “real” story of Charles Darwin, refusing to admit that

1. Darwin was a poor scientist, both in terms of practice and theorizing;
2. Darwin plagiarized the theory of evolution by means of natural selection;
3. Darwin was psychologically unbalanced; and
4. Darwin held immoral views (e.g., racism and sexism).

By claiming to tell us this “real” story, Bergman constructs an *ad hominem* argument by which he seemingly intends to discredit both the man and his theory—and possibly that community of academic scholars who value the theory and admire the man.

The errors and inconsistencies in this book are too many to enumerate and refute, so in this review I will simply give a few examples to indicate why the book should not be taken seriously. Let’s begin with the question of plagiarism. Bergman notes a number of pre-Darwinian evolutionists and complains that Darwin did not acknowledge them in citations. Even more importantly, Bergman accuses Darwin of actually plagiarizing from Edward Blyth and Alfred Russel Wallace. Of course, as Bentley Glass noted, evolutionary ideas were hotly debated from the mid-eighteenth century on, and it is generally accepted that ideas that are commonly discussed need not be cited.¹ But even if Darwin should perhaps have noted his precursors more, what about the main point—that he really utilized Blyth’s and Wallace’s ideas?

Bergman cites Loren Eiseley as evidence that Darwin had known of Blyth’s research and ideas, especially his concept of “natural selection,”² but Eiseley’s argument has been refuted by numerous scholars since his article appeared in 1959 and his book came out in 1979. As the editors of Darwin’s correspondence point out in a footnote to a letter written by Darwin to J. S. Henslow in late 1832, Blyth’s work itself was based on the widely well-known work of William Sharp Macleay.³ Darwin was merely discussing ideas widely known in the current debate over

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evolution. Moreover, Darwin did think highly of Blyth's observations which he cited three times in *On the Origin of Species*. However, as Susan Sheets-Pyenson points out, "Blyth seemed to function for Darwin as an imaginary devil's advocate."⁴ Blyth affirmed special creation and the fixity of species, not evolution, but his evidence pushed Darwin to refine his own theory in a way to account for the data Blyth presented. In other words, it was Blyth's observations and facts (which are used and cited as noted above), not his theorizing or explanations, that impressed and influenced Darwin.

But what about Alfred Russel Wallace? Bergman uncritically accepts Rhawn Joseph's claim that Darwin had "abandoned the field of 'evolution' early in his career."⁵ No one acquainted with Darwin's correspondence and the continuing comments, questions, and requests for information related to the development of his theory could make such an outlandish assertion. In May 1857, Darwin continued his correspondence with Wallace and wrote,

This summer will make the 20th year (!) since I opened my first-note-book, on the question how & in what way do species & varieties differ from each other. — I am now preparing my work for publication, but I find the subject so very large, that though I have written many chapters, I do not suppose I shall go to press for two years.⁶

In fact, on "14 May 1856, Charles Darwin recorded in his journal that he 'Began by Lyell's advice *writing* species sketch.'"⁷ Hence, when Darwin received Wallace's letter and manuscript in June 1858, he was well into his book. He wrote to Lyell admitting that he had been too slow in publishing his ideas and commending Wallace in these words:

If Wallace had my M.S. sketch written out in 1842 he could not have made a better short abstract! Even his terms now stand as Heads of my Chapters.⁸

Lyell and J. D. Hooker encouraged Darwin to publish Wallace's paper, but they also told him to write a short synopsis of his own to go with it. What Darwin sent to the Linnean Society, according to the historian of science Peter J. Bowler, consisted of

(a) a short extract from Darwin's manuscript, (b) part of a letter that Darwin had sent to the American botanist Asa Gray in 1857 (this demonstrated Darwin's priority) and (c) Wallace's paper.⁹

Bowler also refutes the charge of plagiarism and analyzes the differences between Wallace's paper and Darwin's. He notes, first, Wallace's lack of interest in artificial selection and his failure to appreciate the analogy between artificial and natural selection, and second, his silence on how natural selection acts on differences between individual organisms to bring about changed populations.

These comments should be sufficient to demonstrate the error of Bergman's plagiarism charges. However, there are other issues related to them that need to be addressed. Bergman seems to chastise and devalue Darwin because others such as Erasmus Darwin, Jean-Baptiste Lamarck, Robert Chambers, and Patrick Miller had talked about evolution before him. Science does not give priority to the individual who first proposes a theory or publicizes an

idea. If that were the case, we would study Aristarchus of Samos rather than Copernicus and Galileo for heliocentrism. No, science credits the individual who not only puts forward a theory, but also provides evidence to support the theory and articulates a research program that can be built on the theory and evidence. However, Bergman argues that Darwin was a bad scholar and an inept scientist. His failures, according to Bergman, included numerous errors in his text (but Bergman does not explain if these were simply spelling/grammar mistakes, mistaken attributions, etc., or serious content errors, faulty analysis, erroneous conclusions, and fraud). No reputable historian of science would deny that Darwin sometimes erred, based on misunderstanding of the data provided him by others or on errors in those data, or on the state of science at that time. But Bergman fails to understand that Darwin thought and acted as a nineteenth-century Englishman, not as a twentieth- or twenty-first-century American. In other words, Bergman is doing "Whig History." Many of Darwin's methods, ideas, and conclusions were consistent with those of other scientists and thinkers of his period. Mendel's research was not rediscovered until early in the twentieth century, and until then, Lamarck's theory was the most common alternative explanation for heredity. Nineteenth-century Europeans in general believed that Africans were "lower" forms; some even questioned if they were of the same species as Europeans. And eugenics was a strong force in the USA through the Second World War.

But, so what? What if Darwin made mistakes? What if he held ideas which we now know to be wrong? What if he did criticize his colleagues, enjoyed hunting (including killing) animals, had unorthodox (or maybe even no) religious views, possibly had psychological issues, or had doubts about his theory? If we rejected every scientist who exhibited these traits, along with his (or her) theory, we would be back in the Stone Age. Newton would be out, since he was heterodox in theology, was viewed as less than congenial by some of his colleagues and has been described as a "solitary scholar,"¹⁰ performed alchemical experiments, probably even having a psychological breakdown as a result of mercury poisoning related to those experiments, and was involved in a priority dispute for many years with Gottfried Wilhelm Leibniz over who invented the calculus. James Watson and Francis Crick, the "discoverers" of the double helical structure of DNA, unethically "appropriated" Rosalind Franklin's research and were sexists, and Crick, at least, was a philosophical materialist and a eugenicist.¹¹

Ad hominem arguments, which are the essence of this book, provide irrelevant and insufficient grounds for evaluating scientific theories. Just as scientific hagiographies distort the scientist and his or her work by portraying an idealized person, books such as Bergman's distort the individual and his or her accomplishments by demonizing the person. Neither is good scholarship and both should be eschewed.

