

PERSPECTIVES on Science and Christian Faith

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In this issue ...

Lessons from the Heavens: On Scripture, Science and Inerrancy

A Comparison of Green Chemistry to the Environmental Ethics of the Abrahamic Religions

Professional Engineering Ethics and Christian Values: Overlapping Magisteria

RATE Responds to the Isaac Essay Review

Isaac Replies

Intrinsic Radiocarbon?

Historically Inaccurate and Seriously Misleading Argument

Critiquing the Uncritical

Poe Replies

Genesis 1–11 in the Light of Its Second Millennial Worldview: A Response to Carol Hill's Worldview Alternative

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

Psalm 111:10

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1. Submit all manuscripts to: **Arie Leegwater, Editor, Calvin College, De Vries Hall, 1726 Knollcrest Circle SE, Grand Rapids, MI 49546-4403. E-mail: leeg@calvin.edu.** Submissions are typically acknowledged within 10 days of their receipt.
2. Authors must submit **an electronic copy of the manuscript formatted in Word** as an email attachment. Typically 2–3 anonymous reviewers critique each manuscript submitted for publication.
3. Use endnotes for all references. Each note must have a unique number. Follow *The Chicago Manual of Style* (14th ed., sections 15.1 to 15.426).
4. While figures and diagrams may be embedded within the Word text file of the manuscript, authors are required to also send them as individual electronic files (JPEG or TIFF format). Figure captions should be provided as a list at the end of the manuscript text. Authors are encouraged also to submit a sample of graphic art that can be used to illustrate their manuscript.

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- **James C. Peterson** (peterso@mcmaster.ca): theology, ethics, biblical studies, philosophy, apologetics, bioethics, genetics, and medical education.
- **Arie Leegwater** (leeg@calvin.edu): physical sciences, cosmology, mathematics, non-bio technologies, engineering, and history of science.

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Rapprochement between Science and Religion



Arie Leegwater

New beginnings are events that do not occur *ex nihilo*. In a sense they entrain the efforts of the past, both the successes and the failures, and simultaneously they anticipate a pregnant, but unknown, future. *PSCF* has existed for sixty years; it has responded to many different needs and addressed a wide variety of concerns. Its voice is one that will need continual refining and updating. Stepping into the shoes of the previous editor, I have already become aware how delicate the task may become: whether, on the one hand, to become too enamored by the need for moderation, attempting not to make any waves, or, on the other hand, to antagonize everyone in sight. Clearly there is a fine line to be drawn, but a position that avoids any hint of controversy or detects no need for reforming action would not be one that I would want to stake out. So at times I will take the opportunity to speak my mind about matters which I think we should prize in our affiliation and journal.

What unites us is the Gospel of Christ, our Savior and Lord, who invites allegiance and calls us to lead a life that is deeply committed to the scriptural injunction not to be conformed to the patterns of this age, but to be re-formed by the renewal of our consciousness, so that we may discern what God wills for our lives—our scientific practices included. Ultimately our sciences and their practices are not what unite us, no matter how firm our allegiance to an academic discipline or professional association may be. But clearly there are particular views on offer that energize us and even seemingly divide us in implementing Christ's call to be his servants in our scientific practice. To take but one example: in the long history of discussion about the relationship of science and religion, we often find that theology, particularly in its Christian theistic form,


is either being used to "sacralize" nature or is being employed as a complement to science in the interpretation and description of the "natural" world. As a consequence, the metaphor of warfare between science and religion would now appear to be dated; rather, warfare has been replaced by metaphors of rapprochement or harmony. We tend to invoke what I would call c-words in our descriptions: descriptions move from metaphors of conflict and confrontation to those of concordance, compatibility, complementarity, convergence, congruence, coherence, and so forth. Many of these ventures in harmonization and integration can too quickly curtail legitimate debate and discussion and evade the essential character of our work as Christian scientists and professionals.

The harmonization strategies in vogue also create a burden, or at least generate false impressions for scientists: for all too many, the word theology sounds like something that scholars advance in order to give Christian meaning to the otherwise secular pursuit of science. At least three options for scientists seem to be on offer: (1) to follow Stephen J. Gould's advice, keep the solution simple: we must distinguish the legitimate sphere of science (the "physical" universe) from the legitimate sphere of religion (meaning, value, and ethics) and we must ensure that neither intrudes on the other [Gould's famous, or infamous NOMA principle], (2) to develop a natural theology in which natural physical events are viewed as mirroring the action and activity of the Godhead, or exemplifying God's very nature (Science, it is said, is "to think God's thoughts after him"), or (3) to argue that modern science and its methodologies are the fruits of Christianity, so that our science is in principle Christian. All of these options have their own particular problems and assumptions which I cannot now trace.

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As much as systematic theology, as a discipline, should pay attention to developments in science, there are other, often confessional, worldview, and philosophical issues which need addressing if we wish to understand the relation between science and religion. For instance, how should we assess situations in which science itself begins to assume religious status, that is, when it offers itself as the *alpha* and the *omega*, the first and last word, on all matters? Can science harbor its own religion? Or to employ a telling phrase of John Brooke: “[Can] the excision of religion from science ... itself be a form of religion?”

Obviously very much depends on how we conceptualize the realities involved. Science, defined in terms of content and methodology—a methodological naturalism, if you will—will fail to take seriously the rich context of scientific practice. It will then be easy to dismiss or minimize religious matters as irrelevant. Similarly if religion is identified with theology or biblical doctrines, or limited to devotional practice, the role of faith will be greatly reduced in its ability to fund scientific practice. We tend to over-intellectualize the relationship between science and religion framing the issues in terms of comparing propositional statements in systematic theology with statements derived from the latest scientific theory. Recent biographical research (on, among others, Arthur Eddington and Charles Coulson) traces out how the relationship of science and religion is far more intimate in a person’s life than we have often assumed. Attention is properly shifted away from a narrowly confining focus on ideas and concepts to a broader, more integral concern with the practices of science. The focus then is not on what scientists say as much as on what they actually do.

In summary, what we need is a Christian anthropology which allows us to go beyond considering a person as a Christian and/or a scientist, but promotes a more integral view of what it is to be human. Only then can we do justice to our human condition and to those who consider religion not as irrelevant *to*, or in conflict *with*, or simply an influential factor *on*, but rather as the very *ground* for scientific practice. 

Arie Leegwater, *Editor*




In This Issue

This first issue in 2008 has a sparkling variety of articles and author exchanges on display. Denis Lamoureux introduces us to the thorny issues surrounding biblical hermeneutics and proposes certain limitations on the concept of biblical inerrancy. The next two articles explore the relationship of ethics to scientific and engineering practices. George Bennett’s article examines the principles of green chemistry and its relationship to environmental ethics found in Abrahamic religions. In the other article, Gayle Ermer, utilizing the idea of overlapping *magisteria*, proposes a solution to the seeming dilemma of integrating professional engineering ethics and the specific goals and values Christian institutions wish to advance.

Recent articles in *PSCF* have evoked spirited responses. Two author exchanges are featured. The RATE team responds to Randy Isaac’s assessment of their work, and Isaac and Kirk Bertsche offer rejoinders. The Poe exchange of views involves an assessment of the meaning and extent of “methodological naturalism.” Walter Thorson’s and David Siemens’ analyses elicit a reply by Harry Poe. I consider these types of exchanges to be important for the intellectual life of the journal.

A communication by Paul Seely, thirty-four book reviews, and several letters complete this issue.

Take up and read, and grace subsequent issues with such stimulating articles, author exchanges, and communications. Book reviews, of course, are also welcome. [Please consult the Call for Book Reviewers on p. 42.] 

Arie Leegwater, *Editor*

Looking Back: The Journal 50 Years Ago!

Fifty years ago in the March 1958 issue, the *Journal of the American Scientific Affiliation* published four major articles:

- “The Physico-Chemical Synthesis of ‘Biological’ Compounds” by Richard A. Hendry
- “Theological Aspects of Mechanists’ Views of the Origin of Life” by R. Laird Harris
- “Christian Beliefs and Personal Adjustment in Old Age” by David O. Moberg
- “What Are the Scientific Possibilities for Original Kinds” by Wayne Frair

To hear these voices from the past, you can access these four articles online at the ASA website using the following link:

www.asa3.org/ASA/PSCF/1958/

HANS KÜNG

The Beginning of All Things

SCIENCE AND RELIGION

"The prolific and inquisitive Hans Küng guides us through the conundrums of Big Bang cosmology, evolution, and brain science, showing how science raises questions it cannot answer. God is the answer. God is a rational answer, based on a faith that trusts. Küng's is a grippingly lucid and insightfully thoughtful addition to the field of science and religion."

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"Many will find it fascinating to see how a distinguished theologian offers his personal contribution to the dialogue between science and theology, writing in a bold and challenging manner and making good use of his wide reading and personal encounters."

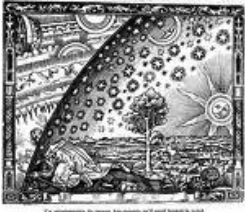
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Article

Lessons from the Heavens: On Scripture, Science and Inerrancy

Denis O. Lamoureux



Denis O. Lamoureux

*Is scientific
concordism
truly
a feature of
an inerrant
Holy
Scripture?*

Evangelical hermeneutics and the notion of inerrancy are marked by concordism. An examination of the structure and origin of the heavens in Scripture offers an opportunity to reconsider the popular assumption that statements in the Bible align with the facts of nature. The ancient Near Eastern notion of a solid firmament upholding a heavenly sea appears in the Word of God. An approach to inerrancy without concordism is proposed that is rooted in the very words of the Bible and modeled upon the Incarnation. The implications of ancient science in Scripture for the evangelical debate on origins are considered.

Most evangelical Christians assume that the Holy Spirit revealed scientific facts in the Bible well before their discovery by modern science. As a result, they believe that statements regarding the physical world in Scripture are inerrant like those assertions revealing the nature of God and his will. Today this hermeneutical approach characterizes the origins debate within evangelical circles.¹

The father of modern young earth creationism, Henry Morris, declares:

The Bible is a book of science! It contains all the basic principles upon which true science is built.² (My italics)

Similarly, leading progressive creationist Hugh Ross argues:

Obviously, no author writing more than 3400 years ago, as Moses did, could have so accurately described and sequenced these events [in Genesis 1], plus the initial conditions, without divine assistance. And if God could

guide the words of Moses to scientific and historical precision in this most complex report of divine activity, we have reason to believe we can trust him to communicate with perfection through all the other Bible writers as well.³

The interpretive approach embraced by Morris and Ross is known as “concordism.”⁴ I prefer to qualify this term as “scientific concordism” in order to include a wide variety of concordist views—from the strict literalism of creation science, to general harmonization of the days of Genesis 1 with cosmological and geological epochs of hundreds of millions of years, to the minimalist approaches which simply align Gen. 1:1 or 1:3 to the Big Bang and no more. It must be underlined that scientific concordism is a perfectly reasonable hermeneutic. God is the Creator of the world and the Author of the Bible, and an alignment or accord between his works and words is a legitimate expectation. But the question must be asked: Is scientific concordism truly a feature of an inerrant Holy Scripture?

In an attempt to answer this question, I will first examine the structure of the heavens according to the Bible. The advantage of dealing with astronomy is that it is a non-threatening science for most evangelical Christians. Next, I will draw examples from church history and modern evangelical Old Testament scholarship in order to outline the “conservative” interpretation of the heavens

Denis O. Lamoureux is an ASA Fellow and assistant professor of science and religion at St. Joseph's College in the University of Alberta. He holds the first Canadian tenure track position in science and religion, and has three earned doctoral degrees—dentistry, theology, and biology. He co-authored with Phillip E. Johnson *Darwinism Defeated? The Johnson-Lamoureux Debate on Biological Origins* (1999). His forthcoming *Evolutionary Creation: A Christian Approach to Evolution* (Wipf and Stock, 2008) advances the provocative thesis that the Father, Son, and Holy Spirit created the universe and life through an ordained and sustained evolutionary process. Lamoureux has a great appreciation for materials engineers because titanium golf clubs allow him to revisit the driving distances of his youth and to keep the dream/illusion alive!

in Scripture. This biblical and hermeneutical evidence is then examined in light of the notion of inerrancy commonly held by evangelical leaders. In closing, I will suggest that we move beyond inerrant scientific concordism and introduce an approach to statements in Scripture regarding nature that reflects the Incarnation.

The Firmament and Waters Above

One of the best passages to explore the veracity of scientific concordism is the origin of the heavens on the second day of creation:

God said, "Let there be a firmament between the waters to separate the water from the water." So God made a firmament and separated the water under the firmament from the water above the firmament. And it was so. God called the firmament "heavens." And there was evening, and there was morning—The Second Day. (Gen. 1:6–8)

Popular evangelical Bibles like the New American Standard (1971) and New International Version (1978) replace the word "firmament" with the term "expanse."⁵ As a result, readers are given the impression that the expanse refers to the atmosphere and outer space. Such an understanding aligns well with the fourth day of creation and placement of the sun, moon, and stars in the expanse.

Leading anti-evolutionists follow this concordist approach in two basic ways. For example, in their classic *The Genesis Flood* (1961), Henry Morris and John Whitcomb assert:

On the second day of creation, the waters covering the earth's surface were divided into two great reservoirs—one below the firmament and one above; the firmament being the "expanse" above the earth now corresponding to the troposphere ... With the biblical testimony concerning a pre-flood canopy of waters, we have an adequate source for the waters of a universal flood.⁶

In another harmonization of Scripture and science, Hugh Ross claims that the "expanse" in Gen. 1:6–8 refers to the troposphere and the "waters above" are water vapor. He contends that "God's 'separation' of the water accurately describes the formation of the troposphere, the atmospheric layer just above the ocean where clouds form and humidity resides."⁷ Clearly, both of these concordist interpretations are dependent on the meaning of the term "firmament/expanse," which appears five times on the second day of creation.

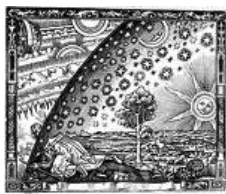
The Hebrew word *rāqîa'* does not refer to the troposphere or outer space.⁸ Ancient Near Eastern astronomers believed that the world was enclosed by a solid dome overhead that upheld a sea of water.⁹ In fact, this ancient science is reflected in the etymology. The noun *rāqîa'* derives from the verb *rāqa'* which means to "flatten,"

"stamp down," "spread out," and "hammer out." That is, this Hebrew verb carries a nuance of flattening something solid rather than forming a broad open space like the atmosphere. Exodus 39:3 and Isa. 40:19 use *rāqa'* for pounding metals into thin plates, and Num. 16:38 employs *riqqa'* (broad plate) in a similar context. The verb *rāqa'* is even found in a passage referring to the creation of the sky, which is understood to be a firm surface like a metal. Job 37:18 asks, "Can you join God in spreading out the skies, hard as a mirror of cast bronze?"¹⁰

It is essential to understand that statements in Scripture about nature are from an ancient phenomenological perspective ... In contrast, we view the physical world from a modern phenomenological perspective.

The Bible also affirms the ancient astronomical concept of a heavenly body of water.¹¹ On the second day of creation, the Creator makes solid *rāqîa'* and lifts the "waters above." Psalm 104:2–3 states that "God stretches out the heavens like a tent and lays the beams of his upper chambers on their waters." In calling forth praise from the physical realities of the sun, moon, and stars, Ps. 148:4 appeals to the heavenly sea, another real astronomical structure according to the ancient writer: "Praise the Lord you highest heavens and you waters above the skies." And Jer. 10:12–13 claims, "God stretches out the heavens by his understanding. When he thunders, the waters in the heavens roar."¹² Notably, these last three passages appear *after* Noah's flood. In other words, the collapse of a pre-flood canopy as proposed by young earth creation betrays the biblical evidence since the "waters above" remain intact in the heavens. For that matter, the firmament holding up the heavenly waters is still there in David's day as revealed in the beloved nineteenth psalm: "The heavens declare the glory of God and the *rāqîa'* proclaims the work of his hands" (cf. Ps. 150:1). Moreover, attempts to argue that the water referred to in these passages is water vapor fail to acknowledge that Hebrew has the words, *'ēd*, *nāsi'* and *'ānān* which carry meanings of "mist," "vapor," and "cloud" (Gen. 2:6, 9:14; Job 36:27; Ps. 135:7), and the inspired writers did not use them. In particular, the common noun *mayim* appears five times on the second creation day and it is always translated as "water/s" in English Bibles.¹³

The conceptualization of the firmament and waters above makes perfect sense from a phenomenological perspective.¹⁴ The color of the sky is a changing blue similar



Article

Lessons from the Heavens: On Scripture, Science and Inerrancy

to a lake or sea, and rain falls to the ground from above. The ancients logically reasoned that a solid structure upheld this body of water. However, it is essential to understand that statements in Scripture about nature are from an *ancient phenomenological perspective*. What the biblical writers and other ancient peoples saw with their eyes, they believed to be real, like the firmament and heavenly sea. This was the science-of-the-day in the ancient Near East (Figs. 1 and 2). In contrast, we view the physical world from a *modern phenomenological perspective*. Thanks to modern scientific knowledge, when we see the

blue dome of the sky, we know that it is only an appearance or visual effect caused by the scattering of short wave light in the upper atmosphere. Consequently, it is critical that these two different perspectives of nature be differentiated and not conflated in the reading of Scripture.

History of Interpretation

For many evangelical Christians today, it comes as a surprise that biblical translators and leading Christian figures during a great part of history accepted the reality of the firmament and waters above. The Greek translation of the Old Testament (Septuagint; ca. 250 BC) renders *rāqia'* as *stereōma*, which ancient astronomers conceived as a physical structure overhead—either an inverted bowl covering over a flat earth in a three-tier universe, or a sphere enveloping a global earth in a geocentric world.¹⁵ This noun is related to the adjective *stereos*, a common term for “firm,” “hard,” and “solid.” The importance of the Septuagint cannot be overstated since New Testament writers often used it in quoting Old Testament passages. Similarly, the Latin translation of the Bible, the Vulgate, has *rāqia'* as *firmamentum*. This word is also associated with an adjective (*firmus*), from which derives the English word “firm.” The Latin Bible was translated during the fifth century and served the church for over one thousand years. Its impact upon early English versions like the King James Version (1611) is obvious in that *rāqia'* is rendered as “firmament.”

The towering church father Augustine also embraced an ancient astronomy. In a chapter entitled “The Motion of Heaven and the Meaning of Firmament” from *Literal Meaning of Genesis* (415), he cautions:

Bear in mind that the term “firmament” does not compel us to imagine a stationary heaven: we may understand this name as given to indicate not that it is motionless but that it is solid and that it constitutes an impassable boundary between the waters above and the waters below.¹⁶

Similarly, protestant reformer Martin Luther in his *Lectures on Genesis* (1536) noted that the Bible

simply says that the moon, the sun, and the stars were placed in the firmament

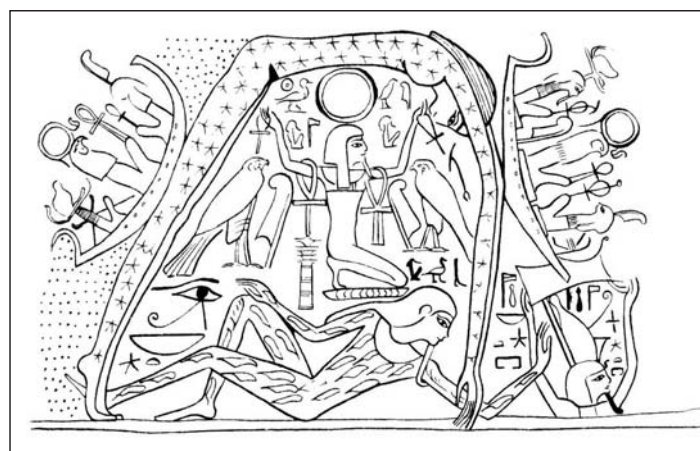


Fig. 1. Egyptian sun god Re travels in his boat across the heavenly sea. Stars adorn the firmament (1570–1085 BC). From Othmar Keel, *The Symbolism of the Biblical World*, trans. Timothy J. Hallett (New York: Seabury Press, 1978), 36, Fig. 32. Reprinted by permission of Eisenbrauns.

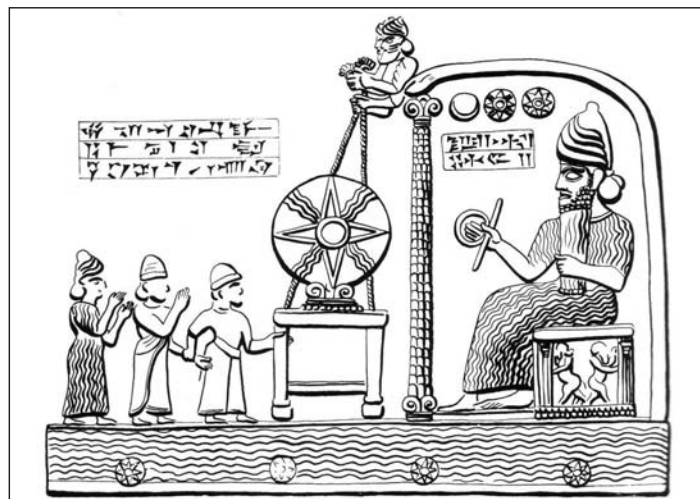


Fig. 2. Mesopotamian sun god Shamash seated in heaven on his throne over the heavenly sea. Mercury, Mars, Saturn, and Jupiter are seen below in the waters which are held up by the firmament (885–850 BC). From Othmar Keel, *The Symbolism of the Biblical World*, trans. Timothy J. Hallett (New York: Seabury Press, 1978), 174, Fig 239. Reprinted by permission of Eisenbrauns.

of the heaven (below and above which are the waters) ... The bodies of the stars, like that of the sun, are round, and they are fastened to the firmament like globes of fire.¹⁷ (Fig. 3)

In fact, Luther was quick to chastize anyone questioning concordism:

We Christians must be different from the philosophers in the way we think about the causes of things. And if some are beyond our comprehension like those before us concerning the waters above the heavens, we must believe them rather than *wickedly* deny them or *presumptuously* interpret them in conformity with our understanding.¹⁸ (My italics)

The concordist hermeneutic was not limited to theologians only. Scientists like Galileo attempted to align their astronomy with Scripture. In the "Letter to the Grand Duchess Christina" (1615), he explained the stopping of the sun in Joshua 10 by using a heliocentric universe.

With the Copernican system one can very clearly and very easily give a literal meaning to another detail which one reads about the same miracle; that is, that the sun stopped in the middle of the heavens.¹⁹



Fig. 3. Martin Luther's geocentric universe. From his 1534 translation of the Bible. Redrawn by Andrea Dmytrash.

According to Copernicus, the sun was literally in the center of the universe and surrounded by spheres with their respective planet (Fig. 4). Galileo argued that since the rotation of the sun caused the movement of spheres and planets, then inhibiting the motion of the sun would also stop the earth's rotation and account for the miracle in Joshua 10. Regarding the firmament, which was the final sphere in Copernicus's heliocentric universe, Galileo argued that "the word firmament is literally very appropriate for the stellar sphere and everything above the planetary orbs, which is totally still and motionless according to this arrangement."²⁰

Scientific concordism and belief in the reality of the firmament and waters above characterizes the hermeneutical approach of Christians for over three-quarters of church history.²¹ In other words, the traditional and *conservative* interpretation of the creation of the heavens on the second day of Genesis 1 affirms that God called into existence a solid structure that lifted up a body of water over the earth. Of course, no one today believes in the firmament or heavenly sea, and I doubt anyone would see him or herself as a *liberal* Christian, let alone a "wicked" denier of Scripture or a "presumptuous" interpreter of it. With this being the case, the question naturally arises: should our scientific views determine the orthodoxy of our faith?

Modern Evangelical Old Testament Scholarship

Interestingly, a review of evangelical commentaries published in our generation reveals that most interpreters

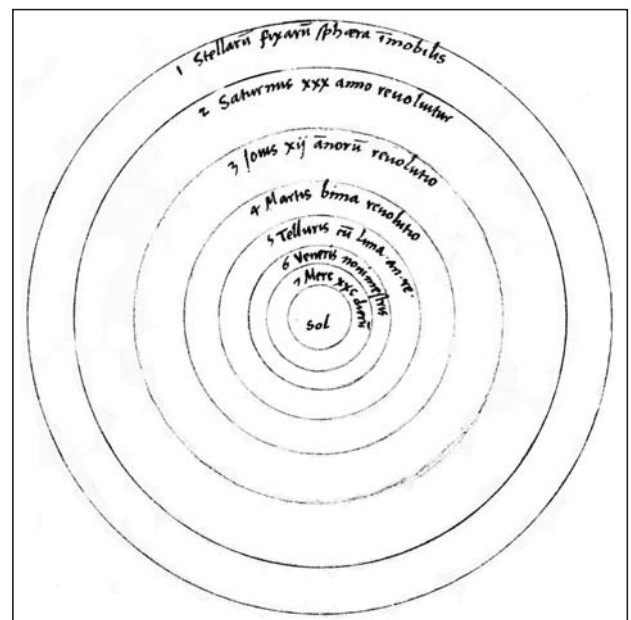
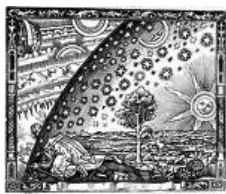


Fig. 4. Nicolas Copernicus' heliocentric universe. From his autograph manuscript for his *On the Revolutions*. The printed edition (1543) added "of the Heavenly Spheres" to the title. The outer sphere labeled '1' reads: immobile sphere of the fixed stars. Courtesy of Owen Gingerich.



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Article

Lessons from the Heavens: On Scripture, Science and Inerrancy

dismiss the originally intended meaning of the Hebrew word *rāqîa'* and fail to conserve the traditional Christian understanding of the origin and structure of the heavens in Scripture.²² In order to do so, two basic hermeneutical approaches appear. First, the notion of a firmament has evolved conceptually from a solid dome overhead into the atmosphere and outer space. Similarly, the waters above no longer refer to a heavenly sea but to clouds, rain, and water vapor. Second, a number of evangelical Old Testament scholars employ a poetic or figurative language argument in order to mitigate conflicts between the Bible and modern astronomy. The former strategy is openly concordist, while the latter attempts to redirect attention away from difficulties produced by concordism.

Harris, Archer, and Waltke's *Theological Wordbook of the Old Testament* (1980) depicts these interpretive approaches. Notably, the word studies in this two-volume set have been a powerful influence in shaping the meaning of Hebrew terms for the current generation of evangelical theologians, pastors, and students of Scripture. In the entry on *rāqîa'*, J. Barton Payne states:

Rāqîa' is the most important derivative of *rāqa'*. It identifies God's heavenly expanse. The Mosaic account of creation uses *rāqîa'* for [1] the "open expanse of the heavens" in which birds fly (Gen. 1:20 NASB), i.e., the atmosphere, and [2] that farther expanse of sky in which God placed "the light ... for signs and for seasons" (vv. 14, 17, referring apparently to their becoming visible through cloud cover; the stars, sun, and moon presumably having been created already in v. 3), i.e., empty space, over which, as Job said, "He stretches out the north" (Job 26:7). The former [the atmosphere] receives greater emphasis, particularly during that period before the second day, when the earth cooled sufficiently (?) to permit surface waters, separated from what must still have been a massive cloud-bank above, by the atmospheric expanse.²³

According to Payne:

In pre-Christian Egypt, confusion was introduced into biblical cosmology when the LXX [Septuagint], perhaps

under the influence of Alexandrian theories of a "stone vault" of heaven, rendered *rāqîa'* by *stereōma*, suggesting some firm, solid structure.²⁴

Embracing a similar concordist hermeneutic, Walter C. Kaiser asserts in his word study on *mayim* that the waters above are "the watery clouds of heaven."²⁵ He then sharply rebukes "liberal" interpreters for misunderstanding the nature of figurative language in Scripture.

Many liberal critics draw a crude picture of biblical cosmology in which the "waters on high" [i.e., waters above] are held back by a solid firmament, being permitted to fall to the earth through "windows." Actually, this is a strange mixture of mistranslation and misuse of poetic imagery ... An "expanse" (rather than the Greek and Latin derivative "firmament") was created between two bodies (Gen. 1:6). No idea of hardness, dome-like effect or solidity is attached here.²⁶

Ralph H. Alexander explains more precisely the poetic language argument in his entry on *shāmayim*, the Hebrew word for "heavens." He notes:

The heavens are frequently described in figurative language as having windows (Gen. 7:11 ...), gates (Gen. 28:7), doors (Ps. 78:23), pillars (Job 26:11), and foundations (2 Sam. 22:8). They are stretched out and spread out like a tent or a curtain (Isa. 40:22). The use of such figurative language no more necessitates the adoption of a pagan cosmology than does the modern use of the term "sunrise" imply astronomical ignorance. The imagery is often phenomenological, and is both convenient and vividly forceful.²⁷

Despite the unnecessary and uncharitable rhetoric in some of its entries, *Theological Wordbook* presents an interpretation of the origin and structure of heavens in Scripture commonly held by evangelical Old Testament scholars today.

A few comments are in order regarding the poetic language argument. First, the use of metaphors is a common practice in science to describe physical reality. For example, the magnetic *field* theory employs

an agrarian category. In Scripture, the world is compared to a tent (Ps. 19:4; Ps. 104:2; Isa. 40:22), modeling exactly an ancient understanding of the structure of the universe—a flat earth (tent floor) with a heavenly dome overhead (tent canopy).

Second, poetic passages in Scripture often refer to actual physical realities. To illustrate, “Praise the Lord, sun and moon, praise him, all you shining stars. Praise him, you highest heavens and you waters above the skies” (Ps. 148:3–4). No one today doubts the existence of the sun, moon, and stars. However, attempts to write off the “waters above the skies” as merely “figurative” because this phrase appears in a poetic passage introduces a blatant inconsistency in the interpretation of these verses—acceptance of the first three heavenly bodies mentioned and then rejection of the last. To ancient Near Eastern peoples, the waters above were as real as the sun, moon, and stars, and not fanciful poetic dressing.²⁹

The poetic language argument is eisegetical in that it reads into the Word of God alien categories from the modern scientific world.

Third, if the biblical writers had intended the terms “firmament” and “waters above” to be poetic expressions, then it means that they had an understanding of the structure of the world *other* than that presented in Scripture. In other words, these inspired authors would be like us, knowing the real structure of the heavens. Consequently, they and other ancient Near Eastern people would have *both* poetic literary works and a distinct scientific literature that describes and explains physical reality. But there is no historical evidence whatsoever indicating that this was the case. The astronomy found in God’s Word is the same as that found in the written works of nations surrounding God’s chosen people.

Finally, the poetic language argument is ultimately rooted in a conflation of the ancient and modern phenomenological perspectives. To explain this categorical confusion, consider the fact that everyone today understands the “rising of the sun” is only figurative language based on a visual effect. When we see the sun “rise,” we know that it is only an appearance caused by the earth’s rotation. However, this was not the case in the ancient world. The biblical authors and surrounding peoples believed what their eyes saw—the sun literally moved across the sky. In fact, the idea that the earth rotates daily on its axis causing the visual phenomenon of “sunrise” only became accepted in the seventeenth century.

Consequently, the inspired writers of Scripture did not use poetic language regarding the heavens in the way we do because the modern phenomenological perspective had yet to be conceived. In sum, the poetic language argument is eisegetical in that it reads *into* the Word of God alien categories from the modern scientific world.

Modern Evangelical View of Inerrancy

Biblical inerrancy is a notion that is often seen as a distinguishing characteristic of evangelical Christianity. During this generation, it has been a hotly debated issue, resulting in a variety of conceptions. Three examples outlined in Erickson’s monumental *Christian Theology* (1998) include: (1) “absolute inerrancy” asserts that all scientific and historical statements in Scripture are completely precise and true; (2) “full inerrancy” also claims that the Bible is entirely true, but qualifies that assertions about nature and the past are phenomenological; and (3) “limited inerrancy” focuses on the messages of faith in the Word of God since references to science and history reflect ancient understandings.³⁰

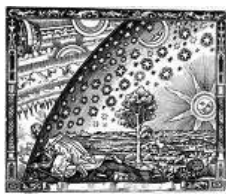
Harold Lindsell’s *The Battle for the Bible* (1976) became the spearhead document that defined the notion of inerrancy in popular evangelical circles. He defended absolute inerrancy:

[T]he reliability of the Bible is that it can be trusted as truthful in all its parts. By this I mean that the Bible is infallible and inerrant. It communicates religious truth, not religious error. But there is more. Whatever it communicates is to be trusted and can be relied upon as being true. The Bible is not a textbook on chemistry, *astronomy*, philosophy, or medicine. But when it speaks on matters having to do with these or any other subjects, the Bible does not lie to us. It does not contain any error of any kind. Thus, the Bible, if true in all parts, cannot possibly teach that the earth is flat, that two and two make five, or that events happened at times other than we know they did.³¹ (My italics)

Notably, Lindsell directs sharp criticism at the American Scientific Affiliation (ASA) for having been “infiltrated” with members “in support of biblical errancy.”³² As an example, he takes Paul Seely to task for his ASA *Journal* paper which argues that an ancient astronomy appears in Scripture. According to Seely:

The Bible assumes that the universe consists of three stories ... but we do not believe that Christians are bound to give assent to such a cosmology, since the purpose of the Bible is to give redemptive, not scientific truth.³³

Insightfully, Seely then adds: “To insist that the Bible be inerrant every time it touches on science is to insist on an *a priori* doctrine that has been read into the Bible.”³⁴



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Article

Lessons from the Heavens: On Scripture, Science and Inerrancy

However, Lindsell charges that such an approach is a “disease” and “infection” that “has spread into parachurch organizations” like the ASA.³⁵ Given Lindsell’s central hermeneutical assumption—“the Bible does not lie to us”—it is clear that scientific concordism is an interpretative inevitability.

In response to a growing need within evangelicalism to define inerrancy, a coalition of professional scholars formed the International Council on Biblical Inerrancy (ICBI) in 1977. The first two of three “summit” meetings resulted in landmark statements with significant implications for scientific concordism. “The Chicago Statement on Inerrancy” (1978) includes a five-point Summary. The fourth tenet asserts:

Being wholly and verbally God-given, Scripture is without error or fault in all its teachings, not less in what it states about God’s acts in creation, about the events of world history, and about its own literary origins under God, than in its witness to God’s saving grace in individual lives.³⁶

This 1978 statement also features nine-teen “Articles of Affirmation and Denial.” Article XII states:

We affirm that Scripture in its entirety is inerrant, being free of falsehood, fraud, or deceit.

We deny that infallibility and inerrancy are limited to spiritual, religious, or redemptive themes, exclusive of assertions in the fields of history and science. We further deny that scientific hypotheses about earth history may properly be used to overturn the teachings of creation and the flood.³⁷

Given these hermeneutical assumptions, it is obvious why the majority of evangelical Old Testament commentaries render the *rāqîa’* as atmosphere and outer space, and the *mayim* above as clouds, rain, and water vapor. Modern astronomy must align or be harmonized with the structure and creation of the heavens in Scripture. In particular, astronomical statements in the Bible are on par with “its witness to God’s saving grace in individual lives” and its “spiritual, religious, or redemptive themes.”

The second summit meeting of the ICBI resulted in the publication of “The Chicago Statement on Biblical Hermeneutics” (1982).

Following a similar interpretive approach to the 1978 “Statement on Inerrancy,” Article XXII asserts:

WE AFFIRM that Genesis 1–11 is factual, as is the rest of the book.

WE DENY that the teachings of Genesis 1–11 are mythical and that scientific hypotheses about earth history or the origin of humanity may be invoked to overthrow what Scripture teaches about creation.³⁸

The assumption of concordism is clear in Article XXI of the 1982 Statement:

WE AFFIRM the harmony of special with general revelation and therefore of biblical teaching with the facts of nature.

WE DENY that any genuine scientific facts are inconsistent with the true meaning of any passage of Scripture.³⁹

In his “Commentary” on this Chicago Statement, Norman Geisler explains further the meaning of the twenty-first article. He claims: “[I]t is insisted here that the *truth* of Scripture and the *facts* of science never contradict each other. ‘Genuine’ science will always be in accord with Scripture” (*italics original*).⁴⁰

However, a contradiction definitely exists between the Bible and science regarding the origin and structure of the heavens. Genesis 1:6–7 states:

God said, “Let there be a firmament between the waters to separate the water from the water.” So God made a firmament and separated the water under the firmament from the water above the firmament. And it was so.

But modern astronomy offers no evidence whatsoever for the existence of a solid heavenly structure upholding a body of water. To state this problem even more incisively, God’s *very words* (“Let there be a firmament ...”) in the Book of God’s Words do not accord with physical reality in the Book of God’s Works.

Biblical Inerrancy without Scientific Concordism

To the credit of ICBI scholars, they wisely qualified in the “Preface” to the 1978 document on inerrancy that they “do not propose

that this Statement be given creedal weight.”⁴¹ Their humble, tentative, and open approach to understanding the nature of biblical revelation is also seen in the prospect of further development on this issue:

We invite response to this Statement from any who see reason to amend its affirmations about Scripture by the light of Scripture itself, under whose infallible authority we stand as we speak.⁴²

Led by the gracious spirit reflected in ICBI scholarship, I suggest that biblical inerrancy not be extended to statements in Scripture regarding the origin, structure, and function of the natural world.

*Everyone agrees that the goal of understanding any written work is to determine and respect the intended meaning of the author. The original meanings of *rāqîa’* and *mayim* ... reveal that scientific concordism is an alien preunderstanding and not an inerrant feature of Scripture.*

Similar to the ICBI leadership, my central hermeneutical assumption emphasizes a thoroughly committed and unapologetic *submission* to the Word of God, in particular, to the very words. As the Bible judges our thoughts, and remodels our mind (Heb. 4:12; Rom. 12:1–2), so too the ancient words in Scripture assist us in evaluating and reshaping our position on how the Holy Spirit revealed inerrant messages of faith through the inspired writers. Of course, the preunderstandings brought to the interpretation of a biblical word are critical in determining its meaning. As Article XIX of “Biblical Hermeneutics” astutely acknowledges:

WE AFFIRM that any preunderstandings which the interpreter brings to Scripture should be in harmony with scriptural teaching and subject to correction by it.

WE DENY that Scripture should be required to fit alien preunderstandings, inconsistent with itself, such as naturalism, evolutionism, scientism, secular humanism, and relativism.⁴³

Notably, evangelical Old Testament scholarship brings to the Bible a dictatorial preunderstanding—scientific concordism. Consequently, *rāqîa’* and *mayim* above are forced to fit modern astronomy. More precisely, alien scientific

categories are being imposed upon the words in the Word of God. Instead of an exegetical (Greek *ek* “out, out of;” *ēgeomai* “to guide”) reading of this Hebrew terminology, most evangelical commentaries are eisegetical (*eis* “in, into”). But everyone agrees that the goal of understanding any written work is to determine and respect the intended meaning of the author. The original meanings of *rāqîa’* and *mayim* above reveal that scientific concordism is an alien preunderstanding and not an inerrant feature of Scripture.

