

# PERSPECTIVES on Science and Christian Faith

JOURNAL OF THE AMERICAN SCIENTIFIC AFFILIATION

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Pandemic Justice

A Recovery of Wisdom as Virtue for an Ethics of Genetics

How Old Is It? How Do We Know?

A Review of Dating Methods—

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Concordism and a Biblical Alternative:

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Is Intelligent Design "Scientific"?

*"The fear of the Lord  
is the beginning of Wisdom."  
Psalm 111:10*

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2. Authors must submit **an electronic copy of the manuscript formatted in Word** either on a floppy disk or 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 Style Manual* (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.

**ARTICLES** are major treatments of a particular subject relating science to a Christian position. Such papers should be at least 2,000 words but **not more than 6,000 words in length**, excluding endnotes. An abstract of 50–150 words is required. Publication for such papers normally takes 9–12 months from the time of acceptance.

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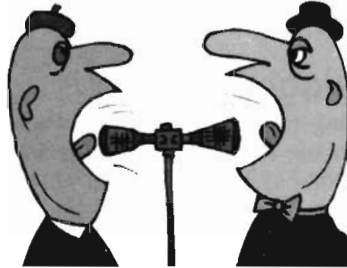
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## Do We Debate or Dialogue



### Issues of Science and Faith?

**D**iscussions on hot issues abound in our time! Among contemporary faith and science issues, I think three of them—origins, abortion, and global warming—have especially been divisive in the Christian community. In our Shenandoah Valley of Virginia community, a church group promoted a public debate between a nationally known young earth creationist (YEC) and an obscure retired professor who advocated naturalistic Darwinian evolution. The YEC promoter quickly pointed out two positions for understanding origins—his specific Christian interpretation and his opponent's atheistic evolutionary interpretation. Using good debate techniques gained from years of experience with this forum, the YEC clearly won the debate in the minds of most persons in the audience. Since only two choices were represented and the Christian option was well promoted, the outcome was inevitable. However, I do not think audience understanding was enhanced.

Similar scenarios have occurred within abortion and global warming debates. Recently, I participated in an online email discussion with a group of persons on faith and science issues, especially as they relate to Intelligent Design (ID) ideas. In a week or two, the discussion morphed away from ID to a "debate" on the exclusive validity of YEC. Soon the discussion shifted from discussing issues such as a recent creation, animal death before the Fall, fossil record, hominid evidences, and length of creation days in Genesis into slanderous attacks on the few persons not holding a YEC view.

In reflecting on these encounters, I wonder about the value of debate as a tool to create understanding. In my experience, debates have created more heat than light and have served to further entrench combatants in defending their position while attacking their opponent's position.

More and more, I am convinced that within the circles of the Christian community, we should avoid the "debate mode." Rather, we should deliberately advocate a "dialogue mode." Why?

The goal of a debate is to win, while the goal of a dialogue is to find common ground with delineating differences. One listens in a debate to find argument flaws, which can be exposed and countered. Within dialogue, one listens in order to understand an alternative viewpoint. Debates tend to be polemic and oppositional, while dialogues are collaborative and work to enhance understanding. Dialogue advocates typically try to re-state an alternative view to test the accuracy and clarity of their understanding of that view. Consequently, a dialogue advocate may say, "This is how I understand what you are saying ... Is my description accurate?" Dialogue participants seek self-correction; debate participants seek to correct the other. Open mindedness is created with dialogue; a closed mind position is enhanced with debate. Dialogues encourage respectful conversations over cups of coffee; debates promote forceful speakers behind podiums and lecterns. Finally, debates attempt to finalize a discussion, while dialogues provide for continued conversation. Especially in these issues in which we "dimly peer through our varied perspective glasses," it behooves us to admit that we do not know or understand with entirety and to hold our positions with humility and grace.

Scripture (Acts 17:16–34) describes the dialogue approach of the Apostle Paul with the Greeks on Mars Hill in Athens. The Apostle begins with a Greek understanding of an unknown god and expands by proclaiming that this unknown god is the Creator of the world and of humankind. Using a common ground approach, Paul affirms the text of a Greek poet to make a further connection with his audience. What was the outcome of this dialogue attempt? Some in the audience disagreed and sneered; some wanted to hear more. However, others (maybe only a few) believed.

As editor, I promote a dialogue approach. I believe that dialogues well presented with respect and care can provide us with more understanding and light, while generating less heat. Furthermore, dialogues enhance the actuality of our common faith and Christian commitment and thereby build the body of Christ. What do you think about the dialogue approach? Do you want to talk more about it? I will buy the coffee.

Shalom,  
**Roman J. Miller, Editor**





# In This Issue

## Issue Overview ...

Dialogue is a reoccurring theme in this issue. The editorial promotes dialogue as a medium for advancing knowledge and understanding. Two separate dialogue sections with exchanges between multiple viewpoints make up a major portion of this issue. Some of the Letters dialogue between authors and readers.

This expanded issue of 88 pages is made possible by the generous contribution of an anonymous donor who is providing the funds to increase the number of our journal pages from our normal 72- to the 88-page size in some issues. ("May his tribe increase!")

The quality of our journal is largely depended upon the capable work of our reviewers who read and critique manuscripts submitted for publication. As an acknowledgment of appreciation, we list the names (p. 27) of those individuals who have graciously contributed their time and expertise to review one or more manuscripts in 2006.

## One Essay/Talk ...

Last year, Luke Johnson, biblical scholar from Emory University, presented a well-received talk at a local meeting. One of our editorial board members was so impressed that he urged Dr. Johnson to submit his talk for publication and simultaneously urged the editor to publish the talk. Johnson reminds us about the limits of language and the diversity of language in Scripture and then applies those realities to help us think theologically about creation (pp. 3-9).

## Three Regular Articles ...

Two keynote addresses from the 2006 ASA Annual meeting provide the material for two regular articles. In the first article (pp. 10-18), Karen Lebacqz, bioethicist and Methodist minister, advances the inclusion of four values—equality, expediency, conservation, and caregiver priority—in responding to a pandemic. Are these the appropriate guidelines for response? What are the essential Christian virtues that dare not be comprised during a pandemic?

In the second article (pp. 19-27), Celia Deane-Drummond, director of the Centre for Religion and the Biosciences at the University of Chester in Great Britain, promotes prudence (practical wisdom) infused with divine grace as an essential virtue needed in the issues of genethics. The author carefully links her understanding of prudence both with the insights of Aquinas and theological ideas in Scripture. Can this wisdom rule in our decision-making?

The third article in this section (pp. 28-36) contains Part Two of the three-part series by geologist Davis Young, which reviews scientific dating methods used to quantify geological materials. Young describes several specific radiometric dating methods by providing an overview of their theory and application.

## Two Dialogues ...

The underlying topic of the first dialogue (pp. 37-54) is the appropriate method of Scripture interpretation in relating the Bible to origins. Biblical scholar and writer, Paul Seely, critiques concordism, as illustrated by Hugh Ross' approach to the early chapters of Genesis. Seely offers an alternative, more harmonious approach to the biblical content. Ross, astronomer and founder of Reasons to Believe, responds by pointing out alternative understandings to the points raised earlier by Seely. Read this mutually respectful exchange between two persons, each passionately committed to a specific paradigm, but able to critique another view without denigrating the view holder. So how do you helpfully harmonize Scripture with science? Maybe some readers will want to continue this dialogue.

The second dialogue (pp. 55-65) revisits the views of Intelligent Design (ID) in connection with evolution. Three contributors, Loren Haarsma, Michael Behe, and John Bloom, provide varied insights into the adequacies and inadequacies of ID as a way of understanding issues of origin. Physicist Haarsma provides the initial critique of ID; biologist Behe gives a short response; and then physicist Bloom wraps up the conversation by reminding us that the discussion about ID and evolution includes scientific as well as philosophical and theological issues. Can we come to some synthesis on the role of ID, or must we say that we simply do not know enough yet?

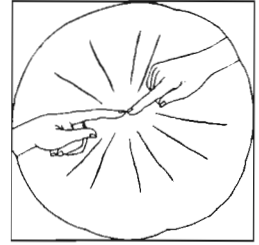
## Other Sections ...

Art Eyes Science includes two intriguing poems by Harry Poe and one by Paul Arveson (pp. 66-8).

In a News & Views article (pp. 69-70), Linda Whitby describes an enhanced mission effort that reaches beyond spirituality and includes the sustenance of living. Read this short illustrated article to understand how the bee industry affects the well-being of persons.

In the Book Review section (pp. 71-84), 22 published books are classified, briefly reviewed and critiqued. Many readers find these reviews helpful in selecting additions to their libraries.

Our journal issue concludes with six Letters (pp. 84-7). One letter by Jeff Mino corrects a couple of items in a prior published article. The last four letters illustrate readers responding to published articles and then the original authors responding back on those reader comments. ★



# Creation

Luke Timothy Johnson

**T**he three topics of creation, resurrection, and eschatology have important features in common. They represent the three critical moments in the Christian myth, describing where we come from, in whom we live, and where we are heading. They, unlike many other theological topics, are of absolute importance: their affirmation or denial, and for that matter, the manner in which they are understood, affect everything else in the Christian worldview and in Christian practice.

The three subjects are all, furthermore, much more about the decisions humans make about their own existence than they are about the description of an objective reality detachable from the mystery of human freedom. To declare God as Creator merely as an opinion that has no effect on how one lives is no more interesting than to declare that Pluto is or is not a planet. To state that Jesus is risen Lord without at every moment paying him absolute obedience is to be stating nothing very much more important than observing that the USA is a democracy without voting. To opine that Jesus will return has the same seriousness as reading a train schedule if that expectation does not direct the conduct of one's life.

All three topics also remind us of how limited our knowledge of reality is, how imperfect our capacity to speak truly about matters that matter most. These topics force us to think about our language and remind us that we strictly do not know what we are saying when we make statements about creation, resurrection, and eschatology.

## The Limits of Language

Our language works best when we speak about everyday things, although we all have experienced the way even the solidest object or common word can seem to dissolve under close scrutiny. Still, the statement, "I like cornflakes" not only makes grammatical sense, it touches real things at every point. The "I" in question is the one with taste

buds, the "like" is the sensation of pleasure, and "cornflakes" is there in the bowl, waiting to be conveyed to my mouth. Contrast the similar-sounding statement, "I love the Lord," whose every word challenges definition even as the combination of words makes the same sense as "I like cornflakes." Who is the "I" in this case? It is both larger and more vague than the taste buds. What is "love?" Something greater and more complex than "like," but in this case especially, made obscure by the obvious fact that "the Lord" is very much unlike cornflakes, not available in my cereal bowl or in any other empirically verifiable manner.