Notes

¹Bentley Glass, Owsei Temkin, and William L. Straus Jr., eds., *Forerunners of Darwin: 1745–1859* (Baltimore, MD: Johns Hopkins Press, 1959), v.

²Loren Eiseley, *Darwin and the Mysterious Mr. X* (New York: E. P. Dutton, 1979), 45–80. An earlier form of this chapter can be found in

Eiseley's "Charles Darwin, Edward Blyth, and the Theory of Natural Selection" in the *Proceedings of the American Philosophical Society* 103 (1959): 94–158.

³The *Correspondence of Charles Darwin, Volume 1: 1821–1836* (Cambridge: Cambridge University Press, 1985), 282, footnote 8.

⁴Susan Sheets-Pyenson, "Darwin's Data: His Reading of Natural History Journals, 1837–1842," *Journal of the History of Biology* 14, no. 2 (Fall 1981): 243.

⁵Jerry Bergman, *The Dark Side of Charles Darwin: A Critical Analysis of an Icon of Science* (Green Forest, AR: Master Books, 2011), 152 citing Rhawn Joseph, *Astrobiology, the Origin of Life, and Death of Darwinism* (San Jose, CA: University of California, 2000), 223.

⁶The *Correspondence of Charles Darwin, Volume 6: 1856–1857* (Cambridge: Cambridge University Press, 1990), 387.

⁷*Ibid.*, xiv.

⁸The *Correspondence of Charles Darwin, Volume 7: 1858–1859* (Cambridge: Cambridge University Press, 1990), 107.

⁹Peter J. Bowler, *Charles Darwin: The Man and His Influence* (Cambridge: Cambridge University Press, 1996), 112.

¹⁰Robert Westfall, *Never at Rest: A Biography of Isaac Newton* (Cambridge: Cambridge University Press, 1980). The title of chapter 3 is "The Solitary Scholar."

¹¹In 1964, Francis Crick, Hermann J. Muller, and Joshua Lederberg urged that the USA establish a large-scale eugenics program, and Crick suggested "the reversible sterilization of the citizenry by placing 'something into our food' and licensing 'the people with the qualities we like' to bear children." Cited by Howard L. Kaye in his *The Social Meaning of Modern Biology: From Social Darwinism to Sociobiology* (New Haven, CT: Yale University Press, 1986), 48.

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MATHEMATICS

MATHEMATICS AND RELIGION: Our Languages of Sign and Symbol by Javier Leach. West Conshohocken, PA: Templeton Press, 2010. xi + 188 pages, with glossary and index. Paperback; \$20.00. ISBN: 9781599471495.

Conceding that twenty-first century, visually oriented denizens no longer inhabit a literate culture, but seeking to reach out in words to those curious about our human place in the cosmos, the Templeton Science and Religion Series commissions compact scientific/theological explorations of big questions. "Doomed to fail," a skeptic scoffs. "But worth the effort," a sympathetic respondent counters, "if such a text gives, as intended, a good overview of the field for a general audience or rouses the occasional reader to delve more deeply into works on a similar theme."

Connections between mathematics, religion, and metaphysics spark few scholarly fires today. Professional mathematicians never explore such matters as part of their education, and hardly any theologians or philosophers are prepared to follow technical discussions that venture beyond elementary mathematics. Nevertheless, a small pocket of readers is interested in all of this on a general level, at least in North America, where the largely evangelical Association of Christians in the Mathematical Sciences continues to flourish.

This book comes out of a very different context and tradition, however. The author is a Jesuit priest who holds an academic position in mathematics and logic at a Span-

ish university. Trained in mathematics, philosophy, and theology, Javier Leach seems ideally qualified for writing a book on this topic. Drawing upon these disparate backgrounds, he relates religion, science, mathematics, and metaphysics not as antagonists or isolated spheres but as fields sharing common features and interests.

Mathematics and Religion is quite short, shorter even than the bibliographic data above suggests. The body of the text consists of nine brief chapters that run to only 130 pages. The remainder of the book is devoted to a preface (5 pages), ten rather technical appendices (30 pages), a glossary (9 pages), an essay on resources (6 pages), and an index (10 pages). With editorial assistance, the author might have integrated some of his appendices' material into the text (and dropped most of the remainder), but perhaps the publisher judged that enlarging the text proper in this way would reduce sales. Better editing would also have improved the English in a number of places. Readers familiar with idiomatic mathematical terminology will find statements such as " m is equal or less than n ," " π is transcendent," and "odd-grade polynomials with real coefficients have a real number solution" awkwardly phrased or momentarily perplexing.

The first two chapters of the book lay out Leach's overall schematic. Mathematics deals with objects of the mind via logic and formal language. Science deals with objects we perceive with our senses, and it asserts truths about them in representational language, though mathematics and logic are also indispensable. Metaphysics and religion deal with ultimate causes, which mathematics and science are constitutionally unequipped to address. The language of metaphysics and religion employs symbols and terms having personal, communal, and traditional meanings in addition to referring to ultimate realities. Appropriate evidences for the validity of claims in these fields differ, but assertions in each area must strive for consistency; without that, language and thought have no real value.

Chapters three and four give a highly condensed and Eurocentric history of mathematics and logic. Chapter five briefly recounts the rise of modern science, focusing mostly on Galileo, including his conflict with the Roman Catholic church, but giving some attention to Newton and a few later thinkers as well.

With this introductory material out of the way, chapters six and seven focus on the historical and systematic process of formalizing mathematics, and on the rise and contours of mathematical logic. These receive more extended treatment (40 pages), being closest to Leach's area of expertise and relating most directly to the current state of mathematics. Given its broad scope, however, this material contains a number of oversimplifications and omissions. Cantor is portrayed as if he reduced all of mathematics to set theory. Peano is never mentioned for his work on formalization. Brouwer's intuitionism seems to arise in response to Gödel's incompleteness results. Constructive mathematics is claimed to be a subset of classical mathematics. The syntax and semantics of formal logic are presented but with almost no mention of the role deduction systems play in constructing proofs (even though Gödel's completeness and incompleteness results touch primarily on deducibility). And so on. These defi-

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ciencies may be unavoidable, given the brevity of the text, but such are evidently the consequences of aiming to be so concise while trying to cover such a broad expanse.

Leach ties the fields of mathematics, science, metaphysics, and theology together with the connecting threads of language and logic. As the preface states, "This book is about our languages, ... by which we convey meaning." In all four fields, theories are constructed with language and rely upon logical reasoning. Individually, they share an interest in logical consistency, a concern made prominent by twentieth-century foundations of mathematics. Jointly, they complement each other and offer truths from their own perspectives.

Twentieth-century foundational developments in mathematics (especially incompleteness and undecidability results) also suggest, according to Leach, that mathematics is pluralistic and open-ended. Different perspectives are welcome, as are competing theories. If this is so for our most objective field of thought (and Leach sees this trend in physics as well), we certainly should be open to a variety of complementary perspectives from metaphysics and religion. Room is thus carved out for metaphysics and religion to consider ultimate questions. Mathematics cannot even decide all the important issues in its own field with axiomatic and foundational methods; it certainly cannot dictate positions outside its purview.