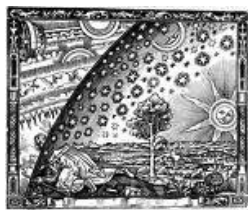
To be sure, recognizing that the Bible features an errant ancient science is at first disconcerting for most evangelical Christians. However, the Greatest Act of Revelation—God becoming flesh in the person of Jesus—offers the archetype to help us appreciate the Holy Spirit’s revelatory process.⁴⁴ A corollary of Divine revelation is that the Infinite Creator has to descend to the level of finite creatures in order to communicate. In other words, accommodation is an inherent and necessary characteristic in God revealing to men and women.⁴⁵ To illustrate with a simple example, in a parable on the kingdom of heaven, Jesus stated that the mustard seed “is smaller than all the seeds on the earth” (Mark 4:31).⁴⁶ Of course, science has discovered that there are many smaller seeds, like those of orchids. But by entering history in first-century Palestine, the Lord lowered himself and employed an incidental ancient botany in order to reveal as effectively as possible an inerrant message of faith prophesying the growth of the church.⁴⁷

Similarly, the Holy Spirit accommodated to Paul’s understanding of the structure of the cosmos. In the beloved Kenotic Hymn testifying to God emptying himself through the Incarnation, the apostle concludes:

Therefore God exalted him [Jesus] to the highest place and gave him the name that is above every name, that at the name of Jesus every knee should bow, [1] in heaven and [2] on earth and [3] under the earth, and every tongue confess that Jesus Christ is Lord, to the glory of God the Father. (Phil. 2:9–11)

Today most Christians are unaware of the three-tier universe presented in this passage, but they all recognize the inspired revelation that Jesus is Lord over the entire creation.⁴⁸ In fact, English Bibles fail to render fully the meaning of the third phrase in the original Greek. Translated more precisely, *katachthoniōn* refers to “the beings down (*kata*) in the chthonic (*chthovios*) or subterranean world.” For the biblical writers, “the underworld” was every bit as real as the heaven overhead and the surface of the earth. These terms were not merely poetic figures of speech, nor were they only “an appearance” or “phenomenological” as some understand today. Once cognizant of this ancient astronomy, it becomes necessary to separate, and not conflate, the incidental ancient science and the inerrant message of faith.

Finally, it must be emphasized that the intention of the Holy Spirit in biblical revelation is absolutely inerrant.



Article

Lessons from the Heavens: On Scripture, Science and Inerrancy

The astronomy and biology in Scripture are rooted in an ancient phenomenological perspective, and it follows that the Word of God must have a similar understanding of human origins ... and the origin of physical death ... The historicity of Adam and the entrance of sin and death into the world can now be seen in a new light with the aid of evolutionary biology.

God knew exactly what he was doing by using ancient astronomy in the revelatory process. This was not a mistake. Nor was it a lie! Lying requires deceptive and malicious intent. The Lord is not a God of deception and malevolence. Of course, the Holy Spirit could have disclosed modern scientific facts such as the Big Bang and cosmological evolution. But it is doubtful ancient peoples would have understood these modern concepts, and more than likely such a revelation would have been a stumbling block to faith. Instead, in an Incarnational fashion, God graciously descended and employed ancient human words to reveal the inerrant message *that* the Father, Son, and Holy Spirit created the heavens, not *how* he created the heavens.⁴⁹

Historical Perspectives and Modern Implications

The history of hermeneutics reveals that Christians have wrestled with the relationship between Scripture and science. Without a doubt, scientific concordism has characterized biblical interpretation throughout the ages. Yet in the midst of debates over the structure of the heavens, Augustine put these exchanges in proper perspective. He notes:

It is also frequently asked what our belief must be about the form and shape of heaven *according to Sacred Scripture*. Many scholars engage in lengthy discussions on these matters, but the sacred writers with their deeper wisdom have omitted them. Such subjects are of no profit for those who seek beatitude, and, what is worse, they take up precious time that ought to be given to what is spiritually beneficial. What concern is it of mine whether heaven is like a sphere and the earth is enclosed by it and suspended in the middle of the universe, or whether heaven like a disk above the earth covers it over on one side? ... The Spirit of God, who spoke through them [sacred writers], did not wish to teach men these facts that would be of no avail for their salvation.⁵⁰ (My italics)

In retrospect, it is obvious that the concordist attempts in Augustine's generation over the structure of the heavens were ultimately fruitless. No Christian today argues

for an accord between Scripture and either a geocentric or three-tiered universe. In the light of history, will future generations look back at the current preoccupation with scientific concordism in evangelical circles and conclude it of "no profit" and "no avail"?

The Galileo affair led to further insights into the relationship between the Bible and astronomy. Well known for his popularization of Cardinal Baronio's aphorism ("The intention of the Holy Spirit is to teach us how one goes to heaven and not how heaven goes"), few are aware that Galileo had a remarkable grasp of biblical hermeneutics.⁵¹ In the "Letter to the Grand Duchess Christina," he argued that "the primary purpose of the Holy Writ [is] ... the worship of God and the salvation of souls."⁵² At the same time, Galileo recognized that Scripture "speak[s] *incidentally* of the earth, water, sun, or other created thing" because "propositions dictated by the Holy Spirit were expressed by the sacred writers in such a way as to *accommodate* the capacities of the very unrefined and undisciplined masses" (my italics).⁵³ And most importantly, Galileo recognized the critical role that science plays in hermeneutics. Believing that scientific Facts were "a gift from God," he argued that "after becoming certain of some physical conclusions, we should use these as very appropriate aids to the correct interpretation of Scripture."⁵⁴ The historical record leads to more questions: Are the modern evolutionary sciences "a gift from God"? Will geology, paleontology, and evolutionary biology ever be used by born-again Christians as "very appropriate aids to the correct interpretation of Scripture"?

Lessons from the heavens have significant implications for the modern origins debate within evangelical circles. The current anti-evolutionary positions of young earth creation and progressive creation are undergirded by a concordist hermeneutic.⁵⁵ However, the astronomy in Genesis 1 is ancient, indicating that scientific concordism not only fails, but the very words of Scripture reveal that such an interpretive approach is impossible.⁵⁶ Moreover, the attribution of Divine creative action in the origin of the heavens on the second day is cast in the ancient category of *de novo* creation. The quick and complete creation by God of the firmament and waters above

is an accommodation by the Holy Spirit to the conceptual level of the ancient Hebrews. Consequently, Scripture does not reveal how the Creator made the astronomical world. Consistency demands that this, then, is also the case with biology. In particular, the notion of creating plants and animals “after their/its kinds” in Genesis 1 reflects the retrojection of an ancient phenomenological perspective of living organisms. To the eyes of ancient peoples, hens always gave birth to chicks, ewes to lambs, women to infants, etc., and it was perfectly logical to assume that God had created original chickens, sheep, and humans. In the light of Scripture, biblical inerrancy cannot extend to the incidental statements regarding the origin of the physical world in the creation accounts. Christian orthodoxy rests in embracing the eternal messages of faith delivered through the incidental vessel of an ancient origins science.

Of course, most readers by this point will recognize where I am heading. The astronomy and biology in Scripture are rooted in an ancient phenomenological perspective, and it follows that the Word of God must have a similar understanding of human origins. And if the *de novo* origin of life is an ancient conception, then this must also be the case for the origin of physical death presented in the Bible. The implications of these notions for the traditional and evangelical interpretations of Genesis 3, Romans 5–8 and 1 Corinthians 15 are profound. The historicity of Adam and the entrance of sin and death into the world can now be seen in a new light with the aid of evolutionary biology.

Acknowledgment

I am grateful to Anna-Lisa Ptolemy, Trevor Froehlich, Esther Martin, and Lyn Berg for their assistance.

Notes

¹A survey of American adults found that 87% of evangelical Protestants believe the Genesis 1 creation account is “literally true, meaning it happened that way word-for-word.” ABC Prime Time Poll conducted February 2004 with a random sample of 1011 adults; 3% margin of error. Surveyed by ICR-International Communications Research Media, PA.

²Henry M. Morris, *Many Infallible Proofs: Practical and Useful Evidences of Christianity* (San Diego: Creation-Life Publishers, 1980), 229.

³Hugh Ross, *Creation and Time* (Colorado Springs: NavPress, 1994), 154.

⁴The term “concordism” in evangelical circles often refers to a progressive creationist hermeneutic of Genesis 1. I suspect this is due to the influence of Bernard Ramm’s work on the relationship between science and religion in the mid-twentieth century. He notes that age-day, geological-day or Divine-day interpretative approach “is called *concordism* because it seeks a harmony of the geological record and the days of Genesis interpreted as long periods of time briefly summarizing geological history” (italics original). Bernard Ramm, *The Christian View of Science and Scripture* (Grand Rapids: Eerdmans, 1954), 145. See note 21 for a wider definition of concordism by Jaki.

⁵Interestingly, the TNIV (2006) now employs the term “vault.”

⁶Henry Morris and John Whitcomb, *The Genesis Flood: The Biblical Record and Its Scientific Implications* (Phillipsburg: Presbyterian &

Reformed Press, 1961), 77, 229. A recent attempt by young earth creationists places the waters above at the outer edge of the universe (Russell Humphreys, “Creation Cosmologies Solve Spacecraft Mystery,” *Acts and Facts* [October 2007]: 11–12). But as I will argue, this is not the original meaning of the waters above.

⁷Hugh Ross, *The Genesis Question: Scientific Advances & the Accuracy of Genesis* (Colorado Springs: NavPress, 1998), 34, 199, 201. Also see his *The Finger Print of God* (Orange, CA: Promise Publishing, 1989), 165–8; *A Matter of Days: Resolving a Creation Controversy* (Colorado Springs: NavPress, 2004), 236. Other progressive creationists embracing this approach include the following: Alan Hayward, *Creation and Evolution: Rethinking the Evidence from Science and the Bible* (Minneapolis: Bethany, 1985), 179–81; H. Donald Daae, *Bridging the Gap: The First Six Days* (Calgary: Genesis International Research Publishers, 1988), 56–68; John L. Wiester, *The Genesis Connection* (Nashville: Thomas Nelson Publishers, 1983), 202.

⁸Francis Brown, S. R. Driver and C. A. Briggs, *Hebrew and English Lexicon of the Old Testament* (Oxford: Clarendon Press, [1906] 1951), 956; Paul H. Seely, “The Firmament and the Water Above. Part I: The Meaning of *raqia’* in Gen. 1:6–8,” *Westminster Theological Journal* 53 (1991): 227–40. Though a concordist hermeneutic ultimately undergirds the translation of *raqia’* as “expanse” in evangelical Bibles, the terms “expanse” and “expansion” appear with this noun and a cognate in one of the most respected and used Hebrew lexicons (Brown, Driver and Briggs above). However, the entries clearly point out that solid structures are being referred to. I suspect part of the confusion is that the English word “expanse” commonly meant a flat two-dimensional “extended surface” (like an expansion bridge) in 1906, the year this lexicon was published, but since that time has evolved conceptually to denote a three-dimensional open space.

⁹See Luis I. J. Stadelmann, *The Hebrew Conception of the World* (Rome: Biblical Institute Press, 1970); Paul H. Seely, *Inerrant Wisdom: Science and Inerrancy in Biblical Perspective* (Portland: Evangelical Reformed, Inc., 1989), 32–7; John H. Walton, *Ancient Near Eastern Thought and the Old Testament: Introducing the Conceptual World of the Hebrew Bible* (Grand Rapids: Baker Academic, 2006), 165–78; Lloyd R. Bailey, “The Cosmology of the Ancient Semites,” in his *Genesis, Creation and Creationism* (New York: Paulist Press, 1993), 172–85; Stanley Jaki, *Genesis 1 through the Ages* (New York: Thomas More Press, 1992), 275–9.

¹⁰Other verses implying the solidity of firmament include Exod. 24:10; 2 Sam. 22:8; Job 26:11; Ezek. 1:22, 25–26; 10:1; and Dan. 12:3.

¹¹For literature, see note 9 and Paul H. Seely, “The Firmament and the Water Above. Part II: The Meaning of ‘The Water Above the Firmament’ in Gen. 1:6–8,” *Westminster Theological Journal* 54 (1992): 31–46.

¹²In fact, the Hebrew word for “thunder” (*qōl*) means “voice.”

¹³Other verses implying the heavenly sea include Gen. 7:11; 2 Kings 7:2, 19; Rev. 4:10.

¹⁴The Koran also has a three-tiered understanding of the cosmos: “Throned above the waters, God made the heavens and the earth in six days, to find out which of you shall best acquit himself” (Hud. 11:7).

¹⁵Lancelot C. L. Brenton, ed., *The Septuagint with Apocrypha: Greek and English* (Peabody, MA: Hendrickson, [1851] 1995). Greek lexical sources include the following: Walter Bauer, *A Greek-English Lexicon of the New Testament and other Early Christian Literature*, ed. William F. Arndt and F. Wilbur Gingrich (Chicago: University Press, 1958), 766–7; Henry George Liddell, *A Greek-English Lexicon*, rev. Henry Stuart Jones, 9th ed. (Oxford: University Press, 1966), 1640. For ancient astronomical models see Charles Hummel, *The Galileo Connection: Resolving Conflicts between Science and the Bible* (Downers Grove: InterVarsity Press, 1986), 23–38; David C. Lindberg, *The Beginnings of Western Science: The European Scientific Tradition in Philosophical, Religious, and Institutional Context, 600 B.C. to A.D. 1450* (Chicago: University Press, 1992), 41–3, 54–62.

¹⁶St. Augustine, *Literal Meaning of Genesis*, trans. John Hammond Taylor, 2 vols. (New York: Newman Press, 1982), I:61. In August-

Article

Lessons from the Heavens: On Scripture, Science and Inerrancy

tine's day, debate existed with regard to whether the structure of the world was three-tiered or geocentric. See passage with note 50.

¹⁷Martin Luther, *Luther's Works: Lectures on Genesis, Chapters 1-5*, J. Pelikan, ed. (St. Louis, Concordia 1958), 42-43.

¹⁸Ibid., 30. Luther was aware of Copernicus' heliocentric theory, but wrote-off the famed scientist because "the fool will turn the whole science of astronomy upside down" (Agnus Armitage, *The World of Copernicus* [New York: Signet, 1963], 90). Also see Martin Luther, *Table Talk in Luther's Works*, vol. 54 (Philadelphia: Fortress Press, 1967), 359.

¹⁹Galileo Galilei, "Letter to the Grand Duchess Christina," in *The Galileo Affair: A Document History*, ed. and trans. Maurice A. Finocchiaro (Berkeley: University of California Press, 1989), 117.

²⁰Ibid., 118.

²¹For a history of concordist interpretations dealing with the creation of the inanimate world in the first four days of Genesis 1, see Jaki, *Genesis 1*. Jaki notes:

Around 1900 or so, two leading Catholic exegetes, Lagrange and Hummelauer, admitted that none of the countless interpretations of Genesis 1 that had been offered during the previous eighteen hundred years could carry conviction. The source of that debacle was concordism, or the belief that Genesis 1 was cosmogenesis in a scientific sense, however indirectly (quoted from back cover).

²²C. John Collins, *Genesis 1-4: A Linguistic, Literary, and Theological Commentary* (Phillipsburg: P & R Publishing, 2006), 45-6, 264; Carl J. Lawrenz and John C. Jeske, *A Commentary on Genesis 1-11* (Milwaukee: Northwestern Publishing, 2004), 52-6; Kenneth A. Matthews, *Genesis 1-11:26*, vol. 1, *The New American Commentary* (Nashville, TN: Broadman and Holman Publishers, 1996), 149-51; John Sailhamer, *Genesis Unbound: A Provocative New Look at the Creation Account* (Sisters, OR: Multnomah Books, 1996), 115-23; Allen P. Ross, *Creation and Blessing: A Guide to the Study and Exposition of Genesis* (Grand Rapids: Baker, 1996), 109; Meredith G. Kline, "Genesis" in *The New Bible Commentary Revised*, ed. D. Guthrie and J. A. Motyer (London: InterVarsity Press, 1970), 82; Gordon J. Wenham, *Genesis 1-15* (Waco: Word Books, 1987), 19-20; Ronald F. Youngblood, *The Book of Genesis: An Introductory Commentary*, 2d ed. (Grand Rapids: Baker, 1991), 28; Gleason Archer, *Encyclopedia of Bible Difficulties* (Grand Rapids: Zondervan, 1982), 61; John Phillips, *Exploring Genesis* (Chicago: Moody Press, 1980), 41; G. Ch. Aalder, *Genesis: Bible Student's Commentary*, vol. 1, trans. William Heynen (Grand Rapids: Zondervan, 1981), 60; Derek Kidner, *Genesis: An Introductory Commentary* (Downers Grove: InterVarsity Press, 1978), 47; Harold G. Stigers, *A Commentary on Genesis* (Grand Rapids: Zondervan, 1976), 56; John C. Jeske, *Genesis* (St. Louis: Concordia Publishing, 1971), 15. Study Bibles include the following: Charles C. Ryrie, ed., *The Ryrie Study Bible New American Standard Translation* (Chicago: Moody, 1978), 6; Kenneth L. Barker, general ed., *Zondervan Today's International Version Study Bible* (Grand Rapids: Zondervan, 2006), 6. For a monograph on "the waters above," see Robert C. Newman, *The Biblical Firmament: Vault or Vapor?* (Hatfield, PA: Interdisciplinary Biblical Research Institute, 2000). Bruce Waltke, who is arguably the most important American evangelical Old Testament scholar today, offers a paltry and confusing entry regarding the second day of creation in his 656-page commentary on Genesis:

expanse [*rāqia'*]. This seems to be the atmosphere or sky, which in 1:8 is called *šamayim*, "heavens" or "skies." The expanse separating the waters is part of the sky. Elsewhere it is said to be hard as a mirror (Job 37:18) and like a canopy (Isa. 40:22).

water from water. The expanse separates the source of rain from the waters on earth (Bruce Waltke with Cathi J. Fredricks, *Genesis: A Commentary* [Grand Rapids: Zondervan, 2003], 62).

He also refers to the firmament on three occasions (57, 58, 62), but makes no attempt to explain its meaning. A notable exception in the evangelical commentaries includes John H. Walton, *Genesis: The NIV Application Commentary* (Grand Rapids: Zondervan, 2001), 110-3. I am grateful to John Walton for introducing me to Keel's *The Symbolism of the Biblical World*.

²³R. Laird Harris, Gleason L. Archer, Jr. and Bruce Waltke, *Theological Wordbook of the Old Testament*, 2 vols. (Chicago: Moody Press, 1980), 2:862. The NASB states, "Let the birds fly over the earth in the open expanse of the heavens." However, the literal translation of the Hebrew is "Let the birds fly above the earth and across the face of the *rāqia'* of the heavens." There is no mention whatsoever of an "open" *rāqia'*. Commitment to a concordist hermeneutic is clearly reshaping the meaning of Scripture. Those unfamiliar with Hebrew can affirm this point by checking any Hebrew-English interlinear Bible. For example, see John R. Kohlenberger III, ed., *The NIV Interlinear Hebrew-English Old Testament*, vol. 1, *Genesis-Deuteronomy* (Grand Rapids: Zondervan, 1979), 2.

²⁴*Theological Wordbook*, 2:862.

²⁵Ibid., 1:501.

²⁶Ibid. Of course, the irony is that Kaiser fails to conserve the traditional and Christian interpretation of *rāqia'* and the *mayim* above it.

²⁷Ibid., 2:935. Alexander's concordist presumption also appears with the meaning of *rāqia'*. "It is the idea of spreading out that carries over to the noun, not the idea of a metallic substance. 'Expanse' is an acceptable translation." He appeals to Lev. 26:19 and Deut. 28:23 to suggest a "metallic vault ... would be meaningless since the skies would already be metal." However, ancient astronomy held that sluice-gates and windows existed in the firmament (Gen. 7:11, 2 Kings 7:2, Mal. 3:10) through which water and rain poured. Thus, the Divine judgments in Leviticus 26 and Deuteronomy 28 are threats to seal these passages off. A more subtle example of Alexander's concordism appears in his assertion that "the usage of *šamayim* falls into two broad categories, 1) the physical heavens, and 2) the heavens as the abode of God" (Ibid.). Distinguishing the "physical heavens" from the "abode of God" fails to recognize that the latter for ancient Near Eastern peoples was indeed a physical place that was set on the waters above (see Figs. 1 and 2). It is for this reason that the idea of a tower (Genesis 11) or a stairway (Genesis 28) reaching to the heavenly realm makes perfect sense for the biblical writers. In other words, Alexander eisegetically imposes our modern theological notion that God's realm is in a dimension beyond the one in which we live.

²⁸The power of fruitful models is critical in science. See Ian G. Barbour, *Religion in an Age of Science* (San Francisco: Harper, 1990), 31-92.

²⁹This was also the case with God's dwelling place. It was not in another dimension as most suggest today. Rather, the Divine abode was a physical reality that rested upon the heavenly sea as stated in Ps. 104:2-3, "God stretches out the heavens like a tent and lays the beams of his upper chambers on their waters."

³⁰Millard J. Erickson, *Christian Theology*, 2d ed. (Grand Rapids: Baker, 1998), 248-50. Regrettably, Erickson collapses all historical statements in Scripture into one category—history. In particular, no attempt is made to distinguish the history in Genesis 1-11 from that in the New Testament. Consequently, this leaves the creation of the firmament on par with the bodily resurrection of Jesus. Such a conflation is indefensible if the former is an ancient understanding of the past and the latter actual history.

³¹Harold Lindsell, *The Battle for the Bible* (Grand Rapids: Zondervan, 1976): 18. There are over 100,000 copies of this book. Lindsell notes that some theologians distinguish between the terms "inerrancy" and "infallibility." But he uses them synonymously when he asserts "that the Bible is free from error in the whole and in the part" (Ibid., 27); and note 1.

³²Ibid., 129.

³³Paul H. Seely, "The Three-Storied Universe," *Journal of the American Scientific Affiliation* 21 (March 1969): 18.

³⁴Ibid., 22.

³⁵Lindsell, *The Battle for the Bible*, 131. Notably, Lindsell also casts this very criticism against the Evangelical Theological Society.

³⁶Norman L. Geisler, ed., *Inerrancy* (Grand Rapids: Zondervan, 1980), 494. The 1978 Statement on inerrancy remains prominent within evangelical circles in that it was added to the bylaws of the Evangelical Theological Society in November 2006.

³⁷Ibid., 496.

³⁸Earl D. Radmacher and Robert D. Preus, *Hermeneutics, Inerrancy and the Bible* (Grand Rapids: Zondervan, 1984), 886. Also see related Articles XIX, XX and XXI. Papers dealing with the relationship between Scripture and science from this second ICBI summit appear in a chapter entitled "Trustworthiness of Scripture in Areas Relating to Natural Science" (Ibid., 283-348). Contributors were all anti-evolutionists, including progressive creationist Walter Bradley and young earth creationist Henry Morris.

³⁹Ibid., 886.

⁴⁰Norman L. Geisler, "Explaining Hermeneutics: A Commentary on The Chicago Statement on Biblical Hermeneutics Articles of Affirmation and Denial" in *Hermeneutics, Inerrancy and the Bible*, 902.

⁴¹Geisler, *Inerrancy*, 493.

⁴²Ibid.

⁴³Geisler, "Explaining Hermeneutics," 901.

⁴⁴For a similar Incarnational approach to understanding the nature of Scripture, see Peter Enns, *Inspiration and Incarnation: Evangelicals and the Problem of the Old Testament* (Grand Rapids: Baker Academic, 2005).

⁴⁵For the notion of accommodation, see Clark Pinnock, "The Accommodation of Revelation" in *The Scripture Principle* (San Francisco: Harper and Row, 1984), 95-100. Pinnock argues that the Incarnation is

the prime example of accommodation ... It is natural to see an analogy between the incarnational character of revelation and the Bible. As the Logos was enfleshed in the life of Jesus, so God's Word is enlettered in the script of the Bible. In both cases there is some kind of mysterious union of the divine and the human, though of course not the same kind. But in each case both the divine and the human are truly present (p. 97).

Galileo notes that the concept of accommodation "is so commonplace and so definite among all theologians that it would be superfluous to present any testimony for it" ("Christina," 106).

⁴⁶The NIV translates this verse as "the smallest seed *you plant* in the ground" (also Matt. 13:32). However, the personal pronoun "you" and verb "plant" are not in the Greek New Testament or any variants. Kurt Aland, Matthew Black, Carlo M. Martini, Bruce M. Metzger and Allen Wikgren, *The Greek New Testament*, 3d ed. (West Germany: United Bible Societies, 1983), 49, 136; Alfred Marshall, *The New International Version Interlinear Greek-English New Testament* (Grand Rapids: Zondervan, 1976), 56, 153. Clearly, this is an attempt by NIV translators to avoid an unnecessary conflict in the mind of modern readers. In other words, they accommodate to the level of the average person. The TNIV does not add "you" or "plant," and attempts to mitigate the problem in a footnote. Kenneth L. Barker, ed., *Zondervan TNIV Study Bible* (Grand Rapids: Zondervan, 2006), 1632, 1676.

⁴⁷Other examples of the Lord's use of ancient science include botany (Mark 4:26-29, John 12:24-25), astronomy (Matt. 24:27, 29, 31) and geology (Matt. 12:42).

⁴⁸The possibility exists that Paul might have held a geocentric (Platonic/Aristotelian) understanding of the cosmos with the "underworld" either in the core of the earth or at the antipode. Nevertheless, my point remains in that he accepted an ancient science.

⁴⁹Ladd incisively presents this concept in his aphorism: "*The Bible is the Word of God given in the words of men in history*" (George Eldon Ladd, *New Testament & Criticism* [Grand Rapids: Eerdmans, 1967], 12).

⁵⁰St. Augustine, *Literal Meaning of Genesis*, vol. 1: 58-9.

⁵¹Galileo, "Christina," 96.

⁵²Ibid., 93.

⁵³Ibid., 92-3. In recognizing the ancient science in Scripture, namely the "current opinion of those times," Galileo appreciated the pastoral implications of this accommodation so as "not to sow confusion into the minds of the common people and make them more obstinate against dogmas involving higher mysteries" (p. 106).

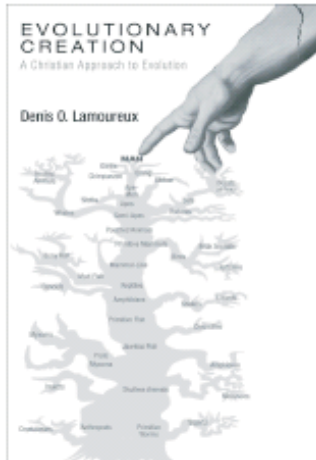
⁵⁴Ibid., 105, 93. This approach is anticipated in the hermeneutics of Sir Francis Bacon, who popularized the notion of Two Divine Books. Reprinted in Stephen Jay Gould, ed., *The Advancement of*

Learning, Modern Library Science Series (New York: Modern Library, 2001 [1605]), 43. He states:

Our Savior says, "You err, not knowing the scriptures, nor the power of God," laying before us two books or volumes to study, if we will be secured from error; first the Scriptures, revealing the will of God, and then the creatures expressing his power; whereof the latter is a *key* unto the former: not only opening our understanding to conceive the true sense of the scriptures, by the general notions of reason and rules of speech; but chiefly opening our belief, in drawing us into a due meditation of the omnipotency of God, which is chiefly signed and engraven upon his works (my italics, 1.6.16).

⁵⁵I have intentionally not included intelligent design theory since it remains too vague as an origins model. It could be classed as a form of progressive creation with fewer creative interventions and less concordist alignment between the Bible and nature. Leading ID theorists are careful not to appeal to Scripture, yet their scientific concordism at times emerges. See Phillip E. Johnson, *An Easy-To-Understand Guide for Defeating Darwinism by Opening Minds* (Downers Grove: InterVarsity, 1997), 87; William A. Dembski, *Intelligent Design: The Bridge Between Science and Theology* (Downers Grove: InterVarsity Press, 1999), 264; Stephen C. Meyer, quoted in Lee Strobel, *The Case for a Creator: A Journalist Investigates Scientific Evidence That Points Toward God* (Grand Rapids: Zondervan, 2004), 88; and especially Jonathan Wells, "Darwinism: Why I Went for a Second Ph.D.," found at www.tparents.org/library/unification/talks/wells/DARWIN.htm.

⁵⁶For further examples regarding the failure of scientific concordism, see chapters entitled "The Ancient Science in the Bible" and "The Bible and Science: Beyond Conflict and Concordism" in my *Evolutionary Creation: A Christian Approach to Evolution* (Eugene, OR: Wipf and Stock, 2008).

<p>EVOLUTIONARY CREATION A Christian Approach to Evolution DENIS O. LAMOUREUX ISBN 13: 978-1-55635-581-3</p>  <p>DENIS O. LAMOUREUX is an associate professor at St. John's college in the University of Alberta.</p> <p>AVAILABLE IN BOOKSTORES Tel. (541) 344-1528 orders@wipfandstock.com VISIT WWW.WIPFANDSTOCK.COM</p>	<p>WIPF and STOCK Publishers</p> <p>"This book forthrightly and unflinchingly addresses difficult issues at the interface of science and theology. In doing so, it remains faithful to the authority of scripture, the historical testimony of the church, and the observed record of Creation's history." —KEITH MILLER editor of <i>Perspectives on an Evolving Creation</i></p> <p>"What a magnificent understanding, reaching far beyond stereotypical received views on evolution and Christianity! This [is a] well-informed case, with teeth." —THADDEUS J. TRENN President of Canadian Science and Christian Affiliation</p> <p>AVAILABLE SPRING 2008 ESTIMATED RETAIL: \$45</p> <p>This title can be pre-ordered at a 20% discount off the retail price.</p>
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Article

A Comparison of Green Chemistry to the Environmental Ethics of the Abrahamic Religions

George D. Bennett



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Green chemistry ... began as a specific form of implementation of a national policy of the United States that focused on source reduction as a pollution prevention strategy.

Green chemistry, or environmentally benign chemistry, is in its second decade as a recognized area of research. It is unique within chemistry because of its normative character. It rests on a set of principles, and the principles rest on certain ethical propositions. The ethical tenets that underlie green chemistry are substantially consistent with the environmental ethics of the Abrahamic religions of Christianity, Judaism, and Islam. The ethical presuppositions of green chemistry bear the greatest similarity to the ethics of the productivity stewardship model of Christian environmentalism and bear the least similarity to the ethics of preservationist stewardship of Islamic environmentalism.

Green chemistry, or environmentally benign chemistry, is now in its second decade as a recognized area of research. Its normative character makes it unique within chemistry. It began as a specific form of implementation of a national policy of the United States that focused on source reduction as a pollution prevention strategy. Because green chemistry sprouted from an enacted law, and because laws result from political compromise and agreement among interested parties in order to garner broad support, the ethical tenets that underlie green chemistry reflect ethical beliefs regarding the environment that large portions of the public share. Although not everyone derives environmental ethics from theology, many people in the U.S. who do so derive their ethics from an Abrahamic religion, such as Christianity, Judaism, or Islam. Hence, the ethical tenets that underlie green chemistry are substantially consistent with the environmental ethics of the Abrahamic

religions. Such theologically derived environmental ethics invoke the idea of stewardship, but they differ as to what degree that stewardship should aim to preserve natural resources for future generations or to put natural resources to productive use now. The ethical presuppositions of green chemistry bear the greatest similarity to the ethics of the productivity stewardship model of religious environmentalism and bear the least similarity to the ethics of preservationist stewardship of Islamic environmentalism.

This article begins with an overview of green chemistry, including its development, its definition, its codification in principles of best practice, and its ethical premises. Following this account is a discussion about the circumstances that led to the enshrinement of these ethical premises in policy. The discussion of professionally derived environmental ethics is followed by a brief overview of the rise of modern environmentalism and a discussion of theologically derived environmental ethics on the basis of a comparison between the preservationist stewardship and productivity stewardship models of Christianity, Judaism, and Islam. The article concludes with an analysis of how the ethical assumptions of green chemistry compare with the preservationist and productivity stewardship models.

George Bennett graduated from Wittenberg University in 1992 with a B.A. in chemistry. He completed his Ph.D. in organic chemistry in 1997 at the Ohio State University under the supervision of Professor Leo Paquette. Immediately after graduate school, Bennett began a position as assistant professor of chemistry at Millikin University. He was awarded tenure and promoted to associate professor in 2003. His primary teaching responsibility is organic lecture and laboratory. Bennett has been a member of the ASA since 1994. He is also a member of the Decatur Running Club and has completed eight marathons.

Green Chemistry

Green chemistry rests on a set of principles, and the principles, in turn, rest on certain ethical propositions. In this section, I will first briefly survey the development of green chemistry since 1990, then define green chemistry and its principles, and delineate the ethical assumptions that underlie the principles.

Green chemistry arose in the United States in response to the Pollution Prevention Act of 1990. That piece of legislation declared pollution prevention by source reduction (as opposed to waste management and control) to be the national policy of the United States.¹ In 1991, the Office of Pollution Prevention and Toxics at the U.S. Environmental Protection Agency (EPA) initiated a research grant program in the area of Alternative Synthetic Pathways for Pollution Prevention.² The EPA also announced its Industrial Toxics Project, a.k.a. the 33-50 Program, through which companies agreed to voluntarily cut emissions of certain high-volume toxic chemicals.³ At about the same time, the Chemical Manufacturers Association (now known as the American Chemistry Council) launched its Responsible Care initiative that established a set of guiding principles and management practices, including pollution prevention through source reduction.⁴ At the basic research level, Barry Trost of Stanford University introduced the concept of atom economy, which is a measure of how much of the reactants in a synthetic process end up in the intended product.⁵ Since that watershed year, green chemistry has become a theme of basic and applied research, graduate and undergraduate education, industrial methods, conferences and symposia, and grants and award programs.⁶ Green chemistry reached the symbolic pinnacle of science when it figured prominently in the announcement of the 2005 Nobel Prize in chemistry.⁷

Green chemistry has been defined, among other ways, as “carrying out chemical activities—including chemical design, manufacture, use, and disposal—such that hazardous substances will not be used and generated.”⁸ The key feature of this definition is the intentionality expressed by the word *design*. Prior to the emergence of green chemistry, chemists typically designed products and processes for functionality. Within that framework, a decrease in the use or generation of hazardous substances might occur but only as a pleasant coincidence. Green chemistry elevates the goal of hazard reduction through technological innovation to an equal level with the goal of function.

Paul Anastas, who worked at that time at the Office of Pollution Prevention and Toxics at the EPA, and John Warner, then a faculty member at the University of Massachusetts-Boston, enumerated twelve principles of green chemistry,⁹ which can be summarized as (1) prevention, (2) atom economy, (3) less-hazardous chemical synthesis, (4) design of safer chemicals, (5) safer solvents and auxiliaries, (6) design for energy efficiency, (7) use of renewable

feedstocks, (8) fewer derivatives, (9) catalysis, (10) design for degradation, (11) real-time analysis for pollution prevention, and (12) inherently safer chemistry for accident prevention (Table 1). These principles reveal why green chemistry is unique within the field of chemistry: green chemistry is not just prescriptive but normative. Much of chemistry is descriptive. A descriptive proposition takes the form, “If you do A, then B will happen.” A significant portion of chemistry (for example, synthetic organic chemistry) is prescriptive. A prescriptive proposition takes the form, “If you want B to happen, then do A.” A normative proposition takes the form, “You should want B to happen, therefore do A.” The distinction between prescriptive and normative propositions is that prescriptive propositions do not depend on the value of the result, whereas normative propositions require a value judgment about the worthiness of the result. Thus, normative propositions rest on particular ethical assumptions.

To be sure, green chemistry is no more able than any other science to justify its own ethical assumptions, but those assumptions are inseparable from the principles. Principle 1 assumes that preventing pollution is better than treating it after it is formed. Principles 2, 6, 8, and 9 assume that waste is bad and efficiency is good. Principle 7 assumes that resources may be used, but those that are nondepleting are superior. Principle 10 assumes that, if pollution must be generated, that which does not persist in the environment is preferable to that which does persist. Principles 3, 4, 5, and 12 assume that the welfare of the people who handle materials or oversee processes is at least as important as the welfare of the environment.

A less overt assumption deals with the approach green chemistry takes to risk reduction. Risk is a function of the inherent hazard and the probability of exposure to that

Table 1. Twelve Principles of Green Chemistry

1. Prevention
2. Atom Economy
3. Less-Hazardous Chemical Synthesis
4. Design of Safer Chemicals
5. Safer Solvents and Auxiliaries
6. Design for Energy Efficiency
7. Use of Renewable Feedstocks
8. Fewer Derivatives
9. Catalysis
10. Design for Degradation
11. Real-Time Analysis for Pollution Prevention
12. Inherently Safer Chemistry for Accident Prevention



Article

A Comparison of Green Chemistry to the Environmental Ethics of the Abrahamic Religions

hazard. Most environmental regulations aim to reduce risk by reducing the probability of exposure. Green chemistry, however, assumes that chemists understand hazard (e.g., toxicity) sufficiently well to make reducing the inherent hazard possible and that doing so is a better way to reduce risk.

Green chemistry assumes that the profit motive is legitimate. Remediating waste and implementing exposure controls add cost to products and processes without adding value. Reducing waste, maximizing efficiency, and decreasing hazards have the potential to add value to products and processes. Thus, there is an economic incentive to implement the principles of green chemistry. Moreover, green chemistry assumes that economic and environmental goals can be mutually compatible, and that the accomplishment of these goals will contribute to sustainable development.

Professionally Derived Environmental Ethics

Green chemistry did not spring overtly from a particular ethical tradition. Rather, the effort to define green chemistry was for the purpose of encouraging the application of the concept of source reduction to the field of chemistry. It was a response on the part of the EPA to a directive included in the Pollution Prevention Act of 1990. In hindsight, the notion that source reduction is more desirable as a pollution abatement strategy than treatment and disposal might seem obvious, but the findings of Congress suggest that it was not obvious twenty years ago.¹⁰ An interesting question, then, is, what circumstances led to the political decision to emphasize source reduction?

Congress found that the regulatory framework that was in place prior to 1990 was not sufficient for stemming pollution. Congress also recognized that liability costs had increased but worker safety had not. The findings imply that effective incentives and rewards for pursuing source reduction initiatives were not available to industrial companies because of institutional barriers.¹¹ The Pollution Prevention Act aimed at providing information and technical assistance that would enable companies to overcome such barriers so those companies could begin to realize the potential rewards of reduced costs of materials, compliance, and

liability. In this sense, the legislation was rooted in the behaviorist idea of operant conditioning. Source reduction would become conditioned because it produces the reward of higher profit (or grant money in the case of individual academic researchers).