Thinking about the limits of language ought to make us modest in our claims, no matter what our field of study. But modesty should be the mark above all of theologians for three good reasons. The first is that although all theological statements have some sort of real-life, practical corollaries, they are also always predicates whose subject is invisible and ultimately unknowable. The second is that, because theological language is intimately linked to human desires and longings, it is especially susceptible to manipulation and corruption. The third is that theologians can speak so often and glibly about their invisible subject, they can fall to thinking that their subject was as ordinary and digestible as cornflakes, and, worse, that they themselves understood their subject perfectly.

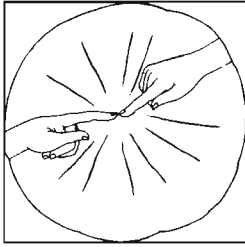
Thomas Aquinas insisted that all language about God and God's activity be chastened by a three-fold dialectic of affirmation and



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*To prevent language about God from becoming idolatrous ... we must also negate it. If mythic language asserts, "God makes," or "God is wise," then the apophatic impulse must quickly assert, "but God does not make," and "God is not wise," as a reminder of how all our language falls short of the reality toward which it points.*

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denial. He recognized the importance, indeed the necessity, of simple affirmations about God such as we find in Scripture, where God appears as a character among other characters, and where the language is therefore properly considered mythic. But such language is inadequate both because it ascribes inappropriate anthropomorphisms to God and because if taken as simply true becomes idolatrous. As Augustine remarked, "If you can say it, it is not God." Affirmative language must therefore be negated by what Aquinas called the *via negativa*, which was nothing else than the apophatic tradition of eastern Christianity: this moment of the dialectic insists that we cannot know God in the way we know cornflakes or even cornflake consumers.

To prevent language about God from becoming idolatrous, then, we must also negate it. If mythic language asserts, "God makes," or "God is wise," then the apophatic impulse must quickly assert, "but God does not make," and "God is not wise," as a reminder of how all our language falls short of the reality toward which it points. God truly is *not* wise in the way we ascribe wisdom to humans; similarly, God does *not* make the world in the way a baker makes cornflakes. The third moment of the dialectic is called the analogical (*via analogia*), which combines both affirmation and negation: we can say that God is wise but only in a way analogous to the ascription of wisdom to humans, and in this analogy, dissimilarity is as great as or greater than the similarity.

## The Fundamental Truth

I remind myself and you of the problem of human language when speaking of God at the beginning of this essay on creation, precisely because this topic is so fundamental for everything else, and is also so vulnerable to distortions of language. The profession of God as Creator is fundamental first of all for the rest of the Christian myth to have any sense at all. It is because God is the Source of all things that God can also be Revealer, Savior, Sanctifier and Judge of all. Because heaven and earth are not God but come from God at every moment, they reveal by their very existence the one who makes them (Wis. 13:1–9; Rom. 1:19–20). Because God has "Maker's knowledge" of all things—that is, knowledge from within—God can judge

righteously as one who "knows the heart" (Acts 1:24) and cannot be swayed by appearances (1 Pet. 1:17). Because God loves what God has made, God seeks to save his world (Pss. 65:1–15; 79:9; 1 Tim. 4:10). Because the universe is the bodily expression of God's Spirit, by his Holy Spirit, God is able to transform the world and sanctify it (Ps. 51:1–17; Rom. 15:16; 2 Thess. 2:13).

The profession of God as Creator is fundamental as well because it most decisively divides humans in their most basic response to the world in which they find themselves. The real divide is between atheists and believers. Deists and agnostics fall on neither side of the divide because they neither affirm nor deny anything very important. A deist god who once wound the world like a clock and then let it tick on its own may be praised or blamed for good or poor craftsmanship, but in no manner resembles the God professed as Creator of heaven and earth by robust Jews, Christians, and Muslims. As for agnostics, their pretense of intellectual respectability and detachment masks intellectual confusion and moral laziness; humans cannot remain detached concerning the most pressing of all existential questions, as though it were a hypothesis still requiring more information to be satisfactorily demonstrated, and we were only interested observers in the outcome.

Atheists seldom adopt their position because of scientific knowledge, although science often serves to legitimate a stance that derives from a moral rather than a purely intellectual posture toward the world. There is a long tradition of "noble atheists" who refuse to acknowledge the existence of an all-powerful and loving God precisely because of the perceived savagery in nature ("bloody in tooth and claw") and the overwhelming evidence of cruelty and evil among humans. As memorably stated by Montaigne, "God's only excuse is that he does not exist." Such atheists regard belief in a creator God as a craven relinquishment of human freedom and moral responsibility. Other atheists, to be sure, are less noble. They are named in the Bible as the fools who say in their heart, "there is no god," precisely to exercise their freedom in moral irresponsibility. As Nietzsche stated, "If there is no god, all things are possible." Such atheism is not the result of scientific reasoning;

it is the willful denial of human contingency and the assertion of a false independence.

## The Languages of Faith

On the other side of the divide are those who profess belief in a creator God. On this side also, it is necessary to examine the expression of that belief and its basis. For believers, three kinds of language are involved. None of them are scientific in any sense of the word. Just as atheism seldom if ever results from strictly scientific examination of the empirical world, so does belief equally rarely stem from or find its basis in a strictly scientific analysis. The first language is that of the Christian creed, the second is the language of Scripture, and the third is the language of the human heart.

I take the beginning of the Nicene Creed—the most widely used liturgical expression of Christian faith—as a starting point: “We believe in one God, the Father Almighty, maker of heaven and earth, of all things, visible and invisible.” Even the minority of Christians who find creeds generally unpalatable will subscribe to this statement as representing their position. I would hope that they would agree to two further observations concerning this declaration. The first is that the creed is a communal and public declaration rather than an individual and private one. The person who recites the creed with others in worship thereby declares an allegiance not only to the truth of the proposition but to all the others affirming the proposition, and acknowledges implicitly as well that, at any given moment, the church believes more and better than any individual believer. The second is that the language of the creed is performative: those who recite it *profess* the conviction that God is the Source and End of their existence and their commitment to live in a manner consonant with that profession.

The creed, in turn, derives from and provides a guide to reading the much more complex language of Scripture. All Christians would agree that the specific language shaping their view of creation, which the creed reduces to the level of a proposition, is the rich and variegated language of the Old and New Testaments concerning God as the Source and Goal of all that exists. The language of Scripture is indeed rich, but it is also variegated.

It is diverse first of all because Scripture’s compositions were written by humans across many centuries and lands and reflect the linguistic and cultural features of their time and place. Christians affirm the divine inspiration of Scripture, to be sure, but that affirmation is connected to the equally important one that, as the creed says, the Holy Spirit “spoke through the prophets,” that is, the human Moses, Isaiah, David, Solomon, and Paul, and gave specific and finite expression to the Word that God wanted humans to hear and obey. Because of the distinct historical location and perspective of these human authors, further-

more, Scripture contains distinct witnesses concerning everything from creation to incarnation, witnesses whose value is to be found precisely in the fact that they do not agree on every point. We are not astonished, then, to find one witness to God’s creative activity in the first chapter of Genesis and another in the second chapter, and still others in the psalms and the prophets. One way to misuse the language of Scripture is to ignore this plurality of voices and consider only one as significant. The creed, in fact, derives its terse but comprehensive statement concerning God as Creator from the entire range of its witnesses.

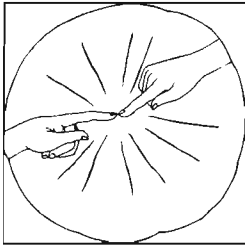
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The language of Scripture is diverse also because the compositions speak in a variety of modes. Some are narratives of a quasi-historical character and others are narratives in a legendary or mythic mode. Other parts of Scripture consist in law. Still others speak in the form of prayer or poetry or prophecy or proverb, and in these modes the metaphorical is always dominant. It is an abuse of scriptural language to reduce all the modes to one, and above all to literalize, and thereby kill, Scripture’s metaphors. Despite all this diversity, it is true that Scripture’s many witnesses speak with a remarkable consistency on the points that matter most. Indeed, this is one of the small miracles that make people think of the Bible as inspired: written by so many people over so many centuries and social settings, Scripture nevertheless imagines a world that is internally and satisfyingly coherent.

I use the term “imagines” advisedly. Scripture does not so much describe the empirical world that is the realm of scientific hypothesis and demonstration as it imagines the world as at every moment deriving from and directed to one ultimate power. Because Scripture so imagines the world, it also reveals the world as a place permeable to and penetrated by that divine power and invites readers to share that imaginative vision and to render it as empirical by living as though it were real. Because goodness, beauty, and truth exist among humans, Scripture imagines their Maker as also possessing goodness, beauty, and truth, and so imagines humans—all empirical evidence to the contrary notwithstanding—as created in the image of their



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Maker. But, wonder of wonders, although wickedness and unrighteousness also exist among humans, Scripture does not ascribe those qualities to the Creator; instead, all that God makes is “good, very good,” and God is imagined as faithful and compassionate and righteous in every respect.

The third language that comes into play in Christian faith in God as Creator is the language of the heart. By this I do not mean simply feeling or sentiment. “A feeling of dependence” does not necessarily translate to the creating God of Scripture and the creed. When the Bible speaks of the human heart, it refers also to the seat of the deepest forms of thought and discernment, of decision and of moral disposition. Blaise Pascal drew on this dimension when he said that “the heart has its reasons which reason knows nothing of” (*Pensees* 277).

The heart in this sense leads us to the deepest and most obscure mystery of human freedom: just as the noble atheist looks at the world and finds it lacking either logic or mercy, so does the believer gaze on the world and find it drenched with grace. Who knows how, or why? We cannot account for the tangle of causes that lead to such different effects. We do not know why one person can place a finger to pulse and feel the power of God and another can feel only the movement of blood. All we can say is that it is the language of the heart within the believer that makes the language of the Bible sensible, even compelling, and the language of the creed something gladly to embrace, while the atheist finds the language of the Bible unintelligible when not obscure, and the creed’s profession the perfect example of intellectual alienation. The believer finds congruence among the three languages. The atheist finds a dire dissonance between the first two and what the heart speaks.