Complementarity is not due to these areas being totally disjointed. Each field has its own focus, language, and criteria for evidence, but it is a mistake, Leach says, to see them as nonoverlapping. They do not describe different worlds. "Mathematics and science try to answer how things are. Metaphysics and religion try to answer why the world is the way it is" (p. 128). Leach sums up his view of their interrelationships with a model he calls *Non-Symmetrical Magisteria*: while these fields each have authority in their own domains, they are related through language and logic, albeit in a nonsymmetrical way.

Religious knowledge needs science, while science can do without religion. In effect, this asymmetry is a plus for science by making it autonomous, but it is also a plus for religion by endowing religion with a more comprehensive vision ... [F]aith cannot close its eyes to mathematics and the empirical sciences. I can separate mathematics from theology, but I cannot separate theology from mathematics. Mathematics and the empirical sciences are independent of religious beliefs, but theological reflection cannot do without mathematics and the empirical sciences. (p. 131)

In this way Leach gives a sort of primacy to mathematics and science. In fact, he even says a few pages earlier that "the history of Christianity ... can be viewed as a series of responses to scientific cultures over the ages" (p. 127). He finds no intrinsic influence passing from religion and philosophy to mathematics and science; the latter are autonomous. But a grounded and well-rounded metaphysics and theology need to take into account what we know about/from mathematics and science.

Assessing the book's success in relating mathematics and religion depends upon one's own preconceptions of the fields involved and how they are properly linked.

The heavy focus on logic and the posited asymmetric relationship between mathematics and religion/philosophy are not universally accepted by historians and philosophers of science and mathematics. Many now conceptualize mathematics more in the way it is holistically practiced than as an abstract body of formalized theoretical results. Leach's outlook may also be questioned by evangelical Christian mathematicians, some of whom believe there is a more integral way to relate their faith to their professional work. But *Mathematics and Religion* does offer an informed discussion of the topic by a mathematician committed to faith in Jesus Christ, and as such provides a viewpoint readers can use to test and sharpen their own ideas on the relationships.

Reviewed by Calvin Jongsma, Professor of Mathematics, Dordt College, Sioux Center, IA 51250.



ORIGINS & COSMOLOGY

EVOLUTION: A View from the 21st Century by James A. Shapiro. Upper Saddle River, NJ: FT Press Science, 2011. 253 pages. Hardcover; \$34.99. ISBN: 9780132780933.

Whether James Shapiro is prescient or just a maverick, time will tell. Either way, this relatively short volume is a refreshing change from the constant barrage of books lambasting other positions while rehashing the same tired arguments for their own. Shapiro argues against Darwinism, but for evolution: he presents an evolutionary model that is saltational, a teleological model in which the cell itself sets the goal, a natural genetic engineering model without an intelligent engineer. Exceedingly well documented and highly technical, this will not be an easy read unless you have a good knowledge of modern molecular genetics, but Shapiro suggests a method whereby other readers can get the main idea without getting lost in the details.

The book is divided into four parts (without designated chapters). The first three lay out what we know about the way the cell works, focusing on recent advances in molecular biology. The last part shows how the first three suggest a new conceptual basis for evolutionary research, and why philosophical commitments prevent many researchers from accepting this new approach. The text itself is less than 150 pages, followed by a 25-page glossary and 65 pages containing over 1,000 references to the primary scientific literature. There are over three hundred more references online, documenting the examples cited in tables in Parts Two and Three of the book.

Throughout the book, Shapiro challenges many key tenets of Darwinism, including gradualism and the primary role of natural selection. He begins the book with the statement,

Innovation, not selection, is the critical issue in evolutionary change. Without variation and novelty, selection has nothing to act upon. So this book is dedicated to the many ways that living organisms actively change themselves. (p. 1)

Shapiro then proceeds to show how cells not only change their gene expression, but also make rapid changes to the

DNA itself, in response to environmental factors. These changes appear to be targeted, and allow significant heritable change to take place within a generation. Along the way he discusses what he sees as an ongoing change from a mechanistic model to an informatic view of living organisms, leading to a systems engineering metaphor in which the cell can no longer be spoken of in reductionist terms as merely the sum of its component parts.

In Part One, Shapiro claims, "Life requires cognition at all levels" (p. 7). While many would challenge the equation of chemical signaling with cognition, he cites several examples of how all cells respond to changes in the environment, and how that affects cell reproduction. His description of control mechanisms in the *lac* operon shows the complexity of that system, but one might wonder why he did not instead describe replication and its control mechanisms, which are just as complex and would have tied in better with the rest of the chapter. He goes on to make the claim that DNA replication tends to be conservative in times of successful growth, but allows active restructuring in times of stress. He says that the numerous proofreading systems operate as if they were applying "fuzzy logic," changing the degree of precision in response to the degree of stress, and then he describes the complex SOS response in bacteria, mating in yeast, and cell death (apoptosis) in multicellular organisms to demonstrate this. The main purpose of Part One is to convince the reader that there is a complex interaction going on in the cell all the time, and that, contrary to the unidirectionality of the central dogma (DNA produces RNA produces protein), the information transfer goes in all directions.

The controversial claims begin in Part Two, in which Shapiro says that, in contrast to the traditional view of the genome as a "read-only memory (ROM) system subject to change by stochastic damage and copying errors," it would be better to view it as a "read-write (RW) memory system subject to non-random change" (p. 28). Most of Part Two is devoted to a description of various molecular mechanisms for reformatting the information in the genome. The main contention is that if cells can restructure their genome during normal life cycles, there is no reason why they cannot do the same to produce "significant evolutionary novelties" (p. 56), and that this is more probable than the likelihood that "each individual component of these elaborate circuits evolves by making its own independent random walk" (p. 31). He cites numerous studies demonstrating that changes in the genome have been induced by various signals or conditions, using numerous "natural genetic engineering functions" in organisms as diverse as bacteria and humans. From various types of epigenetic control to ten different mechanisms for making changes in the DNA, Part Two is written at a level that will be challenging to anyone without extensive training in molecular biology. It could be used in an advanced course in molecular genetics as a summary of the various types of genetic elements and how they work.

In Part Three, Shapiro directly takes on the Darwinian ideas of gradualism and natural selection. Claiming that gradualist models are only supported by analysis of certain types of DNA, Shapiro cites a broad range of studies to show that "nature does indeed make leaps" (p. 90) and that "selection has never led to formation of a new spe-

cies" (p. 121). Going beyond transposable elements and other ways of reorganizing the DNA cited in Part Two, he shows how processes like horizontal transfer and symbiosis can lead to major changes in one generation. Most of Part Three, although not easy, should be accessible to undergraduate science majors, or nonmajors who keep up with science news in the popular press.