Operant conditioning still requires a judgment about what behavior to condition. Yet, the enactment of legislation results from political solutions that represent negotiated agreements among constituencies. Therefore, the judgment of what behavior to condition through legislation typically rests on ethical assumptions that are shared broadly by the citizenry. Consequently, these ethical assumptions are not likely to encounter objections on a pronounced scale. Because the Pollution Prevention Act was approved by a Democratic-controlled congress and signed into law by a Republican president, the ethical assumptions of source reduction—and, by extension, the ethical assumptions of green chemistry—are likely to be consistent with the ethical traditions that are most prevalent in the U.S.

If the ethical assumptions of green chemistry are likely to be consistent with the ethical traditions that are most prevalent, it stands to reason that those same assumptions are likely to be consistent with the ethical positions of most chemists, too. My experience lends support for this induction. My first involvement with green chemistry was as a graduate student in 1995. The EPA-funded project centered on using water as a safer solvent for certain organic addition reactions (Principle 5). The project appealed to me because I immediately saw a correspondence between the ends and means of green chemistry and my Christian perspective on the environment. I was not the only student in our research group working on an aspect of the project. I was, however, the only evangelical Christian working on it. In other words, the normative character of the green chemistry was at least tolerable if not appealing to several group members with varied backgrounds. In fact, the normative nature of green chemistry has not been a source of controversy in the chemistry community at large. (The most controversial aspects of green chemistry have been what role it should play in education and whether a process must be viable on an industrial scale to be considered green.)

Green chemistry is not just prescriptive but normative ... The distinction between prescriptive and normative propositions is that prescriptive propositions do not depend on the value of the result, whereas normative propositions require a value judgment about the worthiness of the result.

In summary, green chemistry was not so much the fruit of one particular ethical paradigm as it was the outgrowth of political negotiation. As such, it is predisposed to reflect the ethical values common to the various constituencies involved in the negotiation process.

Theologically Derived Environmental Ethics

Given the normative character of green chemistry, an examination of how these ethical assumptions compare to the environmental ethics of various religious traditions is in order.

Environmental ethics tend to reflect a dichotomy, suggested by Jordan Ballor of the Acton Institute for the Study of Religion & Liberty, between preservationist stewardship and productivity stewardship.¹² These viewpoints differ in what place humanity occupies within creation and what mandate God gave to humanity. For example, advocates of preservationist stewardship within the Christian tradition generally argue that humankind is supposed to tend the garden of creation with a pre-Fall ideal in mind. Indeed, one organization is named "Restoring Eden."¹³ In contrast, advocates of productivity stewardship within the Christian tradition generally argue that humankind is to act in the capacity of bearers of God's image to use the resources of the earth to build and to improve the world.¹⁴

Articulation of theologically derived environmental ethics has occurred primarily in the last four decades, largely in reaction to modern environmentalism. Therefore, an overview of the development of modern environmentalism will help provide a context for the contemporary religious viewpoints that follow. The contemporary viewpoints include the preservationist and productivity stewardship models within the Abrahamic religions of Christianity, Judaism, and Islam. In each section, I will highlight the environmental ethics of that religion as expressed by commentators. To the greatest extent possible, the environmental ethics presented consist of what those commentators derive from the canonical sources of their respective religions as opposed to the individual or collective behavior of adherents of those religions. The aim of this survey is to present a cross-section of viewpoints. More exhaustive reviews are available elsewhere.¹⁵ After the comparison, I will conclude with an analysis of the overlap/similarity between those ethical propositions and the ethical assumptions of green chemistry.

One caveat worth noting is that the most influential contributors to the development of environmental ethics within a given religion might constitute a small minority of followers of that religion. This limitation is especially acute for Islam but by no means exclusive to it. In addition, most commentators are Western-educated individuals addressing predominantly Western audiences.

The Development of Modern Environmentalism

In 1940, Walter Lowdermilk's essay on land usage, "The Eleventh Commandment," helped usher in the modern environmental movement as a matter of moral consequence.¹⁶ Aldo Leopold elaborated on this theme in his 1949 book, *A Sand County Almanac*.¹⁷ The first explicitly Christian contribution to the discussion was an article in 1954 by Joseph Sittler, Jr., a Lutheran seminary professor.¹⁸ Sittler rejected a neo-orthodox separation of humanity from the nonhuman world. Instead, he echoed the argument of St. Francis that the relationship between humanity and nature is that of siblings. Nature, therefore, also bears God's image. In other words, all created things are equal, and people should treat nature as such.

Perhaps the seminal moment in environmentalism was the publication of an article by Lynn White, Jr. in 1967.¹⁹ White blamed religion, namely Christianity (but by extension Judaism and Islam as well), for the crisis in ecology. He asserted that Christianity established the very dualism that Sittler rejected, so the purpose of creation became to serve humanity's ends. In addition, Christianity destroyed animistic beliefs, so usage of natural objects could take place without a consideration of the objects' feelings. White concluded that, because religion caused the problem, only a religious remedy could fix the problem. This remedy, though, would need to involve a new or different religion than what was practiced previously (that is, a new religious paradigm).

Francis Schaeffer responded to White in 1970 with the book, *Pollution and the Death of Man*.²⁰ He agreed with White that the way people think about nature determines how they treat nature. Furthermore, he supported White's contention that Christian acceptance of a dualistic view of nature and grace was harmful. Schaeffer, however, argued that the only answer to the environmental problem was the form of Christianity that properly emphasizes nature. In this view, according to Schaeffer, nature has value in itself because God created it. Humans are unique within creation by virtue of bearing God's image but are united to all other creatures by virtue of being created. In the same way Christians are to love non-Christians as neighbors, Christians should deal with non-image-bearing creatures with much respect and with an aim toward bringing about healing.

Contemporary Environmental Ethics: Preservationist Stewardship

People who hold to a preservationist view of stewardship generally stress what humankind has in common with the rest of nature as part of the created order. They often characterize the relationship of humankind to nature in egalitarian terms or in the language of service. They also



People who hold to a preservationist view of stewardship generally stress what humankind has in common with the rest of nature as part of the created order. They often characterize the relationship of humankind to nature in egalitarian terms or in the language of service ... They emphasize the word "sustainable" in the phrase "sustainable development."

Article

A Comparison of Green Chemistry to the Environmental Ethics of the Abrahamic Religions

tend to focus on the consumptive role that humankind plays with respect to nature. They consider the present situation to be a distortion of equilibrium or a state of unbalance that is in need of correction. They emphasize the word "sustainable" in the phrase "sustainable development." They try to prevent the present generation from externalizing its environmental costs to future generations and to prevent the populace of one region from externalizing its environmental costs to people in other regions of the globe.

In terms of policy recommendations, people who hold to a preservationist view of stewardship tend to gravitate toward national and supranational legislative remedies. Although they do not always define the term, proponents of the preservationist stewardship model call for "economic justice" with some frequency. They seem to mean redistribution of wealth and/or re-allocation of resource use in approximate proportion to population.

Preservationist Stewardship within Christian Perspectives

Christians who conform more closely to the preservationist stewardship model follow the lead of Joseph Sittler as described above. Unlike with some theological issues, a Catholic/Protestant divergence in terms of environmental ethics is not evident, so Catholic and Protestant perspectives will be treated together. The Orthodox perspective will be treated separately because of the sacramental role nature plays in Orthodox theology.

Catholic/Protestant Perspectives

Two organizations aligned more closely with the preservationist stewardship model are the Academy of Evangelical Scientists and Ethicists (AESE) and Restoring Eden. Both are members of the Noah Alliance and the National Religious Partnership for the Environment (NRPE), which includes the Evangelical Environmental Network (EEN), the U.S. Conference of Catholic Bishops, and the National Council of Churches of Christ. Other outlets include the Evangelical Climate Initiative (ECI), the Christian Environmental Studies Center (CESC), and the Au Sable Institute for Environmental Studies. For the AESE, stewardship involves "raising our voices against attempts to weaken public policies that protect the com-

mon good."²¹ According to the EEN, human sin has led to a perverted stewardship, and poverty both causes and ensues from environmental degradation. Consequently, the EEN sees economic justice (i.e., reduction in the gap between rich and poor) as an important aspect of sustaining the environment in a just fashion.²² The ECI adds that "any damage we do to God's world is an offense against God himself."²³ The CESC also emphasizes just relationships as an essential part of stewardship. Although humans may appropriately use creation to meet our needs, we ought "never destroy creation's ability to be replenished."²⁴

One of the themes in preservationist stewardship ethics that has risen to prominence in recent years is *creation care*. This theme dictates that stewardship must allow creation to serve as a witness to God. Richard Cizik, the vice president for governmental affairs for the National Association of Evangelicals (NAE) and a leading proponent of creation care, maintains that thinking our interests and the interests of nature are in conflict with each other is erroneous.²⁵ Calvin DeWitt, professor in the Nelson Institute for Environmental Studies at the University of Wisconsin-Madison, president emeritus of the Au Sable Institute for Environmental Studies, co-founder of the EEN, and an ASA Fellow, elaborates that creation care focuses on the restoration and reconciliation of all things. This focus stems from a triad of science, ethics, and praxis. Valid discoveries in science pertaining to nature and the damage it suffers, regardless of who discovers them, must inform ethics and behavior.²⁶

Sallie McFague, a now-retired professor of religion at Vanderbilt University, follows in the mold of Lynn White, Jr. by criticizing the historical ties between Christianity and classical liberal economics.²⁷ Consumerism in Christendom exploits nature as well as poor people. Jesus ministered to the oppressed and overturned conventional hierarchies. In McFague's view, Christians need a new worldview that extends Jesus' ministry to nature and overturns the hierarchy of humans over the nonhuman world.²⁸

Orthodox Perspective

Orthodox Christianity derives its environmental ethics on the basis of its sacramental theology. According to a 2003 faith state-

ment, "The Orthodox Church teaches that humanity, both individually and collectively, ought to perceive the natural order as a sign and sacrament of God."²⁹ Just as the Incarnation and icons open a connection between this world and the next, so, too, does creation itself. Earth is a place of encounter with Christ. Therefore, the entire created order is sacramental in that it discloses the experience of the uncreated kingdom of Heaven. As a result, a chief ethical obligation of humans is to allow room for the Spirit to act continually in this world. To fulfill this obligation, stillness and inaction are necessary to keep vigil without interfering in the Spirit's work. This stillness is known as *asceticism*.³⁰ Asceticism is a communal social attitude of respectful use of material goods because we are never alone in this world.³¹

Preservationist Stewardship within Jewish Perspectives

Some Jewish commentators are circumspect about what humanity's role as steward of creation means. For example, the Coalition on the Environment and Jewish Life (COEJL), a legislation advocacy organization and a member of both the Noah Alliance and the NRPE, says that the commandment given to Adam and Eve was to serve and protect the garden of Eden and that there is a relationship between economic justice and ecological sustainability.³² Daniel Fink identifies "[W]e are only tenants on this earth" as the fundamental premise of all Jewish environmental ethics.³³ Aloys Hütterman invokes the Talmudic thoughts of Rashi, who analogized the relationship between humanity and nature with marriage. The covenant God made with people includes creation, and the dominion humankind was given over nature is strictly limited. If the dominion is not exercised properly, humanity can and will lose its supremacy.³⁴

In a similar vein, Tikva Frymer-Kensky describes humanity as the "avatar of God" whose essential role in creation is that of executive, to keep everything running properly. When humans fail in this duty, we pollute the earth directly and indirectly. Direct pollution results from moral misdeeds, and indirect pollution results from the divine reaction our moral misdeeds inspire.³⁵ Ecologically beneficial virtues include humility, modesty, moderation, and mercifulness.³⁶

Arthur Waskow points out that the Jewish festival cycle correlates with the seasons and involves both consuming food from the earth and resting with the earth as sacred acts. He adds that consumption and production are not opposites but complements. If we, as individuals or as a society, become addicted to consumption of a natural resource, such as petroleum, we are guilty of idolatry. He somewhat ominously notes that Leviticus says that the earth will rest one way or another; we can rest with it, or it will kick us out in order to get rest.³⁷

Preservationist Stewardship within Islamic Perspectives

Though most attempts to describe Islamic environmental ethics have occurred in recent decades, Seyyed Hossein Nasr foreshadowed Lynn White, Jr.'s critique in 1966 when he wrote that humankind's domination of nature resulted from and contributed to a desacralization of nature that led to a disharmonious relationship in which nature was no longer humanity's wife but a prostitute.³⁸ Islamic contributions since then have typically focused on the concept of *khilafa*, or vice-regency, along with the concept of justice.

Islamic authors express different viewpoints as to how responsible guardianship of nature is to be determined. Hyder Ihsan Mahasneh, in an Islamic Faith Statement written in 2003 on behalf of the Muslim World League for the Alliance of Religions and Conservation,³⁹ and Fazlun Khalid⁴⁰ agree that the human capacity to reason is the main factor in Allah's giving such duty to people. By contrast, Saadia Khawar Khan Chishti maintains that a responsible approach to the environment is intuitive. She argues that thoughtful consideration of nonhuman creatures and conservation of resources are innate traits that need to be reawakened. From her standpoint, we as humans should balance our needs with the needs of other human, plant, and animal communities.⁴¹

Although Abdul Aziz Said and Nathan Funk affirm humanity's role as custodians of nature, they paradoxically claim, "All things are necessarily *muslim* because, consciously or unconsciously, they perform the will of Allah."⁴² Nawal Ammar opposes such predestinationism on the grounds that reason provides a basis for human action within the moral parameters established by revelation. Ammar states that the guiding principles for human action with respect to the environment should be dignified reserve, justice in transactions, and the primacy of community over individuals.⁴³

In terms of barriers that stand in the way of a fully implemented Islamic environmental ethic, Khalid identifies "Cartesian" dualism and skepticism,⁴⁴ whereas K. L. Afrasiabi identifies Islamic humanism.⁴⁵ Khalid also identifies the global banking system, which creates the "illusion of economic dynamism."⁴⁶ Yasin Dutton expands on this theme when he says that usury (i.e., credit) creates an incentive to use resources exhaustively.⁴⁷

Contemporary Environmental Ethics: Productivity Stewardship

People who hold to a productivity view of stewardship generally stress what distinguishes humankind from the rest of nature. They often characterize the relationship of humankind to nature in hierarchical terms or in the



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Article

A Comparison of Green Chemistry to the Environmental Ethics of the Abrahamic Religions

language of management. They also tend to focus on the fecundity of humankind with respect to nature. They consider the present situation to be a point along a trajectory that describes an ever-evolving system. They emphasize the word "development" in the phrase "sustainable development." They try to prevent the present generation from imposing costs on the welfare of future generations and to prevent the populace of one region from imposing costs on the welfare of people in other regions of the globe in exchange for reduced environmental costs.

In terms of policy recommendations, people who hold to a productivity view of stewardship tend to gravitate toward market-based remedies. Proponents of the productivity stewardship model caution with some frequency that legislation often has unintended side effects.

Productivity Stewardship within Christian Perspectives

Christians who conform more closely to the productivity stewardship model bear greater resemblance to Francis Schaeffer than to Joseph Sittler. (Note: I do not mean, however, to imply that Schaeffer held to the productivity stewardship model.) Within this group, no sectarian divergence in terms of environmental ethics is evident, so Christian perspectives will be treated collectively.

Two organizations that promote a productivity stewardship model are the Interfaith Council for Environmental Stewardship (ICES) and the Interfaith Stewardship Alliance (ISA). The ICES composed the Cornwall Declaration on Environmental Stewardship, which states that humans are primarily producers who add to the abundance of the earth rather than consumers and polluters. Humans are the most valuable resource because only humans can enrich creation. Environmental stewardship includes attention to human well-being. The Declaration also asserts that "growing affluence, technological innovation, and the application of human and material capital are integral to environmental improvement."⁴⁸ The ISA holds that God's commandment to humans to exercise stewardship "strongly suggests that caring for human needs is compatible with caring for the earth."⁴⁹

Pope John Paul II said in his 1999 World Day of Peace Message, "Placing human well-being at the center of concern for the environment is actually the surest way of safeguarding creation."⁵⁰ In a 2002 common declaration with Patriarch Bartholomew I, the Pope also held that humans are at the center of creation and should use science and technology in a constructive manner in order to enhance the spiritual and material welfare of future generations.⁵¹ Pope Benedict XVI and Patriarch Bartholomew I issued a common declaration in 2006 that cited economic, social, and cultural development as part of the Christian calling.⁵²

The productivity stewardship model avoids a fundamental flaw of the creation care version of preservationist stewardship as described by DeWitt: the creation care triad of science, ethics, and praxis does not include economics as a source of knowledge that can inform praxis unless economics is regarded as a science on a par with the natural sciences (an assumption that might not command universal agreement). In contrast, productivity stewardship systematizes knowledge from economics along with knowledge from the natural sciences. For instance, Gerald Zandstra writes that economic development is empirically demonstrated to be key to environmental improvement in almost all countries. Economic growth is expected to furnish environment-friendly goods and services just as it has in Western Europe and North America.⁵³

Biesner et al. explain that economic development and environmental improvement correlate directly and positively. According to them, pollution declines in a country once economic growth progresses enough to secure the basic needs of the people, to allow more efficient use of resources, and to enable the populace to afford environmental solutions.⁵⁴ Beers et al. note the similar etymologies of *economics* and *ecology* and argue that development and wealth make environmental care easier. They also write that, because we as humans can make new things that creation on its own cannot from that which God has created, we can infer that God's giving us stewardship over creation meant to empower us to sustain and enhance our existence.⁵⁵

Proponents of productivity stewardship look more cautiously on governmental solutions to environmental problems. Whereas the AESE celebrates legislative achievements such as the Endangered Species Act,⁵⁶ the official statement of the NAE says:

Because natural systems are extremely complex, human actions can have unexpected side effects. We must therefore approach our stewardship of creation with humility and caution.⁵⁷

Productivity Stewardship within Jewish Perspectives

According to a Jewish Faith Statement written in 2003 for the Alliance of Religions and Conservation, "Man is commanded not to spoil the creation, but rather to improve and perfect it."⁵⁸ The statement notes that the environment includes the people who live in it. The statement also warns that love for other people takes precedence over love of nature, but wasteful destruction of nature is prohibited.⁵⁹

Hava Tirosch-Samuelson affirms this hierarchy of humanity over nature when she writes that "a Jewish environmental philosophy and ethics cannot give up the primacy of the human species in the created order."⁶⁰ Other authors note that because humanity is the apex of creation, the rest of creation is available for humans to use and develop. Use of resources in a beneficial manner is permissible. We may make an impact on creation as long as the impact represents an improvement. Hence, pollution is considered a serious offense.⁶¹ In addition, the Cornwall Declaration includes Jewish signatories.⁶²

Productivity Stewardship within Islamic Perspectives

Mahasneh wrote in the aforementioned Islamic Faith Statement that "man is invited to make use of the nourishing goods that Allah has placed on earth for him, but abuse—particularly through extravagance and excess—is strictly forbidden."⁶³ Similarly, S. Nomanul Haq identifies "In everything that lives there is a reward" as an underlying principle of Islamic environmental ethics.⁶⁴

Abdur-Razzaq Lubis defines *khalifa* as "one who inherits a position, a power, a trust, and who holds it responsibly and in harmony with its bestower."⁶⁵ According to Said and Funk, "The earth and its resources are placed in the care of human beings as custodians for their preservation, development, and enhancement."⁶⁶ They elaborate that spiritual development is the highest purpose for using nature and the surest foundation for environmental ethics.⁶⁷

Conclusion

Preservationist Stewardship and Green Chemistry

Preservationist stewardship ethics assume that people's use of natural resources is acceptable; wasteful use or depletion of resources is bad; and preventing pollution is superior to treating it. In these respects, the model is consistent with the ethical assumptions of green chemistry. Advocates of preservationist stewardship are likely to disagree with the green chemistry assumptions that emphasize the primacy of the welfare of people, the legitimacy of the profit motive, and the compatibility of economic growth and environmental improvement. They are, however, likely to agree that chemists have sufficient understanding of chemical hazards to predictably reduce those hazards and that sustainable development is possible.

Of all the Christian variants, the Orthodox preservationist perspective is among the least compatible with the ethics of green chemistry. The liturgical character of the natural world does not encourage resource consumption, whereas green chemistry does not discourage it. Furthermore, green chemistry requires human action that could contravene the Orthodox approach of asceticism. On the other hand, if nature is sacramental, then pollution prevention follows as a moral imperative, and wasteful use or depletion of resources is an offense.

Muslims who assert that the global financial system is illusory and usurious will view the green chemistry assumptions regarding economic incentives and rewards with skepticism, if not hostility. Islamic commentators who hold a strong view of predestination would not see any particular need for green chemistry but would not have any particular objection to its implementation, either.

Productivity Stewardship and Green Chemistry

Productivity stewardship ethics assume that people's use of natural resources is acceptable; wasteful use or depletion of resources is bad; and preventing pollution is superior to treating it. In these respects, the model is consistent with the ethical assumptions of green chemistry. Advocates of productivity stewardship are also likely to agree with the green chemistry assumptions that emphasize the primacy of the welfare of people, the legitimacy of the profit motive, and the compatibility of economic growth and environmental improvement. They, including Islamic commentators who claim a role for human reason in the exercise of guardianship, are also likely to agree that chemists have sufficient understanding of chemical hazards to predictably reduce those hazards and that sustainable development is possible. The commentators who are sanguine about the prospects for humans to improve the world for future generations are likely to find further agreement with the assumptions that green chemistry adds real value to products and processes.




With the exception of certain Islamic environmentalists who think that the world economic system is a sham, followers of the Abrahamic religions can practice green chemistry in good conscience.

Article

A Comparison of Green Chemistry to the Environmental Ethics of the Abrahamic Religions

Summary

The environmental ethics of the Abrahamic religions all incorporate an anthropocentric concept of stewardship of an intrinsically valuable creation. Within this framework, use of nature is permissible, but abuse of nature through pollution, waste, and depletion is prohibited. The environmental ethics diverge over what characteristics creation shares with humanity. They also diverge over the quality and extent of the relationship between economic and environmental health. The ethical propositions of the productivity stewardship model of religious environmentalism bear the greatest resemblance to the ethical assumptions of green chemistry. The environmental ethics of all the religious perspectives examined in this article support those ethical assumptions of green chemistry that deal with pollution prevention and improved safety. The only point of direct conflict is between the position of certain Islamic environmentalists that the world economic system is a sham and the assumptions of green chemistry that deal with economic goals. With the exception of this latter sub-set, followers of the Abrahamic religions can practice green chemistry in good conscience. 

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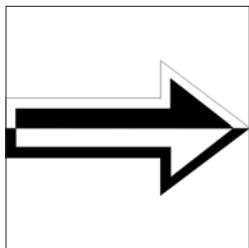
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Article

Professional Engineering Ethics and Christian Values: Overlapping Magisteria

Gayle E. Ermer



Gayle E. Ermer

Many faith-based colleges and universities with engineering programs find themselves trying to simultaneously satisfy two educational objectives: (1) meeting the requirements of the Accreditation Board for Engineering and Technology (ABET) to produce graduates who have “an understanding of professional and ethical responsibility” and (2) meeting the goals of their own institution for student spiritual formation and development of Christian moral values. This paper will describe and analyze several approaches to understanding the relationship between these two objectives and the implications of these approaches for engineering education.

It could be argued that the two goals mentioned above are mutually exclusive. Since professional ethical standards arise out of a secular context and by means of purely logical reasoning, they bear no relationship to personal religious commitments. The implication of this view would be that all engineers need to be taught the engineering code of ethics without regard to any commitments they might have to religiously determined moral absolutes. It could also be argued that the two goals mentioned above are one and the same. Each individual appropriates an all-encompassing system of values and this system is operative in all situations, including professional engineering work. The implication of this view would be that engineers do not need to know the engineering code as long as their parents, early school experiences, church, and devotional life had contributed to a strong moral conscience.

This paper will argue that while each of the two areas has its own distinctiveness, each overlaps the other in content and depends on the other for successful ethical decision-making and action. This argument will be based on the Reformed Christian philosophical perspectives expressed by Abraham Kuyper and Herman Dooyeweerd. The paper will conclude with some practical suggestions for emphasizing the relationship between both domains within the engineering curriculum. A method for integrating engineering ethics into the technical portion of the engineering curriculum within the context of a Christian worldview will also be presented.

In 2002, I had the good fortune to be accepted into a National Science Foundation (NSF) sponsored workshop on Ethics Across the Curriculum in engineering and science. In the course of the workshop, I was introduced to several scholars inter-

ested in promoting engineering ethics among engineering practitioners and students. Their goals, and the methods promoted to achieve them, struck me as worthy initiatives. I came back to my home institution, Calvin College, and proceeded to implement many of the workshop's recommendations by designing our own Ethics Across the Curriculum program. But a niggling doubt about the effectiveness of this style of professional ethical analysis was generated by a comment made by the workshop instructor while addressing the issue of “freeloaders.” The ethical theories and evaluation process discussed in the workshop assumed that professionals would

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adhere to their codes of ethics because logic dictated it was beneficial to do so (if everyone follows the code, the profession will be better able to achieve its humanitarian goals). But what about people who choose the profession primarily because of its financial or status rewards rather than to achieve the profession's goals? What would be their incentive to follow the rules rather than following their own self-interest? The workshop instructor seemed to indicate that the ethics principles we were discussing were inadequate to deal with someone who was not already willing to make sacrifices for the sake of professional goals (except to the extent that violation of the codes could be made to have serious consequences, which is not the case in engineering). The conversation at the workshop seemed to imply that religious faith or personal virtues were irrelevant to professional ethics.

In 2006, I sat on Calvin's all-college assessment committee. One of our main tasks was to draft a list of assessment outcomes for the college. The list included many of the standard goals for a college or university: we wanted our students to gain knowledge and skills as part of the educational process. But it became very clear as we looked at the Calvin College Expanded Statement of Mission¹ that our goals extended beyond knowledge and skills. We wanted our students to have knowledge of God and to understand their place in the world in light of that knowledge. We also wanted our students to develop certain attitudes or virtues. Clearly, it seemed to me, we have certain expectations for our students in terms of their values and ethics as they go out into the world to develop God's kingdom. But, I was struck by the fact that these "virtue" goals were completely unrelated to the kind of ethical knowledge and analysis presented at the NSF workshop.

I came to think that perhaps I had discovered two camps with quite different perspectives on questions of how we ought to convince engineering students and professionals in general to behave responsibly. This paper is an exploration of the ethos of each of these two camps and an examination of whether and how they are related to each other. I hope sharing some of these thoughts will be instructive to others who also have "feet in both camps" and wish to reconcile the goals and methods of each in ways that would allow engineering programs to best educate our students to respond appropriately to the ethical problems that they might encounter in their engineering careers.

The Two Camps

To clarify the problem of how these two camps are related, I will begin with a more thorough description of their goals and emphases. For the sake of brevity, I will refer to the emphasis reflected in the NSF workshop described above as the Professional Ethics camp, and the emphasis reflected in the assessment committee discussion described above as the Christian Values camp.

Professional Ethics: Goals, Content, and Methods

Every engineering program in the United States is required to satisfy the criteria of the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET). This includes educating students to meet a list of specified outcomes, including those related to ethics: students must have

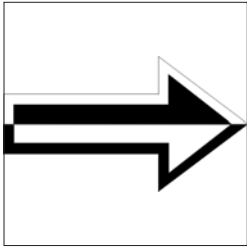
- c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability ... f) an understanding of professional and ethical responsibility.²

Michael Davis (one of the sponsors of the NSF workshop), in his book, *Thinking Like an Engineer*, proposes that a profession is partially defined by its published Code of Ethics:

The history of a profession tells how a certain occupation organized itself to hold its members to standards beyond what law, market, and morality would otherwise demand.³

If that is the case, the National Society of Professional Engineers (NSPE) Code of Ethics is an engineering mission statement. This code is representative of the codes for other engineering disciplines (although there have historically been differences between the various codes) and expresses the goals of the engineering profession as conceived of by its practitioners (Christian and otherwise) over the past century. The fundamental principles and canons are included in Table 1 (p. 28).⁴ The entire code includes sections on Rules of Practice and Professional Obligations which amplify the canons substantially, but are not included here for the sake of length.

This approach to professional ethics emphasizes that engineering ethics is "special ethics," in the sense that the standards described in the codes do not necessarily apply to everyone generally (as would the standards of common morality), but are a special set of standards generated by the nature and content of the profession. Ethical requirements for a professional are based on the moral ideals of the profession. The result of implementing the mission of the profession is a set of standards the profession decides each practitioner must follow. Therefore, ethical expectations, or at least the weight given to different expectations when they conflict, may differ depending on the profession. For example, the primary responsibility of a lawyer is to promote justice, which may require a high priority placed on maintaining confidentiality of client information. For engineers, the safety of technology users and the general public is of the utmost importance (which may make confidentiality ethically undesirable). Although it might be easy to argue that the canons themselves (including the primacy of safety) merely summarize a set of



Article

Professional Engineering Ethics and Christian Values: Overlapping Magisteria

common ethical principles, examining the more detailed sections of the code reveals directives that are more specific to the discipline.

Those promoting this interpretation of engineering ethics emphasize using a “design process” (which is something very natural for engineers) to determine an action plan for ethical response in a given situation. This step-by-step problem-solving method includes developing a clear description of the ethical problem, gathering relevant data and principles, creatively generating possible responses, evaluating the responses, choosing an optimum response, and implementing the response chosen. Within the evaluating step, ethical theories, like utilitarianism or duty ethics, can be used to evaluate different actions.

Engineering codes and the methods of engineering ethics are supposed to guide the conduct of engineering practitioners. Unfortunately, there are reasons why this is not always the case for industrial engineering work. Many engineers have never heard of the code, since the vast majority of engineers do not belong to the professional organizations which generate them. This may

indicate that despite the idealist rhetoric, engineers do not strongly identify with the ideals of engineering as a profession. In fact, many engineers work for organizations which have their own ethical codes. Though these codes are unlikely to directly conflict with the professional code, they may assign higher priority to values that are not seen as particularly helpful to the profession’s goals (for example, a requirement not to disclose proprietary information).

The engineering code of ethics can be viewed by many engineers (and especially engineering students) as a somewhat arbitrary list of “do’s” and “don’t’s” that discourages honest moral reflection and inhibits the development of personal conscience. As mentioned above, there are disagreements among engineers about the relevance of some of the more specific items in the code related to rules of practice and professional obligations. The canons themselves may not adequately reflect a robust understanding of the mission of the profession. If engineers were to “conduct themselves honorably, responsibly, ethically, and lawfully” (6), it seems unnecessary to specifically list (3), (4), and (5) which also emphasize honesty and responsibility. Pursuing honorable conduct “to enhance the honor, reputation, and usefulness of the profession” in (6) seems self-serving.

It is also worth noting that the wording of the fundamental canons is open to a great deal of interpretation. In today’s postmodern and global culture, the meaning of a term like “honesty” cannot be assumed to be the same for all people. For example, some students do not view cheating as dishonest and in some cultures, lying is expected in order to avoid social conflict. Despite these problems, the engineering code of ethics provides a window into professional life, and if used conscientiously with an ethical decision-making process, can help to clarify the issues and provide direction in a given situation.

Another perspective on engineering ethics is provided by Martin and Schinzinger’s influential textbook, *Ethics in Engineering*. According to this text:

Engineering ethics consists of the responsibilities and rights that ought to be endorsed by those engaged in

Code of Ethics for Engineers

Preamble

Engineering is an important and learned profession. As members of this profession, engineers are expected to exhibit the highest standards of honor and integrity. Engineering has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare. Engineers must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.

The Fundamental Canons

Engineers, in the fulfillment of their professional duties, shall:

1. hold paramount the safety, health and welfare of the public.
2. perform services only in areas of their competence.
3. issue public statements only in an objective and truthful manner.
4. act for each employer or client as faithful agents or trustees.
5. avoid deceptive acts.
6. conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

Table 1. NSPE Code of Ethics

engineering, and also of desirable ideals and personal commitments in engineering ... Engineering ethics is the study of the decisions, policies, and values that are morally desirable in engineering practice and research.⁵

This not only supports the importance of codes, by stressing the responsibilities of those who choose the engineering profession, but it also broadens the discussion to include the implications for society of implementing different technologies. It also includes a short section on the importance of personal motivations and religious commitments to the practice of engineering.

Tau Beta Pi, the honor society for engineers, also places a strong emphasis on ethics. In recognition of some of the poor ethical choices being made among students (studies showing high rates of cheating) and among researchers (falsified and exaggerated results), in 2004, this organization, along with other college honor societies, generated a program titled "A Matter of Ethics" intended to encourage members to reach their full potential by "building upon the core of one's character, by encouraging honesty, trustworthiness, integrity ... ethics."⁶ This program does not focus on a code, but does promote the use of a set of guidelines for resolving ethical dilemmas.

Christian Values: Goals and Content

All faith-based educational institutions have goals for their students that extend beyond strict adherence to professional codes. These goals are often very broad and sometimes difficult to articulate, but they are directly tied to the mission and context of the institution. The recently adopted assessment outcomes for graduates of Calvin

Students who complete a Calvin degree should:

Develop and articulate knowledge of:

- God as revealed in Scripture and creation as expressed in the Reformed Christian tradition,
- The diverse cultural, natural, and social forces that shape our world,
- Themselves—their nature, gifts, and identity, and
- A chosen area of in-depth study.

Demonstrate skills in:

- Critical thinking,
- Sound reasoning,
- Effective communication,
- Problem-solving, and
- The particular methods of their area of in-depth study.

Demonstrate—given a Christian commitment—

- A devotion to the life of discipleship,
- A dedication to Christian virtues, and
- An active pursuit of their vocation in renewing God's world.

Table 2. Calvin College Student Learning Outcomes

College, are listed in Table 2. Although ethics does not show up explicitly in the list, it is clear that knowledge of God, culture, and self, as well as skills in communication and reasoning, are all linked to the mission of the college to produce students who are committed Christians, doing what is right in all the roles they assume in their lifetimes.

The engineering department at Calvin has also developed its own objectives and outcomes for student learning. These are reproduced in Table 3. The first three items are general objectives, while the last three are a subset of more specific outcomes related to ethics. The very nature of these objectives implies that there can and should be an understanding of ethical responsibility that is distinctive due to a Christian framework of understanding the world. These objectives indicate that Calvin engineers are expected to have more than just a commitment to a set of professional ideals, but a commitment to the ideals of all Christians to spread the gospel, to mature in discipleship, and to promote justice and shalom in this fallen world.

Degrees of Overlap

Some members of each of the domains described above believe (or at least behave as if they believe) that the two

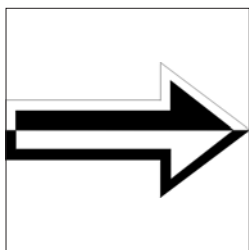
Department Objectives: *Students graduating with a BSE degree from Calvin College will be ...*

- ... kingdom servants whose Christian faith leads them to engineering careers of action and involvement, to personal piety, integrity, and social responsibility, and to leadership with a prophetic voice advocating appropriate technologies;*
- ... firmly grounded in the basic principles and skills of engineering, mathematics, science, and the humanities, for correct, perceptive, and sensitive problem assessment at a level appropriate for entry-level professional work and graduate studies;*
- ... equipped to creatively move a project from problem statement to final design utilizing the interdisciplinary and interdependent character of the engineering profession.*

Department Outcomes: *Calvin's engineering program will demonstrate that its graduates have ...*

- (f) an understanding of professional and ethical responsibility from a Christian, holistic perspective,*
- (j) engaged contemporary issues demonstrating how their Christian faith relates to their profession,*
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice to develop responsible technologies*

Table 3. Calvin Engineering Department Objectives



Article

Professional Engineering Ethics and Christian Values: Overlapping Magisteria

There is nothing in the engineering code of ethics that directly conflicts with a Christian understanding of moral responsibility. ... An engineering curriculum constructed to meet the goals specified in the code should therefore also be consistent with what a Christian engineer would want to teach.

domains are mutually exclusive. The professional ethics promoters see their domain as an essential part of engineering education, while viewing faith-based values as only tangentially related to the ethical decision-making ability of an engineer. One of the ramifications of this view for engineering education is that ethics becomes just another content area within engineering, similar to electronic circuit analysis or machine dynamics. All of these technical content areas (including engineering ethics) are viewed as independent of faith commitments.

One of the benefits of this approach for the educational process is the assumption that there is something distinctive to engineering ethics that can and must be taught. That is, engineering ethics is not like morality in general, which students absorb from a variety of sources, such as family upbringing, primary school experiences, church programs, and engagement with art and literature. Since students know, or at least think they know, this kind of morality already, engineering ethics gives engineering educators something to add. This approach also fits well with the preferences of many engineering faculty (including Christians) who feel uncomfortable discussing such “personal” issues as faith commitments and moral values in the classroom setting.

In today’s postmodern cultural context, engineering professors do not want to be accused of sermonizing or indoctrinating students into particular worldview perspectives, which would imply intolerance of other systems. It is much safer to simply focus on the professional expectations which are particular to engineering work and which have broad application independent of worldview. From the professional ethics standpoint, engineering ethics can be taught the same way—wherever you are and whoever your students are. Some Christians also view engineering ethics this way, and do not see a need to make explicit connections between faith and ethics.

What is obscured by treating the two domains as mutually exclusive is the commonality of their goals. Most broadly, both the secular professional accrediting boards and Christian educators are concerned with encouraging professionals, including engi-

neers, to do the right thing in their occupational activities. According to Davis:

Because of the scale on which engineers generally work, engineering is particularly dangerous. Engineers long ago realized this and set about to ensure, as much as possible, that engineering would be used for good rather than evil.⁷

According to Martin and Shinzinger, one of the purposes of studying engineering ethics is to “increase one’s ability to deal effectively with moral complexity in engineering.”⁸ These statements share some of the same concerns as Calvin’s engineering student outcomes.

On the other hand, those promoting Christian values sometimes argue that engineering ethics is just a subset of general morality. Students should be encouraged to develop a broad Christian world- and life-view which encompasses their career along with all other aspects of living. The assumption is that good Christians will do the right thing because of who they are and what they believe, regardless of their profession. The educational focus should then be on inculcating Christian values into the person, rather than learning profession-specific standards and ethical decision-making methods.

In engineering education, the core curriculum of the college (or even chapel attendance and Bible studies) can be relied on to produce the sorts of people and develop the skills and knowledge to make appropriate ethical decisions, which those people will then carry into the engineering context. The implication is that special engineering ethics does not need to be taught as such, and codes are unnecessary. This attitude is prominent among some Christians who fear that using a code of ethics generated by secular individuals through purely logical processes may conflict with their absolute moral standards.