## Thinking with Scripture

Christian thinking about God as Creator – something distinct from believing in and obeying God as Creator – starts with and never moves far from the language of Scripture, for what Christians confess as creation is not the result of a logical inference from the available empirical data, but the acceptance and celebration of the imaginative vision offered them by Scripture. Thinking

with Scripture about this topic often suffers, however, from two interrelated errors. The first is to take the first two chapters of Genesis as though they were the only pertinent texts to consider, the second is to reduce the stunningly imaginative vision of Genesis to a literalism that simultaneously robs it of poetry and diminishes the importance of its witness. I suggest that the best way to avoid the second error is by eliminating the first.

Each of the creation accounts in Genesis has its own beauty and power. The first tells us that God is not to be identified with the world or with part of the world, but rather is the Originator of all that exists; that God brings everything into being by the power of his word; that creation is therefore ordered and declared good as God makes it. It imagines humans as created in the image and likeness of God, male and female equally participating in that image, and equally exercising dominion among other creatures. It declares human sexuality good by making the propagation of children the first divine commandment. This vision of creation is majestic, the unfolding of a cosmic drama, with God orchestrating the entire process through his command, his internal counsel (“let us make man”) and his approving comment.

The creation account in Genesis 2 has its own distinctive vision, equally imaginative and powerful. Here, God is much more intimately involved with creation, forming a human from the dust of the earth, placing him in a garden to tend and preserve, parading the animals before Adam to receive a name and possibly find a mate for the man, expressing empathy (“it is not good for man to be alone”), shaping a partner for the male from his rib. In this version, the narrator focuses on the relationship between man and woman (they cleave to each other) more than their propagation of children; and imposing limits to what they can eat that introduces the possibility in the creature of obedience or disobedience.

Taken together, both accounts of creation have a wisdom that speaks inexhaustibly to the human condition, not only as it was “in the beginning” but above all as it continues to be in every circumstance throughout time. It is not at all strange that these accounts are echoed in the paeans to personified wisdom



in Proverbs 8 and Sirach 24, for they have preoccupied sages in the Jewish and Christian traditions for centuries, constantly enriching those who invest their minds, and especially their imaginations, in the study of these texts.

When these wonderful passages are isolated from the other voices within Scripture and read in an inappropriately literalistic fashion, the passages are deprived of their power precisely to the degree that they are robbed of their magic. The perils of reading the beginning of Genesis as though it were a literal, historical description, are illustrated by Saint Augustine, who tried three times to interpret Genesis according to the letter, and never got past the opening passages. Augustine kept getting stuck. From our advantage, we can see that he lacked an understanding of narrative truth that would enable him to engage the metaphoric qualities of the accounts in their own terms. As soon as one starts trying to parse out in the first chapter the relation of light and day, of the temporality of days, or the placement of the firmaments or the arrangement of the plants and animals, as though these were matters of natural scientific inquiry, one loses the point of the account altogether.

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The second chapter of Genesis is worse. How can one speak literally of humans made from dust or a woman made from a rib? Such conceptions do not defy sophisticated theories of evolution; they do not rise even to the level of basic human biology. Only people who are simultaneously desperate to maintain the truth of Scripture and have reduced the truth of narrative to the referential can commit such grievous offenses against intellectual integrity as to seek science in these poetic tales.

The temptation to literalize the poetry of Genesis 1–2 grows greater to the extent that these chapters are isolated from other scriptural voices and treated as though they contained all that Scripture had to say on the subject of God’s creation. In fact, these chapters are not the only or even the most important scriptural witnesses to this reality. And what happens when they are isolated is that

creation appears to be an event that happened in the distant past (rather than also in the present)—it is read as a chronological beginning rather than as existential cause—and therefore also as something that is concluded rather than continuing. In short, when isolated and read literally, the passages in Genesis can be read as supporting precisely the deist conception of a god who is around to get things started and then leaves creation to its own devices—apart from a few extraordinary interventions that have come to be called “miracles.”

The other voices of Scripture, in contrast, suggest that God’s creative activity never ceases. Psalm 104, for example, celebrates creation as a wonder that God performs new every day. Continuously God summons and controls the forces of nature, establishes and maintains the boundaries of the universe, and calls into being and nourishes the world’s plants and animals. God does this not once but always:

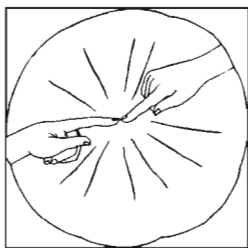
These all look to you to give them their food in due season; when you give it to them they gather it up; when you open your hand they are filled with good things. When you hide your face they are dismayed, when you take away their breath, they die and return to their dust. When you send forth their spirit, they are created, and you renew the face of the earth. May the glory of the Lord endure forever, may the Lord rejoice in his works, who looks on the earth and it trembles, who touches the mountains and they smoke ... bless the Lord, O my soul. Praise the Lord! (Ps. 104:27–35).

This God creates anew every day. This is a God who is totally in touch with the changing world because it is by his power that it comes into being and changes!

In the prophets we find a deep congruence between God’s continuing creative power and God’s shaping human events in history. Thus Isaiah mingles the language of creation and that of new creation in history. The God who now “makes the things to come” (Isa. 45:11) is “the Lord who makes you” (Isa. 54:5) and who makes things new (43:19; 48:6). Isaiah links God’s creative energies in the beginning, his constant renewal of the earth, and his work within human events:

Thus says God, the Lord, who created the heavens and stretched them out, who spread forth the earth and what comes from it, who gives breath to the people upon it, and spirit to those who walk in it: I am the Lord, I have called you to righteousness, I have taken you by the hand and kept you, I have given you as a covenant to the people, a light to the nations ... I am the Lord, that is my name (Isa. 42:5–8).

In the New Testament, God’s continuing capacity to create is expressed above all in the resurrection of Jesus from the dead (Rom. 4:17–24). For Paul, the resurrection of Jesus is so radical that it can only be called a “new



## Essay

### Creation

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creation" (2 Cor. 5:17; Gal. 6:15). Christ is the "last Adam" (1 Cor. 15:45), who is the "new human" (Col. 3:10), by whose image other humans are measured and into whose image the Spirit shapes believers (2 Cor. 5:17–18). Paul merges creation and resurrection language when he declares, "The God who said, 'Let light shine out of darkness,' has shown in our hearts to bring to light the knowledge of the glory of God in the face of Christ" (2 Cor. 4:6).

Not even the resurrection of Jesus and the renewal of humanity (Rom. 12:1–2) mark the end of God's creative activity. The Book of Revelation joins the first creation to the new: "Worship him who made heaven and earth, the sea and the springs of water" (14:7); and "Then I saw a new heaven and a new earth; for the first heaven and the first earth had passed away and the sea was no more ... and he who sat upon the throne said, 'Behold, I make all things new'" (21:1–5). Also 2 Pet. 3:13 declares: "According to his promise, we await new heavens and a new earth in which righteousness dwells." In sum, the dominant testimony of Scripture is that creation is not simply an event in the past, but is a constant and present activity of God.

### Thinking Theologically about Creation

I have elsewhere used the expression "critical theological concept." By this I mean that we cannot supply an adequate account of the positive content of a conviction, but we know that the denial of it distorts essential truths. By analogy, I may not be able to demonstrate the ways or degree to which my wife loves me, but to deny that she loves me would mean distorting every aspect of my life.

In conclusion, I make a series of ten short affirmations that spell out the critical theological concept of God's creation that is stated as a proposition by the creed, witnessed to poetically by Scripture, and testified to by the hearts of believers.

1. The profession of God as Creator is the supreme example of a critical theological concept. It is impossible for us to declare the positive content of the statement. We cannot demonstrate in any scientific fashion that God creates the world, much less how cre-

ation takes place. But we stake our lives on the conviction that denying God's creation means distorting both the world and our place within it. We agree with Paul that this first and greatest lie, the failure to acknowledge God's claim on us in our creaturely status, leads to the systemic lies and distortions that corrupt human existence and lead creation itself into bondage (Rom. 1:18–32; 8:20).

2. Theologically, we must think of the phrase of Gen. 1:1, "In the Beginning," not in terms of time but in terms of causes. If we think of "beginning" only in terms of chronology, then we may imagine creation as initiated and completed by God long ago. God would indeed be like a watchmaker whose work can still be detected from the intricate design of a timepiece, but who is no longer needed once the watch leaves the shop. Scripture, in contrast, sees God as the breath that moves through and stirs the world, as the "Life-Giver" who brings all things into existence at every moment. God is the world's "beginning," not once long ago but at every moment.

3. Scripture and the human heart also attest to the truth that God's creative activity continues as the fundamental sustaining and shaping power at work in all things, as the cause that causes all other causes. God as Life-Giver always moves ahead of the processes of the world because at every moment of every process God's power is at work. God as Creator is not, as some have supposed, like the first cause in a series of causes, which demands, as Bertrand Russell complained, an infinite regress. Rather, God's creative activity is the cause simultaneously (so to speak) underlying the entire series of causes.

4. The Christian confession of God as Creator is therefore not a theory about *how* things came and come into existence, but is rather a perception *that* all things are always and at every moment coming into being. God's self-disclosure in creation, therefore, is not like the traces of the watchmaker in his watch. God is revealed first of all not in the *whatness* of things—their essence—but in the *isness* of things—their very existence. That anything exists at all—that there should be rather than not be anything—is the primordial mystery that points us to God.

5. Everything that exists, insofar as it exists, is equally capable of revealing God. Although they differ in size and significance, a mouse and a mountain reveal the creating God in the same way, by their coming into being in the world. The smallest cell and the largest stellar constellation are equally fragile, equally dependent on God—at every second—for their existence. Likewise, every human breath, thought, impulse, and movement is dependent on the creating God, and that state of contingency—of real but unnecessary existence derived from another—never changes into a more secure condition, not for mountains, not for humans. All that is constantly comes into and moves out of existence while God alone, who breathes through them all, remains necessary and sufficient.

6. All that is sensible in our world—everything material that presses upon us and that we engage in daily—points beyond itself to an unseen power that brings it into existence. Understood in this fashion, the world itself in all its creatures and all its processes can be regarded as God's chosen instrument of self-revelation. Spirit needs body for its expression, and the world itself in its contingent existence, in its continual coming-into-being, is the body God has chosen to express his own spirit. God's revelation is not something that takes place outside the world's processes but precisely and necessarily through them, through the expressive shape of leaf and flower, through the slink of snakes over stones and the movement of tigers in the night, through the body language of erotic love, through the symbolic gestures and words of the prophets. A corollary of this appreciation of revelation is that the appropriate disposition of humans toward the world is not one of dominance or manipulation but one of the profoundest reverence and attentiveness.