The last part of the book presents no new ideas, but summarizes the argument at a level the nonspecialist will be able to understand (an upper undergraduate level). Shapiro concludes that living organisms are connected by common descent, but that the evidence points to abrupt change as a result of horizontal transfer, movement of transposable elements, chromosome rearrangements, genome duplication, and cell fusion, all of which reassemble useful genomic elements in novel ways. This happens not because of any innate drive, nor because of random, accidental genetic change, but, rather, it is due to a built-in capacity to rearrange genetic information to achieve specific purposes. He claims the cell's desire to survive is the teleological agent directing change, especially at times of severe stress and unparalleled opportunity such as the great mass extinctions.

Beyond the science itself, Shapiro addresses the connection between interpretation of the evidence and philosophical presuppositions. He recognizes that many evolutionary scientists will not readily accept the conclusions of the book, because of prior philosophical commitments. He claims that the ideas that genomic changes are random and undirected (p. 56) and that cells cannot operate teleologically (p. 137) are philosophical prejudices that prohibit proper interpretation of the evidence. These prejudices spring from a fear of vitalism (p. 138) and ad hoc assumptions about the nature of genetic change based on the principle of gradualism (p. 142). In his words, "The common impulse is to declare 'impossible' what does not agree with the assumptions or prejudices of a particular school of thought" (p. 80).

Responses to this book will predictably be varied, depending on the perspective of the reader. Proponents of Darwinian evolution will undoubtedly claim that all of his examples represent small changes and only appear nonrandom and teleological as a result of the selective influence of natural selection acting on stochastic variation. Proponents of intelligent design will agree with his interpretation of the evidence, but claim that the presence of an inbuilt system of genetic engineering is yet another level of complexity that points to the presence of an intelligent engineer. Proponents of young earth creation will pick up on his comment that, "as many biologists have argued since the 19th century, random changes would overwhelmingly tend to degrade intricately organized systems rather than adapt them to new functions" (p. 134). In other words, most everyone will find something to agree with and much to disagree with in this book. Nevertheless, it will be useful to all because so much of the book is devoted to bringing together in one place a huge volume of research, however it is interpreted.

There are several areas that Shapiro does not address that weaken his argument. He does not discuss the currently popular notion of emergent properties, a mechanistic explanation that would challenge his metaphor of

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systems engineering. More importantly, although he admits, "From an evolutionary point of view, the main question to ask is how transcriptional regulatory circuits arise in the first place" (p. 31), he does not really address how these, or the basic genomic components themselves, originated. As modern technology shows, it is relatively easy to shuffle or modify components, compared to the work of fashioning innovative, functional components in the first place. This is closely related to the origin of life, which remains largely a mystery, with "little solid evidence" (p. 128).

Personally, I view Shapiro as prescient. Of course that is largely because the evidence he presents and his interpretation of it fulfill predictions I made to my students a decade ago about things that would be discovered soon (too bad I did not put those predictions in writing). In other words, I think his arguments are valid because they support my own position and philosophical prejudices. This is definitely a minority position at the moment, but time will tell if it remains that way. Either way, it is definitely worth reading.

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PHILOSOPHY & THEOLOGY

AGAINST ALL GODS: What's Right and Wrong about the New Atheism by Phillip E. Johnson and John Mark Reynolds. Downers Grove, IL: InterVarsity Press, 2010. 119 pages. Paperback; \$15.00. ISBN: 9780830837380.

Can anything good come from the new atheism? Phillip Johnson and John Mark Reynolds argue in *Against All Gods: What's Right and Wrong about the New Atheism* that the new atheists raise important and substantive questions deserving of serious attention. Moreover, the notoriety of the new atheism offers increased opportunity to advance Christianity's critique of the movement itself.

Johnson and Reynolds engage the new atheism on two levels: one, objecting to the new atheism's alternatives to religious explanation, particularly its commitment to Darwinism; and two, explaining Christian commitments that are frequently misunderstood or ignored by the new atheists. Johnson takes the first task; Reynolds, the second.

The belief that no God exists is obviously not a new phenomenon. In the past few decades, however, an evangelical atheism has developed, one that makes the eradication of religion and religious belief a fundamental goal. The new atheist celebrities are often scientists or philosophers committed to Darwinism. Among these are Richard Dawkins, Sam Harris, and Daniel Dennett. The movement also includes literary figures, such as the late Christopher Hitchens, who argue from a familiar conceit that religion is socially divisive and destructive.

Johnson writes the first five chapters of the book, and as those familiar with Johnson's previous work would expect, he focuses on the "science" behind the new-atheism movement. The new atheists typically frame the debate as a conflict between science and religion. Johnson

demurs, recognizing that the issues are not scientific ones; rather, they are philosophical in nature.

For example, he comments on an exchange between Francis Collins and Richard Dawkins, appearing in *Time* magazine in 2006. Dawkins alludes to the "multiverse" theory of the universe's origins. The theory is used to contradict the "fine-tuning" argument that a universe with life-conducive properties would not likely exist unless it were created by God. The "multiverse" hypothesis posits, instead, the actual existence of an indefinite number, or at least a large number, of alternative universes. If these universes exist, then there is some probability that our universe with its life-conducive properties would be one of them. As Johnson points out, the "multiverse" hypothesis, with its postulation of multiple, nonobservable, alternative universes, is philosophical speculation, and not science.

Johnson challenges the new atheists in a myriad of other ways. Johnson believes that Steven Pinker and the new atheists misconstrue the nature of faith, and because of that, they fail to recognize the role of faith in science. The new atheists understand that faith is belief without, or contrary to, reason. Johnson discusses a proposal made at Harvard to include a course in its required curriculum on faith and reason. Pinker, an evolutionary psychologist sympathetic to the new atheism, railed against the proposal because it puts superstition, that is, faith, as an equivalent way of knowing. Pinker's view of faith, as Johnson describes it, is to believe "something (such as that God exists) *without good reasons to do so*" (p. 28, my emphasis).

Quoting C. S. Lewis to make his point, Johnson argues that faith is not believing without reason; rather, faith is confidence in a reasonable belief when counter-reasons exist. On this view, *contra* the new atheists, faith is not a leap, but rather a confidence in the future vindication of a belief. In this sense, Johnson argues that science requires faith as much as religion does.

Using as his foil Pinker's suggestion that our planet is but an otherwise insignificant speck in a vast purposeless universe (p. 26), Johnson raises the issue of cosmic design. Johnson counters that Pinker has no scientific basis for his claim. In fact, Johnson concludes, it is reasonable to believe that "our planet is unique in the universe because intelligent life exists only on this planet and has never existed anywhere else" (p. 44). In his view, this is important because it shows that the scientific evidence itself lends weight to the theistic hypothesis. The immense improbability of our planet's being uniquely suited for life, according to Johnson, suggests a Designer.