There is nothing in the engineering code of ethics that directly conflicts with a Christian understanding of moral responsibility. For the most part, these are goals that Christians can readily appropriate. Christians certainly want to use their knowledge and skill for the enhancement of human welfare, and to be truthful, faithful, and fair. The emphasis on safety holding priority

in design work is central to the engineering ethos. A Reformed understanding of common grace allows us to recognize that even those engineers without experience of God's saving grace can still do good in this fallen world. An engineering curriculum constructed to meet the goals specified in the code should therefore also be consistent with what a Christian engineer would want to teach. Certainly our ultimate loyalty does not belong to our clients or employers, to our profession, or even to the public. But, in most cases, serving these constituencies faithfully can be an expression of our ultimate loyalty to God. This should mitigate the fear that appropriating this "secular" approach is a danger to Christian values.

Strengths and Weaknesses of Each Approach

In order to educate engineers who can truly further God's kingdom through their work with technology, we need to identify the strengths and weaknesses of each of the domains described previously, and appropriate the best contributions of each to achieve our goals. Table 4 summarizes some of these. Further elaboration of the bulleted items will be included in this section.

The value of the engineering ethics approach centers around the usefulness of the tools and the direct connection provided to engineering practice. Engineering ethics has a very strong problem-solving focus. Usually, a step-by-step approach is advocated for designing a solution to an ethical problem. This recognizes that most ethical choices are not right/wrong, but better/worse. The choices are constrained by multiple factors and often involve prioritization of competing factors (tradeoffs) along with the element of creativity. This is something engineers gravitate toward and have experience with in their technical work. In fact, there could be significant benefits in exporting this approach to the liberal arts side of the curriculum. The professional ethics perspective makes good use of ethical theories for helping to clarify ethical problems and evaluate the merit of particular responses to those problems. The engineering code can also be used as one of those evaluative tools. Engineering ethics has the added attraction for students of focusing on case studies and situations that are directly relevant

to their chosen career path. It can expand their understanding of the complexities involved in contributing to a large-scale engineering project once they graduate and of what will be expected of them both technically and ethically as professionals.

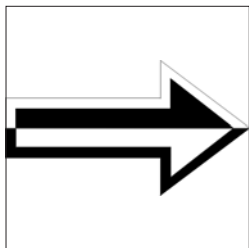
Engineering ethics appeals mostly to the intellect. In this sense it can be reductionistic. The assumption is that an engineer needs to know certain things in order to do what is right. The impression is given that ethical problems are just like technical design problems, which in a way they are. But, often behaving ethically requires more than just knowledge. Empathy and willingness to sacrifice personal gain for the greater good are also needed. An engineering code of ethics embodying the profession's goals usually functions as an extrinsic motivator. The code is applied as a legal document, forcing practitioners to follow the rules for fear of penalties, rather than emphasizing conscience. Professional ethics does not speak very much to the intrinsic motivation that is necessary for someone to care about behaving ethically in the first place and to have the will to carry out ethical actions. The code can also be interpreted as providing the minimum requirements for adequate engineering practice, rather than encouraging individuals to pursue the best possible contribution to the profession from an ethical standpoint.

The engineering ethics methods tend to address individual decision-making within a limited context (micro issues), rather than system level consequences of organizational or corporate decision-making in society. As such, the codes (currently, at least) do not address all the principles Christians care about. An obvious example is the lack of inclusion in the NSPE code of any ethical responsibility to the environment and sustainability. The Christian values approach should encourage reflection on the overall ideals of the profession. In this way, students are encouraged to think beyond the micro issues of a particular ethical dilemma toward broader issues of how technology can benefit society.

The Christian values side emphasizes holistic personal development. This is often neglected in engineering ethics education (or given only lip service). The truth is that each individual needs personal character to be committed to behaving ethically in the engineering arena. The knowl-

	Strengths	Weaknesses
Engineering Ethics	<ul style="list-style-type: none"> • Design Approach • Ethical Theories • Relevant Examples • Industry Expectations 	<ul style="list-style-type: none"> • Reductionism • Extrinsic Motivation • Micro Issues • Minimal Approach
Christian Values	<ul style="list-style-type: none"> • Intrinsic Motivation • Macro Issues • Holism 	<ul style="list-style-type: none"> • Broad Principles • Maximal • Conflicting Principles

Table 4. Distinctive Features of Each Domain



I want to characterize the two domains focused on in this paper as “overlapping magisteria.” ... I see the relationship between professional engineering ethics and Christian values not as one of isolation, but as overlap and interdependence.

Article

Professional Engineering Ethics and Christian Values: Overlapping Magisteria

edge of professional expectations and codes can help, but so can a recognition of Christ's claim on us to become more like him through the power of the Holy Spirit. The Christian values approach lends itself more readily to consideration of issues at the macro scale, such as social justice. These issues are especially important for engineers to think about as they move into management in industry or help to develop government policies governing technology.

The weaknesses of the Christian values approach include the fact that it tends to focus on broad principles that are difficult to apply to specific technical problems. It is even more difficult to apply these principles when they seem by nature to conflict (for example, justice and mercy). These values are naturally considered to be maximal in nature, that is, the claims of faith have priority over all of our decisions. In an extreme case, taking the demands of living our Christian commitments seriously can cause a student to consider leaving engineering in favor of professions that seem more obviously tied to their Christian calling, like missions or full-time church work. It can be helpful in these cases to emphasize that engineering as a profession is dedicated to serving society, and that Christian engineers can participate in the profession as a means for Christian service.

Overlap and Dependence

I want to characterize the two domains focused on in this paper as “overlapping magisteria.” The phrase references Steven J. Gould's characterization of Science and Religion as “nonoverlapping magisteria.”⁹ I see the relationship between professional engineering ethics and Christian values not as one of isolation, but as overlap and interdependence. The explanations above support this interpretation from a practical standpoint, but reasons for this conclusion also are supported by a Reformed Christian philosophical perspective.

It is inevitable that people bring personal values (or worldview) to their understanding of ethical responsibility, including with respect to their occupation or profession. Reformed Christians emphasize that all of creation belongs to God; therefore, professional ethics, along with all other human

activities, needs to reflect our Christian faith. Hermann Dooyeweerd, expanding on the insights of Abraham Kuyper, argues that everyone approaches theorizing (about ethics or anything else) with an accepted set of presuppositional commitments. This shapes the process and affects the outcomes of their theorizing.¹⁰ So, it makes a difference how engineering ethics problems are approached and solved if those involved are committed to Christian presuppositions.

One key Christian presupposition is that God is the Creator and Sustainer of all things. He is the only nondependent entity and all of creation is ultimately dependent on him. Many non-Christians elevate something in creation to the position of God, for example matter and/or energy. Those who choose something within creation as non-dependent, or “divine,” must necessarily explain all of the world's activity in terms of the divine.¹¹ This leads, for example, the physical naturalist to explain life processes and human emotions, as well as everything else, in terms of interactions between molecules. A Christian can assert that God has created a multi-faceted universe in which activities are not reductionistically explained by one domain's set of laws. In fact, all phenomena for humans are experienced holistically, that is, all of our God-given faculties interact with the complexity of the creation. But, God has also created in us the capacity to abstract things from this holistic picture in order to understand them better and determine their God-ordained structure. The ethical aspect is one of those areas which can be abstracted in order to discover the rules governing this area, but actual ethical decisions and actions cannot be separated from the other aspects, including the physical and the social, among others.

One implication of this perspective is that professional ethics should not be reduced to the logical aspect, which engineering ethics tends to do. We can acknowledge the contributions of secular theories of ethics to the discussion of ethical problems, but we should retain a healthy skepticism toward the claim of any particular ethical theory of providing definitive answers. The secular theories and processes upon which the domain of engineering ethics is founded can contribute many good ideas, but ultimately they may need to be modified and combined to fit the

more robust picture of what is good for society provided by a Christian worldview. Neither can the ethical aspect be reduced to the faith aspect, as Christian values tend to do. We ought not to assume that anyone with a Christian commitment will make the right choices with respect to technological design, since the ethical and economic aspects have distinctive explanatory theories. An engineer needs to have specific information related to expectations of the profession and the character of modern technical society in order to correctly assess the ethical implications of his or her work.

Integrating a Christian Perspective on Ethics into the Curriculum

If the domains of engineering ethics and Christian values can be understood as overlapping magisteria, then how can Christian engineering educators better tie together the domains and integrate them into the engineering educational process? I suggest three methods for injecting the strengths of both areas into the engineering curriculum.

First, engineering education at all levels should focus on the concept of vocation as a link between the profession of engineering and the commitment to Christian service. Professional occupations in technology, mathematics, and the sciences provide opportunities for Christians to fulfill the calling to serve God and others by reforming his creation. Byron Newberry, in an essay in the Fall 2005 issue of *Christian Scholars Review* entitled "The Challenge of Vocation in Engineering Education," discusses the benefits and trials of building in students the identification of their engineering career with the service to which God has called them by virtue of their gifts, talents, and opportunities.

Second, all of the design experiences in the engineering curriculum can be presented along with a holistic set of design norms, such as those presented in Table 5. These design norms are requirements for technology based on a biblical worldview that reflects the holistic setting in which designs operate.¹² These design norms expand on the narrower concept of ethics captured in the engineering code and emphasize broader issues. The norms provide a way to tie Christian values with specific engineering problems. The norms also emphasize the need to make tradeoffs in design between technical as well as ethical considerations.

Technology Should Promote ...
• Cultural Appropriateness
• Transparency
• Stewardship
• Harmony
• Justice
• Caring
• Trust

Table 5. Design Norms

Third, all of the ethics-related topics are best integrated into the technical curriculum via "micro-insertion." Rather than requiring an ethics course, or simply relying on other core subjects in the liberal arts to introduce ethics, inserting ethics issues into technical courses in small chunks is an optimal way to maintain engineering student interest in ethics and promote awareness of the relationship of ethics to industrial practice. Engineering students are not as interested in hypothetical issues as they are in what they are likely to experience as professionals in industry.

Ideally, the micro-insertion approach would fill the need for continuity in exposure to ethical issues throughout the engineering education experience and provide a structure for building on previous concepts. At the first-year level, students could start with simple problems where doing the right thing is relatively obvious. The "design process" for ethical decisions can be introduced, with a focus on gathering relevant information (such as professional codes of ethics and biblical principles). Later in their engineering education, they can be asked to consider more complex problems with significant ambiguity. The emphasis can shift to evaluating ethical solutions that have technical, as well as economic and political implications. There should also be a natural flow over the years from "micro" problems involving personal actions over which individuals have a high degree of control to "macro" problems embedded in institutional and societal structures which require more than individual action.

Case studies are a particularly useful way to micro-insert ethics topics into technical courses. In the "Introduction to Engineering" course that I teach to first-year students, I have used the "Catalyst B" case study developed by Michael Pritchard at Western Michigan University,¹³ which presents students with the situation of a newly hired engineer who is asked by his boss to ignore some data in a report supporting a design decision. Although the case is hypothetical, it is very important for students to recognize that there may be times in their careers when, based on their personal convictions and understanding of professional obligations, they need to say "no" to an employer despite the potential for adverse consequences. This case study allows students to search the code for relevant expectations, while also determining for themselves what honesty requires in this situation, allowing both personal values and the engineering ethics analysis methods to contribute to a correct assessment of the problem.

Conclusion

Technology and the interactions of technology with individuals and society are becoming more and more complex. Knowledge of the technologies themselves and methods used to produce them are necessary to determining moral actions with respect to technology.

Since engineers bear a great deal of responsibility for technological development, they need to be aware of the ethical expectations of their profession. Christian values go deeper and are more personal than the considerations of professional engineering ethics as it is often taught in secular settings. Without an appropriate value system, it is difficult to establish the importance of engineering ethics and to motivate individuals to choose the interests of their profession over their own.

We need to avoid the “two camps” mentality and allow the strengths of both approaches to contribute to a robust understanding of the ethical responsibilities involved in being an engineer. We also need to integrate ethical issues into the engineering curriculum in a way that allows them the prominence they deserve relative to technical considerations. Christian engineers and scholars should be encouraged to continue to explore the connections between faith and action, between personal morality and professional ethical responsibility, and between ethical theories and technological practice. Engineering students and practicing engineers need to carefully consider a holistic approach to ethics and their work in order to direct technological development along a path that truly serves the kingdom of God.



Notes

- ¹An Expanded Statement of the Mission of Calvin College: Vision, Purpose, Commitment, rev. ed. (February 2004).
- ²ABET Engineering Accreditation Commission, *Criteria for Accrediting Engineering Programs* (Baltimore, MD: ABET, 2007), 2.
- ³Michael Davis, *Thinking Like an Engineer: Studies in the Ethics of a Profession* (New York: Oxford University Press, 1998).
- ⁴From the National Society of Professional Engineers (NSPE) website: www.nspe.org/ethics/eh1-code.asp
- ⁵Mike Martin and Roland Schinzinger, *Ethics in Engineering*, 4th ed. (New York: McGraw-Hill, 2005), 8.
- ⁶From the Association of College Honor Societies (ACHS) website: www.achsnatl.org/ethics/index.asp
- ⁷Davis, *Thinking Like an Engineer*, 16.
- ⁸Martin and Schinzinger, *Ethics in Engineering*, 9.
- ⁹Stephen J. Gould, “Nonoverlapping Magisteria,” *Natural History* 106 (March 1997): 16–22. Gould described the relationship between science and religion as being a relationship, not of conflict, but of different domains, each prepared to address different questions. I tend to disagree with this interpretation of the relationship of science to religion.
- ¹⁰See L. Kalsbeek, *Contours of a Christian Philosophy: An Introduction to Hermann Dooyeweerd’s Thought* (Toronto: Wedge Publishing Foundation, 1975).
- ¹¹See Roy Clouser, *The Myth of Religious Neutrality: An Essay on the Hidden Role of Religious Beliefs in Theories* (Notre Dame, IN: University of Notre Dame Press, 1991), chaps. 2 and 3.
- ¹²See Stephen Monsma, ed., *Responsible Technology* (Grand Rapids, MI: Eerdmans Publishing Company, 1986), chap. 9.
- ¹³This case study can be found online at <http://ethics.tamu.edu/pritchar/an-intro.htm> under Larom, along with others.

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Isaac Exchange

RATE Responds to the Isaac Essay Review

Randy Isaac published an essay review on *Radioisotopes and the Age of the Earth, Vol. II* in the June 2007 issue (pp. 143–6). The members of the RATE group who conducted the research and published this work representing the Institute for Creation Research and the Creation Research Society appreciate the thoroughness with which Isaac reviewed our report and his investment of time. However, we disagree with his accusations of deception and lack of integrity in claiming that our data affirm a young earth. Thank you for allowing us to defend ourselves against these charges and briefly respond to some of the more serious technical issues he raised.

Although our research on radioisotopes and the age of the earth is a work in progress, we discovered several major evidences for *accelerated nuclear decay* during the eight-year project, and therefore we felt justified reporting them as we did. Even though a full understanding of the mechanism of accelerated decay is not yet complete, we wanted to encourage others that the apparent conflict between the billions of years of earth history commonly espoused by conventional science and the thousands of years declared by Scripture seems to be resolvable. We were careful to point out not only the evidence that supports our theory of accelerated decay, but to also state explicitly where we still had problems and shortcomings. To accuse the RATE group of deception and lack of integrity for concluding that the earth is young based on our evidence is like requiring Isaac Newton to delay publishing his law of Gravity because he could not explain the mechanism of gravitational attraction. We believe the rate of helium diffusion from zircons, the presence of polonium radiohalos near uranium radiohalos in granite, the discordance of isochron dates among multiple conventional dating methods, and the presence of measurable concentrations of carbon-14 in coal and diamonds as explicated in our book provide strong evidence for a young earth. To weakly assert the significance of this evidence would not only do a great disservice to Christians but also to the advancement of science.

In response to Isaac's specific technical criticisms of the RATE research, we encourage the reader to find the details in our reports and evaluate for themselves if we have presented evidences that are "... not based on any accepted scientific methodology" and "... are not reliable for dating" (p. 145). The methods in our report are widely used for dating of rocks and minerals. Our report carefully applies accepted geochronological practices, discovers new evi-

dence for rapid nuclear decay, points out inconsistencies in conventional interpretations, and calculates alternative, young-earth dates. We address most of the criticisms which he raises in detail either in our book or in published research reports and show that they are invalid. For example, his criticism that our helium diffusion measurements made for zircon crystals in a laboratory vacuum do not apply to high-pressure conditions found underground is refuted in Humphrey's article, *Helium Evidence for A Young World Overcomes Pressure*, www.trueorigin.org/helium02.asp. The bottom line is that external pressure has practically no effect on diffusion rates in crystals when they are hard. Zircons are some of the hardest crystals known. Diffusion rates in our zircons were influenced far less than one percent by removing them from underground pressures to a vacuum chamber.

Isaac made the statement that "*the presence of uranium also seems to provide a reasonable explanation for the source of the polonium and polonium halos with normal decay rates and standard ages of granite*" (p. 144). He apparently does not recognize that below the annealing temperature of 150°C, hydrothermal convective systems can only last for a short time. Laboratory observations show that water below that temperature will flow through the biotite for only a few months, certainly not for millions of years. Uniformitarian rates of decay in a uranium halo fall vastly short of producing the hundreds of millions of water-transported polonium atoms needed to make a fully-developed polonium halo, particularly for polonium-214 and polonium-218 radiohalos. Because of their extremely short half-lives, on the order of days to months, only accelerated decay will work.

In his critique of the chapter, Do Radioisotope Clocks Need Repair? Isaac faults the authors, "... they fail to explain why there are so many cases where there is good concordance of isochrons ..." (p. 144). Again, he says the RATE authors, "... fail to invalidate the vast amount of concordance" (p. 144). Isaac needs to provide documentation from technical literature where *vast amount of concordance* is established. Does he have examples of concordant isochrons between U-Pb, Sm-Sr, Rb-Sr and K-Ar in suites of earth rocks? If he has such documentation of a vast amount of concordance, he could easily trivialize the RATE researcher's statements about discordant isochrons. If Isaac could provide this documentation, he would have one of the strongest arguments in favor of the accuracy of radioisotope ages. Good scholarship and scientific integrity require documentation of such statements.

The RATE group shows large *discordances* in isochron estimates of the age of rocks and minerals to be normative and as large as factors of two or three in some cases, much larger than the 15% Isaac stated in his review. These discordances were far outside the usual statistical confidence limits. We believe such common mismatches show

Author Exchange:

Isaac

large differences in decay rates depending on decay type and atomic weight. These consistent trends may be hints of a mechanism of accelerated decay. The large discrepancies invalidate the usual isochron ages, requiring an extensive overhaul of the conventional analysis to account for variable decay rates.

The basic argument for a young earth from the presence of carbon-14 in coal and diamonds is that they cannot be older than about 50,000 years even using uniformitarian assumptions about the concentration of atmospheric carbon-14. These dates are young compared to the millions or billions of years conventionally assumed. Isaac's criticism of circular reasoning in estimating a biblical age of 5,000 years does not apply to our basic premise. His concerns about contamination were considered in our reported results by subtracting an experimentally-determined standard background from the measurements. *Contamination* becomes unlikely when one considers that roughly the same amount of radiocarbon has been reported in over seventy published measurements of fossil carbon from a wide variety of materials, depths, and sites all over the world. His alternative hypothesis for the presence of carbon-14 due to the interaction of neutrons with nitrogen impurities in diamonds would require a neutron flux four orders of magnitude higher than the largest fluxes observed deep underground, as we pointed out on pages 614-6.

We believe the four primary evidences for accelerated decay stand on their own merit. This does not mean that we have solved all the problems, far from it. The primary concern openly admitted by the RATE group is the disposal of the large amount of heat if the decay processes were multiplied by a factor of one million or so during the Flood. We discussed this frankly and suggested at least one possible solution—cosmological cooling. There are other problems such as the radiation problem and the exact explanation of the mechanism of accelerated decay. Isaac stated that we assumed that “C-14 did not have an accelerated decay constant while heavier nuclei did” (p. 145). What we assumed was that the C-14 decay would not be accelerated as much as heavier elements. This assumption is supported by more recent research which shows that variation in the strength of the nuclear force would not affect the C-14 nucleus as much due to weak or nonexistent pairing forces in light nuclei such as C-14 (Chaffin, paper submitted to the 2008 International Conference on Creationism). We discussed some of these issues and problems in great detail in our book and offered suggestions on several others.

Rather than name calling and putting down quality scientific progress because we have not answered all of the questions, we would encourage Isaac and the ASA to recognize good science when it occurs and join us in advancing research on the problems yet to be overcome.

Since reporting the RATE results, we have been encouraged to hear of work being done in various university and government laboratories on accelerated decay, particularly as applied to the disposal of radioactive waste. It would be a feather in the cap of Christian scientists of all stripes if we were to make a contribution to such an important topic as the age of the earth. We could claim a more accurate understanding of earth's history and contribute to advances in conventional science and its applications. And, most importantly, we could increase confidence in the Word of God. Will you not join us?

The RATE Group

Larry Vardiman, Andrew A. Snelling, Eugene F. Chaffin, Steven A. Austin, D. Russell Humphreys, Donald B. DeYoung, Steven W. Boyd

Isaac Replies

We share with the RATE team the fundamental belief in the doctrine of creation and we unite with them in worshipping God our Creator. We agree that an accurate study of God's book of nature will reveal a story of the creation that is complementary and not contradictory to the inspired book of Scriptures. As an important step toward quality in such a scientific endeavor, we encourage the RATE team to ensure that all work is published in relevant peer-reviewed technical literature prior to being publicly claimed as a scientific result. Henry Morris, Jr., writing in an appendix to the introduction in the RATE Vol. II report, deems it sufficient to obtain reviews from those pre-selected to be committed to a young-earth conclusion.¹

Christian leaders from St. Augustine to contemporary evangelical theologians have maintained that there is no clear teaching of the age of the earth in the Scriptures. Christians who agree on the reliability of the Bible can differ on their estimates of the age of the earth as inferred from the Bible. We should distinguish between the clear *teachings* of Scripture and *inferences* which we may draw from biblical texts.

The interested reader is invited to peruse the technical geochronology literature which addresses the key scientific issues raised by the RATE team. Space permits us to reference only a few examples.

The high sensitivity of noble gas diffusion in solids to many factors, particularly grain size and structural phase, is addressed by McDougall and Harrison.² They attribute a two order of magnitude higher diffusivity in vacuum measurements to early phase breakdown during heating. In a method known as zircon (U-Th)/He thermochronometry, it is possible to determine the rate at which helium is produced in a zircon from alpha-emitting radioactive elements. The time since a zircon cooled to the closure temperature, when helium outdiffusion became

negligible, can be calculated from the measured helium concentration. This averts the need to know the specific diffusivity of helium except to estimate the value of the closure temperature. The results are consistent with standard ages of zircons.³

The RATE team uses a very different diffusion dating method based on the amount of helium that is lost. They assume an initial helium concentration derived from Gentry's estimated retention factors⁴ and calculate how long it would take, if there were no further alpha decay, for the concentration to decrease to the current level. However, the diffusion equations tell us that the helium concentration will only increase and not decrease unless there is an increase in temperature. The RATE team model does not describe physical reality and the results are irrelevant. To assess what they call a uniformitarian model, they assume the zircons are in a steady-state condition. However, age information cannot be extracted directly from a steady-state condition since values are not changing with time. The RATE team inserts 1.5 billion years into their steady-state condition Eq. 16⁵ and the results are physically meaningless. The proper mathematical treatment of helium generation and diffusion in a mineral has been reported in the literature⁶ and the results are consistent with standard ages. Helium diffusion in zircons does not indicate a young earth but provides strong evidence for an old earth.

Studies of radiohalos have not been widely reported in the peer-reviewed literature since Gentry documented them in the 1960s and 1970s. Though there remain unexplained phenomena connected with these halos, there does not appear to be an unsolvable contradiction with accepted ages of granite. Polonium halos have only been found in granite that also contain myrmekite and not in magmatic granite without myrmekite.⁷ Though there is no scientific consensus in the literature about the formation of granite containing myrmekite, unpublished work by Collins indicates the plausibility of explanations for these halos with standard ages.⁸

The isochron methodology and abundant data are reported, for example, by Dalrymple,⁹ who cites more than 250 measurements of terrestrial, lunar, and meteoric rocks with excellent concordance. These data include both isochron and non-isochron techniques and demonstrate consistency among all techniques. The RATE team acknowledges in its report that there is a high degree of concordance in measurements of meteorites.¹⁰ This alone confirms the validity of this dating technique.

The discordances claimed by the RATE team in terrestrial rocks are not unexpected in light of the thermal history and environmental exposure of the selected samples. Each of the radioactive decay systems measures a different point in the thermal history of the rock. Concordance is expected only where those thermal points

coincide. Some systems such as Rb-Sr are more sensitive to environmental exposure than others like U-Pb. Discordant measurements are therefore common while the high degree of concordance documented by Dalrymple offers ample verification to meet the RATE team's criterion.

The carbon-14 levels that Baumgardner claims to find in ancient coal and diamonds show significant variation from sample to sample, suggesting contamination. Virtually all of the previous literature cited by Baumgardner are studies of AMS instrument sensitivity and calibration. More details are discussed in an adjacent letter by Kirk Bertsche. There is no basis for concluding that these radio-carbon signals indicate any age of the samples.

The idea that radioactive decay rates have been significantly different in the past is strongly contradicted by experimental data and theoretical analysis.¹¹ The RATE team has provided no direct evidence for a change in decay rates. They note the evidence for a massive amount of radioactive decay, particularly based on fission track data, and postulate accelerated decay rates to accommodate the idea of a young earth.

The RATE team has honestly acknowledged that even if their technical claims were accurate, there remain unsolved problems that cannot be reconciled with any known scientific process. In his summary at the RATE conference in Denver on Sept. 15, 2007, Don DeYoung noted the need to invoke divine intervention in order to circumvent these problems. However, the oft-stated summary by the RATE team, that their results provide assurance of the biblical interpretation of a young earth, leaves the average listener with the mistaken impression that these problems are nonexistent, trivial, or soon to be resolved. Rather, the RATE team acknowledged overwhelming evidence for hundreds of millions of year's worth of radioactivity¹² and admitted that compressing this activity into a few thousand years would generate more than enough heat to vaporize all granitic rock.¹³ They state that no known thermodynamic process could dissipate such a large amount of heat.¹⁴ Their expressed hope in solving heat dissipation by cooling via enhanced cosmological expansion¹⁵ has not been realized and is not consistent with our knowledge of the expanding universe.¹⁶ Thus, the RATE team has provided solid evidence that, scientifically, the earth cannot be thousands but must be billions of years old.

Notes

¹L. Vardiman et al., *Radioisotopes and the Age of the Earth 2* (Institute for Creation Research, 2005), 24.

²I. McDougall and T. M. Harrison, *Geochronology and Thermochronology by the ⁴⁰Ar/³⁹Ar Method*, 2d ed. (Oxford: Oxford University Press, 1999), 143–54.

³P. W. Reiners, "Zircon (U-Th)/He Thermochronometry," *Reviews in Mineralogy and Geochemistry* 58, no. 1 (January 2005): 151–79.

⁴R. V. Gentry, *Geophysical Research Letters* 9, no. 10 (October 1982): 1129–30.

⁵Vardiman, *Radioisotopes and the Age of the Earth 2*, 53.

⁶R. A. Wolf, K. A. Farley, and D. M. Kass, "Modeling of the Temperature Sensitivity of the Apatite (U-Th)/He Thermochronometer," *Chemical Geology* 148 (1998): 105–14.

⁷C. W. Hunt, L. G. Collins, and E. A. Skobelin, *Expanding Geospheres, Energy and Mass Transfers from Earth's Interior* (Calgary: Polar Publishing, 1992).

⁸L. G. Collins, www.csun.edu/~vcgeo005/creation.html

⁹G. Brent Dalrymple, *The Age of the Earth* (Stanford, CA: Stanford University Press, 1991)

¹⁰Vardiman, *Radioisotopes and the Age of the Earth*, 465.

¹¹V. V. Flambaum, "Variation of Fundamental Constants: Theory and Observations," http://arxiv.org/PS_cache/arxiv/pdf/0705/0705.3704v2.pdf; and J. P. Uzan, "The Fundamental Constants and Their Variation: Observational and Theoretical Status," *Review of Modern Physics* 75 (2003): 403–55.

¹²Vardiman, *Radioisotopes and the Age of the Earth*, 284.

¹³*Ibid.*, 183.

¹⁴*Ibid.*, 763.

¹⁵*Ibid.*, 184.

¹⁶Glenn Morton and George L. Murphy, "Flaws in a Young-Earth Cooling Mechanism," *Reports of the National Center for Science Education* 24, no.1 (2004): 31–2.

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Intrinsic Radiocarbon?

I am concerned that readers may come away from Robert Rogland's recent article¹ with mistaken impressions about radiocarbon and nuclear decay rates. Rogland suggests that an increase in nuclear decay rates over time could account for "residual radiocarbon" in "radioactively dead" samples, though he puts "little stock in the hypothesis." I concur with Rogland's skepticism; there is no scientific support (either theoretical or experimental) for the notion that the decay rate of radiocarbon has changed with time.

So what should we make of RATE's claims of "intrinsic radiocarbon," which they claim is inconsistent with "the uniformitarian assumption of time-invariant decay rates"?² They present two classes of data. First is a set of ninety previously published radiocarbon AMS dates of old samples (most >100k years). Second is a set of new samples that they collected and sent to a leading radiocarbon AMS laboratory for analysis. In both cases, I am convinced that their "intrinsic radiocarbon" is nothing more than contamination and background.

Modern radiocarbon dating by AMS is a complex process with numerous potential sources of contamination. Furthermore, the instrument itself always introduces a background (similar to most other high-sensitivity analytical instruments).³ A sample originally containing absolutely no radiocarbon will still give a nonzero measurement due to these contributions.

Baumgardner's first class of data is a set of previously published radiocarbon AMS dates. He has selectively divided these into two groups: Precambrian geological samples and Phanerozoic biological samples. His geological samples have a mean radiocarbon content of 0.06 pMC (percent modern carbon) and the biological samples, a content of 0.29 +/- 0.16 pMC. He concludes that all biological material contains intrinsic radiocarbon (and suggests the same of all geological carbon). But he fails to note that all of these geological samples are actually of geological *graphite*, so did not undergo the combustion and graphitization required for the biological samples. Many of Baumgardner's references document controlled tests to characterize the contamination introduced by this sample chemistry (including two re-processed geological samples that he omitted from his analysis).⁴ Sample chemistry is shown to add from 0.1 to 0.7 pMC, highly dependent on sample size and procedure. It is clear that the main difference Baumgardner sees between geological and biological samples is simply laboratory contamination introduced by sample chemistry. Further, the radiocarbon content of his geological samples of <0.1 pMC is in good agreement with the instrument backgrounds characterized in many of his references. These previously published dates give no evidence of intrinsic radiocarbon.

Baumgardner's second class of data consists of samples that the RATE team collected and sent to a leading radiocarbon AMS laboratory for analysis. This includes a set of 10 coal samples (0.10 to 0.46 pMC) and later, a number of diamond samples. The measurements showed large variations, suggesting contamination. Both materials are problematic in general.

Coal is easily contaminated *in situ* by the mobile humic acids that are generally present, and potentially by biological activity, natural uranium content and cosmic rays.⁵ It is also possible that the samples were contaminated while stored in a DOE geology lab refrigerator.⁶ Geology labs often have elevated levels of radiocarbon due to tracer studies, neutron activation studies, and dust from uranium-bearing rocks. Carbon is highly mobile and contamination can spread through an entire lab and persist for decades.⁷

With extreme care and specialized techniques, anthracite coal has been measured with an apparent age of more than 75,000 years (<0.01 pMC), the detection limit of the procedure.⁸ Diamond is difficult to combust, but unprocessed diamond has been measured by AMS as low as 0.005 pMC.⁹ This is claimed to be the instrument background, a claim supported by the fact that samples yielding higher ion source currents also gave older dates, indicating that the measured carbon did not actually come from the sample itself. This provides clear evidence that coal and diamond exist which do not contain measurable radiocarbon. The RATE claim that all carbonaceous

material contains intrinsic radiocarbon is not supported by the data.

Notes

- ¹R. Rogland, "Residual Radiocarbon in an Old-Earth Scenario," *Perspectives on Science and Christian Faith* 59, no. 3 (2007): 226–8.
- ²J. Baumgardner et al., "Measurable ¹⁴C in Fossilized Organic Materials: Confirming the Young-Earth Creation-Flood Model," in *Proceedings of the Fifth International Conference on Creationism*, ed. R. L. Ivey, Jr. (Pittsburgh, PA: Creation Science Fellowship, 2003), 127–42. www.globalflood.org/papers/2003ICc14.html
- ³R. E. Taylor and J. Southon, "Use of Natural Diamonds to Monitor ¹⁴C Instrument Backgrounds," *Nuclear Instruments and Methods B* 259 (2007): 282–7.
- ⁴See, for example, M. Arnold et al., "¹⁴C Dating with the Gif-sur-Yvette Tandem Accelerator: Status Report," *Nuclear Instruments and Methods B* 29 (1987): 120–3; K. van der Borg et al., "Precision and Mass Fractionation in ¹⁴C Analysis with AMS," *Nuclear Instruments and Methods B* 123 (1997): 97–101.
- ⁵P. Grootes, "Carbon-14 Time Scale Extended: Comparison of Chronologies," *Science* 200 (1978): 11–15; and D. Lowe, "Problems With the Use of Coal as a Source of ¹⁴C-Free Background Material," *Radiocarbon* 31 (1989): 117–20.
- ⁶Baumgardner et al., "Measurable ¹⁴C in Fossilized Organic Materials."
- ⁷P. Zermano et al., "Prevention and Removal of Elevated Radiocarbon Contamination in the LLNL/CAMS Natural Radiocarbon Sample Preparation Laboratory," *Nuclear Instruments and Methods B* 223–224 (2004): 293–7.
- ⁸Grootes, "Carbon-14 Time Scale Extended: Comparison of Chronologies."
- ⁹Taylor and Southon, "Use of Natural Diamonds to Monitor ¹⁴C Instrument Backgrounds."

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Poe Exchange

Historically Inaccurate and Seriously Misleading Argument

"From Scientific Method to Methodological Naturalism: The Evolution of an Idea" (Harry L. Poe and Chelsea R. Mytyk, *PSCF* 59 [2007]: 213–8) presents a discussion of methodological naturalism as a very recent development in thought about science and scientific method. The discussion is framed primarily in philosophical terms, and the general tenor of the authors' argument is that "methodological naturalism" is an unnecessary *addition* to the general principles of scientific method and could just as well be dispensed with.

The authors' argument is *historically inaccurate* and seriously *misleading* in respect to essential issues in science.

It also *rests on and supports* an extremely naive view of "scientific method," one that taken to its logical extreme would imply that all sorts of methods of inquiry and argument have an equally valid claim to be regarded as "science." Although the authors mention neither "intelligent design" in biology, nor "creation science" in relation to modern physical science, it is clear to any thoughtful reader that their argument tends to support the idea that such alternatives are (in principle) equally valid approaches to science. It is not clear how far the authors themselves might go in actually supporting these or other specific alternatives, but this only illustrates the deceptive and insidious effect of making philosophical arguments about science without reference either to the history of science or to the specific scientific questions entailed.

I make no particular issue out of defending "methodological naturalism" in the context of most contemporary debate about the term. However, the effort of Poe and Mytyk to present the idea as though it were a recent and unnecessary addition to "scientific method" is completely inaccurate historically. What we today call *physical science* has its origins in an approach to understanding the physical world championed by Robert Boyle, Isaac Newton, and their seventeenth-century contemporaries, which they called "*the mechanical philosophy*." Since these men (especially Boyle) held clear and explicit theological views about God's sovereignty and agency in creation, it is obvious their advocacy of *mechanical philosophy* was purely "methodological"—specifically, as an approach to physical science. In a long article published in *PSCF* (March 2002),¹ I presented an extended discussion of the theological context legitimizing such a naturalistic approach to science. Part of my purpose in doing so was to anchor this "naturalism" by affirming its continuity and coherence with the point of view taken by Boyle in relation to physical science. I cannot develop these arguments here, but I think for the sake of historical accuracy alone, Poe and Mytyk ought to have been aware of their force and connection with the scientific past.

The authors' argument is also seriously *misleading* in respect to the effectiveness and success of "naturalism" in the approach of physical science to explaining the physical world. Over more than three centuries, firm adherence to this "naturalism" as a basis for application of the scientific method to physical phenomena has spectacularly succeeded in understanding the physical world. Alternative approaches based on "non-naturalistic" assumptions have *never* done so. Since that is the case, it is specious and misleading to conduct a purely philosophical discussion (as Poe and Mytyk do) suggesting that "methodological naturalism" is really irrelevant to the success of physical science. As someone has said in relation to recent generic attacks on methodological naturalism by some Christian writers, *if it isn't broken, don't fix it!*

While Poe and Mytyk do not make this point clear, recent attacks on the legitimacy of “methodological naturalism” as a presupposition of science are almost entirely predicated by problems of the origin of complexity and information in the “genetic code” of biological organisms. This is obviously true in the cases of J. P. Moreland, William Dembski, Stephen C. Meyer and other advocates of “intelligent design” as an alternative to a purely mechanistic and reductionist Darwinian account of biological origins. Authors cited by Poe and Mytyk as “in favor of the concept” of methodological naturalism have not all endorsed the Darwinian approach without reservation, but their opposition to attacks on “methodological naturalism” by ID proponents represents their conviction, based on scientific experience and historical understanding, that such attacks are erosive of the scientific enterprise in the long run. For reasons I have developed at some length elsewhere, I share this general conviction,² but *without* also defending the reductionist scheme implicit in a Darwinian approach to biological origins.

Finally, I would stress that a “naturalism” adequate to a sound understanding of biological systems may require a wider scope than that provided by the mechanical philosophy of Boyle and Newton, which, though it was entirely appropriate to the limited concerns of *physical science*, was merely developed as a heuristic scheme for dealing with that specific subject. I would distinguish sharply between the general notion of *naturalism* as a methodological approach to scientific enterprise, and the specific model or paradigm of “nature” adequate to a particular part of that enterprise. It is an interesting fact that even Robert Boyle thought that the scope of the “mechanical philosophy” would prove inadequate to a full understanding of biological organisms. As a number of astute persons have pointed out (and I have discussed in some detail elsewhere³), the logical organization of biosystems clearly embodies some limited notion of *achievement* or *function*, a concept entirely absent from the mechanistic paradigm of the “mechanical philosophy” or *physical science*.

Notes

¹Walter R. Thorson, “Legitimacy and Scope of ‘Naturalism’ in Science. I. Theological Basis for a ‘Naturalistic’ Science,” *PSCF* 54, no. 1 (2002): 2–11.