7. To see God's creative activity at work in every worldly process and event, in the coming to be of all that comes to be, means to see the miraculous everywhere and in everything. Everything that exists is wondrous and inexplicable in its existence. The miraculous is not, as modernity would have it, an exception to the iron-clad laws of nature, but is rather the magic of God's work in everything whose law or logic humans strive to decipher. In this understanding, a healing worked by the medical art is just as much a miracle as a healing accomplished by prayer, for existence in all its forms and expressions is equally a surprising and gracious demonstration of the power of God. Christians correctly perceive the efforts of modernity to demystify the world as erroneous, an idolatrous effort to replace with a set of mechanical explanations, the beauty and mystery inherent in the veiled dance we call existence.

8. This vision of creation—which is the vision supported by the entire weight of Scripture—is entirely compatible with theories of evolution, for it sees God's world as

always in the process of becoming, never finished once for all, always flowing from the infinite creative energies of the all-powerful Life-Giver. Theories of astronomy and geology and biology that enable us to perceive a universe immeasurably more vast than we had earlier imagined, an earth far more constantly in ferment from the powerful interactions among tectonic plates than we appreciated until very recently, and an ecology far more complexly developed and more fragilely interconnected than ages before us realized, all these scientific perspectives address and can only address the interconnecting causes and effects of beings that have been or are now already in existence. They cannot account for existence itself, for the fact that anything at all should be rather than not be, for the reality that all things together hang dependently on a power not their own. But concerning the sequence of becoming, scientific theories touching on an expanding universe and evolving species are actually more congruent with the scriptural witness concerning the ever-creating God than an antiquated science of static and stable entities set forever in an unchanging order.

9. If God's creation of the world is not a scientific theory but a critical theological concept, neither is it simply a vision of reality that gives rise to worship (though it certainly does that!), but a profession that commits believers to certain dispositions and practices with respect to the world. Among dispositions, I have already mentioned an attitude of reverence and attentiveness rather than manipulation and dominance as prerequisite to discerning God's self-disclosure through his continuing creation of the world. Connected to this disposition are practices with respect to the use of material things, among them a commitment to an ecological care for the earth based not on a craven fear of extinction but on the theological perception that "the earth's is the Lord's and the fullness thereof," and that, as God's chosen instrument of self-disclosure, the earth remains always God's gift, given at every moment. It never becomes a human possession or plaything for careless disposal. Closely connected to such an ecological awareness is a commitment to the sharing of possessions among all God's creatures, a sharing that can be open-handed and generous precisely to the degree that humans recognize that their contingency cannot be erased through what they possess (as though being were having) but can be celebrated through what they share with others.

10. Finally, the vision of the world as coming into being at every moment out of nothingness by the power of an unseen but infinitely powerful God is the premise for any serious consideration of the resurrection of the dead or the realization of God's rule. Paul directs our thoughts when he speaks in Romans of the faith of Abraham: "He is our father in the sight of God in whom he believed, who gives life to the dead, and calls into being what does not exist" (Rom. 4:17). ■



## Article

Pandemic Justice

# Pandemic Justice

Karen Lebacqz



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*To answer the question of what justice requires, we have to begin with some generally agreed values. I propose two values: (1) equal value of all people; and (2) option for the poor.*

*The history of "triage," deriving largely from war, suggests four possible principles for triaging in times of disaster: medical need, first come first served, doing the greatest good, and expediency. These principles both reflect and threaten two basic Christian and American values: equality and an "option for the poor." Drawing on these values, with attention to the particular circumstances of pandemic, the author rejects some proposed principles for triage and argues for the priority of expediency in order to serve the interests of equality and of the poor. She concludes with some cautioning notes about process.*

**W**hat would justice require in times of pandemic? Surprisingly little has been written on this topic. What I propose here is preliminary and incomplete. My focus is on ethical principles rather than on specific practices or ways to implement principles. This article is intended as a conversational platform from which more immediate and concrete decisions might be made, appropriate to particular settings.

## Two Basic Values

To answer the question of what justice requires, we have to begin with some generally agreed values. I propose two that reflect my Christian faith affirmations. However, I believe that these values are sufficiently well entrenched in American narrative, culture, and philosophy to serve as a general grounding from which considerations of justice can be elucidated for social policy. The two values are these:

### 1. Equal Value of All People

Christians and other Americans share a fundamental commitment to the *equal value* of all people. Equality before the law is a grounding conviction in American culture, even if it is violated in practice.<sup>1</sup> A classic philosophical principle of justice is "treat

similar cases similarly." In religious tradition, the equal value of all people is sometimes called "equal dignity." It is grounded in the conviction that all people are "made in the image of God." Whether grounded in secular law and philosophy or in religious tradition, equal treatment is a sufficiently shared value to serve as one of the *constraints* that justice must meet. Justice requires that different treatment be justified on the basis of morally relevant differences between people. I will return below to the question of locating and justifying morally relevant differences.

### 2. Option for the Poor

The second value is what Christians call the "option for the poor."<sup>2</sup> While this notion has received considerable development in Roman Catholic moral theology, it is also widely acknowledged in current Protestant ethics. It means that those who are oppressed or marginalized are deserving of special attention and that social systems can be judged by how they benefit the least advantaged. The option for the poor implies both an *epistemological privilege* for the oppressed—that is, the perspectives of oppressed people are to be taken most seriously when assessing a situation—and also a *distributive advantage* for those who are disadvantaged, so that any social arrangements benefit "the least of these"<sup>3</sup> For Christians, this option is based on faith convictions—that we are to welcome the widow, the orphan, the alien in the land—those who are outcast or marginalized or powerless. It may be because of the Christian influence on American culture that John Rawls' "difference principle" has also found such resonance and been so influential in

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contemporary Christian and philosophical circles.<sup>4</sup> Rawls' "difference principle" requires that inequalities in distribution of basic goods must redound to the advantage of the disadvantaged.<sup>5</sup> While there has been considerable debate about the precise implications of this principle, Rawls himself clearly thought that it worked toward equality and thus had a leavening effect on society, raising the status of the poor. Thus, in both philosophical and theological circles we get a second basic value—the need to assess situations by how they affect the poor.

Disaster threatens both of these values, particularly the option for the poor. In times of disaster, when many more need medical treatment than can be accommodated, how do we uphold equal value? Is there any way to protect the option for the poor, or must we yield to other principles or procedures in times of disaster? In particular, "triage" in times of disaster has come (as we shall see) to be associated with utilitarian principles of doing the greatest good overall. Can such principles be reconciled with an option for the poor? Does a Christian perspective allow accommodation to principles of utility or expediency?

## Facing a Pandemic: Four Reasons Why We Should Worry

### 1. Recurring Pandemics

Over the last century, we have seen recurrent pandemics of flu. Up to 50 million people died worldwide from the influenza pandemic of 1918; 70,000 died in the U.S. alone in the flu pandemic of 1957; 34,000 died in the U.S. in 1968 from yet another pandemic.<sup>6</sup> Whether it will be this flu or the next strain, experts predict that we cannot avoid a pandemic at some time.<sup>7</sup>

### 2. The Possible Escalating Current Situation

At present, our eyes are on the H5N1 strain called avian flu. There are fewer than 300 known cases of humans contracting avian flu and until June 2006, it was thought that those who contracted the flu all had direct—and generally prolonged—contact with infected birds. Even so, the rapid spread of the virus (it has been found in Europe most recently) and the potential of all viruses to mutate rapidly engendered a realistic fear that this one may eventually spread from person to person, rather than simply from bird to person. In June 2006, anxiety rose as the first cases were reported in which the flu appeared to have spread from person to person, increasing the likelihood of a pandemic.<sup>8</sup> It therefore seems prudent to consider what justice might require in times of pandemic.

### 3. Evidence that the Poor Suffer Most in Times of Disaster

Hurricane Katrina and the Asian tsunami of 2004 demonstrate that, in times of disaster, it is often the poor who

suffer most.<sup>9</sup> If justice requires an option for the poor, then we must look closely at what might happen in a pandemic.

### 4. The Failure of the National Disaster Medical System

A study completed in December 2005 for the House of Representatives concluded that the U.S. National Disaster Medical System has been undermined during the Bush administration and is currently inadequate for response to future disaster.<sup>10</sup> Failures at all levels during Hurricane Katrina indicate the urgency for American communities to consider their own disaster response systems.

## Some Opening Cautions

### Is Justice Applicable to Situations of Dire Scarcity?

Some believe that in times of war or other disasters involving massive casualty and injury, "justice" simply becomes moot. This is for two reasons. First, justice requires *order*. There must be enough remaining authority to keep sufficient order so that decisions about distribution are not simply the result of looting, pillage, and armed citizens run amok. Experience following Hurricane Katrina suggests that in times of disaster, there may not be enough order left for justice to operate at all. Perhaps, then, asking about justice is a futile exercise. Part of the reason that we plan ahead is in hopes of retaining enough order for justice to operate. The need to secure order may itself affect principles of justice, as we shall see below.

Second, justice concerns apply when there is a *shortage* of needed goods—some, but not enough to go around. A pandemic raises the probability of *dire* scarcity of needed resources. For instance, some predict that there will be enough flu vaccine to treat fewer than 500 million people worldwide—scarcely 14% of the population.<sup>11</sup> Does justice disappear under conditions of dire scarcity rather than simple shortage? If there *are* no resources to distribute, then one can hardly be accused of unjust distribution. Under such conditions, failure to treat someone may be tragic, but it may not be unjust or blameworthy.<sup>12</sup> Hence, perhaps considerations of justice do not apply at all in cases of pandemic. Yet I would argue that scarcity, even dire scarcity, renders justice necessary. When not all can be served, the question of who shall be served and who shall be neglected takes on special urgency.

### Is War a Good Model?

The question of justice in times of disaster has been best studied with regard to war and treatment of the wounded during war. Principles of "triage" generally derive from that context. Whether war provides a good context for considerations of principles for medicine is certainly debatable. Philosopher Michael Gross has recently argued that war transforms the usual principles of medicine, elevating utility in a way that may run roughshod over





*Disaster threatens both of these values, particularly the option for the poor. ... In particular, "triage" in times of disaster has come ... to be associated with utilitarian principles of doing the greatest good overall. ... Does a Christian perspective allow accommodation to principles of utility or expediency?*

## Article

### *Pandemic Justice*

honored principles of autonomy and doing good for the patient.<sup>13</sup> It is not clear, then, that principles drawn from battlefield experiences should prevail in examining medical disasters or pandemic. Nonetheless, I will begin with some considerations of the triage principles that have emerged from wartime medical interventions, as they help to display some options and principles.