In his most incisive chapter, Johnson challenges the new atheists' commitment to Darwinism as a worldview. He writes that Darwinism can be taken in either of two ways: as a strictly scientific theory of biology or as a way of thinking about things generally, namely, as a worldview. As a worldview, or as a general way of thinking about everything, Darwinism is a philosophical thesis, not a scientific one. Johnson points out numerous tensions when Darwinism is taken as a worldview. Among those he highlights, two are particularly important. First, Darwinism makes a hash of morality. Darwinism, when taken comprehensively, inevitably leads to social Darwin-

ism with its attendant injustices. Natural selection sits with normative morality very uneasily. Second, Darwinism as a worldview is self-defeating. Johnson points out that Darwinists explain religious belief by way of Darwinian natural selection, not by reasonableness. Where, then, Johnson asks, does that leave Darwinism itself? If belief arises because of survival value, then Darwinism's own reasonableness must be questioned. Johnson suggests that Darwinism, taken as a worldview, is "hoist on its own petard," so to speak.

The first five chapters of *Against All Gods* criticize the arguments of the new atheists. In the sixth chapter, the focus shifts. Reynolds takes up the task of clarifying Christian beliefs often misunderstood by naturalist critics. Reynolds discusses the Bible (chapter 6), the relationship between faith and reason (chapter 7), and the development of western culture (chapter 8).

Reynolds makes the case that the naturalists' critique often reflects an inability to read the Bible properly as an ancient text. The accusation, for example, that the God of the Bible is morally corrupt because he commanded genocide, rips the biblical story out of its historical context and uncharitably ignores how Christians actually interpret their text. Reynolds suggests that in the conquest narratives, God was "faced with an educational problem" (p. 79). God had to accommodate himself to a people with a very limited horizon of understanding. Given their primitiveness, God commanded, for example, "total war," because it was the "best of the bad options available in the time and with the people he had" (p. 80).

Reynolds rightly makes the point that understanding an ancient text involves hermeneutical sophistication that the new atheists either do not understand or refuse to understand. If the Bible is a divine and human text, one would expect it to reflect the "finitude, folly, and foibles" (p. 71) of the human authors. For that reason, interpreting the text is more complicated than the new atheists suggest.

Reynolds then discusses the issue of faith and reason, particularly in a Christian understanding of education, where faith and reason are complementary rather than antagonistic. According to the Christian tradition, education is about discovery and wonder. Education is not an exercise in endless scepticism, but rather in openness and awe before creation. Faith aids in discovery by providing a "hypothesis that can be tested against reason and experience" (p. 89). Faith provides an explanatory web of belief, a worldview if you will, that education and inquiry seek to justify. Reynolds describes it this way: "Education is the process of grounding our religious and cultural hopes in long discourse, reason and life experience" (p. 89). And ultimately, Christian education is training for excellent living. Christian education, oriented as it is to the cardinal and theological virtues, prepares a student for happiness and fulfillment.

In the final substantive chapter, Reynolds addresses the argument made by Hitchens and others that religion is destructive of culture and civilization. Here he provides a counter-narrative to the frequently repeated allusions to the Crusades and *jihad*. In a blazingly fast overview of the history of Western civilization, Reynolds makes the point that Western culture developed, not in spite of

Christianity, as the new atheists might suggest, but because of Christianity. Western culture and civilization—the arts, science, political liberty—developed from the confluence of Christianity and Greek philosophy, nurtured within the context of a Christian worldview. It is all well and good to criticize religion for its failures, but, Reynolds contends, one must also praise religion for its contributions.

Reynolds concludes with a challenge to the sort of secularism advocated by the new atheists. Secularism cannot sustain Western culture as it has been received. Secularism's lack of a higher vision leads to cultural and political impoverishment. It has no conception of a common good that would provide social unity or give meaning to human choice beyond satisfying a particular individual's subjective wants and desires. Moreover, secularism has no resources for self-correction. To what standard will the secularists appeal to correct social evils?

Johnson and Reynolds have provided a useful book. I recommend it. Its chief virtue is in distinguishing clearly when the new atheists are philosophers masquerading as scientists. Johnson rightly hammers home the point that Darwinism cannot answer certain kinds of questions precisely because it is a scientific theory and not a philosophical one. And Reynolds's contribution is particularly helpful to disabuse the new atheists of misconceptions of Christian theism.

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NEW PROOFS FOR THE EXISTENCE OF GOD: Contributions of Contemporary Physics and Philosophy by Robert J. Spitzer. Grand Rapids, MI: Eerdmans, 2010. 336 pages. Paperback; \$28.00. ISBN: 9780802863836.

The title of this book will probably put off some people. One group that will be put off is those who reject the whole idea of an apologetic for the existence of God. For such people, the hallmark of true faith is to believe without any good reason at all, and proofs of any sort irritate them. Another group believes that we can persuade ourselves and others that God exists, but rejects any type of logical or scientific proof. For this group, we must simply "see" God in nature or in the inner experience of our souls. To give arguments for God is like giving arguments that a sunset is beautiful; we can point to it, but we cannot quantify it. Yet another group, in which I include myself, is quite happy to use logic and science in aid of persuading ourselves and others that God exists, but has found the typical philosophical treatises on this subject dry and far from the living God of the Bible.

In this respect, I found some parts of Spitzer's book a pleasant surprise. The book does not entirely revolve around deductive "proofs" of the existence of God. Part One could more accurately be titled "newly updated, extremely strong evidential arguments for the existence of some super-intelligent being." This part of the book is the best and most up-to-date survey I have seen of the cosmological arguments for the existence of God, including the crucial evidences for a beginning of time

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and fine-tuning of the characteristics of the universe. It is surprisingly well written and accessible to nonexperts, but also gets the science right without oversimplifications. I will recommend this section to all my friends looking into this subject.

In the same vein, Part Three of the book presents an inductive argument from desire, which will be familiar to readers of C. S. Lewis: all humans appear to have deep desires that can only be fulfilled by God. Our general experience is that the things we desire exist, even if they are not at hand. For example, a man dying of hunger in the desert may try to eat sand, but his hunger is evidence that food exists somewhere.

Unfortunately, Part Two has exactly the type of abstract thicket which I feared on reading the title of the book, even though I have enjoyed reading many carefully reasoned works such as *Classical Apologetics* by Sproul, Gerstner, and Lindsley, and the works of Jonathan Edwards, Aquinas, and Augustine. The chapters in this part of the book involve layers of definitions and syllogisms, which will be hard going for a layperson not well versed in logic. Moreover, even if one agrees with all the arguments, all one has deduced is some abstract being compatible with deism and not necessarily the living God of the Bible. Nevertheless, I am fully supportive of arguments that lead us to some limited concept of God. My chief problem with this part of the book is that I did not find many of the arguments convincing, even as a believer in God, and I doubt that many atheists will.