²Walter R. Thorson, “Telos in Biology: Steering Between Aristotle and Darwin,” *CRUX* 34, no. 2 (2003): 23–33 [*CRUX* is a quarterly published by Regent College, Vancouver, BC]; Walter R. Thorson, “Naturalism and Design in Biology: Is *Intelligent Dialogue* Possible?” *PSCF* 56, no. 1 (2004): 26–37.

³Walter R. Thorson, “Legitimacy and Scope of ‘Naturalism’ in Science. II. Scope for New Scientific Paradigms,” *PSCF* 54, no. 1 (2002): 12–21. See also further discussion of this idea in note 2 above.

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Critiquing the Uncritical

Poe and Mytik, “From Scientific Method to Methodological Naturalism: The Evolution of an Idea,” *PSCF* 59, no. 3 (2007): 213–8, present a number of popular but erroneous notions. The first is that “science is only qualified to describe what we can learn through sensory observation” (p. 214). Were this true, any effort to understand social or personal phenomena by surveys must be nonscientific. Even granting that questionnaires involve subjective responses which must be handled statistically, excluding the study of persons and their institutions from science seems arbitrary and futile. The studies are empirical, as objective as possible given the entities studied. If they are not scientific, in what category do we put clinical psychology, sociology, cultural anthropology and related studies?

The authors give only one of two applicable definitions of “nature” from the *Oxford English Dictionary* (the same in both editions), the one given under IV 11 a (215). Another, IV 13 a, is clearly less metaphysical, but sufficient for science:

The material world, or its collective objects and phenomena, esp. those with which man is most directly in contact; freq. the features and products of the earth itself, as contrasted with those of human civilization.

The quotations supporting the originally cited definition go back to the fourteenth century, well before the Enlightenment, which supposedly gave the current metaphysical twist to the term. Seventeenth and eighteenth century attitudes were not operative that early. The quotations for the later definition begin with 1662.

The gravest error is surely “A chance event has no cause” (p. 216), which is nonsense. The only reason I can think of for writing something this ridiculous is our tendency to think of a precipitating cause as *the* cause, as in “Flipping this switch causes that light to go on.” Random occurrences do not have precipitating causes. However, any honest recognition of the causal situation must include more: e.g., that the bulb is not burnt out and is screwed in tightly, that the fuse is not blown or the breaker not tripped, that there is no blackout, and so on, extending to the physical principles involved in the generator and turbine. A reasonable understanding of a chance event merely recognizes that we do not know the causes, for they are properly multiple. Of course, there are those with a metaphysical ax to grind who specify chance to end the investigation and to specify that no further cause may be given.

Consider, for example, the declaration that the Big Bang was only a chance variation in the quantum vacuum. The intent is to end the inquiry, especially to exclude the Creator. But there are immediate questions: Where did the quantum vacuum come from? How did what we detect

only in the evanescent production of minute entities produce such immense mass-energy? That the cutoff is unsatisfactory is evident in the promotion of the multiverse, which only pushes the need for a first cause back. But a creator or first cause is never a scientific notion.

Adding that methodological naturalism tends to make naturalism “the proper metaphysical explanation” (p. 217) essentially denies the relevance of modifiers. The metaphysical naturalism they describe is not the methodological naturalism or empiricism of scientific investigations. Usually, only those with a dogmatic agenda, such as atheists or adherents to Intelligent Design, equate the two. However, methodological naturalism claims only that the scientific endeavor seeks natural causes for the phenomena investigated. It is equally open to atheism, deism, dualism, idealism, monism, panentheism, pantheism, theism, etc.—but it excludes miracles as scientific explanations.

It is unfortunate that neither authors nor reviewers analyzed matters more deeply and carefully. However, the description of the origin of “methodological naturalism” is useful, even though it may be little more than a new label for Francis Bacon’s exclusion of final causes in empirical investigations.

David F. Siemens, Jr.

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Poe Replies

Walter R. Thorson and David Siemens, Jr. have raised several objections to the article on methodological naturalism written by me and Chelsea Mytyk which appeared in the September 2007 issue (pp. 213–8). I would like to respond to their objections.

Thorson states that our article is “historically inaccurate” because methodological naturalism has been part of science since the seventeenth century. While we agree that “naturalism” has been a philosophical position adopted by many scientists since the seventeenth century, “methodological naturalism” is an idea first introduced in the 1980s by Paul de Vries, at that time a professor of philosophy at Wheaton College. We believe that Dr. de Vries deserves credit for developing this creative idea that proposes the blending of philosophy and methodology, though we think it is a bad idea. Science is rooted in methodological objectivity, not methodological naturalism.

Thorson bases his argument on what he construes from what Boyle, Newton, and their ilk believed to conclude that they practiced methodological naturalism. The argument involves several leaps based on what is “obvious” to a modern mind. That a scientist may be committed to

naturalism we allow, but we do not conclude that the scientific method only works if a scientist is committed to naturalism. A scientist may believe in the resurrection of Jesus Christ without it affecting a chemistry experiment. A scientist may believe that God became incarnate in flesh without it affecting DNA research. A scientist may believe that God communicates with people and hears prayer without it affecting the development of the LASAR. The success of Boyle and Newton was not based on their philosophy but on the objectivity and accuracy of their observations and analysis of those observations.

Thorson pulls out one of the most effective rhetorical devices available by suggesting that if we disagree with “methodological naturalism” then we must believe in Intelligent Design and Creation Science. I have addressed both of these issues in print in *Science and Faith*, *Designer Universe*, *What God Knows*, and *Dance or Chance*. I have discussed why the Creation Science position is a misinterpretation of Scripture. I have argued that Intelligent Design is a very good apologetic argument, but that it is not science. What Thorson fails to understand is that methodological naturalism is not science for the same reason that Intelligent Design and Creation Science are not science.

Thorson seems to wed opposition to methodological naturalism with the Intelligent Design movement. This issue has nothing to do with Darwin or Dembski and the current controversy that swirls around them. This issue concerns how scientists are taught to think of their discipline. I suspect that what really concerns Thorson is the difference between efficient cause and final cause. Science is concerned with efficient cause and cannot work if people want to put the hand of God into a scientific explanation. But it works both ways. Methodological naturalism assumes that God is not a *final* cause. It does no good to argue that I believe God is the Creator and Sustainer of the universe, except when I do an experiment. Science cannot make statements about final causes; therefore it should remain silent on the issue. By invoking methodological naturalism, a person is saying that God plays no part in the universe at all.

Siemens seems to suggest that reading social science survey data does not involve sensory observation. I am afraid I do not follow him. As to a difference between the hard sciences and the soft sciences, I think most people in physics, chemistry, and biology recognize the difference between the natural sciences and the social sciences. The social sciences do not have the same predictive power of the natural sciences. We may say something is “scientific” in that it borrows from the methodology of the natural sciences, but the social sciences have enormous problems that the physical sciences do not face. In this sense, the social sciences are in their infancy, but I think this whole line of discussion is beside the point.

Author Exchange:

Poe

Siemens correctly notes that the meaning of the word “nature” has been changing. That is our point. The discussion that follows the early definition of nature describes how the word has changed in its usage over five hundred years and that we are in the midst of a re-sacralization of nature.

Siemens employs a masterful strategy of lifting a sentence out of context (“A chance event has no cause.”). In the paragraph in which the sentence is found, the meaning is made clear and the causes of “random events” explored. It is possible that Siemens honestly did not follow the argument at this point, and if that is the case, I apologize for being unclear.

Siemens joins Thorson in arguing that people who oppose methodological naturalism are adherents to Intelligent Design or atheism. Siemens appears to be emotionally embroiled in a debate with the Intelligent Design people, but not every discussion is about Intelligent Design. We have not argued to include God in the exploration of efficient causes. We have argued that no philosophical agenda should be brought into the exploration of efficient causes. God and naturalism are final causes. We do not argue for methodological theism. We

argue for what Bacon argued for against the Aristotelians of his day: clear the deck of philosophical presuppositions about how the world works.

Christians at work in the scientific community have been embarrassed by the claims and declarations of those involved in Creation Science. Attempts to make God a scientifically explanatory efficient cause and to date the universe at a mere 6,000 years old make the Christian faith look ridiculous and place a huge stumbling block to the gospel. The sins of Creation Science, however, do not justify excluding God as the final cause of all things. Though well intended, the term “methodological naturalism” is misleading to young scientists and unhelpful to the progress of scientific knowledge. It also assumes the position of the Deists: God has no involvement in the universe of cause and effect. Christians would do well to realize that we have more options than the extremes of Creation Science and Naturalism.

Harry Lee Poe

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A Call for Book Reviewers

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Communication



Paul H. Seely

Genesis 1–11 in the Light of Its Second Millennial Worldview: A Response to Carol Hill's Worldview Alternative

Paul H. Seely

Carol Hill ... repeatedly presented Divine Accommodation in "A Third Alternative to Concordism and Divine Accommodation: The Worldview Approach," as the accommodation of myth. This characterization ... needs to be corrected.

Carol Hill has written some good articles on Genesis. I regard her "A Time and Place for Noah" as one of the best articles about origins ever to be printed in this journal. Her most recent paper, "A Third Alternative to Concordism and Divine Accommodation: The Worldview Approach," (PSCF 59, no. 2 [2007]: 129–34) is a good contribution to the dialogue but is in need of some correction. She repeatedly presented Divine Accommodation in that article as the accommodation of myth. This characterization of Accommodation needs to be corrected. One of the main things accommodated in the Bible is the science of the times. It would be as inaccurate and unfair to characterize that science as a myth as calling the eighteenth-century theory of phlogiston a myth. Outdated and naive as it is, the science of the times was based on taking observations of the physical world at face value. It had an empirical basis and should not be equated with myth.

Also accommodated in Genesis 1–11 are Mesopotamian traditions. Some of them were scientific theorizing, like the idea that a giant ocean ("the Deep") preceded the making of heaven and earth. Others, like the Flood were more historical. These traditions were originally presented in combination with mythical gods and goddesses, but they were demythologized in Genesis. So, the myth is not accommodated. Hence, neither the theorizing traditions nor the historical traditions deserve to be equated with myth. With

regard to the Flood, I specifically said in my Flood paper:

The Flood account is not trying to educate the Israelites scientifically but is accommodated to their prior scientific understanding. This does not mean that the story of the Flood is a myth. A comparison to the Mesopotamian accounts of the same flood shows that Genesis 6–9 is a- if not anti-mythological. Nor does it mean that the story is just fiction. There is good reason to believe that both the Mesopotamian and biblical accounts are based upon an actual flood that occurred c. 2900 BC, and both accounts agree upon other various particulars.¹

There may be some justification of the term myth in conjunction with some accommodated Mesopotamian motifs, but for the most part the writer of Genesis demythologized his sources. The story of Adam accommodates (with some revision) several Mesopotamian motifs such as "a lost opportunity to gain immortality," but there was no ancient Near Eastern myth of a first man who sinned, so the story of Adam cannot be an accommodated myth.

Hill's View

Although Hill builds her article on interpreting Genesis in the light of the second millennial Near Eastern worldview of the biblical author, she only appeals to this worldview selectively, namely, when it can be used to justify interpreting the biblical text in a way that is in concord with "real history." Her "third alternative" to Accommodation and Concordism is an alternate form of concordism. As is the case with

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classical concordism, she is willing to take the biblical text out of its biblical context to make it agree with science and the historical facts. She is also willing to take it out of its historical context, interpreting it in a way that is contrary to the worldview of the biblical author in order to make it agree with science and the historical facts.

The topics in Genesis being dealt with in this dialogue are complicated, and a full answer to Hill's interpretations cannot be given here. So instead, let me simply show what happens if the biblical text is left in its historical context, that is, if the second millennial Near Eastern worldview of the biblical author is consistently rather than selectively applied to the biblical text.

With regard to Gen. 1:1, the second millennial worldview would make us realize that the author is not talking about a global planetary earth in the midst of a spacious heaven, but of a stationary, circular, flat earth covered with a solid dome of a sky—as all people in the ancient Near East believed.² In addition, above this solid dome, above the sun, moon, and stars was an ocean.³ This was the science of the day, and it is incorporated into the biblical text. Since this cosmology is not true to the scientific facts, it fits into Calvin's concept of accommodation.⁴ Calvin attributed similar accommodations to Moses, but since Moses would have believed in this cosmology just as much as the uneducated Israelites, I attribute the accommodation to God. It is a divinely inspired accommodation.

The next thing the second millennial worldview would tell us is that the "Deep" sea in Gen. 1:2 is following a Mesopotamian tradition, found in both Sumerian and Babylonian texts, that a deep sea (Nammu/engur in Sumerian; Tiamat in Babylonian) preceded the creation of heaven and earth.⁵ Regardless of whether or not the days in Gen. 1 are sequential, the biblical context and the second millennial worldview tell us that a primeval Deep sea preceded the creation of light on day one and all the following acts of creation. But modern geology and astronomy tell us there was no sea at all prior to the creation of light, the firmament, etc. Genesis 1:2, therefore, matches the science of the times, but is antithetical to modern science. Thus this is another example of divine accommodation, not "real history."

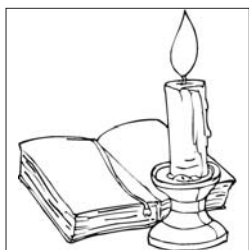
The next thing the second millennial worldview tells us is that the biblical account of the origin of the ocean follows very closely the account given in the Babylonian creation epic, *Enuma Elish*.⁶ Both accounts agree that the creation of the ocean occurred by means of splitting the primeval Deep into two parts, removing the upper half of the Deep's waters to above the firmament, and leaving the lower half to be the earth's ocean (Gen. 1:6–10). This is certainly not a view of the origin of the ocean that will be accepted by modern geologists. It is, accordingly, another divine accommodation. It is not "real history."

With regard to Adam, the second millennial worldview would emphasize the material nature of man, his being made from the dust of the earth, which follows an ancient Near Eastern tradition that shows up in various Mesopotamian texts.⁷ The idea that Adam is merely "the spiritual father" of humankind is in agreement with the later Greek worldview, but is scarcely an ancient Near Eastern view, much less a view that agrees with the biblical context (Gen. 2:5 and 3:20; cf. Acts 17:26).

In addition, the phrase in Gen. 2:5, "... no plant ... no herb ... not a man to till the ground," is typical of a second millennial worldview introduction to a creation story.⁸ In the light of the second millennial worldview, it is incredible that this phrase would be used to refer to a situation where numerous human beings already existed. Both the biblical context and the second millennial worldview tell us this story is about the first man created on earth. Since he is late Neolithic, all of the people who archaeologists say lived long before him were not real humans—if this is "real history." As noted earlier, the story of Adam is not an accommodated myth. It does employ some second millennial worldview motifs, but the specific features are unique to the Bible.

The second millennial worldview of the Flood, as seen in Mesopotamian traditions, is that it destroyed *every* human being except those on the boat.⁹ The biblical account is in full agreement with this as is seen not only in the various phrases which indicate universality (e.g., "all the high mountains under all the heavens"), but in the way Noah is addressed after the Flood as a second Adam.¹⁰ In real history, however, neither the flood of 2900 BC nor any other flood in Neolithic times destroyed all of humankind, even in Mesopotamia. If "all the earth" in the biblical account referred just to Mesopotamia, the flood should have at least destroyed all humans in Mesopotamia. None did. The Near Eastern archaeologist Mallowan said, "No flood was ever of sufficient magnitude to interrupt the continuity of Mesopotamian civilization."¹¹ The flood of 2900 BC did not even destroy all humans in southern Mesopotamia where it left its sedimentary deposits. In Kish, the most northerly city where the flood of 2900 BC left a deposit, the inhabitants came back soon after the flood, did a few minor repairs on their mud-brick houses, and moved back in.¹²

The biblical account of the Flood, as interpreted both by the biblical context and by the second millennial worldview does not match the findings of archaeology. Although there really was a flood and all accounts agree that a man was divinely warned to build a boat and escape, all the rest of humankind was not destroyed. The biblical Flood account is thus not accurate history. It is an accommodated Mesopotamian historical tradition revised to teach lessons of faith and morals.



A major problem with this modern view and its rejection of accommodation is that it is arbitrary. ... Another major problem ... is that it leads Christians down a path that is exactly opposite to that enjoined by Scripture. ... The Bible teaches us ... that claim[s] should be tested empirically before being accepted ...

Communication

*Genesis 1–11 in the Light of Its Second Millennial Worldview:
A Response to Carol Hill's Worldview Alternative*

The “Conservative” Evangelical View of Scripture

The view of the Bible which drives Hill and other concordists to force the Bible into agreement with the findings of modern science and which also underlies “creation science” can be traced to the Reformed scholastic theologian Francis Turretin (1632–1687).¹³ In order to establish the Bible as a greater authority than the Roman Catholic Church, Turretin took his view of Scripture to an extreme. He forsook Calvin’s doctrine of accommodation, taught that every word in the Bible was dictated by the Holy Spirit including the Hebrew vowel points, and that the Bible was *absolutely* inerrant, that is, inerrant not only in the area of faith and morals but in the areas of history and science as well.¹⁴ Consistent with his absolutist definition of biblical inerrancy, he appealed to the biblical statements about the sun moving and the earth being stationary as proofs that Copernicus was wrong.¹⁵

Turretin’s view of Scripture was fundamentally adopted by Presbyterian theologians at old Princeton Seminary (c. 1840 to 1920). The inspiration of the Hebrew vowel points and dictation were formally rejected, but the inerrancy of the Bible in all of its “affirmations” (or “assertions”) including those of historical or scientific facts was retained.¹⁶ Calvin’s concept of accommodation was ignored, although inerrancy was occasionally said to be restricted to that which the human author taught.¹⁷ This view is now the modern “conservative” view of Scripture.¹⁸

A major problem with this modern view and its rejection of accommodation is that it is arbitrary. There is no biblical proof that God would not speak as a Father to his children in terms of their scientific understanding. This is not to mention that Jesus did not hold an absolutist view of the authority of Scripture but taught that the inspired permission given in Deut. 24:1–4 to divorce for any reason was an accommodation (Matt. 19:3–9).¹⁹

Another major problem with the absolutist view of Scripture besides the fact that it is arbitrary and sets the teaching of Jesus aside is that it leads Christians down a path that is

exactly opposite to that enjoined by Scripture. Christians who have adopted the view that the scientific and historical statements in the Bible are intended by the divine author to be accepted as infallible teachings naturally refuse to test them empirically. When empirical data seem to falsify any of those statements, the “creation science” folks throw out the science and the concordists find some way to make the Bible say it really agrees with the science. No one tests the claim that every historical and scientific statement in the Bible was intended by God to be accepted as an infallible teaching.

The Bible teaches us to employ the exact opposite course of action: If a claim is made that a statement is an infallible teaching from God, that claim should be tested empirically before being accepted (Deut. 18:21, 22). These verses in Deuteronomy speak specifically of prophetic statements telling what *will* happen, but they apply in principle just as much to historical statements telling what *did* happen. It makes no difference in principle whether a statement is about the future or the past. According to these verses, if a statement is falsified by empirical data, it is *not* an infallible teaching from God.

When the doctrine of the absolute inerrancy of Scripture makes the claim that God intended to teach as infallible truth that the creation of light was preceded by the existence of a giant ocean, that a late Neolithic man was the first human being, and that a flood ~2900 BC (or any other date in Neolithic times) destroyed all of humankind, Christians and especially evangelical scientists ought to point out that the empirical evidence is clear enough to conclude that all of these events are falsified by the empirical data, and therefore, according to Deut. 18:21, 22 (cf. 1 Thess. 5:20, 21), they are *not* infallible teachings from God, and hence the doctrine making this claim is not of God.

It is also important to recognize that the Princetonian theologians, who are most responsible for giving us the doctrine of the absolute inerrancy of Scripture, agreed that the truth of this doctrine could be and should be tested by empirical evidence.²⁰ By appealing to concordism and phenomenal language, they found agreement between science and Scripture, and they expected any future scientific discoveries to agree with the

biblical accounts.²¹ Given the immature state of the relevant sciences in their day, their sanguine optimism is perhaps excusable. There is, however, enough clear scientific data today to prove that science does not always agree with the Bible, and has, in fact, falsified the Turretin-Princetonian doctrine of the absolute inerrancy of Scripture.


Scripture never claims to be authoritative *except* in the area of faith and morals (2 Tim. 3:16). Any failure of Scripture to be scientifically or historically correct is irrelevant to the authority of Scripture because unlike the area of faith and morals, Scripture never claimed to be authoritative in these other areas.

God is a Father, not a rationalistic scholastic philosopher-theologian. He was willing to come down to the intellectual level of his children in order to communicate to them lessons of faith and morals. His employment of ancient history and science as if it were really true is a gracious accommodation to the Israelites' limited knowledge.

It is a distortion of his grace to call this accommodation a disguising of fiction as real history. The people of that time believed it was real history. God accommodated it as such for their sakes, and we read it over *their* shoulders. Since our knowledge falsifies this history, we should let it go and retain only the lessons of faith and morals it was designed to teach. The doctrine that pre-existing yet errant beliefs can be accommodated into Scripture is perfectly biblical (Matt. 19:7-9; Mark 10:5-9), and it is also in accord with Scripture that God could even use fiction disguised as real history in order to communicate a lesson of faith and morals (2 Sam. 12:1-12).

Where is the divinely intended normative teaching in Genesis 1-11? It is in the theology, not the history or science as such. Though the human author was inspired by God to accommodate the history and science of the day, the scientific and historical data came from human sources. The theology came by revelation, and the divine character of its source is seen in the fact that although the biblical writer accepts and employs the second millennial worldview for history and science, he rejects and opposes its theology. Contrary to the theology of the second millennial worldview, Genesis 1-11 says that God is one, not many. God created and has control over every part of nature including the awesome sea. God made the universe for humans, not humans for the universe. Humans are the main creation, not an afterthought. Humans are made to serve God, but as stewards not as mindless slaves. Humans should work six days, and rest the seventh. No other religion has inculcated a regularly recurring day of rest each week.

Ultimately, of course, our faith rests in knowing Jesus Christ, and apart from that faith we would be blind even to this light that shines out from the pages of Genesis 1-11.

But the divine source of this light is evidenced by its intrinsic excellence and its ability to rise above the theological traditions of its time found in the second millennial worldview. Let the Lord be praised. 

Notes

- ¹Paul H. Seely, "Noah's Flood: Its Date, Extent, and Divine Accommodation," *Westminster Theological Journal* 66 (2004): 311.
- ²Peter Enns, *Inspiration and Incarnation* (Grand Rapids: Baker Academic, 2005), 54, 55; John H. Walton, *Genesis* (Grand Rapids: Zondervan, 2001), 110-3.
- ³*Ibid.*; Paul H. Seely, "The Firmament and the Water Above, Part II: The Meaning of 'The Water above the Firmament' in Gen. 1:6-8," *Westminster Theological Journal* 54 (1992): 31-46.
- ⁴Davis A. Young, *John Calvin and the Natural World* (New York: University Press of America, 2007), 161-88.
- ⁵Alexander Heidel, *The Babylonian Genesis*, 2d ed. (Chicago: University of Chicago, 1961), 18, line 3 and p. 42, lines 135 ff (read the notes); also p. 62, line 10; John L. Hayes, *A Manual of Sumerian Grammar and Texts*, 2d ed. (Malibu: Undena, 2000), 35.
- ⁶W. G. Lambert, "A New Look at the Babylonian Background of Genesis," *Journal of Theological Studies* 16 (1965): 293.
- ⁷Richard J. Clifford, *Creation Accounts in the Ancient Near East and in the Bible* (Washington, DC: Catholic Biblical Association, 1994), 41, 69, 79.
- ⁸Examples in Heidel, *The Babylonian Genesis*, p. 18, lines 1, 2, 6-8 and p. 62, lines 1-9.
- ⁹Sumerian Flood account in W. G. Lambert and A. R. Millard, *Atra-Hasis* (Winona Lake, IN: Eisenbrauns, 1999) 157-8, 259; Atrahasis Flood account in Lambert and Millard, *Atra-Hasis*, 2:8:34; 3:3:37; 3:5:44; Gilgamesh Flood account in Alexander Heidel, *The Gilgamesh Epic and Old Testament Parallels* (Chicago: University of Chicago, 1946), 11:133, 173.
- ¹⁰These statements and more that indicate the universality of the Flood are fully expounded in my paper, "Noah's Flood," 291-311.
- ¹¹M. E. L. Mallowan, "Noah's Flood Reconsidered," *Iraq* 26 (1964): 81.
- ¹²Mallowan, "Noah's Flood Reconsidered," 78-9; Watelin and Langdon, *Excavations at Kish IV 1925-1930* (Paris: Paul Geuthner, 1934), 7-8.
- ¹³Jack B. Rogers and Donald K. McKim, *The Authority and Interpretation of the Bible* (New York: Harper & Row, 1979), 172-9.
- ¹⁴Francis Turretin, *Institutes of Elenctic Theology* 1, trans. George M. Giger (Phillipsburg, NJ: Presbyterian & Reformed, 1992), 114-6.
- ¹⁵Francis Turretin, *Compendium Theologicæ Didactico-Elencticæ* (Amsterdam, 1695) in Edward Hitchcock, *The Religion of Geology* (Boston: Phillips, Sampson, and Company, 1854), 11-13, available at www.geology.19thcenturyscience.org/books/1851-Hitchcock-Religion-Geology/htm/01.htm When you have the web page, use Find (control F) with the word Turretin to go to the correct pages.
- ¹⁶Rogers and McKim, *The Authority and Interpretation of the Bible*, 279-89; 299-309; 344-8; Charles Hodge, *Systematic Theology* 1 (reprint, London: James Clarke & Co., 1960) section 2, F, p. 163; Archibald A. Hodge and Benjamin B. Warfield, *Inspiration* (1881; reprint, Grand Rapids: Baker, 1979), 8.
- ¹⁷Charles Hodge, *Systematic Theology* 1, 165, 169, 170; Benjamin B. Warfield, "The Real Problem of Inspiration," in *The Inspiration and Authority of the Bible* (Philadelphia: Presbyterian & Reformed, 1948), 197.
- ¹⁸Hodge and Warfield, *Inspiration*, 14.
- ¹⁹In order to show that Jesus believed in absolute inerrancy, "conservatives" have taken relevant Bible verses out of context and ignored verses to the contrary. See my *Inerrant Wisdom* (Portland, OR: Evangelical Reform, 1989), 46-136.
- ²⁰Hodge and Warfield, *Inspiration*, 26, 27; Hodge, *Systematic Theology* 1, 169.
- ²¹Hodge and Warfield, *Inspiration*, 31; Hodge, *Systematic Theology* 1, 170, 171.

Book Reviews



ENVIRONMENT

AMERICA'S ENVIRONMENTAL REPORT CARD: Are We Making the Grade? by Harvey Blatt. Cambridge, MA: The MIT Press, 2005. 272 pages, notes, index. Paperback; \$27.95. ISBN: 0262025728.

Blatt, who taught at the University of Houston and the University of Oklahoma for many years, is the author of six textbooks. Currently he is a professor of geology at the Institute of Earth Sciences at Hebrew University of Jerusalem in Israel.

This book focuses on the environmental issues that polls show are most important to Americans today. Water issues are analyzed in the first two chapters of the book. The first chapter deals with water shortages in the western portion of the United States, and the second chapter summarizes flooding problems in other locations. Garbage production and disposal is the subject of chapter three while chapter four provides an overview of soil and agricultural issues. Energy resources are covered in chapter five and the next three chapters deal with air quality issues (global warming, air pollution, and ozone depletion). Chapter nine, the longest chapter in the book, is concerned with the problems associated with nuclear energy and the storage of its radioactive byproducts. The book concludes with a chapter in which the author tries to chart a realistic path to a sustainable future, one with enough water, clean and abundant soil, clean sources of energy, a stable climate, and pollution-free air.

The topics discussed are presented in a manner that is accessible to all readers. Numerous charts and graphs are included and entertaining anecdotes are sprinkled throughout the text. Citations are provided in each chapter so the reader can check the author's statements against statements made by professionals in each field. Additional readings relevant to each topic are listed at the end of the book. While a number of statistics are included, they are presented in a way that does not detract from the flow of the text. Many of these mind-boggling statistics not only provide support for the author's arguments, but they also enable the reader to better appreciate the magnitude of our nation's environmental problems. However, the book is much more than "gloom and doom" statistics with supporting text. The emphasis throughout the book is on workable and reasonable solutions that map out the course to a sustainable future.

America's Environmental Report Card is an excellent environmental science primer for the general reader. It could also be used as a supplementary textbook in an undergraduate environmental science course. Blatt is to be commended for writing a book that presents our country's environmental problems in a readable manner. The book offers a number of practical solutions to some of our more pressing environmental questions. It is a timely reminder of what we need to accomplish in order to achieve a sustainable environment.

Reviewed by J. David Holland, Biology Instructor, Benedictine University at Springfield College, 1500 N. Fifth St., Springfield, IL 62702.



ETHICS

DEFENDING ANIMAL RIGHTS by Tom Regan. Champaign, IL: University of Illinois Press, 2007. 180 pages, index. Paperback; \$20.00. ISBN: 9780252074155.

Defending Animal Rights is a collection of lectures given by Tom Regan between 1990 and 1998, and reprinted in paperback, February 2007. The book addresses a wide range of animal rights topics within the broad context of moral philosophy. Regan is a philosophy professor at North Carolina State University, and while the essays are academic in nature, all but one of them are accessible to concerned nonphilosophers. On the whole, this collection of essays is a response to Regan's critics; familiarity with his early work and other opinions on animal rights is not needed but will enrich the reading of this text. Regan's *The Case for Animal Rights* (1983) argues that nonhuman animals bear moral rights equivalent to the rights of humans. The author's conception that nonhuman animals have the right to not be harmed is the basis for his advocating animal liberation.

Of the nine chapters, only three directly confront concepts from Christianity. In his introductory chapter—an overview of the philosophical arguments relevant to animal rights—Regan insists that a Christian perspective of animal rights be classified either as despotism or stewardship. He does not make the mistake of interpreting the Hebrew word *rada*, from the Gen. 1:24–29 creation account, as meaning only dominion, but allows for its application in a context of stewardship. However, stewardship, in Regan's rigid conception of rights, necessarily leads to a position of animal abolitionism. He fails to acknowledge that Christian stewardship could inform improved practices of animal husbandry or biomedical research based on the Matt. 25:40 conception of actions unto the least of these as being done unto Christ.

Regan adopts a novel tactic in sparing biomedical science. He applies none of the criticisms to Christianity's role in subjugating animals for human use. The sixth chapter, "Patterns of Resistance," chronicles several instances in American history where groups of humans were subjugated because of presumptions of lesser rights—presumptions supported by quotes from scientists and theologians. Regan then maps these cases onto current struggles to assure animals' rights. While he does acknowledge that "the two powerful institutions [of Christianity and science] have sometimes been on the side of the right and the good," Regan decides not to "highlight the positive role [*sic*] that Christianity and the scientific enterprise have played in moving America toward an expanded conception of the moral community." His subsequent arguments are weaker for this choice because the accounts are polarizing and divisive.

Where it is convenient to pit science against religion, Regan does so. For example, his harsh ridicule for the concept of special creation appears in "Putting People in Their Place" when he makes no allowance for divine intervention over time. "Darwinism effectively undermines the belief that human life is uniquely valuable if this belief rests on the claim that human life originated because of a special creation of God." Regan is not only selective in

his characterization of Christianity; he chooses emotion-laden moral situations and specific examples that have utility for his arguments, but may not be representative of the common situation of animal welfare. These examples include human slavery, the moral status of developmentally delayed humans, Nazi experimentation on prisoners, and carcinogen evaluation (rather than research to cures) as representative of biomedical research with animals.

Regan's expertise in animal rights and moral philosophy, combined with the advocacy roles he has assumed over the years, provide a clear presentation of a well-rehearsed animal rights position. For scholars interested in such, there is ample room to formally contest some of Regan's characterization of the Christian faith, but these individuals have probably encountered these ideas elsewhere. Individuals interested in a comprehensive introduction to animal rights topics will find *The Animal Ethics Reader* (Routledge) with its wide range of contributors (including Regan) more useful.

Reviewed by Thomas Robey, Medical and Graduate Student, 8005 Sand Point Way NE A55, Seattle, WA 98115.



GENERAL SCIENCES

10 QUESTIONS SCIENCE CAN'T ANSWER (YET) by Michael Hanlon. New York: Macmillan, 2007. 186 pages, index. Hardcover; \$24.95. ISBN: 9780230517585.

Michael Hanlon, one of Britain's most successful science writers, is science editor at the Daily Mail. In addition to writing popular science books, he contributes regularly to magazines and appears on TV and radio as a science pundit.

Writing the book on questions science cannot answer has given Hanlon the opportunity to write brief accounts of a wide range of topics without having to show any connection between them. His introductions to the various topics are designed to capture the reader's interest, and then these are followed by discussion of the present state of investigation in the area.

The author's starting point is a quote from Lord Kelvin in 1900 that there was nothing new to be discovered in physics, an opinion which, of course, we now know was spectacularly false. Hanlon goes on to discuss a number of questions in physics and other sciences that remain open today. Although most of them have been subjects of interest for many millennia, the question about dark matter and dark energy could not have been posed until very recently.

One chapter asks whether the human race is the only species that is self-aware. Another questions how to understand the nature of time, a concept so different from other concepts in physics since, for example, it is not symmetric. Some other questions are how to stop the aging process, whether there is life elsewhere in the universe, and the question of continuity of identity, i.e., what it is that makes me the same person even as the material in my body is being replaced by other matter.

Some questions suggest the need for public policy decisions in addressing certain problems. For example, the question is raised as to what should be done about

people of below-average intelligence who are becoming increasingly unemployable in our highly technological society. Another is understanding the causes of and cures for obesity and how it affects health.

The penultimate chapter deals with the author's desire to disprove the paranormal, and the final chapter asks why anything exists at all. This would seem to be a philosophical rather than a scientific question, but it gives Hanlon the opportunity to discuss cosmology, including the concept of a multiverse.

Michael Hanlon is a very skillful writer. His chapter introductions capture the reader's interest immediately, and he manages to maintain it throughout. However, the chapters are too short to fully satisfy a reader who has an intense interest in the particular topic, but they may whet the appetite of a scientifically minded reader for further reading on some of these topics.

ASA members should take exception to some of Hanlon's remarks. For example, he says that he hates all religions and that science rejects the idea of a soul. Nevertheless, ASA members who are interested in the current state of affairs in a variety of scientific disciplines without going into them too deeply may profit from this book by coming away better informed about up-to-date developments in a variety of areas.

Reviewed by Gordon Brown, 1220 NW State St. #28, Pullman, WA 99163.



HISTORY OF SCIENCE

SCIENCE AND ISLAM by Muzaffar Iqbal. Westport, CT: Greenwood Press, 2007. 209 pages plus annotated bibliography and index. Hardcover; \$65.00. ISBN: 9780313335761.

This is an encyclopedic survey of the field written by the president of the Center for Islam and Science in Canada. His previous books include *Islam and Science* (2002) and *God, Life, and the Cosmos: Christian and Islamic Perspectives* (2002). Iqbal is extremely well versed on the subject being both an Islamic scholar as well as a trained scientist.

The volume is evenly divided between chapters that survey the development of science from the beginning of Islam through the sixteenth century and chapters that deal with the philosophical foundations which continue to guide Islamic science up to the present. Of special interest are sections that detail the debates between Islamic and western scientists in the nineteenth and twentieth centuries.

Initially, I must admit that I often questioned my appropriateness in reviewing this volume. While I am fairly well informed about the history and nature of science in western (particularly Christian) culture, overall I found myself knowing little about Islam in general or science within Islam in particular. This was tough reading—neither the names nor the locales made much sense to me. Perhaps a cross-cultural historian of science would have been a more appropriate reviewer. However, any presumption that, through all centuries and across all sub-disciplines, science has not been alive and well in Islam would be incorrect. Nevertheless, I do feel able to

comment on the difference in presumptions that guide western science as compared to those in Islam that the author details so well.

Cartographers, biologists, astronomers, mathematicians, chemists, geologists, geographers, agronomists, to name only a few—all flourished in Islamic culture from the very beginning of the faith. Their accomplishments have been acknowledged by the introduction of Aristotle, etc., into Spain by the Moors—a remarkable event that sparked the reconstruction of Christian theological thinking by Saint Thomas Aquinas. Science was never discouraged although it always functioned under one overarching conviction that we know in the modern world as *theocracy*. Culture and religion were one—by intention. Science served a basic worldview that controlled every aspect of culture. The distinctions we know today between private religious faith and secular culture coupled with the freedom of religion simply have never existed. However, it should be noted that the Dark Middle Ages following Constantine in the west were controlled by Christian convictions that actually discouraged the scientific enterprise in favor of an emphasis on the afterlife.

Initially the Islamic point of view was focused on the issues of religious ritual. Astronomers, for example, determined the times of worship festivals. Geographers determined the way to face Mecca in prayer from different locales. However, the understanding of how science was to be related to faith was significantly more subtle than this. Three quotes from the volume illustrate this issue:

1. The Qur'an considers Islam to be that path and way (*din*) that corresponds to, and is in harmony with, the innate nature of all human beings, *fitrah*—the pattern on which they are created (p. 62);
2. Knowledge is *ilm* in Arabic, a word that frequently occurs in the Qur'an. Knowledge is considered meritorious; *those who know and those who do not know are not equal*, a verse in the Qur'an tells us Q. 39a;9 (pp. 64-65); and
3. ... scientific knowledge, whether furthering our understanding of the cosmos and its working or merely fulfilling the practical needs of the community, becomes a "religious" duty incumbent on the whole community (p. 65).

Iqbal gives the example of al-Khwarizmi's writing of the book that initiated the study of algebra by saying he "was fulfilling a fard'ayn for which he hoped to receive recompense from the Creator" (p. 65).

I suppose one could say that the deist and Puritan Christian scientists of the seventeenth and eighteenth centuries would agree fully with these motivations. Ian Barbour, in his well-known *Issues in Science and Religion* (New York: Harper and Row, 1966), notes that England's Royal Society stated as its goal to "study the laws of God for the alleviation of human suffering." Many members of ASA would likewise affirm similar life objectives. Nevertheless, since the rise of modern science in the Christian west (beginning with Galileo), the separation of science and religion has taken a decidedly different turn than in Islam where scientists have remained true to these convictions.

This book was not easy reading, by any means. It would probably be best read in sections by those who

seek a better understanding of this parallel development of science.

Reviewed by H. Newton Malony, Senior Professor, Graduate School of Psychology, Fuller Theological Seminary, Pasadena, CA 91100.