#### **Do Justice Demands Differ for Prevention and for Treatment?**

The questions of justice that arise around a flu pandemic should, ideally, be dealt with in two contexts: preventive medicine and treatment of those who become ill. It is possible that principles of distributive justice should differ for each of these contexts—that those who should get priority in access to preventive vaccines, for instance, are not the same as those who should get priority in treatment once ill. In what follows, however, I have not distinguished these two contexts. I do this in part because we have, at present, no effective vaccine for avian flu.<sup>14</sup> If a pandemic hits, the justice questions will be focused on access to treatment and to vaccines such as Tamiflu as part of a combined treatment and prevention plan.<sup>15</sup>

#### **Should We Have Triage at All?**

Some may find repugnant the idea that we make any choices about who gets treated. Perhaps it is better to let all die if not all can be saved. One way to ensure equality is to avoid choosing one over another.<sup>16</sup>

But in fact, the everyday context of medicine is rife with "triage" decisions. As medical resources, including time and energy of staff, are often in short supply, decisions are made constantly to determine who gets attention first. Anyone who has sat in an emergency room sees this clearly. Just as clearly, decisions in the emergency room reflect longstanding judgments that those who are in most urgent need get attention first, and those who are less urgent must wait. This is an implicit triage principle.

However, the emergency room is not the only setting where triage occurs in America. As Larry Churchill noted long ago, the very fact of distributing health care on the basis of the ability to pay already involves a "rationing" system<sup>17</sup>—a form of triage in which some are treated first. With more than

40 million Americans uninsured at any given time, there are many hardworking people who have little access to medical care and whose health is demonstrably worse because of it.<sup>18</sup> Access to health care is already "rationed" in the U.S., and we can say with some certainty that our current system of triage does not advantage the poor. By law, emergency rooms may be accessible to all without regard to the ability to pay, but health outcomes will remain very unequal so long as general health care depends on insurance or the ability to pay. This very fact might give additional impetus to adopting principles in times of crisis that are intended to advantage those whose health has already been harmed by rationing schemes. Further, it is very clear that if we have a genuine commitment to the poor, much needs to happen before a pandemic hits. This, too, is a lesson from Hurricane Katrina. Fixing our National Disaster Medical System must be a priority.

#### **Competing Triage Principles**

As rationing is already a reality, rationing in times of disaster should not come as a surprise. Stuart Rennie and Frieda Behets have recently argued that "in situations of medical scarcity, rationing decisions cannot and should not be avoided."<sup>19</sup> I concur. We must choose some triage principles. Here, a brief history may be instructive.

The term "triage" is defined as the screening of patients to determine their priority for treatment.<sup>20</sup> Casualties in a military or civilian disaster are divided into categories and responses differ accordingly. One of the simplest divisions creates the following response: those who may survive *without* treatment and those who cannot survive even *with* treatment are ignored, while energy focuses on those who need treatment *in order* to survive.

But this simple division is not enough. Those who need treatment in order to survive may be so numerous that not all can be treated at once. Who among them should get priority?

#### **Medical need**

A pioneer in military triage was Baron Dominique Jean Larrey, Napoleon's chief medical officer. Larrey not only invented

the “ambulance” system of taking treatment into the field, but he systematized and ordered the priority of treatment so that more soldiers could be treated in less time. Larrey sorted casualties on the basis of medical *need*. The dangerously wounded were to be treated first, without regard to rank or distinction. Medical need became his “gold standard.” It is interesting that in Larrey’s approach to triage on the battlefield, there is no mention of military utility or rank. Generals are not to be given priority over privates! (Note here the nod to equality of all persons.) Medical need, and medical need alone, was the basis for distribution—at least in theory.

This “gold standard” of medical need survives in many discussions of justice in health care today. Certainly, in nondisaster situations it carries many arguments. In what has become a classic essay on Christian views of justice in health care, Gene Outka reviewed several possible approaches—distribution in accord with need, with merit, with contribution, with the demands of the market, and so on—and concluded that health care should be distributed on the basis of “need.”<sup>21</sup>

In *Spheres of Justice*, Michael Walzer also argues that money or rank should not be the basis for distribution of basic health care; rather, health care should be distributed on the basis of health need.<sup>22</sup> Thus, we have acceptance in both religious and philosophical circles of *medical need* as a first standard for distribution of resources in health care.

## First Come, First Served

From some of Walt Whitman’s writings, it appears that the wounded men in the Civil War simply lay in a queue and were dealt with in the order of the queue, not necessarily in order of medical need.<sup>23</sup> Thus, in practice a second standard emerged: not medical need, but “*first come, first served*.”

“First come, first served” is also an honored principle in some arenas of medical distribution. In the early days of renal dialysis and artificial organs, for example, there was a great deal of discussion of the ethics of decision-making about who should get scarce organs or access to scarce interventions such as dialysis or organ transplants.<sup>24</sup> Almost all ethicists—certainly Christian ethicists—came down on the side of an egalitarian approach, often thought to be equivalent to “first come, first served.” Rather than trying to make qualitative decisions about which patients might “deserve” dialysis, patients were simply to be accepted in the order in which they appeared.

Thus, at least two standards have an honored history: medical need and “first come, first served.” These two standards are the ones that are often most comfortable for medical workers; they accord best with the history and values of the medical profession. But they are not the only possible standards.

## The Greatest Good for the Greatest Number

World War I changed the triage picture. The motorized ambulance resulted in many seriously wounded soldiers making it back to camp. At the same time, new weapons of destruction rendered more wounded on the battlefield than ever before. Medical personnel were often overwhelmed with the incoming wounded and their own time and energy became the scarcest of resources. Under these conditions, “triage” changed. A single case of “medical need” might absorb hours of time, and during that time numerous others would die. Under these circumstances, a third possible rule emerged: do what saves the most lives—the *greatest good for the greatest number*. Thus did a utilitarian standard surface.<sup>25</sup> “Triage” now involved not simply deciding who needed treatment and who was “beyond hope” or who might recover without treatment, but making decisions designed to bring about the greatest savings of life among those who might be helped with treatment.

Yet a dilemma remained. “The greatest good of the greatest number” is not as clear a standard as it might originally seem. Did “the greatest good” mean *saving as many lives as possible*? Or did it mean *maximizing the fighting strength* of the army?

## Expediency

World War II appeared to settle this question.<sup>26</sup> The amazing success of penicillin in overcoming infection coupled with its severe shortage<sup>27</sup> meant that very difficult decisions had to be made about its use. Given the exigencies of the time, sufferers from venereal disease were given priority over those wounded in battle, as the former could return to the battlefield more quickly.<sup>28</sup> Concerns for fighting strength carried the day.<sup>29</sup> NATO subsequently devised a military triage system in which priority is given to those who can be quickly returned to service, then to those who are seriously injured and need immediate surgery, and the “hopelessly wounded” or “dead on arrival” are simply put aside. Expediency defined in terms of a specific goal took precedence over “medical need,” “first come, first served,” or a general utilitarian principle.<sup>30</sup>

## Reconciling Expediency with an Option for the Poor

This (overly) brief review of the history of triage principles suggests a development from treating patients on the basis of medical need to treating them on the basis of expediency in light of a specific cause or purpose. This development may provide a model that could apply to pandemic flu.<sup>31</sup> But is it compatible with a fundamental commitment to equality or with a commitment to the poor and oppressed? While classic defenders of utilitarianism such as John Stuart Mill certainly believed that utilitarian justice upheld the equal value of each person,<sup>32</sup> treating people



## Article

### *Pandemic Justice*

*Are there  
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in terms of their utility to a specific purpose seems at first glance a very far cry from giving the advantage to the poor and oppressed.<sup>33</sup> Given the American commitment to equality and the widely shared conviction that justice requires some commitment to the least advantaged, should expediency carry the day or should it be set aside in favor of advantaging the least advantaged? Why not simply adopt a "first come, first served" or other approach that appears egalitarian? Are there good reasons for adopting the kind of expediency that emerged historically in wartime, or should we temper expediency with other principles designed to protect the poor or ensure equal treatment for all? Space does not permit a full exposition of possible principles and arguments, but I will propose the following:

#### Preserving Equality through Process

By definition, a pandemic implies dire scarcity of resources, risk of huge loss of life, and impossibility of equal achievement of health outcomes. If equal outcome is not possible, then equal treatment must enter the equation in some other fashion. One way to ensure equality is through *process*. Whatever substantive principles are chosen, they must be applied impartially. "Treat similar cases similarly" requires that cases be dealt with on the basis of established criteria, not on the basis of likes and dislikes.<sup>34</sup> In a triage situation, patients should be dealt with impartially, based on the criteria established. Not all will emerge equally healthy, but equality of respect is preserved through impartial procedures. But if equality is preserved through process, what should be the substantive principles?

#### Principles Proposed for Pandemic Situations

**Expediency.** Priority should be given to those who could be of most immediate service to the larger group to ensure the saving of others. This principle supports giving priority to nurses, physicians, and others with medical skill. Priority must also be given to those with other sorts of competence necessary to rebuild a community or keep disaster from spreading—firefighters and police, who may be needed to keep order in the community, electricians, engineers, lab technicians, and support staff who may be needed

to ensure ongoing medical services. In other words, similar to the triage principles that emerged in wartime, those who have crucial skills are saved first. Moreover, the continued functioning of crucial social institutions, such as transportation systems and food production, must get priority.<sup>35</sup> Here, I admit forthrightly that many of these people will not be among the poor as we typically understand that term; the mere fact that they have jobs and incomes may keep them above the poverty line.<sup>36</sup> In general, however, I believe that those who are genuinely poor will ultimately be best served by saving those with life-saving and order-keeping skills. My proposal here is largely in accordance with the HHS Pandemic Influenza Plan,<sup>37</sup> though it differs in two respects: I have not put vaccine manufacturers into the first category of those to be saved, and I have not divided medical personnel and public safety workers (police, firefighters) into two tiers, but have lumped them into the first category.

**Conservation.** The next level of priority goes to those who can recover with little medical intervention or with lower doses of medication, saving more for others. Winslow calls this the "principle of conservation."<sup>38</sup> Philosopher Philippa Foot argues that we should save five patients rather than one, if possible.<sup>39</sup> In other words, efficiency is an acceptable value in emergency situations. Because influenza vaccine generally requires a particular dose for everyone, the principle of conservation may not easily apply in pandemic situations. However, it is possible that children or the elderly would need a smaller dose than others. If more can be saved with the same quantity of resources, then save more.