Chapter three in Part Two presents a nuanced version of the argument of the uncaused first cause, well reviewed in *Classical Apologetics*, mentioned above. (The author uses the language of “conditions” rather than “causes” to avoid unnecessary entanglement in the definition of a “cause.”) At a key point in this argument, however, the author states that an infinite number of causes, each of which depends on another cause, is “unachievable,” but gives no argument why. Later in the book, we learn that the author believes no infinity can exist, and he gives some arguments. I will discuss the author’s view of infinities below. For the argument of the first cause, however, a rejection of infinities is not necessary. A better line of argument, which is persuasive to me, is to note that an infinite number of successive causes in an eternal chain can be lumped together as a single uncaused (or “unconditioned”) entity; in this case, the chain of causation itself is uncaused and eternal.

The section on “simplicity” in this chapter confused me until I realized that the author was using a special, philosophical definition of the word “simple.” The correct word to a physicist would be “fundamental.” Thus, a field is more fundamental than a particle, which is more fundamental than a molecule. That which is more simple, or fundamental, has more possibilities (this sounds more complex to me, not more simple). The main value of this section is to show that dualism and polytheism are not logical, and it succeeds fairly well at that.

This chapter also, like many philosophical books I have read, gets some basic concepts in quantum mechanics wrong, but this is forgivable, since so many things are confusing in quantum mechanics. Saying a particle is

“self-enclosed,” as the author does, has no meaning in modern physics. It seems to imply the concept of a boundary or edge to a particle, but such a boundary can neither be defined nor even discussed meaningfully in quantum theory. The author also repeats a common truism that particle behavior is incompatible with wave behavior, but it is well known that wave behavior in quantum field theory gives rise to particles as resonances of the field (see, e.g., D. Snoke, *Solid State Physics: Essential Concepts*, chapter 4). The existence of particle-like behavior in the theory of oscillating fields is no great mystery. Some particle-like behavior does seem to go beyond what can be deduced from the field theory, but it is an overstatement to say that the waves know nothing of particle behavior.

Chapter four, presenting a “Loneranian” proof, was a low point for me; the chapter seemed to involve a large number of bare assertions and word-play with definitions. For example, on page 147, he asserts that all intelligence involves a “pure, unrestricted desire to know.” Is that true for intelligent dogs, or really boring people? It is at least an evidential point begging evidence. On page 169, he makes a leap from intelligibility—the possibility of being understood—to intelligence when he says that intelligibility must itself equal intelligence. This also begs for evidential or inductive argument. The famous statement of Einstein, that the most incomprehensible thing about the universe is its comprehensibility, seems to me the basis for another good inductive argument, along the lines of the argument from desire, but that is not done here, and the argument comes across as very flimsy.

In chapter five, on the Kalaam argument, and in several other places, the author rests heavily on the premise that no true infinity can exist in nature, and seems to feel that Hilbert settled this question once and for all with his “finite mathematics” program. This assertion will come across as strange to anyone trained in mathematics. Hilbert’s program has been widely discredited and made irrelevant by Gödel’s incompleteness theorem. And the mathematical statements that the author makes in this book convey a lack of understanding about the mathematics of limits. For example, the author asserts without debate that zero times infinity, which is to say zero divided by zero, is unequivocally equal to zero. Mathematicians would say it depends. Some zeroes are smaller than others, so to speak, and often zero times infinity gives a finite number. Similarly, the author asserts that a finite interval cannot contain an infinite number of points, and that both time and space must have some ultimate smallest element (i.e., he declares Democritus the victor once and for all in the debate with Aristotle). Many might demur. In any case, it is strange for the author to insist so strongly that infinities cannot exist when the cosmological model he invokes in Part One, as part of his evidential argument, asserts that the universe is finite in age but infinite in spatial extent along any time-slice. The argument that no infinity can exist proves too much—if it applies to time, it must also apply to space.

There are many useful arguments in this book, summarized or improved upon from other sources, including classical ones. But in trying to find irrefutable “proofs,” the author, like many following the same program, overreaches. The best of these arguments could be cast as evidential arguments that are quite powerful. If we do

not want to bring in actual experience analyzed inductively, all that I see pure logic providing us is the knowledge that there must be one uncaused (or “unconditioned”) cause in the universe that is eternal, a “ground of all being.” The debate between theists and atheists then becomes a debate about the nature of that ground of all being: is it personal or impersonal, loving or detached, living or machine-like? To resolve that we have to look at the actual universe, our experiences in it, and the claims to revelation given us.

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RELIGION & BIBLICAL STUDIES

ENGAGING THE CULTURE, CHANGING THE WORLD: The Christian University in a Post-Christian World by Philip W. Eaton. Downers Grove, IL: IVP Academic, 2011. 206 pages. Paperback; \$18.00. ISBN: 9780830839292.

It is fairly rare for a sitting president of a church-related college or university to write a book on the renewal of Christian higher education. It is even rarer for that president’s rhetoric in his book to coincide so neatly with the missional rhetoric of the school itself. And it is most unusual for a president to have read so widely in the literature of Christian higher education and to write so gracefully.

Happily, the reader is offered all that in a new book by the president of Seattle Pacific University, Philip W. Eaton. He has been president of that university since 1996 and is still going strong. A visit to the university’s website reveals a strong correspondence between the rhetoric of the book and that of the university. And a perusal of the book introduces the reader to many intellectual luminaries in an inviting way. The book is a good read.

The major concerns of the book are two: an ongoing analysis of what sort of challenges a robust Christian university faces, and an animating vision of what should fuel such a school as it meets those challenges. As to the first concern, the book does not stop with analyzing the challenges in the first few chapters. Even toward the end of the book, Eaton brings up yet another challenge of the sort that Stephen Pinker presents—that religion should shrink from public importance in the United States as it has in Europe (p. 175). But Pinker is just one in a host of people and movements that characterize post-Christian America.

Eaton draws on many theorists to elaborate the challenges a Christian college faces: John Henry Newman, Jaroslav Pelikan, Stanley Hauerwas, Stanley Fish, James Davison Hunter, David Brooks, Tom Wolfe, Charles Taylor, George Weigel, Cormac McCarthy, and T. S. Eliot, to name a few of the heavier types. As each commentator adds his voice in assessing the great obstacles to Christian higher education posed by modern culture, the reader can easily despair.

But Eaton certainly does not despair. His constructive words are a call to arms, a rallying cry, a confident summons to a doable task. Drawing upon the great gospel

story of redemption refracted through St. Paul, Eaton articulates his animating vision for the mission of the Christian university.

To announce—right in the face of suspicion and absence of trust—redemption and healing and love to a broken world. Such an announcement is guided by the trusting embrace of a story that gives coherence and meaning to the chaos we experience daily. We have such a story to offer ... But should this be the mission of the university? My answer is decidedly yes. Of course. We must organize our work as a Christian university around this story of healing and redemption, hope and joy. We must come off the margins of our culture, effectively and winsomely, to make such an announcement. (p. 184)

That is the flaming center that animates the university and its people—administrators, faculty, staff, students. Certainly that flaming center has to be refracted through imagination, theological articulation, and engagement with the culture, represented in any university by its secular fields. Eaton moves his argument along by relying heavily on the biblical study and theology of N. T. Wright.