NATURAL SCIENCES

INTO THE COOL: Energy Flow, Thermodynamics and Life by Eric Schneider and Dorian Sagan. Chicago, IL: University of Chicago Press, 2006. 362 pages. Paperback; \$18.00. ISBN: 0226739376.

Eric Schneider has a doctorate in marine geology from Columbia University. He has worked on geophysical, chemical, and oceanographic processes of the deep sea. He worked at the US Environmental Protection Agency (EPA) as a director of science policy and later in the study of marine pollution. He has also worked as a chief scientist at the National Oceanic and Atmospheric Administration (NOAA) and as a chief scientist at other related positions. During the last ten years, he has focused on work related to this book. Dorian Sagan contributed much of the wit and humor to the book.

The book has an extensive index and bibliography and is aimed to the general reader. It does not contain a single derivative, integral, or partial differential equation. It should be understandable to most readers with a general education background in science.

The book has many strong points. First, because I am trained as a physicist and work in biotechnology, I share the author's passion for non-equilibrium thermodynamics in researching many aspects of biology. I agree that gradients are where the action is in biological systems. I enjoyed reading someone who appreciates non-equilibrium thermodynamics and sees its broad importance in understanding biological problems.

Second, I greatly appreciated that Schneider and Sagan showed some agnostic leaning on the matter of ultimate reality. I am weary of reading vulgar displays of scientism; it was refreshing to read a combination of wit and the faint hints of genuine honesty.

Third, I agreed with where the authors apply their ideas. These extend into economics and environmental issues. They also take a different angle on the origin of life. In my own research area on RNA, it is commonly asserted that the RNA world was first. Schneider and Sagan assert that metabolism came first. I think they may have a good point in saying that life is not driven by genes alone, though metabolic models also raise many questions.

The main area where I most strongly differ with the authors comes around the last chapter. There they propose for the purpose of life "that purposeful behavior and functionality as we experience it in ourselves, and observe it in other animals and organisms, is an outgrowth of non-living gradient-reducing systems" (p. 302) and "... human purpose may be a long-evolved consequence of the thermodynamic tendency to come to equilibrium" (p. 309). In other words, "purpose" seems entirely defined by gradients. Perhaps scientifically they have a point, and I appreciate that they nuance it within their writing. I can

agree that we should not think too highly of our significance. That said, I think that there needs to be more for a conscious sentient being to live on than just a gradient. Humans were not meant to live by bread alone, nor—should I think—merely by gradients.

I can certainly recommend this book to readers who are interested in understanding the relevance of non-equilibrium thermodynamics in the processes of life and the environment. Even if Schneider and Sagan have possibly erred on some major issues, the work is informative and quite thought-provoking, and it generates gradients.

Reviewed by Wayne Dawson, Research Scientist, Structural Biology Laboratory, Chiba Institute of Technology, 2-17-1 Tsudanuma, Narashino, Chiba 275-0016 Japan.

GENETICS 101 by Michael Windelspecht. Westport, CT: Greenwood Press, 2007. 195 pages, index. Hardcover; \$49.95. ISBN: 9780313333811.

The study of genetics is extraordinarily complex and broad, and it is in the forefront of technological advances in biology. The lay community often lags considerably behind in understanding the basic concepts of genetics and its human applications. *Genetics 101* is one of a series of books produced by Greenwood Press with a series title *Science 101*. The publisher has put together this book series with the conviction that individuals not in a science career will learn the basics of various scientific fields—in this case, genetics. The author, Michael Windelspecht, assistant professor of biology at Appalachian State University, has several publications explaining organ system biology for laypersons.

This book is written in a manner similar to an undergraduate textbook for genetics. The early history of genetic science is explained and then a straightforward progression through the study of genetics is explored including the history of DNA discovery, the mechanism of DNA replication (including transcription and translation), techniques of genetic study at the microbiological level, mutations and transposons, methods of genetic manipulation to study a desired effect, and genetic applications to real-world scenarios. A few misspelled words were noted which should be corrected in future editions.

The book was difficult to follow at times. For example, “Studying the Gene” (chap. 4) went into considerable detail regarding various techniques for gene identification such as electrophoresis, polymerase chain reaction, Southern blotting, and so forth. However, I think that the lay reader would be overwhelmed by the large amount of data presented. Windelspecht has attempted to help the reader by including appropriate illustrations of these techniques. However, even with these well-made illustrations, some readers will discover that this book requires a significant degree of concentration to understand. The book seems better suited for an introductory college course of genetics, rather than reading for simple enjoyment by the layperson.

Several areas of genetics that are coming to the forefront of research and clinical application are touched upon lightly in this book. Single nucleotide polymorphisms are described briefly in the context of genetic diseases,

but this topic needs to be expanded greatly. RNA interference also is mentioned in a short manner and does not go into any detail about the thousands of newly discovered RNA types that suggest Lamarckian evolution (in which changes in the environment affect an organism’s phenotypic characteristics) may be more of a reality than previously thought. For that matter, it would have been helpful for the author to discuss Charles Darwin and the theory of natural selection as a precursor to the discovery of DNA.

The multiple brief biographies of the giants of genetics contained in this book are enjoyable to read. I had not realized that Gregor Mendel published his research on pea shape and color in a well-known scientific journal of the day; I thought that his works suffered in obscurity for years. In summary, this book is very complete in its overview of genetics, but it would be helpful if discussion on some newer areas of research in this field were expanded.

Reviewed by John F. Pohl, Associate Professor of Pediatrics, Scott and White Hospital, Texas A&M Health Sciences Center, Temple, TX 76508.



ORIGINS & COSMOLOGY

SCIENCE VS. RELIGION? Intelligent Design and the Problem of Evolution by Steve Fuller. Malden, MA: Polity Press, 2007. 177 pages. Paperback; \$22.95. ISBN: 0745641225.

Be not deceived by the title. Fuller is neither an “objective” reporter on the fortunes of the intelligent design (ID) movement nor does he attempt in this book to weigh the pros and cons of ID. Rather, he writes as one convinced that Darwinism and Neo-Darwinism are no more than “rhetorical achievements” that will wither in the twenty-first century as did Marxism in the twentieth. In seeking to “balance the ledger between evolution and ID” (p. 7), the book’s five chapters discuss the “problem of evolution” historically, ideologically, and in terms of complexity theory, the legal issues, and “Life after Darwinism.”

Fuller is a historian, philosopher, and sociologist of science who has held full professorships at the Universities of Durham and, most recently, Warwick. As founding editor of the journal *Social Epistemology* (1987), he has long argued that the major epistemological problem of science is not the question of how we can know what is true, but how the many different scientific interpretations emerge out of common scientific practices. This central question is interwoven throughout the over ten substantive volumes (excluding edited books) he has written in the last twenty years. Fuller’s own proposals are creative efforts to think through the issues in critical dialogue with Kuhnians and Popperians on the left and right.

It is precisely because of Fuller’s conviction that the practices of science open up to a wider range of interpretations rather than leading incontrovertibly to either methodological or metaphysical naturalism that he was called in as an expert defense witness in the recent *Kitzmiller v. Dover Area School District* trial. Although judgment was rendered against the school district’s quest to include an ID textbook as part of the science curriculum on the grounds that ID was religion, not science, Fuller’s testimony was that the history of religion and science have

Book Reviews

been intertwined since the inception of the latter. Only in the last century have scientific hypotheses derived from religious commitments found confirmation, and the latter then have been called upon to conclude toward a naturalism that rejected the premises upon which the hypotheses were originally based.

Science Vs. Religion can be understood as Fuller's *apologia* for his participation in the Dover trial. He argues not only that the Establishment Clause has been transformed into an ideology that institutionalizes atheism, but also that methodological naturalism is "a pseudo-philosophy tailor-made to counteract a perceived pseudo-science" (p. 117). Further, Fuller suggests that the current anti-ID animus parallels the anti-communist McCarthyism of the Cold War era; that Darwin's natural selection should itself be understood as a design-based mechanism; and that in the long run the use of computer simulations will bring ID and mainstream science closer together (e.g., William Dembski's notion of specified complexity overlaps with Stuart Kauffman's quest for identifying self-organizing complexity surviving at the edge of chaos). Hence design-based research does not stunt inquiry; rather, it fosters scientific discovery. In fact, Fuller urges ID theorists to reclaim the tradition stretching from Carolus Linnaeus through Georges Cuvier to Gregor Mendel—all "special creationists" whose scientific theories were inspired by their theological conviction that human beings saw themselves as made in the image of God and thus had the capacity both to understand nature and to transform it for human purposes. Fuller even anticipates that ID's future might be to push the biological sciences to re-calibrate as design-based disciplines (so that, e.g., bird flight can be studied to develop further aviation technology).

However, Fuller himself is far from a stereotypical ID advocate. A self-styled secular leftist, naturalist (who wants to naturalize or historicize naturalism), and public intellectual, his agenda is to illuminate the social practices and contexts of all scientific endeavors. At this level, he criticizes ID for reading the history of biology (rather than the Bible) too literally. All in all, then, *Science Vs. Religion* is an engaging book. It will provide fuel for Fuller's critics who have accused him of "pomo science" (postmodern science); energize ID theorists in their efforts to "widen the wedge"; and serve food for thought for those still sitting "on the fence" between ID and mainstream science. These are marks of a good book, and, for purposes of this journal, a good science story.

Reviewed by Amos Yong, Professor of Theology, Regent University School of Divinity, Virginia Beach, VA 23464.

THE WONDERFUL ADVENTURES OF NAT SELLECK AND EVA LOU SHINN IN SCI FI LAND: A Spoof on Evolution and Natural Selection by A. Nonymous. Claremont, CA: Paige Press, 2007. 85 pages. Paperback; \$14.95. ISBN: 1930053525.

I am an avid fan of National Public Radio's long-running program "Car Talk." In particular, I always get a chuckle at the end of the show when the hosts acknowledge their "staff" in a fanciful series of word plays—thanking, for instance, their chauffeur Peekup N. Dropov and their attorneys Dewey, Cheatum, and Howe. So I became

understandably intrigued when a recent ASA book review list included a short tome by an author adopting the pseudonym A. Nonymous, and whose title introduces characters named *Nat Selleck* and *Eva Lou Shinn*. In fact, my interest was sufficiently piqued to cause me to offer to prepare the following review.

This work resembles a Greek mythology in which the central characters Nat and Eva, both illegitimate children of Manatura, strive to overcome their checkered parentage. Their goal is to achieve divinity and take their rightful place among the panoply of the gods. As the story unfolds, we are treated to a whimsical history of the development of evolutionary theory. Along the way, we meet many of the major and minor players (all under humorous pseudonyms, of course) in the development of the theory and some of the disciplines (e.g., evolutionary psychology) derived from it. The author is playful in his or her rendering of the subject matter, though there clearly is an undercurrent of sarcasm that suggests the author is unsympathetic to the central tenets of evolution. Defenders of Lord Trewgott (some of our more conservative brethren may cringe at this pseudonym), in their several different forms (e.g., ID), are also represented. By story's end there are several different philosophical camps all claiming to be *THE TRUE WAY*. In a delicious twist that (unintentionally, I think) appears to reject all of them, a voice from heaven inquires, "Where were you when I laid the foundations of the earth ..." (Job 38:4).

This book offers no new information in the seemingly endless debate regarding how the world we see today came into being. It does, however, present the topic in a fresh and original manner that lacks much of the polemics that often attends such discussions. Not only is the style different, but readers are presented with the task of deciphering the pseudonyms that represent the various historical figures that have contributed to the topic. Many are readily recognizable, but a few forced me to sneak a peak at the "cast of characters" in the back of the book. By no means would I consider this book a must-have for most ASAers. But, if you are interested in a short, lighthearted, fanciful read, then this book is worth the asking price.

Reviewed by F. Allen Dray Jr., U.S. Department of Agriculture, Agricultural Research Service, Fort Lauderdale, FL 33314.



PHILOSOPHY & THEOLOGY

THE ATHEIST'S BIBLE: An Illustrious Collection of Irreverent Thoughts by Joan Konner, ed. Los Angeles: HarperCollins Publishers, 2007. 195 pages. Hardcover; \$16.95. ISBN: 9780061349157.

Ernest Hemingway is quoted in this book as saying "All thinking men are atheists." Interesting, since a *Newsweek* poll revealed that only three percent of respondents called themselves atheists and only thirty percent said they would ever vote for an atheist. Based on this statistic, it might be falsely concluded that the USA is mainly run by nonthinking theists.

Nevertheless, while books on theism far outnumber books on atheism, recently atheists have produced some bestsellers. These include books by Richard Dawkins

(*The God Delusion*), Sam Harris (*The End of Faith; Letter to a Christian Nation*), and Christopher Hitchens (*God Is Not Great*). Daniel C. Dennett has argued that religion is a fit subject for scrutiny (*Breaking the Spell: Religion as a Natural Phenomenon*).

Konner has conceived and edited a book of quotations from a variety of sources which question the wisdom of religion and faith in God. Quoted are philosophers, political thinkers, writers, scientists, and humorists. For good measure, she even includes some quotes from the *Holy Bible* (falsely attributing Hebrews to Paul). The quotes are divided into thirty-three chapters. The three that might interest readers of *PSCF* are "The Book of Reason," "Scientosophy," and "Book of Truth."

These books and thoughts have been analyzed by a variety of apologists and theodists. Perhaps one of the most well known is Alister McGrath who has written two books which evaluate Dawkins' thoughts (*Dawkins' God; The Dawkins Delusion?*). If you appreciate mental gymnastics, *The Atheist's Bible* may provide some mental morsels with which to combat!

Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.

SCIENCE AND THE AKASHIC FIELD: An Integral Theory of Everything by Ervin Laszlo. Updated 2d ed. Rochester, VT: Inner Traditions, 2007. 194 pages. Paperback; \$14.95. ISBN: 1594771812.

Over the last four decades, Ervin Laszlo has led the vanguard of work on systems theory and futures theory. His commitment to uncover the connections between the various systems that constitute our world—from the micro- (subatomic) to the macro- (cosmic) domains—has led him inexorably to the search for what in this book is subtitled "an integral theory of everything" (ITOE). With mixed reports coming from (on the one side) cosmologists, many of whom are skeptical about theory-of-everything (TOE) projects, and (on the other side) string theorists, the currently more optimistic bunch about the success of TOE research, what might a systems and futures theorist contribute to the discussion?

One major idea "in-forms" Laszlo's version of TOE, which, as already indicated, he calls "integral": the notion of the coherence of nature at and between its many levels such that what emerges is a thoroughly interconnected world. This is "in-formation": "a subtle, quasi-instant, non-evanescent and non-energetic connection between things at different locations in space and events at different points in time" (p. 68) that is seen in nonlocality at the quantum level (among other quantum phenomena); feedback loops (within organisms, between organisms, and between organisms and their environments) at the level of evolutionary biology; transpersonal, psi, and synchronicity phenomena at the level of consciousness; and the fine-tuning constants at the level of cosmology, among other evidence that Laszlo summarizes in this volume. This interconnectivity is possible, he suggests, because each of these domains is "linked" via the Akashic- or A-field (from the Sanskrit Akasha, which refers originally to what embraced the five fundamental elements of the world), the cosmic plenum from which all things

have emerged and into which all things will ultimately re-converge.

This second edition of *Science and the Akashic Field* updates the science published in the first version (2004), and presents (what Laszlo believes is) a more mature statement of the ITOE. It does present some viable alternatives to some scientific problems—e.g., that since random and chance mutations cannot by themselves account for the emergence of complexity that we have observed within the time constraints of our cosmos, there must be other factors at work, with the result that an organism integrated with its milieu is "designed for evolution" (p. 90). However, Laszlo's ITOE probably goes too far too fast for most scientists—e.g., that it leads to what a previous generation of speculative cosmologists has called the "oscillating" or cyclic universe. But Laszlo goes further and says that our universe is part of a larger "metaverse," with the many (even infinite number of) "universes" successively emerging. With bold optimism, he suggests that each world is more complex than the previous version precisely because of the "in-formation" bequeathed to the new one through its process of coming into being via the quantum vacuum (or plenum).

Last but not least, as befitting an ITOE, Laszlo proffers answers to the "big questions" of whence (we come from), what (we are), and whither (we are headed), and in doing so not only steps beyond science into metaphysics, but even beyond classical metaphysics and traditional religion into what can only be called a scientifically repacked mythology. While he makes religious arguments—he prefers to present a poem of the Akashic vision—in the end, his proposals will probably be seen by Christians (and Christians who are scientists) to be too easily compatible with some versions of contemporary Hindu or Buddhist cosmologies (e.g., like that of the current Dalai Lama).

To be fair, this book is said to be a more accessible version of previous academic works such as *The Interconnected Universe: Conceptual Foundations of Transdisciplinary Unified Theory* (World Scientific, 1995); *The Creative Cosmos: A Unified Science of Matter, Life and Mind* (Florin, 1996); and, especially, *The Connectivity Hypothesis: Foundations of an Integral Science of Quantum, Cosmos, Life, and Consciousness* (SUNY Press, 2003): readers may have to consult the science of those volumes in order to draw final conclusions about Laszlo's hypothesis. But while there is no denying Laszlo's overall contributions, it may turn out that his more recent proposals are neither serious science nor viable theology. Only time will tell if Ervin Laszlo is a prophet or an unsuccessful reformer of an ancient Eastern cosmology.

Reviewed by Amos Yong, Professor of Theology, Regent University School of Divinity, Virginia Beach, VA 23464.

THE RE-EMERGENCE OF EMERGENCE: The Emergentist Hypothesis from Science to Religion by Philip Clayton and Paul Davies, eds. Oxford: Oxford University Press, 2006. 330 pages, index. Hardcover; \$99.00. ISBN: 0199287147.

C. S. Lewis, in his 1943 novel *Perelandra*, ably demonstrated the reductionism, pretended autonomy, and poverty of

naturalistic emergence, which the villain Weston pronounces:

I could admit no break, no discontinuity, in the unfolding of the cosmic process. I became a convinced believer in emergent evolution. All is one. The stuff of mind, the unconsciously purposive dynamism, is present from the very beginning ... The majestic spectacle of this blind, inarticulate purposiveness thrusting its way upward and ever upward in an endless unity of differentiated achievements towards an ever-increasing complexity of organisation, towards spontaneity and spirituality ... spirit—mind—freedom—spontaneity ... That is the goal towards which the whole cosmic process is moving ... *Pure spirit: the final vortex of self-thinking, self-originating activity* ... (Pp. 90–2)

“Emergence” has again become popular in some sciences and in the science-and-religion field, while its meaning and applicability remain enigmatic. This collection of essays by thirteen scholars does not provide definitive answers, but serves well as an advanced primer. The volume is edited by Philip Clayton, philosophy and religion professor at Claremont and author of several science-and-religion monographs, and Paul Davies, well-known physicist and popular author. While not giving much guidance for the required Christian response to the developing claims of emergence, reading this book helps us see the issues.

The ancients observed that the whole is more than the sum of its parts. Much of emergence theory relates to whether and how the brain “gives rise to” the mind. This issue is placed into a wider consideration of the general relations between complex systems and their lower-level constituents, via topics including the connection between classical and quantum physics, bonobo ape behavior and environment, and life chemistry. Clayton’s excellent summary/conclusion suggests a system being emergent means “it is explanatorily, causally, and hence ontologically irreducible to the systems out of which it has evolved” (p. 310); however, “constituted” (instead of “evolved”) would better reflect the observation made most clearly in the essay by George Ellis—among seven incisive theses—that emergence has both diachronic (developmental over the time frame of an individual, or of a species) and synchronic (in terms of present functioning) senses.

After a preface by Davies, the book is organized—between Clayton’s introductory conceptual foundations and his summary/conclusion—into four sections. Physicists Davies, Erich Joos, and Ellis discuss the physical relevance of emergence; Anthropologist Terrence Deacon, Biologist Lynn Rothschild, and Social Psychologist Barbara Smuts consider biology; Philosophers Jaegwon Kim, Michael Silberstein, Nancey Murphy (also a theologian), and David Chalmers discuss consciousness; Scientist/Theologian Arthur Peacocke and Theologian Niels Gregersen ponder religion. Several authors cite each other, and most first overview emergence generally, showing the variety of current positions. Each contribution has its own list of references, but the principal sources could have been collected.

From a Christian perspective, the book has a number of problems. When writing “Emergentists take the position

that brains ... really can be conscious ... while no individual neuron is” (p. x), Davies should have noted the person, not the brain, as being conscious. Also, it cannot be that “minds may ‘contemplate’ and ‘enjoy’” (Clayton, p. 22); rather, persons do, as seen in the integral nature of personhood found in biblical anthropology. Similarly, Ellis writes “non-physical quantities such as information and goals can have physical effect in the world of particles and forces and hence must be recognized as having a real existence” (p. 104), while the person (or group) possessing the goal has the effect. And since goals actually do exist, having effects on particles cannot be a criterion for reality. I also would point out that information and goals are not “non-physical,” since (following Reformed Christian Philosopher Herman Dooyeweerd) everything (including goals) within created reality has a physical aspect which coheres with the other aspects (lingual, ethical, social, etc.). However, Silberstein’s “enactive (embodied plus embedded) paradigm of consciousness and cognition” (p. 208) and Peacocke’s “joint operation” (p. 269) across levels, make significant progress in rectifying the reductionism found in top-down causation and in the individualism intrinsic to several modern theories of mind as well as the compositional materialism found in “non-reductive physicalism.”

Finally, Alexander’s notion that the “universe may become ... divine” (Clayton, p. 25) is not challenged, short shrift is given to any notion of intelligent design, and much of the book assumes a thoroughly naturalistic perspective.

Reviewed by Arnold E. Sikkema, Associate Professor of Physics, Trinity Western University, Langley, BC V2Y 1Y1.

ALL THAT IS: A Naturalistic Faith for the Twenty-First Century by Arthur Peacocke, edited by Philip Clayton. Minneapolis, MN: Fortress Press, 2007. 219 + xvi pages. Paperback; \$22.00. ISBN: 9780800662271.

This is a somewhat unconventional *Festschrift* for Arthur Peacocke. A book in that genre usually contains essays by those in the honoree’s field that deal with ways in which his or her work has been important. Here the essayists do not just celebrate the writings of this biochemist and theologian but respond to the final statement of his views on religion and science in an essay that forms the first part of the book.

And it is a final statement. A *Festschrift* is often assembled for the retirement or a significant birthday of the person whose work is celebrated. This one is composed in view of his approaching death from cancer. The concluding *Nunc Dimittis* by the dying scientist and priest of the Church of England is a moving reminder of this context.

Peacocke’s work, which won him a Templeton Prize, is an important part of the modern science-theology dialogue, but the book’s subtitle indicates that it seeks more than a conversation of theology with science. The search for a “naturalistic faith” means that theology is to be formulated in accord with a philosophical view, “naturalism,” which may be suggested by, but is not identical with, “science.” Just what that philosophical view is or should be is a major issue that is discussed by Peacocke and some of the responders.

Peacocke presents a distinctively Christian view but begins with a more general theistic one. His understanding of God and the world is described by the acronym ENP—emergentist, naturalistic, and panentheistic. The idea of emergence is relatively straightforward: More complex entities in the world develop from simpler ones without the need to invoke entities or forces beyond the world. Naturalism and panentheism are more controversial terms.

Panentheism is, Peacocke says, an “admittedly inelegant term for the belief that the Being of God includes and penetrates the whole universe, so that every part of it exists in God and (as against pantheism) that God’s Being is more than, and is not exhausted by, the universe” (p. 22). He quotes Augustine’s image of creation as a finite sponge immersed in and pervaded by an infinite ocean to illustrate this. There is divine transcendence, for God is “Ultimate Reality and Creator” (p. 23), but divine immanence must be given special emphasis.

It is clear then that “naturalism” in this context will not mean that there is nothing beyond the natural world. Peacocke’s “theistic naturalism” holds that what happens in the world can be explained in terms of natural forces *and* that God works through those forces. It is thus a strong form of methodological naturalism. Not only is scientific investigation limited to natural processes, but we need not invoke other processes or forces to explain what takes place.

Peacocke argued that we should start with First Article considerations before Christology. This is a fairly common idea in religion-science discussions but it should not go without challenge. Justifying it with the claim that “one would expect the created world to reflect in its very nature the purposes of God” (p. 6) leads all too easily to the idea that it is nature, not Jesus Christ, which is the fullest revelation of God. And when the move to Christology is made in chapter 6, we can ask whether the divinity of Christ is given adequate expression.

It is not even clear that this approach presents as persuasively as possible the type of view of the God-world relationship that Peacocke wants. Strong arguments for elements of a naturalistic view, such as divine kenosis, have their basis in Christology. For this and other reasons, it is better to begin with the belief that the character and purposes of God are revealed in Christ, and then to move to creation.

Peacocke’s emphasis on the sacramental dimension of Christianity is welcome. That, as well as his use of other elements of the church’s liturgy, remind us of the old principle, *lex orandi lex credendi*: theology must be coherent with worship. This rule is too often neglected in religion-science discussions. But the treatment of sacraments needs to be completed by giving adequate attention to their salvific dimension. Chapter 8 is devoted to the Eucharist but we miss here any reference to the words “for the forgiveness of sins.” Concepts of sin and atonement are not dealt with explicitly, and most of the responders who mention them at all do so rather negatively.

The initial essay is followed by responses from ten workers in the field, and then by Peacocke’s reflections on them. The responses are both appreciative and critical, and call both for more radical departure from the Chris-

tian tradition and for closer adherence to it. Willem B. Drees asks, for example, why a naturalistic account should give traditions about Jesus of Nazareth a privileged place. On the other hand, Keith Ward’s more conservative critique is not that Peacocke’s basic ideas are wrong but that they can be understood in ways not as far removed from traditional Christianity as they may at first appear.

Not surprisingly, several of the responders discuss aspects of divine action in Peacocke’s program. In particular, the question of miracles seems to require more adequate treatment than he has given. Christopher C. Knight emphasizes insights of the Eastern Orthodox tradition and is able to insist upon an understanding of the God-world relationship which is naturalistic and at the same time is “open to the possibility that there do occur phenomena of the kind usually deemed miraculous” (p. 91).

Peacocke’s 1971 *Science and the Christian Experiment* was one of the books which initiated the modern science-theology dialogue and his *Theology for a Scientific Age*, first published in 1990, is an important contribution to it. His work is responsible in no small part for establishing “religion and science” as a recognized field of study. Philip Clayton, who edited this book and wrote one of the responses, as well as the other writers who participated in the project, are to be thanked for helping to produce a fitting conclusion to the life work of a dedicated Christian scholar.

Reviewed by George L. Murphy, St. Paul’s Episcopal Church, 1361 W. Market St., Akron, OH 44313.

NOT IN HIS IMAGE: Gnostic Vision, Sacred Ecology, and the Future of Belief by John Lamb Lash. White River Junction, VT: Chelsea Green Publishing, 2006. xix + 441 pages, index. Paperback; \$21.95. ISBN: 193149892X.

The author (born 1945), who lives in Europe, has written a number of books, including *The Hero—Manhood and Power*. His biography does not mention his education or professional qualifications. He is principal author of www.metahistory.org, a project funded by the Marion Institute, Marion, Massachusetts.

This book’s twenty-six chapters are grouped into four parts: how Gnosticism was suppressed, what Gnosticism is, the bad effects of its suppression, and the benefits its revival could bring. A picture ornaments the first page of each part. The book continues with an Afterword in which another writer, Derrick Jensen, lavishes praise on what Lash has accomplished, particularly in showing the evil nature of Christianity. Lash then provides 324 notes referred to in the text; next a glossary of unfamiliar terms and familiar ones used with modified, mystical meanings; and finally suggestions for further readings. Although the index has over six hundred entries, several times it did not lead me to a topic I wanted to find again.

Lash opens dramatically with the murder in AD 415 by a mob, urged on by fanatical Christian Peter the Reader, of kind and elegant Hypatia, a wise teacher of the knowledge cultivated by the Gnostics and the adepts of the Mysteries. This deed is but one of many wrongs perpetrated by humans deceived by sinister Christianity, which with Judaism and Islam, constitutes “*salvationism*: the totalitarian belief system that asserts divine intercession in human

Book Reviews

history, and imbues suffering with redemptive value ... assumes superhuman rescue of humanity from its problems and off-planet, remote-control authority on morals, and divine retribution." Those harmed and betrayed by this patriarchal system often succumb to the "insidious tendency" to become "emotionally attached and morally identified with those who harm and betray them," so that some victims become perpetrators in their own right. This *victim-perpetrator bond* is the "primary cause of the European genocide of the Americas." "Human nature is essentially good ... we need no exhortation or off-planet moral commandments to make us take care of each other and the earth."

Far from being a movement arising within Christianity, authentic Gnosticism was diametrically opposed to it, and early Christians ruthlessly destroyed Gnostic writings. Using the fragmentary materials that have survived, Lash has imaginatively reconstructed the myth of Sophia, originally a divinity with the Godhead at the galactic center, who "absorbs herself in *dreaming*, the cosmic process of emanation," and plunges outward, then "morphs into terrestrial form, becoming a planet herself, but an organic one, sentient and aware: the earth." Additional events in this myth account for the origin of evil and the emergence of humanity. Closely related is "*Gaia theory* ... loosely, the understanding that the earth is a living, sentient super-organism ..." No brief summary is possible of all the complex ideas Lash presents, into which he weaves concepts from science in bizarre ways: "variable 20–22-base systems such as the Celtic tree alphabet may be ... significant in indicating that the ancients had direct knowledge of the structure of life down to the molecular level"; "the organs and generic form of the human body are built in a creative programmatic manner by the organizing power of the sun."

This lengthy book was tedious to read. I noticed several errors or misstatements which lessen its overall credibility. The book is an indication that the spiritual side of our lives are important, and that Christians need to live so as to make our Christian faith attractive. Both Lash and Jensen testify to being raised in Christian homes and becoming alienated. Readers may be sensitized to real problems. One is mistreatment of aboriginal peoples by churches, currently an issue in Canada with regard to residential schools. Another is the environmental crisis; while Christians seek a remedy in the context of faith, Lash asserts that Christianity is the problem: "Every reversion to redeemer theology and the ethics of Jesus undermines the quest for sacred ecology." Nevertheless, because twenty-first century Christianity is threatened much more by secular humanism than by the arcane mythology Lash offers, I believe ASA members will have little reason to read this book.

Reviewed by Charles E. Chaffey, Adjunct Professor of Natural Science, Tyndale University College, Toronto, ON, Canada M2M 4B3.



RELIGION & BIBLICAL STUDIES

IN THE NAME OF HEAVEN: 3000 Years of Religious Persecution by Mary Jane Engh. Amherst, NY: Prometheus Books, 2006. 235 pages, index. Hardcover, \$25.00. ISBN: 1591024544.

Many opponents of religion claim that violence and oppression are the characteristics of this distinctive human activity, not the love and peace that we so often assume. Novelist and poet Mary Jane Engh makes a fair case that they are correct, based on a survey of twenty-two cases of religious persecution across the millennia and around the world. It is impossible to browse her vignettes and come away unimpressed by the inventiveness, persistence, and relative pettiness of persecution in all its myriad forms. However, the subject is still waiting for a more definitive treatment than this ultimately disappointing cook's tour through too much diversity squeezed into too few boxes, valuable primarily for its pointers to quality treatments in each chapter's suggested readings.

Engh acknowledges in her introduction that the topic of religious persecution is dauntingly large: "A long view that covers three thousand years and six continents can only be superficial and incomplete, but it is the best way to get the subject into perspective." For unknown reasons, that long view has been compressed into chapters that are ten to twelve pages long, resulting in a slim volume of just over two hundred pages. Each chapter begins with a brief—sometimes no more than a paragraph—tableau that sets the persecution in a particular time and place. And as long as Engh is discussing instances of persecution that are relatively contained in time and space, such as the centralization of Yahweh-worship under King Josiah of Judah, the crackdown on the Bacchanalia in second-century BC Rome, or the monotheistic reforms of Akhenaten in Egypt, the strategy works relatively well. The reader is drawn into the situation by a quick sketch of characters and plot, much like the opening of a short story. The historical information that follows in the rest of the chapter sets the sad situation into context and leaves varied impressions of mania, paranoia, political opportunism, fanaticism, and wasted lives and energies.

After only a few chapters, however, Engh finds herself overwhelmed by information. No longer is she discussing periods of decades, but centuries. How can the bewilderingly rapid changes of fortune for Christians in the second through fourth centuries AD be conveyed in a few pages? And is the task likely to be easier when subsequent chapters try to cover five centuries of the whirlwind of Byzantine peoples, or 1300 years of missions and resistance in China and Japan considered together, in just eight pages? The chapters become crowded litanies of kings, emperors, sects, and martyrs that arise and are dismissed in the space of a sentence or two. Complex shifts in power, origins of doctrines and movements, and frictions between ethnic, language, and political groups are necessarily simplified until they are reduced to names and slogans. Such a treatment does not give us a long view, nor does it offer perspective. Instead, the details of history that might provide some information about why persecution recurs so predictably and how it overwhelms the moral teachings of the religions involved are lost. The only message that survives is that persecution is constant and inevitable. Yet Engh's breezy, drive-by approach suggests that she views her mission as cautionary and consciousness-raising. Such a purpose requires a much heavier volume, and perhaps a comparative approach.

Despite its misguided format, however, selected chapters would serve well to start undergraduate or lay

research into specific historical periods. Engh has excellent taste in her sources, and the paragraph or two of further readings discussed at the end of each chapter are worth their weight in gold. Indeed, the relative poverty of detail, description, and analysis in most of the chapters will whet readers' interest in accessible scholarly treatments of the kind she uniformly recommends. *In the Name of Heaven*, for all its promise as a popular introduction to a diverse and fascinating history, stands instead as a failed opportunity caused by unfortunate decisions about length and scope.

Reviewed by Donna Bowman, Associate Professor of Religious Studies, Honors College, University of Central Arkansas, Conway, AR 72035.

CAN GOD INTERVENE? How Religion Explains Natural Disasters by Gary Stern. Westport, CT: Praeger, 2007. x + 229 pages. Paperback; \$39.95. ISBN: 0275989585.

This first book of an award-winning journalist pursues the explicitly theological question announced in the title. Motivated by the tsunami of December 2004 and the experience of hurricane Katrina the following year, the bulk of the volume—nine of the eleven chapters—is devoted to representing the spectrum of theological and religious views regarding what philosophers call “natural evil” in Judaism, Roman Catholicism, mainline Protestantism, Evangelicalism, African-American Christianity, Islam, Hinduism, Buddhism, and what Stern calls “The Nonbeliever’s Perspective,” which includes secular humanists, agnostics, and atheists. (The justification provided for having four chapters on Christian traditions is that the book is intended for the North American audience.) In each of these chapters, Stern presents in narrative form his findings derived from interviews with at least three representatives—scholars, intellectuals, and other leaders—of the tradition under consideration (forty-three in all, for whom a bibliography of their works would have been helpful). He adequately summarizes their responses, often transcribing, sometimes in fairly lengthy sections, their own words.

Religion scholars will find little new in this book in terms of answers to either the theodicy question (how can natural evil be possible given an omnibenevolent and omnipotent God) or the question of how those in various religious (and secular) traditions respond practically and existentially to natural disasters. But then again, Stern is not writing to the intellectual elite or to theologians. Yet educated laypeople, including scientists with religious interests, will find this volume to be an accessible, stimulating, informative, and even absorbing read. Stern has done his homework to ensure that the diversity of views within each tradition is included. To take just two examples with which readers of this journal may most readily identify, the chapter on Mainline Protestantism includes positions emphasizing relief work over speculative theodicies, highlighting God’s entering into human suffering through the cross of Christ, and rejecting notions of an interventionist God, among other views, while the chapter on evangelical Christianity describes accounts referring to traditional theological explanations regarding the Fall, using the experience of natural evil as a springboard to introduce the gospel, and revising traditional notions of divine power to take into account the interplay

of chance and natural law in the outworkings of the world. Throughout, Stern is fair and respectful, honest about his own questions as well as with regard to the responses of his interviewees, and helpful in making comparisons and contrasts across traditions.

The question “Can God Intervene?” may be of interest to those working at the interface of science and Christian faith primarily in light of Stern’s introducing specifically scientific perspectives on natural disasters in the first chapter. Modern science is increasingly capable of explaining the natural causes of tsunamis, hurricanes, and other such phenomena. How have such accounts impacted, if at all, theological and religious explanations? The most obvious response, one reflected in different ways across the book, is that rather than referring to such events as “acts of God” directed to people (for whatever reason, whether as punishment for sin or as instruments for testing faithfulness, etc.), human beings should instead take more responsibility, given our scientific capabilities and knowledge, for where we live (i.e., not below sea level in hurricane areas), how we live (i.e., in building better levees or constructing better warning systems), and how we might respond to nature’s behaviors. In the case of one interviewee, the Reverend George Coyne (astronomer and director of the Vatican Observatory), science is seen as confirming and deepening rather than detracting from religious piety or theological explanations, while in the case of another, Ibrahim B. Syed (a Muslim professor of medicine), natural disasters are “systems of entropy” designed by God to govern the world.

Of course, Stern is neither capable of formulating nor does he set out to present a developed account of how scientific and theological approaches may converge to provide complementary explanations for natural disasters. Yet those familiar with the “Divine Action Project” will observe that the positions across the spectrum in that discussion correlate in many ways to the range of viewpoints appearing within theistic traditions in this volume. In this sense, *Can God Intervene?* narrows the gap sometimes thought to exist between academic theology and beliefs in the public sphere.

Reviewed by Amos Yong, Professor of Theology, Regent University School of Divinity, Virginia Beach, VA 23464.

RETHINKING CHRIST AND CULTURE: A Post-Christendom Perspective by Craig A. Carter. Grand Rapids, MI: Brazos Press, 2006. 220 pages. Paperback; \$19.99. ISBN: 1587431599.

Craig Carter’s *Rethinking Christ and Culture* is important, prophetic, and frustrating. Carter’s central thesis is that H. Richard Niebuhr’s canonical *Christ and Culture* presents a warped typology of Christian cultural engagement. The problem with Niebuhr’s typology, Carter argues, is that each of Niebuhr’s types arises from a “Christendom” perspective. Niebuhr’s typology assumes that Church and state are co-equal in the process of cultural construction—whether as sparring partners, as in the “Christ Against Culture” type, or as dialogue partners, as in the “Christ Transforming Culture” type. The “Christendom” mentality, Carter claims, dates back to the Western Church’s

Book Reviews

alliance with political power forged at the time of Constantine.

Carter suggests that the “Christendom” perspective is misguided, even idolatrous, because it causes the church to participate in violence. Drawing on Stanley Hauerwas and John Howard Yoder, Carter proclaims that instead the church should “be the Church.” True to these Anabaptist and pacifist roots, Carter argues that violence is the antithesis of Christian faith. The church should reject alliances with secular powers, maintain the separation of church and state, refuse to fight in wars, renounce natural theology and civil religion, and challenge governmental and other abuses of power through nonviolent protest and exemplary moral behavior. Carter proposes a new typology in response to Niebuhr’s, which includes an axis of violence versus nonviolence.