**Priority to those who have dependents.** Third, I believe that those who have dependents should get some priority. By "dependents," I mean both minor children under the age of 16 and adults who are not able to survive on their own. Nicholas Rescher argues that mothers of minor children should get some priority because of their family role; so does Robert Young.<sup>40</sup> Neither mentions fathers, but their texts were written in more sexist days. Fathers and women used to be given deferment from military service because of their family roles. Winslow suggests that the discussion on this idea is inconclusive, and he does not take a side (even

though—or perhaps precisely because—he was a father with young children at the time of writing). Because I give some priority to the needs of children, I believe that priority to those with dependents can be justified. I would also note that many of the poor would be among those with dependents and therefore might get some priority under such a principle.

These, then, are the principles that I propose for pandemic situations. Principles that I have *rejected* include first come, first served; priority to those with overall social worth; priority to the medically neediest; and priority to the generally neediest.

### Principles Rejected for Pandemic Situations

**First come, first served.** This time-honored principle is not adequate for triage in times of disaster. Nor does it serve the interests of the poor. The poor tend *not* to go for treatment as quickly as those who are better off or better insured; therefore, those who are first in line are rarely those who are least advantaged, and the “first come, first served” approach may in fact privilege those who already are better off. If Hurricane Katrina has taught us nothing else, it should have taught us that the poor are often those hardest hit by what we call natural disasters.<sup>41</sup> It is very likely that a flu pandemic would affect poor regions and the poor within other regions more heavily than it will affect those who are better off.<sup>42</sup> “First come, first served” does *not* ensure equality of treatment and is no guarantee of a preference for the poor; indeed, it may work precisely to disadvantage the poor.

**Priority to those with overall social worth.** While I have defended a principle of giving priority to those with specific skills relevant to the situation, I reject the idea of preferring those who are more important or more worthy overall. Is it possible to determine one’s social worth? Winslow argues no.<sup>43</sup> I concur. Childress notes, for instance, that it is difficult to predict social utility. I would note that some who might generally be thought to be of *less* social utility, such as sanitation workers and others who do “dirty jobs” may in fact be the *most* important during a time of disaster. For all these reasons, it seems relevant to choose those whose particular skills may be situationally useful but not to attempt general judgments of worthiness. Certainly, for anyone from a Christian tradition, it is anathema to think that some are worthy of life and others are not.

**Priority to the medically neediest.** Medical need was the gold standard even on the battlefield for Napoleon’s chief medical officer. It is carried over today in proposals such as Robert Veatch’s argument that a just health care system tries to equalize everyone’s health status and therefore gives more to those who are neediest.<sup>44</sup> It may seem cruel to pass by those who are very needy in order to help those less in need. It violates everyday practice in the emergency

room and other medical settings. In discussion, I have found health care workers very reluctant to let go of this gold standard of health care. Yet I believe that the exigencies of disaster may require efficiency in an effort to save more lives, and that the medical gold standard can be overturned in such situations. Further, as Rennie and Behets note: “The criteria for medical rationing are never purely medical.” Indeed, what *treatment* requires is never purely medical: adequate transportation, food, water, and community support may all be crucial to treatment outcomes. Hence, a principle of expediency that helps to preserve crucial public institutions does support response to medical need.

**Priority to the generally neediest.** Of course, as is true of measuring social worth, measuring general neediness is difficult. However, we do have some models. In “normal” (non-pandemic) flu seasons when vaccine is in short supply, those who are relatively healthy are asked not to seek vaccination; supplies are saved for those who are older or more vulnerable. So we are used to the idea that the available care should go to those who are frail, fragile, and particularly needy. Such a principle might be one way to enact an option for the poor and I hesitate to reject it.<sup>45</sup> Under such a rule, those who generally have less would get first treatment. Those least able to fend for themselves would be helped first. Young children, the elderly, and the mentally and physically handicapped might get priority. This fits the classic “women and children first” lifeboat rule. It resonates with the horror many of us felt after Hurricane Katrina when we learned that older people were abandoned to die in flooded nursing homes. Their vulnerability seems to demand that they would not be abandoned. As Hans Jonas once put it: “Utter helplessness demands utter protection.”<sup>46</sup> The root question here, however, may be whether general neediness such as poverty is a *morally relevant* criterion in triage decisions. In pandemic situations, it may be more important to save first those who are young enough and strong enough to lift pallets, carry trays of food and other supplies, clean toilets, drive ambulances, and so on.

### Conclusions

What makes expediency difficult for those trained to believe that *all* people are created in the image of God is that expediency gives priority to some people over others. It therefore seems to fly in the face of a commitment to equality and, since the priority rarely goes to those who are poor, it also flies in the face of a commitment to the poor and oppressed. Can we reconcile this move away from an option for the poor, which is for many of us deeply grounded in our faith traditions? Does pandemic call for different principles than might apply in other situations? Does a process of “reflective equilibrium” suggest that our convictions must be modified?<sup>47</sup>



*The principles that I propose for pandemic situations to preserve equality through process [are] expediency, conservation, and priority to those who have dependents. Principles that I have rejected include first come, first served; priority to those with overall social worth; priority to the medically neediest; and priority to the generally neediest.*

## Article

### *Pandemic Justice*

I have argued above that expediency, somewhat tempered, must carry the day in cases of pandemic. Yet I remain troubled. The triage criteria proposed above seem to violate the commitment to justice as priority to the poor.<sup>48</sup> If the poor are generally more sick than the rich, then the poor are not likely to be among those who are most easily saved. If the focus is on saving those with crucial skills, then it is likely that more of those who begin better off and are more highly trained and skilled will benefit from such a principle, as those with skills are rarely the poorest of the poor. This bothers me! Nonetheless, I do believe that the poor will be better off from a triage system that saves those whose skills can be used to save others. I also believe that the poor may benefit from a triage system that gives some priority to those with dependents, but I realize that this is not the same as a system that simply prioritizes the poor.

So, I offer some cautions. First, under the criteria proposed above, I would be at the bottom of the list in times of disaster. I have no medical or engineering skills that would make me immediately useful to the community; I have no dependents to give me priority in terms of family obligations; and while I have spent a lifetime hefting boxes of books, my arthritic hands would be no match for a younger person when it comes to lifting pallets, digging latrines, or any of the myriad of difficult and "dirty" jobs that might accompany disaster. I might be willing to be of service, but I doubt that I could be of as much service as many others. Except insofar as my general health might permit me to be among those who would need less care than others and therefore might be treated before those needing substantial care, the criteria that I propose here do not privilege me. This lack of privileging seems to me important. If the criteria I propose had the effect of privileging me, then I would urge my listener to bring a strong hermeneutic of suspicion to my proposals.<sup>49</sup>

Second, I have spoken here of pandemics. Work needs to be done to sort out some morally relevant differences in different types of disaster, as pandemic is not the only situation that would call for clear principles of justice and priorities in treatment. I have not done that work here, and it is possible that the criteria I proposed above would have to

be modified or rearranged depending on the specific disaster contemplated. For instance, the devastating effects of an earthquake or tsunami may be very different from the effects of a flu pandemic, and might require a different response. Further, I have not addressed here one of the most difficult and potentially contentious issues in pandemic: the question of quarantine. When a quarantine would be justified, and what level of isolation of individuals, families, or communities may be consonant with principles of justice, is a matter deserving of separate treatment.

Third, in accord with my principle of epistemological privilege to the oppressed, the proposals offered need to be checked against the considered judgments of those who are poor and oppressed. Would they approve the above suggestions? Or would they have other, more creative and more just solutions to offer? The process of determining just rationing principles is itself potentially as important as the principles chosen.<sup>50</sup> That process requires extensive involvement of those who stand to suffer most.

With these caveats in mind, I offer these proposals as a beginning toward a needed conversation on justice in times of pandemic. \*

## Notes

<sup>1</sup>Michael Walzer, *Spheres of Justice: A Defense of Pluralism and Equality* (New York: Basic Books, 1983), 85.

<sup>2</sup>Donal Dorr, *Option for the Poor: A Hundred Years of Vatican Social Teaching* (Maryknoll, NY: Orbis Books, 1983).

<sup>3</sup>In the first of these claims, Western Christians join with and are indebted to liberation theologians around the world.

<sup>4</sup>George Parkin Grant, *English Speaking Justice*, Notre Dame, IN: University of Notre Dame Press, 1974.

<sup>5</sup>John Rawls, *A Theory of Justice*, rev. ed. (Cambridge, MA: The Belknap Press of Harvard University Press), 1999. *A Theory of Justice* has dominated philosophical discussions of justice for more than a quarter of a century. Like many Christians, I have been drawn to Rawls precisely because his "difference principle" requires that social arrangements benefit the least advantaged.

<sup>6</sup>Karen Kaplan, "A Killer Takes Wing," *Los Angeles Times*, January 10, 2006.

<sup>7</sup>The encouraging news is that it may come in milder forms than originally predicted by the WHO. Based on interviews, a Swedish research team reported milder cases of flu; however, their find-



ings require confirmation and other studies have not concurred. Clive Cookson, "Infection Milder But More Widespread, Study Finds," *Financial Times*, January 10, 2006.

<sup>8</sup>Nancy Shute, "A World of Worry," *US News and World Report*, June 5, 2006, p. 52. The CDC does not find evidence that the virus has mutated; nonetheless, it appears that these cases may have been transmitted person to person.

<sup>9</sup>Nicholas Eberstadt, "Why Poverty Doesn't Rate," *Washington Post*, September 3, 2006; E. J. Dionne, "The Poor Still Getting Poorer," *The Buffalo News*, September 5, 2006. A search on Google of "Katrina and poverty" yields numerous essays linking the devastating effects of the hurricane on those who are poor.

<sup>10</sup>"The Decline of the National Disaster Medical System," a report of the United States House of Representatives Committee on Government Reform—Minority Staff Special Investigations Division, prepared for Rep. Henry A. Waxman, Rep. Bennie G. Thompson, and Rep. Charlie Melancon, December 2005. While the study was conducted by Democrats and might therefore reflect political bias against the Republican administration, it quotes extensively from other sources, including an internal HHS study. The report notes, for instance, that HHS found significant gaps in setting up and operating shelters or providing services for special needs patients (pp. 12–3).

<sup>11</sup>John Arras, "Ethical Issues in the Distribution of Influenza Vaccines," *Yale Journal of Biology and Medicine* (forthcoming).