When enough people are committed to this mission, a “grace-filled” community will emerge that will realize human flourishing right in the university, but then spill it into the world in a transformative way. The university is called to change the world. No small vision here.

How do we assess the work of this exuberant leader of a Christian university? He certainly offers a robust and exciting vision for the Christian university. A close look at the Seattle Pacific website indicates that the vision does indeed animate the university Eaton leads. One almost believes that the vision and the university are first steps in overcoming and triumphing over the great obstacles he elaborates early in the book. But I kept thinking that his articulation of that vision sounds more like the mission of the church than the mission of the university. Certainly this idea of a Christian university must enlist only fully committed Christians of a certain venturesome sort as administrators, faculty, and students. It assumes not only a believers’ church, but also a believers’ college.

I applaud such a vision—as well as such a university—but wonder if a more modest vision might be more appropriate for other universities, one that focuses more on forming the mind than the heart. I think that nurturing students in the Christian intellectual and moral tradition and then helping them engage that tradition with the various secular fields are sufficiently ambitious goals for the Christian university. Likewise, more modest goals with regard to the world might be more fitting. I would be happy enough to prepare students to exercise their Christian vocations as salt and leaven in God’s wounded world. “Changing the world” is a pretty daunting task if one takes seriously the challenges the author himself lays out.

One should not read the book for practical advice about how one puts the author’s vision into practice. He stays pretty much at the inspirational level. But it certainly is inspirational.

Reviewed by Robert Benne, Director of the Roanoke College Center for Religion and Society, Salem, VA 24153.



ECOLOGY AND THE ENVIRONMENT: The Mechanisms, Marrings, and Maintenance of Nature by R. J. Berry. West Conshohocken, PA: Templeton Press, 2011. viii + 232 pages. Paperback; \$19.95. ISBN: 9781599472522. E-book; \$9.99. ISBN: 9781599473994.

Robert James "Sam" Berry (born 1934), emeritus professor of genetics at University College, London, honored with the UK Templeton Award (1996) and the Marsh Award for Ecology (2001), is well qualified to write authoritatively on environmental issues, having authored or edited numerous books on natural history and on science and Christian faith. He has led many organizations, including the European Ecological Federation and Christians in Science. *Ecology and the Environment* is the ninth in the Templeton Science and Religion Series, for a general audience interested in science and the humanities, including religion and theology. It seeks to inform readers without a scientific background about ecological concepts, that they may know more about the world on which all depend, getting them to ask the crucial question of how we ought to treat this world. The eight chapters range over a variety of topics much wider than the title implies.

The opening chapter "Ecology—The Study of Place" starts with a list of twenty important ecological concepts, which would be obscure to readers without some ecological background. It then switches from ecology to review Earth's history, from the origin of life, through the formation and breakup of supercontinents Rodinia and Pangaea (incorrectly called Rodinia on p. 19), to the emergence of *Homo sapiens*. Ecology becomes central in the second and longest chapter, "A Green Machine," in which a cryptic discussion of the concept of an ecosystem precedes a treatment of standard ecological topics, including adaptation, industrial melanism, the Galapagos finches, niches, and food webs. The sixteen figures, mostly from the research literature, which illustrate these two chapters, show that a solid basis of data undergirds the general statements in the text; however, specialized knowledge is needed to understand the details of most figures, and some of the labels contain errors. Similarly, an account of population growth briefly introduces the exponential, logistic, and Lotka-Volterra equations, but the connection between the name and equation seems mixed up in places, and needed parentheses in some formulas are missing. Introductory texts on environmental science for undergraduates express the key ideas with simple graphs of J-curves and S-curves and avoid the differential equations, which are unlikely to be intelligible to this book's target audience. To get a clear presentation of these equations one must look elsewhere, for example, lectures 4, 5, and 19 of the third-year Biomathematics course at the University of British Columbia, <http://www.zoology.ubc.ca/~bio301/Bio301.html> (accessed February 2, 2012). Thus by the end of chapter two, this book has discussed nearly all of the twenty most important ecological topics previously identified.

The next three chapters bring insights from Christian faith to complement the preceding essentially scientific

presentation. Chapter three, "From Deluge to Biogeography," documents the change in perception of the world from the static view of natural theology to the modern dynamic view of change governed by natural laws. Unfortunately, a key quotation from William Whewell has its sense erroneously negated by the omission of "not" before "by insulated interpositions of Divine power" (p. 74). In the early modern period, believing scientists gradually changed their interpretations of the biblical account of Noah's ark. Likewise, there has been improved understanding of the distributions of plants and animals, especially endemism in island biotas where the founder effect is significant. Chapter four, "Stewardship and Ecological Services," opens with concepts of the relationship between humans and nature in the Judeo-Christian tradition and in Islam, including a thoughtful critique of the lecture "The Historical Roots of Our Ecologic Crisis" by Lynn White Jr., given in 1966 (not 1956 as stated on p. 103). The contemporary advocacy of a biocentric worldview instead of a human-centered one finds expression in the deep ecology of Arne Naess and the Gaia hypothesis of James Lovelock. Nevertheless, ecosystem services such as primary productivity and water purification are of great value to people. In chapter five, Berry traces environmental literacy from the sixteenth century through to influential writers in the twentieth century such as Aldo Leopold and Thor Heyerdahl. However, he does not address literacy in the sense of improved understanding of environmental issues by the public and by decision-makers.

In the final chapters the focus turns to humanity and our place in God's creation. Chapter six, "The Proper Study of Mankind," first reviews human evolution from *Sahelanthropus* and *Australopithecus* to anatomically modern *Homo sapiens* with brains and larynxes allowing language. It then continues with a discussion of how morality originated, ending with the suggestion that at some time God brought about a transformation to a spiritually distinct "*Homo divines*." With our unique abilities, humans are now "The Most Dangerous Species" (chap. 7) in the world, appropriating 45% of their net primary productivity (NPP) for themselves. Some communities, such as Easter Island, have collapsed after overexploitation of resources. Berry then catalogs thirteen conferences, programs, and declarations on these issues, starting with *Limits to Growth* in 1972 and continuing to the present. He reports findings and recommendations of the Earth Charter (1997), the Millennium Ecosystem Assessment (2005), and the International Covenant on Environment and Development (2010), and then he turns to a discussion of theological reflections by J. Moltmann and H. Küng. In the final chapter, "God's Two Books," after affirming the scientific validity of modern evolutionary theory and genetics, Berry shows how it is also entirely logical to believe in God as Creator and Sustainer, citing Old and New Testament scriptures. The Fall of humanity recorded in Genesis three brought death in the sense of "severance of relationship with God, the source of life," physical death and suffering having existed long before the appearance of humans. Ecological damage is a consequence of disobedience by people without a proper relationship with God. The book ends with four pages of notes, suggestions for further reading, and a six-page index.