Evangelical and other Christian readers who are weary of the Religious Right will appreciate much that Carter has to say. If more evangelical thinkers and leaders were willing to acknowledge and repent of our compromises with political power, we might indeed move closer toward constituting the sort of community Jesus desires us to become—one that transforms the world through the cruciform power of love, patience, gentleness, and self-control rather than through the worldly weapons of political violence.

But for all its prophetic punch, Carter’s analysis is also deeply frustrating. His dogged adherence to a “fall” thesis of Christian history—the notion that nothing good came of the Catholic faith that developed after the fall of the Roman Empire and before the Reformation—often is gratingly reductionistic. History just is not that simple.

Moreover, Carter fails to engage in any meaningful way with the eschatology implied by his new typology. Indeed, it is unclear whether Carter essentially proposes a mostly future Kingdom, in the tradition of old-school dispensationalism, or whether he accepts that the Kingdom breaks into the world in transformative ways in the present age. Carter seems to hold both views at the same time, assigning to the present church the role of “witness” rather than an active role in Kingdom construction. Eschatology, however, directly informs any view of church and state. Eschatology cannot be treated as an afterthought in church-state discussions. A more robust understanding of the Kingdom might lead to a broader transformative role for the church in the present age than Carter envisions.

Notwithstanding its weaknesses, however, this book is a must-read for anyone concerned about how the church should engage the non-Christian culture.

Reviewed by David W. Opderbeck, 20 Smith Ln., Midland Park, NJ 07432.

MISQUOTING TRUTH: A Guide to the Fallacies of Bart Ehrman’s *Misquoting Jesus* by Timothy Paul Jones. Downers Grove, IL: IVP Books, 2007. 176 pages, indexes. Paperback; \$13.00. ISBN: 9780830834471.

Jones is senior pastor of First Baptist Church of Rolling Hills, Tulsa, Oklahoma, and an Ed.D. graduate of the Southern Baptist Theological Seminary. Co-author of *The Da Vinci Codebreaker* and a “fact checker” for the claims

of Dan Brown, Jones continues his foray into apologetics with this book, a rebuttal to the claims of biblical scholar Bart Ehrman. Ehrman famously maintains in *Misquoting Jesus* that the New Testament Gospels do not represent eyewitness testimony. Moreover, he also asserts that the extant manuscripts are too filled with textual errors and scribal additions to be of any use in learning about Jesus. While the title may be somewhat polemical, *Misquoting Truth* is an even-handed and careful rebuttal to these points, touching also on arguments raised in *Lost Christianities* and in Ehrman’s more scholarly works.

Jones begins his answer to Bart Ehrman by considering the man himself. A graduate of Moody Bible Institute, Ehrman had a crisis of faith at Princeton when he found, while learning about textual criticism, that he could no longer hold to “inerrancy” as he understood it; he gradually lost all Christian faith thereafter. As a contrast, Jones graciously tells the story of his own faith crisis at a similar point in his education, and he expounds on both the classes that challenged his faith and the authors (C. S. Lewis, F. F. Bruce, etc.) that brought him to a fuller understanding of it. While acknowledging Ehrman’s stature as a biblical scholar, and praising him for his skill at popularizing scholarly conclusions in such prosaic fields as textual criticism and the history of Christianity, Jones finds fault with the way Ehrman “presents these conclusions and, in some cases, what he adds to them” (p. 12). In his opinion, Ehrman’s books elevate personal, deep-seated doubt about the Bible to a nonexistent “consensus” in the minds of readers.

Jones then moves to expertly unpack Ehrman’s central claims. He grants that, as Ehrman repeatedly points out, the gospel originals no longer exist; nevertheless, the text is recoverable. He makes this point by taking the reader through what is known about early Christian copyists. Summarizing the distribution of variants in the gospels, he whittles down the 400,000 known differences to the handful that have an effect on the text’s meaning. He pays special attention to the three passages Ehrman feels are incorrectly rendered in major Bible translations—and by extension, allegedly threaten the reliability of the entire New Testament. Jones makes a detailed analysis and does not give simple answers (in one passage, he agrees with Ehrman’s reading), yet I must concur that Ehrman has severely overstated his case.

In the second half of the book, Jones engagingly surveys the oral history of Christianity, the authorship and formation of the canon, and the “lost gospels” of Thomas, Peter, etc. Against Ehrman, he argues for the traditional authorship of the gospels, supplying ample background on first-century life and a great deal of material that I had not seen before. On this point, Jones may not have a slam-dunk case, but his argument is certainly compelling.

Overall, the author makes an excellent popular response to a fellow scholar who has gone beyond the evidence in his popularizing. Readers of *Misquoting Truth* will find it meticulously cross-referenced, with seventeen pages of notes; a glossary of foreign words; subject, name, and scripture indexes; and an appendix. A study guide for the book is available on the publisher’s website.

Reviewed by Christopher J. Barden, Dalhousie University, Halifax, NS, Canada, B3H 4J3.

TAKING BACK THE GOOD BOOK: How America Forgot the Bible and Why It Matters to You by Woodrow Kroll. Wheaton, IL: Crossway Books, 2007. 218 pages, appendices. Hardcover; \$19.99. ISBN: 1581348266.

Woodrow Kroll is president and Bible teacher for Back to the Bible and the author of more than fifty books. This new book was prompted by his concern about the decline in biblical literacy among Americans, including evangelicals. He says, "Today the great battle isn't over Bible infallibility; it's over biblical illiteracy." The book documents this decline, suggests some of the reasons for it, and proposes ways to attempt to correct the problem. There are twenty-five short chapters followed by the author's summary of his conclusion and then two appendices with recommended resources.

In order to establish the degree of biblical literacy in the early days of the US, Kroll quotes from statements of many early American leaders and from literature such as the primers used to teach reading in the schools of that era. More recent evidence for the decline in biblical literacy is based mostly on the results of polls by Gallup and the Barna group. These poll results are encountered repeatedly throughout the book, and some of them document parallel trends in other areas such as a biblical worldview. The decline is said to have begun in the 1960s and been greatest in the late 60s and early 70s.

Kroll has criticisms of certain trends among American evangelicals that may be relevant to the downward trend that he sees in biblical literacy. For example, he specifically mentions pre-evangelism that does not lead to evangelism. However, he devotes much more space to the fact that Christian radio is devoting more and more time to music and less and less time to Bible teaching. He characterizes this as a prioritizing of entertainment and sees this preference reflected in what Christian publishers choose to publish. Economic considerations cause broadcasters and publishers to try to satisfy the desires of their listeners and readers.

The author devotes a significant amount of space to listing the benefits of Bible reading, responding to excuses for not reading the Scriptures, and pointing out the negative consequences of biblical illiteracy.

The last third of the book is devoted to ideas for reversing the trend toward biblical illiteracy. The author recommends methods for individual Bible study. He also encourages family devotions and more Bible-centered preaching by pastors. He sees evaluation of church members' spiritual maturity as being valuable and gives an example of a church with an assessment method that he endorses. There is also a list of organizations with exemplary Bible study ministries, and one chapter devoted to describing the work of the Bible Literacy Center, which was established by Back to the Bible to address the problem that Kroll details in his book.

Anyone who is concerned about the lack of biblical literacy in America today, particularly among evangelicals, should be interested in Kroll's book. It is easy to read although one may want to reread some poll results from time to time to make sure which demographic group is involved. It should not be assumed that Kroll has presented every reason for the decline in biblical literacy or every practical suggestion for reversing it. The reader may

have additional ideas about causes for the decline which could have been used in the book to give the subject a more complete treatment.

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RELIGION & SCIENCE

THE NEW FRONTIER OF RELIGION AND SCIENCE: Religious Experience, Neuroscience and the Transcendent by John Hick. New York: Palgrave Macmillan, 2006. 228 pages. Paperback; \$31.95. ISBN: 0230507719.

Hick holds doctorates from both Oxford and Edinburgh Universities. He is an emeritus professor at Birmingham University in the UK and Claremont Graduate University in California. Hick has published thirteen books that have been translated into over seventeen languages.

In this book, we get slight glimpses of Hick's own religious journey that help somewhat in our understanding of what he is saying and why he is saying it. Hick was a Christian until he began studying philosophy in college. He gradually moved away from that faith position and is now much more oriented toward Eastern religions (but not exclusively).

Hick's goal (as stated in the preface) is to demonstrate that "... the living heart of religion is to be found in religious experience, rather than in the religious institutions, with their creeds and hierarchical priesthoods." He considers religious institutions as being somewhat dangerous, even though he admits they also do a lot of good.

The book is developed with four main themes. Hick first explores religion, both as institutions and in terms of basic spirituality. He then focuses on the primary importance of religious experience, no matter which religion is being considered. Thirdly he investigates the supposed links between religion and the neurosciences. Finally, he considers issues regarding epistemology and religious experience.

The book first examines the role of religious institutions and the issue of spirituality. Institutions are there to preserve a specific belief set, while (to Hick) the important common theme of all religions is the experience of the transcendent. It may involve some personal sense of the presence of God (in whatever form the believer prefers) or just the awareness of the beauty of the day.

For Hick, the primary focus is on experience. The revelation forthcoming in whatever sacred book one uses can be and is confirmed at heart by experience. The miraculous has been explained away to a great extent. What we have left is the great moral teaching of a respected religious leader. To Hick, that experience of religious practice (prayer, meditation, worship) is of first importance, not the adherence to specific doctrines.

For this reviewer, the section on religion and neuroscience was particularly disappointing. Hick describes a few well-known experiments, such as Newburgh and d'Aquili's brain-activity studies on Catholic nuns and Buddhist monks. He also repeats the arguments in favor

Book Reviews

of interpreting religious visions (such as Paul's encounter with Christ on the road to Damascus) as being due to epileptic seizures. There is nothing new in this theme, the research has been better evaluated and critiqued by others, and no new insights are contributed. One would expect more of a book with "neuroscience" prominent in the subtitle.

Hick does put forth a challenge to the mind/brain monism that is so prevalent today. He raises the question of transcendence and feels that our current concepts of mind are very much in error. It would have been interesting to see him develop this idea further.

In the final section, Hick makes his proposal for a "universal religion." He strongly rejects the idea that any specific religion should have primacy and be considered the "true" religion. All religions to him are culturally formed responses to some sort of transcendent being (the characteristics of which are very vague). He also advocates a type of multiple reincarnations until we finally get to wherever we should be.

All in all, I was frustrated and disappointed. Nothing new, very little clear—a vague, nebulous acknowledgment of some sort of transcendence, but the reader is left with no specific knowledge of that being.

Reviewed by Donald F. Calbreath, Emeritus Associate Professor of Chemistry, Whitworth University, Spokane, WA 99251.

RENEWAL IN THE WILDERNESS by John Lionberger. Woodstock, VT: SkyLight Paths Publishing, 2007. 158 pages, references, suggested readings. Paperback; \$16.99. ISBN: 9781594732195.

John Lionberger, a former atheist/agnostic, is founder of Renewal in the Wilderness, a wilderness ministry that brings people of all faiths and nonfaiths into nature to experience God. He is also the head chaplain of a retirement community in Evanston, Illinois. This book is an attempt to put the processes and experiences of his wilderness seminars into print.

The book consists of an introduction and eight chapters, essentially describing various aspects of his wilderness seminars. The chapters describe, based on the sacred writings and history of various faiths (Christianity, Judaism, Islam, Buddhism, and Hinduism), how people have experienced God in nature. Testimonies from attendees of the seminars are included to illustrate the points of each aspect of the seminar featured in the chapters. Each chapter ends with a series of "reflection" questions for individual or group study.

The chapter titles, with descriptions from the table of contents, are listed below:

1. God in a Hummingbird (the wilderness is a place of transformation)
2. It is in our DNA (the wilderness is an ancient, universal experience)
3. Presence in the Present (the wilderness brings us into the present moment, into God's presence)
4. Scraping the Hull (the wilderness returns us to our essence)

5. God in a Box (the wilderness takes us beyond our expectations into God's surprises)
6. God on the Edge (the wilderness takes us beyond our comfort zone, tests us, and teaches us)
7. Healing Waters (the wilderness leads us to solitude and silence so we can know ourselves and God)
8. The Rapture of Being Alive (the wilderness opens us up to the transcendent).

Lionberger has a gift at describing the natural environments he has experienced. His description of his own "ambush" by God while on an Outward Bound trip is marvelous. In reading it, I almost felt myself experiencing the cold of a Minnesota winter while cross-country skiing.

The ecumenical (in the broadest sense of the word) approach to his subject matter is both a strength and a weakness. It is a strength because it puts the concept of seeing God in the wilderness (a concept well known to readers of *PSCF*) into a broader context of other faiths. It is a weakness because it fails to go any further than the experience. The book was somewhat redundant from chapter to chapter, with many chapters focusing on the same subject matter (how the wilderness helps us to experience God).

As C. S. Lewis expressed in *Mere Christianity* (p. 136), people can and do experience God in nature. The vague religion expressed by feeling God in nature, and only going that far, is "all thrills and no work" and does not get one anywhere. To go further, one must put one's experience of God in nature into a wider theological context. Lionberger fails to do this in his book. The God he describes is an amalgam of concepts found in various faiths, many with contradictory views (for instance, how is the God of Christianity compatible with the God, or gods, of Hinduism?). God is so watered down as to be almost meaningless.

As a geoscientist and an outdoor enthusiast, I had high hopes for this book, based solely on the title. However, I discovered that the book is focused only on the experience of God in the wilderness and does not place this in a theological context. This theological naivety is the reason I cannot recommend this book to *PSCF* readers.

Reviewed by Wayne R. Belcher, Hydrologist, 160 North Stephanie St., Henderson, NV 89074.

AN ILLUSION OF HARMONY: Science and Religion in Islam by Taner Edis. Amherst, NY: Prometheus Books, 2007. 251 pages, index. Hardcover; \$28.00. ISBN: 9781591024491.

Taner Edis, associate professor of physics at Truman State University, has previously written on issues of science and faith. Since he is Turkish, he is very familiar with Turkish Muslim thought. This book examines the interaction of science and faith in Islam.

The book begins with an introductory chapter discussing general Islamic attitudes toward science. I found the second chapter to be the most interesting, presenting a survey of the history of the interaction between science and Islam. The third chapter discusses (eisegetical) attempts to

find science in the Quran. The fourth chapter discusses specific problems of reconciling evolution with Islam, including Islamic versions of intelligent design and theistic evolution. The fifth chapter discusses the interactions of social sciences and history with the Quran. The sixth chapter discusses liberal tendencies in Islam. The final chapter gives closing thoughts on the future prospects for interaction between science and Islam.

Edis emphasizes that true science is practically nonexistent in Islam. Scientific communities in Islamic lands are weak and disorganized. Even in Islam's medieval golden age, Islamic "science" was not of the modern variety. There was no abstraction of data to form overarching theories, just a loose collection of facts pursued for pragmatic reasons. Islamic attitudes are substantially the same today: technology is accepted for pragmatic reasons, but there is ambivalence toward basic science.

He sees a number of reasons for weak Islamic science, but primarily points to the strength of religious fundamentalism and the strength of community in Islam. (I am not convinced that strong community is a large impediment for scientific development; it does not seem to have killed science in Asian cultures.) He looks longingly to Christian liberalism and to western individualism. He wishes for a more liberal form of Islam but is realistic and realizes that it is highly unlikely that Islam will move in this direction.

Edis writes from a thoroughly secular, philosophically naturalistic perspective. To Edis, a modern scientist must fully embrace philosophical naturalism or he is but a "stamp collector," assembling facts with no cohesive framework in which to place them. He wants to view science very broadly "as the interconnected, multidisciplinary activity of understanding how the world works" and to rule God out of this endeavor.

Hence Edis seems to see religion only as an impediment to science, never as a help to it. He views the development of modern science in a Christian culture as an accident of history with no contribution from a Christian worldview. His dream for Islam seems to be a hands-off attitude toward science, to "let science operate without religious constraints." He wishes to restrict religion to personal beliefs and questions of purpose (though he does note that Christianity helped to shape social movements and democracy). His view is similar to Steven J. Gould's "non-overlapping magisteria."

Edis convincingly shows that the popular Islamic view of harmony between science and Islam is an illusion. His philosophically naturalistic position exaggerates the tension, but there is a fundamental tension nonetheless. He explores and demonstrates historical, sociological, and theological contributions to this tension.

This tension seems to be fundamentally due to the foundations of Islam itself. The Quran is supposedly given by dictation from heaven, so is not open to textual or source criticism and cannot be interpreted to accommodate pre-scientific views of the writer. A cultural-historical hermeneutic is not acceptable in Islam. God's sovereignty is stressed so strongly in Islam that God cannot be truly known or understood by humans; God's actions are not predictable. Hence, there is no Islamic analog to the views of evangelical scientists, where science is viewed as the

actions of a consistent God who desires to be known and whose actions are worthy of study. It is virtually impossible for a healthy harmony ever to develop between science and Islam.

Edis' book provides an informative and balanced perspective of historic and modern interactions between science and Islam. It is quite objective and nonpolemical. It should be helpful for anyone who has interactions with Muslims or for anyone interested in the broader history of science and faith. It gave me a renewed appreciation for the fundamental differences between Islamic and Christian worldviews.

Reviewed by Kirk Bertsche, 242 Ferrari Avenue, San Jose, CA 95110.

SCIENCE AND GRACE: God's Reign in the Natural Sciences by Tim Morris and Don Petcher. Wheaton, IL: Crossway Books, 2006. 352 pages. Paperback; \$17.99. ISBN: 1581345496.

Tim Morris and Don Petcher, professors at Covenant College, have had a long-term interest in the relationship between science and their Christian commitment. It was this interest that led them to create "Science in Perspective," a course at Covenant College, and it was out of this course that this book developed. Both write from a Reformed perspective and yet this book would appeal to Christians of any persuasion and even to open-minded non-Christians.

The book is split into three sections. The first section looks at "Science and Christian belief in the postmodern context." What is refreshing about this chapter is that the authors take postmodernism seriously and do not write it off as a philosophical aberration that science will eventually disprove.

Chapter 3 looks at five "dissenters," Christians who have rejected the Enlightenment Project of the neutrality and objectivity of reason and therefore of science: Blaise Pascal, Johann Georg Hamann, Charles Hodge, Abraham Kuyper, and Herman Dooyeweerd. All of these dissenters agree that there is a need to reconsider the role of faith in relation to reason. Faith commitments are important in the development of science. If there are two different kinds of science—that of the believer and that of the non-believer—then how can we work together? Morris and Petcher answer: common grace.

Section two examines "Jesus Christ, the Lord of creation" and considers God's relation to his creation. Chapter 4 looks at the Trinitarian character of God and his covenant with his creation. The extremes of immanentism or pantheism and transcendence or deism are avoided. The Trinitarian God works in the creation in a covenantal way. This means that the world is not a predictable machine. The next chapter looks at the concept of miracles and God's freedom in the universe. Morris and Petcher rightly regard miracles as being part of God's providence; a miracle is an "outworking of God's purposes." In the final chapter in this section, "The laws of nature and the gospel of grace," they see the laws as a "faithful unfolding of God's covenant promises" that reflect creation's creatureliness and contingency.

Book Reviews

The final section, "Investigating his dominion," analyzes our place in the "doing" of science. The authors ask, "What does loving God and neighbor entail in the natural sciences?" They see science as an opportunity for obedience to the great commandment (Mark 12:30–31). It is a refreshing and inspiring perspective. Materialism and reductionism are resisted and they capture the wildness of creation that has been lost in the "Modern domesticated version" of science.

Throughout the final section is a lot of wisdom and wise advice, for example: "the use of scientific evidence in apologetics may inadvertently cede to science the ultimate truth authority" (p. 270) and "our ultimate allegiance as scientists is not to our scientific disciplines as such but to Christ's church" (p. 191).

The penultimate chapter looks at "The kingdom of Christ and the culture of science"; science is seen as "a cultural enterprise that reflects God's favor and yet calls for His judgment at the same time" (p. 306). The final chapter provides a clarion call for Christians to work out their science in the context of their Christian commitments. There are twenty-four pages of notes, a bibliography of 149 works and an eight-page index.

This is one of the best books on science and Christianity I have read. If you only read one book on science and Christianity this year, make it this one. The authors take seriously Kuyper's claim that there is no inch of secular life that Christ does not declare, "It is mine." They look at what this claim might mean for the biological and physical sciences, but as they do so, it has implications for all of the sciences—theology included. This is a book that demands slow, careful, and prayerful study for any Christian involved in academic study.

Reviewed by Steve Bishop, City of Bristol College, Bristol, UK.

MONKEY TRIALS AND GORILLA SERMONS: Evolution and Christianity from Darwin to Intelligent Design by Peter J. Bowler. Cambridge, MA: Harvard University Press, 2007. 256 pages, bibliography and index. Hardcover; \$24.95. ISBN: 9780674026155.

Bowler, professor of history of science at Queen's University in Belfast, has distilled years of research and writing into this fine little book. He admirably succeeds in providing a succinct "survey of the history of the engagement of religious faith with scientific evolutionism, showing how a whole range of alternative positions have been explored, establishing a continuous spectrum of opinion." This non-believer has produced a respectful account of Christian responses to evolutionism. He summarizes the positive views of nineteenth-century liberals and twentieth-century modernists, and the negative responses of early fundamentalists and latter-day creationists. He holds that a middle way between the extremes of atheistic evolutionism and dogmatic creationism is possible.

The text presents a promenade of thinkers and movements. We survey moments in natural theology from Ray to Chambers, nineteenth-century geology, and early evolutionists from Buffon to Lamarck. The perspective on Darwin's work provides an excellent review of the problems he addressed and the solutions he hit upon.

Bowler sketches the debate over natural selection which occupied the scientific community from the *Origin* to the genetic revolution. The reader learns that evolution was gradually accepted by scientists and most of the educated people in Britain and the United States, but Darwin's materialistic mechanism was less popular than nonmaterialistic notions that incorporated a progressive model of the history of life. The latter allowed liberal Christians such as Charles Kingsley and Henry Ward Beecher to embrace evolution while seeing it as directed within by a purposeful Creator. Such thinkers, for example, combined Lamarck's theory of acquired characteristics with Spencer's and Darwin's ideas about the evolution of morality and incorporated them into the concept of a created and "divinely instituted process" that would lead to a perfected humanity.

The early decades of the twentieth century saw an "eclipse of Darwinism" within the scientific community. Concepts of evolution that eschewed selectionism were to have a significant impact on scientific thinking. Especially important were neo-Lamarckism and the creative evolutionism of Bergson, which offered liberal thinkers hope that evolution could be divested of materialistic implications. These were taken up by modernist Christians such as Americans Henry Drummond, Shailer Matthews, and Harry Emerson Fosdick. In his popular "gorilla sermons" preached in Westminster Abbey, Ernest William Barnes called upon his Anglican co-religionists to reject traditional dogmas and accept a primate ancestry out of which humans have progressively evolved.

Within the scientific community, neo-Darwinian evolutionism emerged with the new science of genetics, and after mid century, the modern synthesis became the reigning theory that, with modifications, persists today. Before this development, both modernist Christianity and social Darwinism came under attack by the emerging fundamentalist movement. Fosdick found himself in intellectual combat with William Jennings Bryan, the Bible's champion at the Scopes "Monkey Trial." The outcome led to the virtual removal of evolution from school science courses, not to be restored until after Sputnik.

Bowler provides brief treatments of the development of the modern synthesis, and two major reactions to it: the atheistic evolutionism of Dawkins and Dennett; and the creationist movement fathered by H. Morris and Gish along with the intelligent design alternative brought forward by Johnson and Behe. In concluding his exposition, he asserts that modern theologians must give up any attempt to integrate theology with outdated evolutionary concepts (e.g., Teilhard's synthesis):

If religion was hoping to deal with science, it had to face up—at long last—to the challenge of an evolutionary mechanism based on the natural selection of randomly generated variations. (P. 220)

After citing a few notions that might be helpful to them (e.g., S. Kauffman's concept of emergent complexity and S. C. Morris' convergent evolution), he credits scientifically trained theologians such as Peacocke and Polkinghorne with proffering ways of understanding divine action in evolution that offer hope for a rational and meaningful articulation of a new natural theology.

This all-too-brief survey hardly does justice to Bowler's exposition. Written in clear and graceful prose and abounding in valuable interpretations and insights, this book is a feast for any interested and educated reader. I thought myself fairly well informed in the subject matter, but Bowler took me back to school and taught me much. The book would be particularly useful in a college-level course on issues of science and Christian faith.

Reviewed by Robert J. Schneider, Adjunct Associate Professor of Philosophy and Religion, Appalachian State University, Boone, NC 28607.

GOD'S UNIVERSE by Owen Gingerich. Cambridge, MA: The Belknap Press of Harvard University Press, 2006. 121 pages plus notes, acknowledgments, and index. Hardcover; \$16.95. ISBN: 9780674023703.

Gingerich began a "love affair with the stars" at age five. The temperature in the house was one hundred degrees at sunset, so the family slept in the backyard on cots. Looking at the darkening sky, Owen asked, "Mommy, what are those?" She replied, "Those are stars; you've seen them before." Owen reportedly responded, "But I never knew they stayed out all night!"

Decades later, as emeritus professor of astronomy and of the history of science at Harvard, he delivered the 2005 William Belden Noble Lectures. This book is a compilation of these lectures. I will discuss its three chapters in order.

Chapter 1: "Is Mediocrity a Good Idea?" The Copernican Principle is often called "the principle of mediocrity." Gingerich explains it as follows:

We will make scientific progress if we consider that everything we see around us is commonplace in the universe, that we are average beings in a run-of-the-mill planetary system in an average galaxy probably populated by scores of other mediocrities.

He concludes that mediocrity is not a fundamental principle of science, but "a generally unexamined ideology, and not one to which I would readily subscribe." He cites a suggestion by physicist John Wheeler, paraphrasing it as:

... perhaps the universe is like a large plant whose ultimate purpose is to produce one small exquisite flower. Perhaps we are that one small flower. Quite possibly mediocrity is *not* a good idea!

Chapter 2: "Dare a Scientist Believe in Design?" After giving several examples that seem to imply design, Gingerich states:

Evolutionists who deny cosmic teleology and who, in placing their faith in a cosmic roulette, argue for the purposelessness of the universe are not articulating scientifically established fact; they are advocating their personal metaphysical stance ... There is, I shall argue, no contradiction between holding a staunch belief in supernatural design and working as a creative scientist ...

Even in the hands of secular philosophers ... the modern mythologies of the heavens, the beginnings and endings implied in the Big Bang, give hints of ultimate realities beyond the universe itself ... our cosmology leads logically to the idea of a transcendence situated beyond time and space, giving the

lie to the notion that the cosmos is all there is or was or ever will be.

He concludes this chapter:

So, just as I believe that the Book of Scripture illumines the pathway to God, I also believe that the Book of Nature, in all its astonishing detail—the blade of grass, the missing mass five, or the incredible intricacy of DNA—suggests a God of purpose and a God of design. And I think my belief makes me no less a scientist.

Chapter 3: "Questions without Answers." Inspired by an Alan Lightman essay saying science owes its success to choosing questions that can be answered, Gingerich discusses the "why" questions that scientific analysis cannot answer: Why is there something rather than nothing? Does the universe have a purpose? Why is the universe comprehensible? What does it mean to be human (including qualities such as altruism and conscience)? Gingerich observes:

It seems to me that within the dappled universe is a theistic space, a perspective for viewing God's universe, a place where God can play an interactive role unnoticed by science, but not excluded by science.

He quotes John Polkinghorne's statement, "... I do not for a moment suppose that my atheistic friends are simply stupid not to see it my way. I do believe, however, that religious belief can explain more than unbelief can."

Gingerich integrates a lifetime of research and reflection into a compact book that combines scholarly wisdom with an eloquent, sometimes poetic, literary style. This book deserves to become a classic.

Reviewed by Dave Fisher, Editor, "Truth in the Test Tube" Mandarin broadcast of Trans World Radio, Aurora, IL 60504.

WHAT ABOUT SCIENCE AND RELIGION? A Study of Faith and Reason (Faith questions) by Paul Stroble. Nashville, TN: Abingdon Press, 2007. 112 pages. Paperback; \$9.50. ISBN: 0687641624.

What About Science and Religion? was written by Paul Stroble, an elder of the Illinois Great River Conference of the United Methodist Church. He is a college teacher who earned an Excellence in Teaching award at the University of Akron, a researcher, and an author of eleven published books.

As one would expect from a Christian writer, this book is written for Christians who are uncertain about science. "The book is designed for use in any of three settings: (1) adult Sunday school, (2) weekday adult groups, and (3) weekend retreat settings" (p. 5). Written as a study guide for Christian groups, this book goes through the main points of contention between religion and science in seven simple chapters. The prose is straightforward, with many asides offering questions or biblical readings for further study.

The first two chapters define science and religion and try to explain how the two can work together. "We rely upon God during medical emergencies, but prayer is not the only thing we do; we also consult physicians, trusting

Book Reviews

that they are skilled in the best and latest science of healing" (p. 16). Chapters three through five each take a different area of contention between science and religion and look at how they diverged by going through a historical overview of the growth of science and religious reaction. The areas of faith and reason, creation and evolution, and the view of the universe are dealt with in this way.

Stroble discusses truth in the chapter on faith and reason. "Truth can ... be multifaceted: the truth of a poem is different than the truth of a scientific study" (p. 38) basically sums up the way he resolves issues. Science helps and supports Christianity, but the Bible is always right. His view of science is mostly as a tool that can be used to help people understand the Bible better.

Medicine, miracles, prayer, and the oft-stated tendency of science to dehumanize are crammed together in the sixth chapter. The final chapter, called "Faith and Science Together," is an overview of all the reasons why science is necessary and has to be integrated into our understanding of religion.

As a study book for Christian teens and adults, this book will probably be helpful as it does not go into detail about scientific terms or expect much more in the way of background knowledge than a basic education provides. The questions and scripture references scattered through the book should help provide jumping-off points for discussion. Many people in the ASA will find that this book's introductory style limits its use to churches where scientific knowledge is minimal, but in its proper setting this book is very good.

Reviewed by Catherine Fleming, English/Classics Major, Duquesne University, Pittsburgh, PA 15282.

THE PANDA'S BLACK BOX: Opening Up the Intelligent Design Controversy by Nathaniel C. Comfort, ed. Baltimore: The Johns Hopkins University Press, 2007. 156 pages. Hardcover; \$20.00. ISBN: 9780801885990.

The Panda's Black Box follows on the heels of two historic court rulings against teaching intelligent design (ID) in schools. In a series of six short essays, a group of contributors dissect ID into scientific, social, philosophical, and legal components. Nathaniel Comfort, an assistant professor of the history of medicine, is the editor and writer of the introductory chapter. Additional contributors are Scott Gilbert (a biologist at Swathmore College), Daniel Kelves (a historian of science at Yale University), Edward Larson (a historian at Pepperdine University), Jane Maienschein (the director of the Center for Biology and Society at Arizona State University), and Michael Ruse (a philosopher at Florida State University).

A survey of anti-Darwinianism is laid out in the Introduction, setting the tone for the rest of *The Panda's Black Box*. The title is a strike against "[t]he ID textbook, *Of Pandas and People*" (p. 9) that seeks to be "one of the few books on the ID issue that moves beyond mere name-calling and finger-pointing" (back cover). As with many editorialized volumes, some chapters succeed while others are peppered with pointed remarks that detract from the author's intention of providing a balanced treatment.

The first chapter provides an overview of ID by focusing on social interactions. While the main issues are clearly presented, the author's disdain for creationists detracts from the material. "One point on which anti-Darwinists and anticreationists agree is that this is a pitched battle between dogmatic religious fanatics on the one hand, and rigorous, fair-minded scientists on the other" (p. 3).

Ruse provides a much fairer perspective in "The Argument from Design," chapter 2. His conclusion is that ID is not new but has a grand historical position that began with Rev. William Paley's book, *Natural Theology*. Ruse concludes that "When Behe suggests (as he does) that he is authoring a breakthrough of the magnitude of Copernicus and heliocentrism, he is not just embarrassing, he is historically wrong" (p. 39).

Scott Gilbert dives into the biological nuts and bolts of ID in the third chapter. Gilbert deftly shows that the issue is clouded by less than complete honesty and provides some nuggets to explain why ID is so controversial, such as "evolution being perceived as the enemy of Divine Providence" (p. 59). Chapter 4 turns from the biology to the high profile legal battles that have brought ID into the public square. Larson concludes:

Perhaps a better science education and deeper understanding of the popular appeal and scientific limits of the Intelligent Design concept can help both sides to appreciate the vital place of both scientific knowledge and religious faith in the evolving American experience. (P. 82)

Jane Maienschein dispels the notion of a simple battle of science versus religion by following Judge Jones' reasoning in the recent Dover decision. In the final chapter, Robert Young goes further by looking at the metaphysical connections emanating from natural selection. His rally against reductionism is couched as a historical survey, concluding that meaning and purpose is intrinsic to reality.

The goal of reducing all explanations to matter, motion, and number impoverishes our worldview. Is it any wonder that sincere people reach for theological explanations to husband and celebrate the wonders of nature, life, and human nature and ground them in transcendent processes which continue to use poetic and celebratory language to characterize truth, goodness, and beauty? (P. 133)

The Panda's Black Box is a valuable source of ID history, arguments, and social influence. Despite the disdain of some authors for creationists, the book is something of an olive branch offering to uncover truth in a complex and heated issue—always a painful process. For this reason alone, the book should be required reading for zealots and is recommended for those interested in ID.

Reviewed by Fraser F. Fleming, Professor of Chemistry, Duquesne University, Pittsburgh, PA 15282.

EMINENT LIVES IN TWENTIETH-CENTURY SCIENCE AND RELIGION by Nicolaas A. Rupke, ed. Frankfurt am Main: Peter Lang, 2007. 255 pages, index. Paperback; \$49.95. ISBN: 3631568033.

A century ago, “eminent lives,” the biographies of distinguished religious scientists, abounded. “God’s scientific witnesses” were duly chronicled in encyclopedic tomes, part of the toolkit of Christian evangelism. But such hagiography dwindled as the twentieth century rolled on.

Nicolaas Rupke, a Princeton Ph.D., currently professor of history of science at Göttingen, has edited a far different successor volume. The eight scientists spotlighted in this compendium are a motley but eminently fascinating crew: the ranks of these biologists, chemists, and physicists include Protestant, Orthodox, agnostic, and atheistic voices. Yet all of these lives are intertwined with religious influences and interactions. Even the atheist Pavlov, son of a priest and once a seminary student, spoke sympathetically to the Soviet government about “our Christianity.” And naturalist E. O. Wilson, whose private agenda in writing *Sociobiology* was to substitute science for religion, has admitted that his Baptist upbringing has morally bankrolled his crusade to preserve biodiversity.

The strength of Rupke’s volume lies both in the judicious selection of eight particularly interesting scientists whose stories blend well together and in his recruitment of eight brilliantly qualified authors to prepare these carefully structured and well-documented biographies. The ordering of these accounts is especially felicitous. First is the deeply religious English chemist Coulson, followed by the Orthodox evolutionist Dobzhansky, then Fisher, the eccentric statistician of evolution but, as a Christian and practicing eugenicist, determined to raise the average intelligence of the British population by having as many children as possible. (It was his evangelist grandfather-in-law, father of nine children, who wrote the unforgettable couplet, “Lord, give me grace that I may be, Able to keep it up for thee.”) Next comes Julian Huxley, grandson of “Darwin’s bulldog,” Thomas Huxley, the Richard Dawkins of his day; Julian, in contrast, set out to “create a humanism that would both remain faithful to the teachings of science and retain a role for the feelings that religious believers valued.”

Among the final quartet are the Protestant physicist Pascual Jordan, whose biography played out in the German Nazi period and beyond, and the Serbian Orthodox physicist Michael Pupin, who established his reputation at Columbia University. These are interleaved with the biographies of Pavlov and Wilson.

Readers of this journal should recognize the names of at least several of the authors. They are, respectively, Arie Leegwater, Jitse van der Meer, James Moore, Peter Bowler, Richard Beyler, Torsten Rüting (Pavlov), Edward Davis, and Mark Stoll (Wilson). Nicolaas Rupke provides an informative historical introduction and Ronald Numbers offers an epilogue. Usually a multiple-authored compilation of this sort has some outstanding essays as well as a few that miss the mark or are just padding. Not everyone is as memorably bizarre as Ronald Fisher, but the truly remarkable feature of this collection is the uniformly high standard of presentation in all these diverse and engaging biographical essays.

As someone who, even as a teenager, found biography my literature of choice, I was naturally attracted to this commendable collection. My only criticism concerns a technical point: in a volume so thoroughly documented

as this one, it is very clumsy to list strings of as many as half a dozen authorities following a given sentence — using numbered endnotes would have diminished this obstacle course. Also, apparently several of the biographies were prepared with a different font, and the conversion to a standard form has left a tell-tale trail of unwanted hyphens in the middle of words.

Reviewed by Owen Gingerich, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA 02138.



SCIENCE EDUCATION

CREATION AND THE COURTS: Eighty Years of Conflict in the Classroom and the Courtroom by Norman Geisler. Wheaton, IL: Crossway Books, 2007. 385 pages, bibliography, index. Paperback; \$22.00. ISBN: 1581348363.

From time to time, I find it instructive to read books written by academics with whom I do not share a worldview. One such, Norman Geisler, has written or co-authored over four dozen books and many articles over a forty year career. He holds the position of dean at Southern Evangelical Seminary. One may disagree with him, and yet respect his fervor and willingness to articulate his views.

The book is blurbed by Josh McDowell, Ravi Zacharias, and others. Duane Gish provides a foreword; Wayne Friar, a preface. There is a lot of good (original) source material in this book, including much of the Overton decision (McLean, 1982) as Geisler analyzes that decision and critiques it. Court cases from the 1925 Scopes trial to the 2005 Dover case are analyzed.

Geisler positions himself as a philosopher, not a scientist. Apparently he has not read deeply into the science of the evolution-creation controversy. He admits, for instance, to have never read Duane Gish’s 1973 book, *The Fossils Say No*. He accepts the scientific expertise of the young-earth creationist adherents on their say-so.

He is deeply convinced of four things: (1) Creation and evolution are the only two views of origins (there can be but one true position); (2) There is a difference in kind between experimental science and “forensic” science; (3) The media is biased; and (4) There is genuine scientific evidence for the creationist position. On these premises he bases his book. Paige Patterson comments that Geisler “offers the sort of clarity this debate requires.” I did not find this to be true. Geisler consistently confuses science and metaphysical speculation, majors in minors and, generally, brings more heat than light into the debates.