<sup>12</sup>Hume, for example, thought that dire scarcity renders justice moot. Winslow notes that "scarcity" itself is a difficult term, depending on desires and needs. There can be false needs and certainly inflated desires. When we say "A needs X," we usually mean that A will suffer harm if A does not get X (Gerald R. Winslow, *Triage and Justice: The Ethics of Rationing Life-Saving Medical Resources* [Berkeley, CA: University of California Press, 1982], 40–1). Dire scarcity, suggests Winslow, involves a condition in which there is need and the resource cannot be divided—i.e., The amount of a life-saving resource is insufficient to sustain the lives of all those in need (p. 43). Hume is not the only one to think justice moot in circumstances of dire scarcity. Gregory Vlastos associates justice with meeting legitimate claims or rights; where those rights cannot be met, justice cannot be done. Hence, in dire scarcity there can be no justice (Winslow, 53). But this approach is problematic, in my view. First, it is not clear that there is a "right" to health care. Second, under a Rawlsian approach, justice applies to the basic system, not to specific responses to individual claims. Third, rights can be respected without being fulfilled. Finally, it is circumstances of extreme abundance that make "justice" irrelevant. If everyone can get what they need, there is no need for principles of distributive justice. It is precisely scarcity that makes distributive justice relevant.

<sup>13</sup>Michael L. Gross, "Bioethics and Armed Conflict: Mapping the Moral Dimensions of Medicine and War," *Hastings Center Report* 34, no. 6 (2004): 22–30.

<sup>14</sup>Part of the difficulty here is that it is not possible to mount a vaccine until the flu spreads from human to human; once it does, a vaccine might be needed quickly, and the question is whether we have the infrastructure to move quickly. Some believe that we do not. Denise Grady reports on a study announced in the *New England Journal of Medicine* that a dose twelve times the standard flu shot gave only "poor to moderate" success in clinical trials. With the needed dose so high, if a pandemic hit soon, "manufacturers could not begin to make enough vaccine for all who would need it." ([www.nytimes.com/2006/03/30/health/30vaccine.html](http://www.nytimes.com/2006/03/30/health/30vaccine.html).)

<sup>15</sup>For instance, 39 of the 54 people who had contact with the Sumatran woman who died last month were given Tamiflu (Shute, "A World of Worry," 52).

<sup>16</sup>This approach seems to derive from a "lifeboat" scenario and from the presumption that it is better to let all drown than to throw some out of the boat. The lifeboat principle reflects a deeply felt egalitarian thrust that all should have an equal chance at life. To this extent, it is instructive. But lifeboats are not necessarily a good analogy for pandemic or other disaster. Throwing some out

involves direct killing and is therefore different from saving only some when not all can be saved.

<sup>17</sup>"[R]ationing is a fact of life for health care in the United States," says Churchill, noting that health care is largely allocated by price and that allocation by price is a rationing scheme. See Larry R. Churchill, *Rationing Health Care in America: Perceptions and Principles of Justice* (Notre Dame, IN: University of Notre Dame Press, 1987), 43, see also, p. 14.

<sup>18</sup>See, for example, Emilie M. Townes, *Breaking the Fine Rain of Death: African-American Health Issues and a Womanist Ethic of Care* (New York: Continuum, 1998).

<sup>19</sup>Stuart Rennie and Frieda Behets, "AIDS Care and Treatment in Sub-Saharan Africa; Implementation Ethics," *Hastings Center Report* 36, no. 3 (2006): 23–31.

<sup>20</sup>Winslow, *Triage and Justice*, 1.

<sup>21</sup>Gene Outka, "Social Justice and Equal Access to Health Care," *Journal of Religious Ethics* 2 (Spring 1974): 11–32, reproduced in *On Moral Medicine: Theological Perspectives in Medical Ethics*, ed. Stephen E. Lammers and Allen Verhey (Grand Rapids, MI: William B. Eerdmans, 1987), 632–43. While Outka does not equate the demands of agape with distribution in accord with need, he does find that they are "conjoined in a number of relevant respects" (p. 638). Most important for my purposes, Outka argues that a need-conception of justice applies to health care with greater relevance than some other possible conceptions of justice, such as distribution on the basis of merit or of market value (p. 639).

<sup>22</sup>Michael Walzer, *Spheres of Justice* (New York: Basic Books, 1983), 86–91. Like Outka, Walzer discusses not individual conceptions of need, but social conceptions. Noting that medical care has historically rested in the hands of physicians who "distribute" it in accord with the ability to pay, Walzer argues (89–90) that medical care is a needed good that should not be distributed on the basis of "free exchange" in the market.

<sup>23</sup>Winslow, *Triage and Justice*, 3.

<sup>24</sup>For an excellent overview, see John F. Kilner, *Who Lives? Who Dies? Ethical Criteria in Patient Selection* (New Haven, CT: Yale University Press, 1990).

<sup>25</sup>It was under the utilitarian rule of doing the greatest good for the greatest number that "triage" began to be a popular term and numerous categories of wounded emerged: those who could be immediately evacuated and those who could not; those requiring minor operations and those requiring major surgery; those who could still walk and those requiring motorized transport, and so on.

<sup>26</sup>Of course, World War II also changed forever the face of war and the triage decisions that might have to be made in the midst of it. The use of nuclear weapons created triage quandaries unparalleled in previous wartime. Massive obliteration and the involvement of huge numbers of civilians made previous military strategies about triage seem almost laughable, however well intentioned and useful they had been.

<sup>27</sup>In the spring of 1942, there was only enough of the drug in the United States to treat one wounded person.

<sup>28</sup>Winslow, *Triage and Justice*, 8.

<sup>29</sup>Michael Gross argues that the principle used was that of "salvage" ("Bioethics and Armed Conflict," 24). If a combatant could be easily salvaged, he or she not only received priority but indeed had no right to refuse treatment.

<sup>30</sup>John Stuart Mill would likely have considered the maximization of fighting strength to be a principle of expediency rather than utility. Expediency is geared to specific interests rather than to the general good. Utilitarianism, for Mill, was not about expediency in the moment but about recognizing the overall tendencies of actions to produce good in the long run. See John Stuart Mill, *Utilitarianism in The English Philosophers from Bacon to Mill: The Golden Age of English Philosophy*, ed. Edwin A. Burtt (New York: The Modern Library, 1939), 912.

<sup>31</sup>My focus here is on pandemic, but as I live on the north coast of California where a tsunami warning was recently issued, other forms of disaster must also be considered.

# Article

## Pandemic Justice

<sup>32</sup>In *Utilitarianism*, Mill argues that each person's happiness is to count exactly as much as any other person's, and he reiterates Jeremy Bentham's dictum, "everybody to count for one, nobody for more than one" (p. 946). This suggests that the founders of utilitarianism held a strong view of equality of persons.

<sup>33</sup>Triaging patients in order to win a war is one thing; treating patients fairly may be yet another.

<sup>34</sup>In grading student papers, for example, whether the professor likes a student should not affect the grade. The grades should be given impartially, based on the criteria established for grades on a paper.

<sup>35</sup>See John Arras, "Ethical Issues in the Distribution of Influenza Vaccine" (paper presented to a Yale symposium on pandemic preparedness, January 11, 2006).

<sup>36</sup>Nurses' aides and home health workers might be included, however, and they often are at the bottom of the pay scale, and receive few benefits; hence, they may indeed be among the poor.

<sup>37</sup>[www.hhs.gov/pandemicflu/plan/pdf/HHSPandemicInfluenzaPlan.pdf](http://www.hhs.gov/pandemicflu/plan/pdf/HHSPandemicInfluenzaPlan.pdf).

<sup>38</sup>Winslow, *Triage and Justice*, 73.

<sup>39</sup>*Ibid.*

<sup>40</sup>The HHS Pandemic Influenza Plan puts pregnant women into the first tier, because they have historically been shown to be at high risk and because vaccinating them will presumably protect the infant to be. HHS also puts household contacts of children into the first tier. However, it does not specifically discuss the issue of dependency as a rationale for priority in vaccination.

<sup>41</sup>This is not the place to discuss whether Katrina was a "natural" or a "human-made" disaster, though this question is also relevant for thinking about justice issues.

<sup>42</sup>This is in part because of the relatively poor health status of those who are economically marginalized.

<sup>43</sup>Winslow, *Triage and Justice*, 81.

<sup>44</sup>*Ibid.*, 93.

<sup>45</sup>For a general discussion of how such a principle might be applied in medical settings, see James Lindemann Nelson, "Saving the Worst Off (Principle)" in *Rationing Sanity: Ethical Issues in Managed Mental Health Care*, ed. James Lindemann Nelson (Washington, DC: Georgetown University Press, 2003), 147-64; also Dan Brock, "Priority to the Worse Off in Health-Care Prioritization," in *Medicine and Social Justice: Essays on the Distribution of Health Care*, ed. Rosamond Rhodes, et. al. (Oxford: Oxford University Press, 2002), 362-72.

<sup>46</sup>Winslow, *Triage and Justice*, 95.

<sup>47</sup>The term "reflective equilibrium" comes from philosopher John Rawls. It connotes testing our initial convictions against the outcome of a reasoned process, and modifying either the convictions or aspects of the process if the testing reveals an incoherence.

<sup>48</sup>An interesting question here is whether justice is being violated or simply set aside, or whether it is indeed fulfilled by utilitarian considerations under some circumstances. Can we claim that justice requires such utilitarian criteria, or must we claim that justice is superseded by such criteria under conditions of disaster? It would take too long to explore this intriguing theoretical question, so I cannot do it here!

<sup>49</sup>The term "hermeneutic of suspicion" also comes from liberation theologies. It connotes skepticism toward received ways of perceiving the world.

<sup>50</sup>The significance of process is noted by Rennie and Behets. Indeed, since Rawls proposed what he called "pure procedural justice," philosophers such as Norman Daniels have argued that, in a pluralistic society, the best we can hope for is agreement on fair process. While I believe that it is possible to justify substantive principles, I agree with the importance of the process by which those are derived. For a critique of Daniels, see Rennie and Behets, "AIDS Care and Treatment in Sub-Saharan Africa."