Berry keeps the interest of his readers by highlighting the contributions of great scientists and thinkers over the centuries, with many vivid quotations. However, the book lacks a sense of urgency. For example, it alludes to the problem of human population growth only indirectly, as an aspect of deep ecology or in the Earth Charter. Berry makes no suggestions of actions individuals can take to lessen the marring and improve the maintenance of nature. This book is more valuable for information on the history of ecological and evolutionary thought, and for the author's view of how science and Christian faith are integrated, than as a call to Christians for better stewardship of the environment.

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Letters

Biblical Longevities: Reply to Huebner

Donald A. Huebner, "Biblical Longevities: Some Questions and Issues" (*PSCF* 63, no. 4 [2011]: 287-8) has published a five-point critique of my article on biblical longevities, "Biblical Longevities: Empirical Data or Fabricated Numbers?" (*PSCF* 63, no. 2 [2011]: 117-30): two of his points are mistaken, and the other three do not relate to the content of the article but are based on what the article did *not* contain.

First, Huebner states that Table 1 is a "... listing of all generations from Adam to Manasseh." This is incorrect: Table 1 lists *longevities* (as the label states) not *generations*. The second paragraph of Huebner's critique is devoted to an argument that the table is not a satisfactory list of all generations; I agree with Huebner on this point because that is not what the table is intended or represented to be.

In his next paragraph, Huebner states, "The author ignores the clear lack of expected randomness in many of the entries of Table 1." This also is mistaken: the article addresses randomness, expected or otherwise, in the sections on the error distribution, statistical independence, Benford's law, rounding, and the systematic properties expressed by the equation for longevity. The rest of his paragraph consists of a discussion of various probabilities, but these points lack specifics (only one numerical probability is specified, and that one is incorrect), lack support by computations or other evidence, and lack awareness of the problems associated with post hoc probabilities. His use of an equation that yields longevities as though it yielded dates of birth, shows a misunderstanding of the points he intends to criticize.

Huebner objects that I failed to explain why some of the numbers are rounded and others are not, and that I did not cite evidence of the rounding of ages in the first millennium BCE. I acknowledge that I do not know why some were rounded and others were not, but I do argue that such is the case; and I also argue that the evidence of rounding contained in the article is sufficient.

Huebner would like to know how the longevities reported in other sources, such as the Septuagint, the Samaritan Pentateuch, and Josephus, affect my conclusions. Although I agree that it would be interesting to subject other sources to the analysis applied here, the outcome of such an analysis cannot affect my conclusions: if the results are the same, the conclusions, of course, are the same; if the results differ, it shows how the Masoretic sources differ from these other sources. Note, parenthetically, that I chose the Masoretic-based sources owing to the extreme measures the Masoretes used to promote accuracy (H. S. Miller, *General Biblical Introduction: From God to Us* 2, rev. ed. [New York: Houghton, 1960], 183-4).

Finally, Huebner objects that I did not address "... how the earliest genealogical numbers were accurately transmitted." However, I do not say that the numbers were accurately transmitted. My analysis simply provides evidence against fabrication as one particular source of inaccuracy. Errors may have arisen from many other sources, as Huebner points out. A particularly likely source of error that he does not mention may have arisen in the translation of numbers from hexadecimal to decimal notation, as pointed out by Philip Metzger (personal communication).

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Engineer and Scientist

The paper "Engineering Is Not Science" by Steven H. VanderLeest (*PSCF* 64, no.1 [2012]: 20-30) deserves comment that illuminates the role of "engineering" within ASA.

History yields some interesting anecdotes on the shifting boundary between science and engineering and associated terminology. In World War II, many scientists (mostly physicists) were recruited to help develop radar (an engineering function) at "radiation labs" at MIT and Harvard that helped win World War II.¹ After the war, these scientists went back to their scientific pursuits.

At Harvard at that time, there was a small engineering department, but in the post-war period there was a great expansion, focusing on the boundary between engineering and science somewhat in response to a large bequest from Gordon McKay in support of "applied science." Flexibility of language was illustrated by the breadth of departments claiming to be part of "applied science" including "social relations." Since then the new department was renamed eight times, including Department of Engineering Sciences and Applied Physics, Division of Engineering and Applied Sciences, and currently, School of Engineering and Applied Sciences (2008).

In my own career, I have played various roles including "engineer" and "scientist." I was in the Raytheon Research Division that applied "scientist" jargon to job titles, but in 1971 I made an important invention (engineering) after a colleague and I did some science on the subject (which would not have been permitted in an operating division). For the next 16 years, I was involved in

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extensive patent litigation (with many tests, depositions, affidavits, etc.) that ultimately yielded to Raytheon/Amana ~\$31 M in royalties. Was I an engineer or scientist in that effort?

In 1968, I was assigned to help Amana deal with the safety of microwave ovens regarding potential microwave radiation effects. This was extended to defense of other technology, including radar and VDTs (video display tubes). I was searching for the truth about the effects of electromagnetic energy and I believe I was a scientist in that work. It prompted the paper "Is the ASA Seeking the Truth in Environmental Matters?" which was presented at the 1986 ASA annual meeting.

I was concerned about the "environmentalist" bias within the ASA and the lack of sentiment that matched my thoughts, for example, in thanking God for modern sanitary engineering that obviated the need for the daily wagon that picked up human waste in nineteenth-century England—or thanking God for automobiles which freed us from the routine of picking our way among horse manure on streets, and above all, as the grateful recipient of two cataract operations in the last five years, thanking God for modern medical technology that transformed what used to be (sixty years ago) major surgery with a hospital stay into a two-hour appointment, less traumatic than a visit to the dentist.

In the 1990s, Don Munro, executive director of ASA, asked me to chair an Industrial Commission (IC) to welcome more members to ASA and also to present within ASA views of industry on controversial matters. I have occasionally commented on anti-industry bias in ASA publications (e.g., my letter in *PSCF* 54, no. 4 (2002): 285–6), but it has become clear to me that the tension is not between "engineering" and "science" but between environmentalism and pro-technology. Hence, when the IC was replaced by a new ASA affiliation, I successfully lobbied for the name Christian Engineers and Scientists in Technology (CEST) for members who are engineers or scientists involved in the development of technology and who find the results compatible with a Christian worldview. CEST continues today with Bill Yoder as president. He issues periodically an informative newsletter to CEST members. It is unfortunate that only one CEST member placed an article with the technology issue and that CEST was not mentioned directly.

Note

¹Robert Buder, *The Invention That Changed the World: How a Small Group of Radar Pioneers Won the Second World War and Launched a Technological Revolution* (New York: Simon & Schuster, 1996).

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