Chapter 4 particularly puzzled me. It is entitled “The Testimony They Refused to Transcribe.” Geisler spends thirty-seven pages on this and then, in Appendix 4, uses another twenty-three pages to completely document that testimony (his own). That is over fifteen percent of the book! He makes no case that the “refusal to transcribe” was anything more than either an oversight or simply the court’s recognition that the content was irrelevant to the issues at trial. When I read the testimony, the latter reason seemed most likely. Geisler did get some bad press after this testimony; its publication may serve, to some extent, to clarify (and normalize) his beliefs about the occult,

Book Reviews

UFOs, and the like. I suspect that is the reason he spent so much time on it.

One point Geisler makes may be instructive and may show how his education in the philosophy, methods, procedures, and assumptions of science is lacking. He writes: "... while naturalistic evolutionists ... criticize creationists of a 'God-of-the-gaps' fallacy ... they are themselves guilty of a 'Nature-of-the-gap' view" (p. 252). It is this sort of thinking, of course, that has led Phillip Johnson's "Intelligent Design" crusade. If magic were real, such thinking might have an audience.

So do I recommend this volume? Yes. It has a place in a university library, and many ASA members may want to check it out for an evening of entertaining reading. It will not, however, stay in my personal collection very long.

Reviewed by John W. Burgeson, 8119 Bideford Lane, Houston, TX 77070.



SOCIAL SCIENCE

THE HAPPINESS TRIP: A Scientific Journey by Eduardo Punset. White Rivers Junction, VT: Chelsea Green Publishing, 2007. 160 pages. Paperback; \$12.95. ISBN: 1933392448.

"Be warned: the writing of many books is endless, and excessive devotion to books is wearying to the body" (Eccles. 12:12, NASB). Such would seem to be the case with books on happiness. *PSCF* has printed reviews of three recently: *Happiness Is a Problem* by Dennis Prager; *Stumbling on Happiness* by Daniel Gilbert; and *The Pursuit of Happiness* by David Myers (ASA member). The books by Gilbert and Myers are based on scientific research. There is not much to be said about the benefits of religion in the book by Gilbert or *The Happiness Trip* by Punset, but Prager and Myers credit faith with considerable power to contribute to happiness.

But, alas, it would be a mistake to think history has sacrificed many trees to provide paper for books on happiness. In *The Happiness Trip*, Punset notes that concerning happiness, with the exception of the Declaration of Independence, "there is no organized inkling of such a birth-right in the history of political or scientific thought ... Being happy would thus appear ... a human concern of relatively recent vintage" (p. xi). Punset has a very high view of science; he writes that "the penetration of scientific knowledge into popular culture will prove to be the most revolutionary event of the last two centuries" (p. 85).

What is happiness? Punset thinks happiness "may be an unconscious recognition, felt physically and emotionally, indicating an organism's synchrony with itself and its environment, its living and nonliving surroundings" (p. 88). What is the road to happiness? Punset suggests that a clue can be found in amoebas, reptiles, and non-human mammals. What is learned from these life forms is that with plentiful resources, happiness may be more easily achieved independently; when a scarcity occurs, happiness (well-being) may be more easily obtained in the organized groups which can provide safety, relative conformity, and increased efficiency (p. 16).

Punset also points out that, with so many lethal threats looming, leading scientists think the odds of finding happiness are only fifty percent. Since happiness is an emotion, it is always in a transient state. For most people, happiness is not related to work, health, money, family, education, or ethnic group membership (p. 70). This is contrary to what most people believe, which is why Punset labels them as myths related to happiness. For example, while most people claim children are a great source of joy, on the parental activity preference scale, raising children comes after social life, eating, watching television, taking a nap, and many other activities. Another example: People who live in India, despite their poverty, are happier than most Europeans (p. 88).

Punset affirms the age-old maxim that happiness lies more in anticipation than in the act of achievement, based on the fact that in Pavlov's dog and human's experiment, the hypothalamus fires during the search, not during the conquest (p. 17). "Getting there is the lion's share of the fun. Happiness is hidden in its waiting room" (p. 18). Another conclusion: The absence of fear augments the increase of happiness (p. 22). Novelty often interferes with happiness, because it requires new rules of the game and potential loss of control (p. 23).

A person who is happy has a tolerance for ambiguity and ambivalence, and possesses the courage to question personal convictions (p. 31). In the final chapter, the author gives a formula for happiness. Factors that destroy happiness include fear, unnecessary conscious processes in decision-making, not accepting that happiness is ephemeral, idealization of objects and people, prejudices against oneself that distort reality, loss of control, and hormone fluxes (p. 59). Some readers may question the wisdom of seeking happiness. Punset does not advocate seeking it; he is merely examining the factors correlated with it. Solomon valued happiness and virtue: "I know that there is nothing better for men than to be happy and do good while they live" (Eccles. 3:12, NIV).

Dan Gilbert has high praise for this book: "I dare anyone to read a single page without learning something new." The author of *The Happiness Trip*, Eduardo Punset, is a professor at a Barcelona, Spain, university. In addition, Punset directs and hosts a TV program on science broadcast throughout the Spanish-speaking world. This book has an index and a recommended reading list for each of its nine chapters.

Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.

ALIEN WORLDS: Social and Religious Dimensions of Extraterrestrial Contact by Diana G. Tumminia, ed. Syracuse, NY: Syracuse University Press, 2007. 305 pages, appendixes, references, index. Paperback; \$34.95. ISBN: 9780815608585.

This compendium of essays is authored by some better-known students of UFOlogy (Unidentified Flying Objects), including sociologists, religious historians, professors of culture and religion, anthropologists, and independent researchers. Tumminia teaches sociology at California State University, Sacramento, and is the author of *When Prophecy Never Fails*, a study of the Unarius Academy of Science.

Tumminia's "introduction" is a helpful contextualizing of a field of study that has had little attention in *PSCF*. After noting how embedded the presence of extraterrestrial thinking has become in popular culture (cf. ET, Star Trek series, Scientology, and such books as James Lewis' *The Gods Have Landed: New Religions from Other Worlds*), Tumminia provides a helpful taxonomy of terms that elucidate the complexity of the field.

She notes three basic types of activity in the field: (1) the UFO investigation group; (2) the contactee group; and (3) the UFO cult. The first type includes secular and religious groups of scientists and others who take an agnostic stance and encourage empirical investigation of the phenomena. The second type is composed of those who claim to have experienced extraterrestrial contact or abduction. The third type includes those who may or may not have experienced any UFO contact but are believers and supporters.

The use of the word "cult" in this typology simply refers to a new, independent spiritual group often led by a charismatic leader. No judgment is implied. This last type can be considered a religion by certain markers: (1) the adherents consider what they are doing as "religion"; (2) the group practices rituals in their meetings; (3) there is deference paid to contactees who repeat their experiences; and (4) the group is organized and not a free-floating association. *When Prophecy Fails* (Festinger, Riecken, and Shachter, 1956) is a book which gives a clear example of a UFO group that was a religion, as was the group called Heaven's Gate in Southern California who committed mass suicide thinking their spirits would be joined to a nearby comet.

An alternative typology suggested by Tumminia distinguishes among "Believers," "Skeptics," and "Debunkers." Obviously "Believers" include contactees/abductees as well as UFO cult members. They accept the reports as real or highly probable. "Skeptics" include investigators as well as doubters. "Debunkers" are actively involved in discrediting the very idea of alien contact or abductions. There is no doubt that the great majority of social/behavioral and physical scientists have been in the Skeptic and Debunker groups.

Following Tumminia's introduction, the remainder of the volume includes descriptions of a variety of incident reports and specific groups, a perceptive analysis of the several understandings of the persons involved, and some reflections on the way this field has counterparts in modern religions.

In regard to understanding the persons involved, at least two approaches have dominated the field: contactees and abductees have either been typified as suffering from some personality aberration, or as using the experience as a way out of environmental stress. Their reports have rarely been taken at face value. Of course, these analyses have been based on the supposition that there can be no such thing as extraterrestrial intervention of any kind. History is replete with these sorts of judgment by the majority about the minority culture.

This leads to a consideration of a major issue raised by this volume—namely, the relevance of extraterrestrial contact to the experiences reported by organized religionists.

Take Christianity, for example. The whole foundation of Christianity is based on an extraterrestrial appearance of a savior who, according to John's gospel, existed with Almighty God from the foundation of the earth. And Christian history is replete with experiences such as that of Saint Paul who reported he had contact with this alien savior who came to him from the spirit world.

The book poses the question of "How are we to distinguish the validity of these two—the more or less contemporary reports of contacts with or abductions by space aliens, and the traditional dogma that Jesus Christ came into the world to save sinners?"

This is probably the most important issue raised by this volume. It is worthy of reflection by *PSCF* readers. Many will find this volume provocative and insightful. It raises questions such as this and causes us to think again about what is a "cult."

Reviewed by H. Newton Malony, Senior Professor, Graduate School of Psychology, Fuller Theological Seminary, Pasadena, CA 91100.

40 DAYS AND 40 NIGHTS: Darwin, Intelligent Design, God, OxyContin® and Other Oddities on Trial in Pennsylvania by Matthew Chapman. New York: HarperCollins, 2007. 272 pages. Hardcover; \$25.95. ISBN: 9780061179457.

Matthew Chapman has an axe to grind. He is an angry man, and it is often difficult to determine in this book who makes him most angry. The "usual gang of suspects" include the Dover, Pennsylvania Board of Education; Republicans; President Bush; and "religious fundamentalists." While the book is ostensibly about a specific court case, Chapman uses it as a vehicle for his disdain and anger toward all of the above-mentioned groups as well as others I perhaps have inadvertently left out.

Chapman is the great-great-grandson of Charles Darwin, which could explain some of his enthusiasm for the theory of evolution. He covered the *Kitzmiller v. Dover (PA) Board of Education* trial (decided in the early months of 2006) that dealt with an attempt by a school board in rural Pennsylvania, to recommend that students be made aware of problems with Darwinian evolution and that alternative ideas (including, but not restricted to, intelligent design) be considered. In addition, the teachers were to read a statement in class that raised questions about the validity and completeness of the evolutionary theory. The statement also affirmed that the Pennsylvania state educational standards had mandated the teaching of evolution and that students would be prepared to meet state standards for proficiency testing on the topic. Since the science teachers refused to read the statement, the ACLU and Americans United for Separation of Church and State got into the middle of things, and the battle was on.

Chapman's coverage of this controversy is puzzling and one-sided. He makes no effort whatsoever to try to understand the culture and mores of the community. The legitimate concerns of people are not explored at all, or they are treated as caricature. Those who express concerns about the teaching (and implications) of evolution are branded as ignorant, anti-science, and religious fundamentalists whose approach to life he compares to Islamic radicals. Chapman's concern, expressed at the end of the

Book Reviews

book, is that Evangelical (his capitalization) teens will soon be in charge. "While other kids are busy having sex and doing drugs, these ones are getting ready to take over America. If there is a 'vast right-wing conspiracy,' this is it." Are we to understand that Chapman would prefer people who engage in sexual immorality and do drugs run the country?

Chapman places a lot of emphasis on appearances. All his heroes (the lawyers and brave townspeople who took on the school board) are attractive and intelligent. Judge Jones was "... a good-looking man in his fifties." Fred Callahan (one of the plaintiffs) was "... a trim, good-looking man ... impeccably turned out ... his hair well cut ... concise, polite, and measured ..." Who could dislike such a person? One of the lead attorneys wore "... the best suits in the trial ..." One "drank good wine ..." Not to show bias, Chapman points out that one of the defense lawyers "... had good teeth ..." even though his "... long head was topped with thinning hair ..."

Equally interesting is Chapman's strong awareness of attractive women. Although one would think that the good (or not-so-good) looks of a woman were irrelevant to the issues being debated, Chapman apparently spent a lot of time noticing who was good-looking and who was not. Well, this does tie in with some evolutionary theories about men.

It is very disturbing that Chapman almost completely ignores the efforts of the Discovery Institute to get the school board to abandon the decisions they made. Institute leaders worked very hard to get the board members to drop their efforts to include ID concepts, but they were not successful. Chapman would prefer to see them as part of the conspiracy.

Equally disappointing is the praise that Chapman provides for the judge. The evidence is very clear that over 90% of the opinion that Jones is said to have authored came directly from the brief submitted by the ACLU.

If you want an extremely slanted account of the controversy, buy this book. If you want to find out what really happened, you are much better off reading the trial transcript.

Reviewed by Donald F. Calbreath, Emeritus Associate Professor of Chemistry, Whitworth University, Spokane, WA 99251.

RENDER UNTO DARWIN: Philosophical Aspects of the Christian Right's Crusade Against Science by James H. Fetzer. Chicago: Open Court, 2007. 194 pages, index. Paperback; \$24.95. ISBN: 0812696050.

James H. Fetzer is Distinguished McKnight University Professor Emeritus at the University of Minnesota at Duluth. He has authored several books on the philosophy of science, computer science, artificial intelligence, and cognitive sciences. He is also known for his advocacy of conspiracy theories concerning 9/11 and the Kennedy assassination.

Fetzer discusses the philosophical issues from which public debates about Creation Science and Intelligent Design (ID) derive. He argues that while God's creation of the universe can be reconciled with the scientific

evidence, the literal account in Genesis cannot be. He claims that attempts to deny biological laws are misconceived. Creation Science is not science because its claims are not conditional, not testable, and not tentative. He thinks the distinction between microevolution (accepted by many Creation Scientists) and macroevolution cannot be sustained.

According to Fetzer, creationists routinely misrepresent evolutionary theory. Evolution does not tend toward what is best, but only toward what is good enough. "Survival of the fittest" can avoid tautology if fitness is defined in terms of probabilities. Attempts to describe the evolutionary process as one of solving algorithms are misconceived.

In Fetzer's view, the failure of Creation Science (which is committed to a young earth and a worldwide flood) to bring creation into the science classroom has led to ID, a creationist movement with more modest claims and a broader constituency. ID rests on an imperfect and misplaced appeal to the analogy of a human designer. The alternative to ID is not "chance," but the interaction of chance with law-governed causal processes.

Concerning morality, Fetzer thinks we rely on our beliefs to guide our actions, and that we are morally entitled to hold a belief only if it is logical. He then looks at eight commonly held moral theories. He also argues that morality can be objectively validated independently of religion, and that only a deontological standard of ethics (treating other persons as ends-in-themselves) passes the essential tests. On this basis, Fetzer argues that persons acquire rights in graduated stages; stem cells, zygotes, embryos, or early fetuses are not persons and hence it is immoral for religious persons to interfere politically with abortions, stem-cell research, or cloning.

On a similar basis, Fetzer concludes that flag burners, hookers, and pot-heads are not immoral. Furthermore, he provocatively argues that an unholy alliance of fundamentalist propagandists and right wing politicians is playing its part in the rise of a new American fascism. This is based on the domination of civic life by unscrupulous business corporations who subordinate everything to the pursuit of profit. He claims that the Bush administration is crushing liberties at home while wreaking mayhem abroad in contravention of international law. In his view, American policy represents the triumph of the most corrupt form of morality: the pursuit of the interests of one's own exclusive group.

In an epilogue, Fetzer indicates how science can help public policy. Culture enables evolution to incorporate the inheritance of valuable acquired patterns of behavior. While science cannot set society's goals, it can help society attain them. The Good Society is founded on the deontological principle that every member of society is entitled to the same rights and opportunities as every other member. Fetzer also argues that public schools should be secular but not atheistic. Further, members of a moral society must tolerate group differences as well as individual differences.

The book contains an appendix on the definition of science from a formal philosophical aspect. A glossary is included. Nonetheless a lay reader may find the going hard.

Someone who is already familiar with the creationism-evolution controversy will find interesting points in the book, if only because of the wide range of topics discussed. However, the book cannot be recommended as an introduction to that controversy. For one thing, the treatment of ID is shallow, in my opinion; the author is too ready to take it as just a development of Young Earth Creationism. While a philosophical approach can add to the lucidity of an argument, the conclusions of the argument are no more valid than the assumptions made at the beginning: garbage in leads to garbage out. Thus, for example, few Christians will be satisfied with Fetzner's assumptions that Scripture and traditional theology can be bracketed out of a treatment of morality.

Reviewed by Donald Nield, Associate Professor of Engineering Science, University of Auckland, Auckland, New Zealand.

AMERICAN RELIGIOUS DEMOCRACY: Coming to Terms with the End of Secular Politics by Bruce Ledewitz. Westport, CT: Praeger, 2007. 242 pages. Hardcover; \$49.95. ISBN: 0275994600.

This book presents a thesis that, if true, would have a positive effect on the politics of this country. Ledewitz, a law professor at Duquesne University, makes the claim that in the election of 2004, the American people gave government the permission to endorse religion and that religion in some form would now be the basis of American public life. In that election, voters explicitly voted according to their religious preferences and elected politicians who will echo those preferences; the resulting government policy would then reflect religious values.

Instead of bemoaning the end of secular politics, Ledewitz wishes to celebrate it. He identifies the secular consensus in American politics as forming around the wall of separation, drawing encouragement from the assumed decline of religion as modernization advances. This secular consensus was fortified by a number of Supreme Court decisions that strengthened the wall and reduced the rights of believers. One of its tenets held that the only way a diverse democracy could function would be to have religious viewpoints kept out of the public square: when religious voters decide on candidates or issues they must not let their religious beliefs influence their decisions. How they are to perform this act of dissonance the committed secularists do not explain, but if they are unable to do this, then religious believers have no legitimate claim to input on many public policy questions. This is clearly untenable and, ultimately, undemocratic.

But this secular consensus did not last for a number of reasons, among which was a lack of majority support. Ledewitz claims that America does not need more secularism since a purely secular approach to politics cannot lead to noble goals; he is unconvinced by attempts to develop theories of human rights in nonreligious terms. Instead, he states provocatively that America needs "more and better religion" (p. xvii). What he means is that secular voters must be made to see that they are in fact believers in a religious sense. And while they may not be Christian or Jew, they share with the Christian or Jew a prevailing sense that

the world has a tilt in the direction of the good that is not attributable to the will of human beings ...

that there is a difference ... between true and false, and that these matters are not matters of human judgment, but are real and reliable ... (and that) the whole universe upholds the righteous ones who live by this path. (P. 171)

Ledewitz claims that the majority of secular voters believe these things and therefore could accept a politics based on religious language. In addition, many of the enduring political issues—equality, liberty, justice—draw heavily from older religious traditions, and that in many ways politics and religion speak to the same fundamental questions. The problem with the current version of religious democracy is that it is too one-sided: it is dominated by conservatives aligned with the Republican party, facing a Democratic party that too often purposely shuns religious voters. This is not a recipe for dialogue or good government. What is needed is a rebirth of progressive politics based on religious values, the "promise of our religions ... the transcendent realm ... For without hope of the transcendent, no politics that matters is possible" (p. 165).

On what basis then will the secularists come to embrace religious democracy? According to Ledewitz, they will not embrace a view of religion that is pushed by what he calls the fundamentalists who sometimes speak in apocalyptic terms. A greater focus on the themes of the Old Testament and its emphasis on the here and now, the value of life in this world, and the fact that a people who willingly disdain the divine call for mercy and justice are subject to judgment, can serve to invigorate a politics of the religious left, including those who call themselves secularists. Grounding the calls for justice and the demands to preserve the environment in religious language can facilitate those ends. Once religious language is fully accepted in American public discourse, then we can bid good riddance to secular politics.

This book certainly has appeal to Christians who believe that religion deserves a place in the public square. It makes a solid, well-documented plea for the religious viewpoint being represented. But I am not as sanguine as the author that such a politics is possible. It may be too much to ask for secularists to come to a new view of religion, to shed their view of God as merely a rule-maker overly concerned with sin, and to adopt a view of religion that instead is focused on a general direction of history toward some conception of the good. From the secularist viewpoint, why would religion be necessary to work toward that good? So, while I applaud the author's call for a greater degree of religious values and language in our politics, I am not sure how many will listen to that call.

Reviewed by Steve Montreal, Associate Professor of Political Science, Concordia University Wisconsin, Mequon, WI 53097.

FAITH AND FORCE: A Christian Debate about War by David Clough and Brian Stiltner. Washington, DC: Georgetown University Press, 2007. 304 pages, bibliography and index. Paperback; \$26.95. ISBN: 9781589011656.

Faith and Force is an unfortunate title for this book. The "and" gives the impression of two separate areas of life; faith is not a separate area because it permeates all of life. However, this title was chosen, I suspect, for its alliteration

rather than its theological purpose as both authors seek to show how their faith integrates with their different positions.

David Clough and Brian Stiltner have produced an excellent and innovative book. They come from different perspectives as well as different sides of the Atlantic. Clough, a Methodist at St. John's College, Durham, UK, expounds and defends a pacifist position. Stiltner, a Roman Catholic at Sacred Heart University, USA, takes a just war position.

The impetus for this book is the 2003 invasion of Iraq. Two friends found themselves on opposing sides of the debate and long e-mail debates ensued. These debates formed the basis of *Faith and Force*. Each of the chapters is co-written and then followed by the e-mail type discussions which retain much of a conversational character and highlight agreements and disagreements.

The key questions addressed are: When, if at all, is it right for a country to go to war? Should a person serve in the armed forces? How much money, if any, is legitimate to spend on the military? These are urgent questions since millions of lives and dollars are at stake.

Along the way, clear and insightful discussions are directed at topics like developing a war-ethic (chap. 1), the issue of weapons' proliferation (chap. 4), and the menace of terrorism (chap. 5).

It is a little disappointing for this neo-Calvinist not to see any major interaction with Reformed authors on the just war position as it avoids the problems of a natural law approach. Nevertheless, this book is highly recommended, not only for its ethical discussion, but also as a model for debate and discussion. Ethics involves a reflective and dialogic process and these aspects are exemplified in this book. The authors have provided useful resources in thinking about the ethical issues of war from two different Christian traditions.

Despite my reservations with the book's title, it would be great to see a series of books using this as a model such as *Faith and Global Warming*, *Faith and Evolution*; though I suspect these debates might not be as cordial as this particular book.

Reviewed by Steve Bishop, City of Bristol College, Bristol, UK. 

Numerology in Genesis

In a recent article,¹ Carol Hill promotes Umberto Cassuto's suggestion that the author of Genesis employed contemporary numerology in writing his account of creation (Gen. 1:1–2:3).² This is an important suggestion, and merits careful consideration. I support the aim of interpreting Genesis in a way that is consistent with how its first readers would have understood it. If the author did use contemporary numerology in writing it, this greatly affects its meaning.

According to Cassuto, in ancient Middle Eastern numerology, seven was a perfect number. From this he suggests that, when the author of Genesis describes creation as taking place in seven days, he is intending to convey that the work was carried out perfectly. The seven days are accordingly symbolic.

An obvious problem with this explanation is that the author says that God made the seventh day holy (2:3), in anticipation of the fourth commandment (Exod. 20:8–11). In this commandment, God told the Israelites to work on six days and rest on the seventh as he had done in creation (v. 11). For the Israelites, the numbers in the commandment were real—they had to rest for one 24-hour day in seven.

Another problem is that the author of Genesis says that, on the first day of creation, God established the cycle of "day" and "night" on the earth (Gen. 1:3–5), and on the fourth day, made the sun and the moon to "rule over" this cycle (vv. 14–19). The implication is that the cycle before the fourth day was the same as that after it, and that "day" throughout the narrative is equal to the time interval between one sunrise and the next.

Cassuto himself acknowledges a further difficulty. This is that, in parallels from ancient Middle Eastern literature, the seven days of working on a project are divided up as 2 + 2 + 2 + 1. Genesis divides them up as 6 + 1 or 3 + 3 + 1.

Carol Hill also promotes Cassuto's suggestion that the author of Genesis used contemporary numerology in his genealogies (Gen. 5; 11:10–32).³ Cassuto points out that most of the ages in these end in zero or five, and that the remainder can be obtained by adding multiples of seven:

$$\text{age} = (5x + 7y) \text{ years}$$

He associates the number five with the base number of the sexagesimal counting system used in ancient Mesopotamia, 60 months being 5 years.

A major problem with this suggestion is that the above formula will reproduce *any* age above 23 years. As the lowest age in the genealogies is 29 years, the fact that all the ages conform to the formula is of no significance. There is a similar problem with the more complicated scheme proposed by Carol Hill.⁴ In her Table 2, she uses 6 x 2 months to reproduce Nahor's ages. Multiples of this increment can be used to reproduce any age.

It is true that most ages in the genealogies end in zero or five, but this can be explained as being the result of rounding to the nearest zero or five. Many of the numbers look rounded. The distribution of the remaining last digits is unexceptional (1, nil; 2, four times; 3, twice; 4, once; 6, nil; 7, thrice; 8, nil; 9, thrice).⁵

I offer these observations for discussion. Can other readers help?

Notes

¹Carol A. Hill, "A Third Alternative to Concordism and Divine Accommodation: The Worldview Approach," *Perspectives on Science and Christian Faith* 59, no. 2 (2007): 129–34.

²U. Cassuto, *A Commentary on the Book of Genesis*, pt. 1, trans. Israel Abrahams (Jerusalem: Magnes Press, 1961), 12–17.

³*Ibid.*, 258–62.

⁴Carol A. Hill, "Making Sense of the Numbers of Genesis," *Perspectives on Science and Christian Faith* 55, no. 4 (2003): 239–51.

⁵I have taken as independent the age at which a patriarch's named son was born and the remaining years of his life.

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Adam and Eve

Peter Rüst suggests that Adam and Eve in Genesis 2–4 came later than the first humans in Genesis 1 (PSCF 59, no. 3 [2007]: 182–93).

A problem with this suggestion is that these chapters are closely linked. The same word is used to describe Adam in Gen. 2:7 (*ha'adam*, "the man") as the first human in Gen. 1:27. The name Adam (*'adam*) is only used later on (the article is retained, except after *le*, until Gen. 4:25). Further, the story of the creation of Eve out of Adam's rib in Gen. 2:21–23 explains the transition from singular to plural in Gen. 1:27: "God created the man in his own image, in the image of God he created him; male and female he created them." Genesis 2:7ff thus amplifies Genesis 1, as its introduction (Gen. 2:4–6) suggests.

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Prudence and the Redeeming of Technology: A Response to Ken Funk

Ken Funk gives sound advice when he concludes his article (PSCF 59, no. 3 [2007]: 201–11) by calling us to "learn prudent technological innovation and practice" and to "think critically and Christianly about technology" (p. 209). However, the arguments for this conclusion would be strengthened and would gain greater coherence if he would abandon what appears to be Platonic presuppositions regarding the nature of created reality, human life, and therefore of technology.

Funk rightly sees and describes the ambivalence in technology. But he cannot quite take the next logical step of admitting that the question, "Is technology good or evil?" is simplistic and ultimately invalid—this in spite of his admission that "technology may be intrinsically value-neutral" (p. 201). This apparent contradiction appears to be caused by Funk's division of reality into a values-neutral physical realm (including technology) and a spiritual realm (which includes "values" and "religion") and his often cited belief in the hierarchical ordering of each realm. While I applaud his discussions of "the ambivalence of technology" (p. 204), "the promotion of subsidiary goods" (p. 204), and "the illusion of human sovereignty" (p. 205), I fear they are weakened by his weddedness to axiological hierarchy and ontological dualism. That hierarchy and dualism resonate more with the world of Platonic philosophy than with the world of the Bible.

When I read the Bible, I learn of a Creator who brought into being all things and who originally delighted in all things (Genesis 1). I learn that the purpose of all things is to serve the Creator (Ps. 119:89–91). I learn that humankind was created in the image of the Creator and called to serve in a particular way: to care for and enable the rest of creation (Psalm 8). I learn that despite humankind's rebellion and the curse wrought upon the whole of creation as a consequence of that rebellion, the Creator has promised to redeem the whole of creation (Col. 1:20). All this suggests that technology is one of many kinds of human activities, all of which are characterized as "service to the Creator" and all of which can be performed in a multiplicity of obedient and disobedient ways. Hence technology cannot be characterized as good or evil in itself (inherently) because it does not exist "in itself." Technology is just one way in which we as the Creator's image bearers, along with the nonhuman creation, relate to the Creator (or as Funk writes, "commune" with the Creator). As such, engaging in technology is no more or less a "spiritual" activity than is attending a church service. For one biblical affirmation of that claim, read the account of Bezalel and Oholiab in Exod. 35:30–36:5. To engage in technology obediently we need, like Bezalel and Oholiab, to be filled with the Spirit of God.

The Platonic notion that there is a hierarchy of human activities ranging from the base, through the mundane, to the noble is often read into the story of Mary and Martha (Luke 10:38–42), as Funk does in his article. For a convincing refutation of that interpretation (which includes arguments made by John Calvin in his *Institutes of the Christian Religion*), read Lee Hardy's *The Fabric of This World* (Eerdmans [1990], 54–8).

Earlier in this letter, I wrote that "humankind was created in the image of the Creator and called to serve in a particular way: to care for and enable the rest of creation." Technology is one of the chief ways in which we "enable" the rest of the creation to be what the Creator intends for it to be as it unfolds in history. There is a relationship that exists between the human and nonhuman creation that is wonderfully described in Ezekiel 36 (particularly verses 8–12) and that is the foundation for our work in technology. To fully realize that relationship (and to fully acknowledge Ken Funk's call for prudence and critical thinking about technology) we need to see all things holistically, casting off the dualistic and hierarchical glasses fashioned for us by the ancient Greeks.

Finally, thanks to Ken Funk for a most interesting article. The Dordt College Engineering Department read it and spent a delightful afternoon discussing it.

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A Response to Ken Funk

Many ASA members share feelings of guilt associated with "technology," triggered by modern doctrinaire

environmentalists and now intensified by Ken Funk in his article (*PSCF* 59, no. 3 [2007]: 201–11) on “technology.” I have an instant cure for this mode of malaise, guaranteed to elicit viscerally from all readers the thought, “Thank God for modern technology”: read, as I have, the book review of *Hubbub, Filth, Noise and Stench in England, 1600–1770* by Emily Cockayne (Yale University Press, 2007) titled “Cesspool in the City” by Florence King in the *American Spectator* (September 2007): 66–8. In this case, we thank God for modern technology of sanitary engineering—plumbing, water supply, waste removal, and so forth. Similar joyful exclamations occur as we read of the sounds, smells, and sights of urban neighborhoods in the nineteenth century. Thus we honestly can thank God for electricity and automobiles (vs. horses).

The point is that “technology,” at least in these cases, can be viewed essentially as an unqualified good, which we not only accept gratefully but perhaps ponder why these gifts were so delayed in the long history of humans. As in all things, we accept the unavoidable risks and work to reduce them—a long-term task for many engineers and scientists.

Technology, per se, can be good with no need to look for associated faults of negligible significance. (In all cases, the goal of perfect reliability is not attainable.) As such, I believe many Christians involved in the development of “technology” can validly present a positive view of technology to the ASA. That was the guiding thought in my role in creating the name “Christian Engineers and Scientists in Technology” (CEST)—a current ASA affiliation.

I have had a life-long career in developing microwave power technology and microwave safety standards. Throughout, I thank God daily for the insights that reflect imperfectly *his* understanding of microwave physics and have never felt guilty before God for my career. If I refer to the “Guide to Prudent Technological Practice” (Table 1 in Funk’s paper), I meet all his criteria for positive assessment except those (especially #8) that imply absence of competition (industrial or academic) and valid proprietary intellectual property. This ethical dilemma is akin to debating whether the New York Yankees or the Boston Red Sox is “God’s team.” We can rationalize this problem and still end up optimistic pro-technology Christians.

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Residual Radiocarbon in an Old-Earth Scenario

Radiocarbon dating of ancient organic material is based on the radioactive decay of ^{14}C , with a half-life of 5730 years, or with a decay constant $\ln 2 / (5730 \text{ years}) = 0.121$ per millennium. After 100 millennia, the ^{14}C has decayed to an undetectably minute fraction of its original value (less than 6 millionths). However, in rocks or minerals millions of years old, contamination by modern carbon or other processes may introduce tiny amounts of ^{14}C . To interpret

these as due to decay of original organic ^{14}C , and thus to get an apparent age, is quite mistaken.¹

Recently, Rogland has reinterpreted some data, cited by young-earth creationists, on minute fractions of ^{14}C in samples dated by other methods as being 0.4 to 2000 million years old.² He considers as a possibility that this ^{14}C is indeed a remnant of original organic ^{14}C , but that it has not been decaying with a constant rate constant. Instead, a decay equation of stretched exponential form is proposed, $N = \exp(-At^{1+B})$.

The similar Kohlrausch-Williams-Watts (KWW) equation³ accurately describes the decay or relaxation of stress in some viscoelastic materials after they are stretched, or the analogous relaxation of charge in a dielectric. A viscoelastic polymer, with a broad distribution of molecular weights, has a spectrum of relaxation processes, each with a relaxation time, the analog of the decay constant. When the relaxation processes have gradually decreasing strength as their relaxation time increases, the KWW equation represents their total effect well. However, radioactive decay is entirely different: there is no distribution of atomic weight of the decaying nucleus. Rather, the one decay process has a single decay constant, leading to simple exponential decay. Accordingly, in teaching or presentations on dating,⁴ one should keep to the accepted understanding of radioactive decay, without mention of the stretched exponential as an alternative.

Maybe we should focus instead on how much change there is in intervals we experience, such as a year or a lifetime. Because of God’s faithfulness in sustaining his creation in a stable way, we see little change in nature during such an interval. The ancient Bible writers, who had no technology to measure tiny changes due to processes taking thousands or millions of years, may have expressed this stability symbolically by attributing life spans of many ordinary lifetimes to the patriarchs (Genesis 5, 11). While the total of several thousand years may then have been effectively infinite to the Bible writers, to our generation with scientific knowledge of Earth’s past going back billions of years, it seems short. Instead of debating vainly about ages, we should rather heed the biblical call to stewardship of creation in the light of scientific understanding of Earth’s history, as we view its destruction in our lifetime extending from atmosphere to zoosphere.

Notes

¹R. Isaac, “Assessing the RATE Project,” *PSCF* 59, no. 2 (2007): 143–6.

²R. Rogland, “Residual Radiocarbon in an Old-earth Scenario,” *PSCF* 59, no. 3 (2007): 226–8.

³Wikipedia, http://en.wikipedia.org/wiki/Stretched_exponential_function. Accessed October 31, 2007.

⁴D. A. Young, “How Old Is It? How Do We Know? A Review of Dating Methods,” *PSCF* 58, no. 4 (2006): 259–65; 59, no. 1 (2007): 28–36; 59, no. 2 (2007): 135–42.

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Editorial

Rapprochement between Science and Religion

1 Arie Leegwater

Articles

Lessons from the Heavens: On Scripture, Science and Inerrancy 4
A Comparison of Green Chemistry to the Environmental Ethics of the Abrahamic Religions 16
Professional Engineering Ethics and Christian Values: Overlapping Magisteria 26

Denis O. Lamoureux
George D. Bennett
Gayle E. Ermer

2007 Reviewers

Reviewers in 2007 34

Author Exchanges

RATE Responds to the Isaac Essay Review 35
Isaac Replies 36
Intrinsic Radiocarbon? 38
Historically Inaccurate and Seriously Misleading Argument 39
Critiquing the Uncritical 40
Poe Replies 41

The RATE Group
Randy Isaac
Kirk Bertsche
Walter R. Thorson
David F. Siemens, Jr.
Harry Lee Poe

Communication

Genesis 1–11 in the Light of Its Second Millennial Worldview: A Response to Carol Hill's Worldview Alternative 44

Paul H. Seely

Book Reviews

America's Environmental Report Card: Are We Making the Grade? 48 Harvey Blatt
Defending Animal Rights 48 Tom Regan
10 Questions Science Can't Answer (Yet) 49 Michael Hanlon
Science and Islam 49 Muzaffar Iqbal
Into the Cool: Energy Flow, Thermodynamics and Life 50 Eric Schneider and Dorion Sagan
Genetics 101 51 Michael Windelspecht
Science Vs. Religion? Intelligent Design and the Problem of Evolution 51 Steve Fuller
The Wonderful Adventures of Nat Selleck and Eva Lou Shinn in Sci Fi Land: A Spoof on Evolution and Natural Selection 52 A. Nonimous
The Atheist's Bible: An Illustrious Collection of Irreverent Thoughts 52 Joan Konner, ed.
Science and the Akashic Field: An Integral Theory of Everything 53 Ervin Laszlo
The Re-emergence of Emergence: The Emergentist Hypothesis from Science to Religion 53 Philip Clayton and Paul Davies, eds.
All That Is: A Naturalistic Faith for the Twenty-First Century 54 Arthur Peacocke, ed. Philip Clayton
Not in His Image: Gnostic Vision, Sacred Ecology, and the Future of Belief 55 John Lamb Lash
In the Name of Heaven: 3000 Years of Religious Persecution 56 Mary Jane Engh
Can God Intervene? How Religion Explains Natural Disasters 57 Gary Stern
Rethinking Christ and Culture: A Post-Christendom Perspective 57 Craig A. Carter
Misquoting Truth: A Guide to the Fallacies of Bart Ehrman's Misquoting Jesus 58 Timothy Paul Jones
Taking Back the Good Book: How America Forgot the Bible and Why It Matters to You 59 Woodrow Kroll
The New Frontier of Religion and Science: Religious Experience, Neuroscience and the Transcendent 59 John Hick
Renewal in the Wilderness 60 John Lionberger
An Illusion of Harmony: Science and Religion in Islam 60 Taner Edis
Science and Grace: God's Reign in the Natural Sciences 61 Tim Morris and Don Petcher
Monkey Trials and Gorilla Sermons: Evolution and Christianity from Darwin to Intelligent Design 62 Peter J. Bowler
God's Universe 63 Owen Gingerich
What about Science and Religion? A Study of Faith and Reason 63 Paul Stroble
The Panda's Black Box: Opening Up the Intelligent Design Controversy 64 Nathaniel C. Comfort, ed.
Eminent Lives in Twentieth-Century Science and Religion 64 Nicolaas A. Rupke, ed.
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The Happiness Trip: A Scientific Journey 66 Eduardo Punset
Alien Worlds: Social and Religious Dimensions of Extraterrestrial Contact 66 Diana G. Tumminia, ed.
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Render unto Darwin: Philosophical Aspects of the Christian Right's Crusade Against Science 68 James H. Fetzer
American Religious Democracy: Coming to Terms with the End of Secular Politics 69 Bruce Ledewitz
Faith and Force: A Christian Debate about War 69 David Clough and Brian Stiltner

Letters

Numerology in Genesis 70
Adam and Eve 71
Prudence and the Redeeming of Technology: A Response to Ken Funk 71
A Response to Ken Funk 71
Residual Radiocarbon in an Old-Earth Scenario 72

P. G. Nelson
P. G. Nelson
Charles C. Adams
John M. Osepchuk
Charles E. Chaffey