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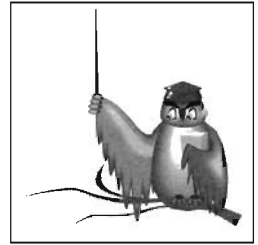
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# A Recovery of Wisdom as Virtue for an Ethics of Genetics

Celia Deane-Drummond

*Why is there so much interest in ethical issues in genetics compared with other areas of science? What form does this ethical discussion take, and what might be the contribution of theological ethics to this discussion? This article attempts to set out the scope of ethical discussion in genetics, and to offer a commentary on its secular development in the light of the relevance of a theologically informed virtue ethics.<sup>1</sup> Genetics, especially human genetics, intuitively seems to equate with our distinctive nature as individual humans, but it also reaches out beyond this to wider social and political questions. Therefore, it is relevant not just for individual ethics, or ethics in a family setting through the new reproductive technologies, but it also affects significant issues of public and political concern. In facing such diverse issues, the temptation for medical science is to resort to a case-by-case approach and to rely simply on ethical principles such as patient autonomy and informed choice. Drawing particularly on the work of the medieval theologian, Thomas Aquinas, I will argue for a recovery of prudence, or practical wisdom, and will suggest that it offers fruitful avenues for exploration in the light of particular questions raised by contested issues in genetics. Moreover, prudence as practical wisdom is aligned with divine Wisdom, understood as integral to a Christian understanding of God as Trinity.*



Celia  
Deane-Drummond

*Genethics  
overlaps with  
bioethics ...  
but it also ...  
includes  
research in  
genetic science  
and its practice  
even prior to  
clinical  
applications.*

**B**iomedical ethics is a field that has grown up and transformed itself from a discipline that was once loosely based in Christian morality, to one that is more akin to a specialist science. Biomedical ethics has more often than not looked to the principles of respect for beneficence, autonomy, justice, and non-maleficence, bringing in a discussion of the virtues almost as a way to supplement these presupposed principles.<sup>2</sup>

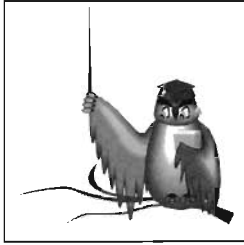
## What Is Genethics?

Genethics overlaps with bioethics in that it raises similar issues connected with the start of life, but it also is even broader than bioethics in that it includes research in genetic science and its practice even prior to clinical applications. The scope of ethical discussion, among theologians at least, has tended to limit the ethical analysis of genetics to those areas connected with reproductive biology rather than consider in more depth those wider medical practices that rely on genetics and have social and political implications,

such as genetic screening, patenting, and feminist concerns.

One reason why genethics has become such an area of acute concern is likely to be related to the view that in altering genetics, we are changing something fundamental about human nature. But where there are overstatements about the importance of genetics on influencing human evolution, and by association, genethics, then there is a failure to provide a critical voice to the discussion that is vitally needed in the midst of heated public discourse. While on the one hand, genetic science is continuing to make

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*According to traditional understanding of medicine, the health of an individual is related to the physiological, functional, and phenomenological appearance of disease ... It is worth asking if there is a new trend to identify the sick with those who have genetic traits, regardless of expression of the disease.*

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more and more discoveries about the importance of genes for bodily function and disease, it is also qualified by the realization that environmental influences play a highly significant role in almost all cases under discussion.

Genetic deterministic attitudes have crept into the way medical practitioners and politicians have thought about health and disease. Such an attitude is represented by the claims that once all genetic elements are known, then future health would be predictable. Thus, genetics plays a central role in health and disease incidence. For example, why does a woman who knows she has genes which predispose her to breast cancer, BRCA1 or BRCA2, choose to have prophylactic surgery, even though the probability of disease expression is also influenced by many environmental factors? Although the philosophy that permits such direct action is one of informed choice, is such choice partly guided by a subtle form of genetic determinism? Statistical results may be loaded by language use such as "high risk" that seem threatening to the patients.

According to traditional understanding of medicine, the health of an individual is related to the physiological, functional, and phenomenological appearance of disease, that is, a person is sick when manifesting the symptoms of disease. It is worth asking if there is a new trend to identify the sick with those who have genetic traits, regardless of expression of the disease. It seems to me unlikely that a medical clinician would consider persons "diseased" if they carry genetic traits predisposing them to contract a given disease. Nonetheless, it is worth asking how far such results are taken up and used in social and political contexts. The use of such information by insurance companies or employers, who have a stake in knowing how likely persons are to contract diseases, is a significant aspect of this trend toward the use of genetics in preventative medicine.

## Genetics and Human Nature

Where genetic knowledge is used as a means to prevent certain types of individuals being born — more often than not because there is no "cure" for a disease — is a form of medical practice that prevents those who are likely to

have a disease from ever existing. Ethical issues in this case bear on the status of the human embryo or foetus. Yet, we might ask ourselves, what if it were possible to change the genetics of such an embryo so that the disease were no longer present, would this in effect be changing the person's human identity?

Some philosophers have argued that if a faulty gene is no longer present, then such changes amount to changes in human identity because the life experience of that individual would be so different from the one who would have lived had the faulty gene been allowed to express itself.<sup>3</sup> In addition, the treatment of a young baby with somatic gene therapy, in those cases where the disease is particularly severe, would also change the infant's self-perception, as for example, the treatment of eight- or eleven-month-old babies for severe combined immune deficiency (SCID) syndrome. This is because without treatment the life experience would be very different compared with those who had treatment, so the identity issue applies in this case. Those diseases that are the most severe, such as Tay Sachs disease, will lead to a life of suffering that is cut short in infancy. A child born without such a disease would have a different life experience than the one with the disease, and arguably a different identity. In other words, according to this philosophical argument, inherited genetic modification (IGM) or somatic gene therapy of very young babies cannot be classed as a type of "therapy," as the person who exists would be very different and have a different identity had the treatment not taken place.

On the other hand, those who have late onset diseases could be considered to be the same person if the faulty gene was removed prior to birth. Where the identity problem exists, decisions are not easy to make on the basis of benefit for the future child, since arguably this child's identity has changed. Yet this form of philosophical reasoning seems counter-intuitive. One possible alternative approach is to use some form of utilitarian calculus in arriving at decisions based on the projected future suffering of persons.<sup>4</sup> This form of reasoning also seems problematic; as it is not always clear what harms might arise. In addition, it is equally clear that the notion of harm is dependent on who is making the criteria about what counts as being harmful.

The debates over whether it is permissible to screen in favor of deaf fetuses prior to implantation are relevant in this context.<sup>5</sup> John Harris has claimed that deliberately deafening a child is the same morally as selecting a deaf embryo prior to implantation, both are choices which lead to the same overall result, namely a deaf child exists. Yet this argument is faulty both morally and conceptually.<sup>6</sup> The case also illustrates the problems associated with an ethical analysis based on impersonal principles that rely on consequentialist arguments that are presented in terms of the overall sum total of suffering. However, Harris fails to consider the identity problem, namely, that if the deaf embryo *had not* been selected, the child would not have existed, while if the child who was hearing had not been deafened, the child would still have existed. In the case of choosing the embryo for selection, a child's best interest cannot be used, as the child would not have existed had the choice not been made. Accordingly, Häyry believes that the "real policy choice must be made between reproductive autonomy and socio-economic considerations" in providing for special needs of the child.<sup>7</sup> He does not consider the other possible hearing children who would have been born had the decision been made *not* to select a deaf embryo. The parents arguing for parental autonomy in this case also do so on the basis of the welfare of the child, namely that a deaf child so born would be then integrated into the deaf community.

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The above is an unusual example in that genetic screening has been advocated more often for screening *out* those who are likely to suffer various disabilities, rather than for selecting in their favor. On one level, one might argue that if hearing parents were to be given the opportunity to choose through pre-implementation genetic diagnosis (PGD) a hearing rather than a deaf child, then why should this choice not also be given to deaf parents, who desperately want a child who can be integrated into their social and communal life?<sup>8</sup> If we take Häyry's policy choice, then we have to decide if we should not burden society with another deaf child in which case this would elevate

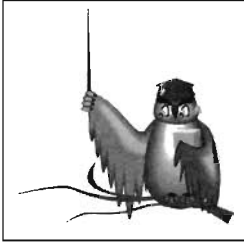
socio-economic considerations above the freedom of choice for the parents.

The argument, however, is weak in this case as there are other reasons why we might want to avoid deafness other than socio-economic ones. Those who speak of the welfare of the child in this vein have to counter those in the deaf community who argue in favor of deafness as a positive option in their family. Of course, if the selection works the other way round for hearing parents, that is, deliberately selecting an embryo that is *not deaf*, or likely to be deaf, then this might imply that deaf existence is a life not worth living. This is particularly the case from the perspective of the deaf community, so that screening out those like them is perceived as a slur on their way of life and value as individuals.<sup>9</sup>

The welfare of the child argument in favor of screening for a deaf child does not make sense, since if the embryo was not selected, it would not have lived. On the other hand, if the capacity were present to genetically alter what might have been a deaf child, this too would change the identity of that child. It seems to me that in this case the mantra of autonomy has overreached itself. In other words, to use PGD either to screen in favor of a deaf child, or to select against a deaf child is an inappropriate reification of freedom and parental "rights" for children of their own choosing and an inappropriate use of PGD. The condition is, in other words, not sufficiently serious to screen out, and to screen in favor implies parental control over their children, rather than parental acceptance of children as gifts, with all their associated weaknesses and strengths.<sup>10</sup> It is, arguably, a version of liberalism that puts value entirely in freedom of choice, rather than rooting such choices in the virtues with an orientation toward the common good. Hence, it is not so much on the basis of socio-economic gains that such an action needs to be resisted, but rather on the basis that there are some uses of the technology which overreach its intentions as medicine, namely to serve to heal those who are sick. Deaf parents who have hearing children face the same sort of difficulties as hearing parents with deaf children, but few would dare suggest that hearing children should be screened out prior to birth.

In addition, the above raises issues about the kind of society we are becoming and the human practices that are being condoned through the use of genetic technologies. Rather than being concerned that human nature or even that the identity of a child might be different if that child were to be given genetic "therapy," we should be more concerned with broader cultural trends that elevate liberalism to such an extent that children become rights that can be purchased according to parental desires and wishes. The limits of a personalist approach that faces the identity problem, and more impersonal approaches that lack the ability to identify with those facing the problems





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at hand come more clearly into view. The question then becomes, are there ways of viewing ourselves as persons that might help us navigate such difficult territory?

There is a recognizable trend in bioethics, including a discussion of genetics, so that it becomes "thinned out" in such a way that overlapping consensus is arrived at through formal modes of reasoning.<sup>11</sup> Such a development could be viewed as a mixed blessing, for formal reasoning seeks to calculate the most effective way of reaching an end that is assumed to be a good. In the case of deaf selection discussed above, the good assumed is that shaped by liberalism, namely, that parental choice trumps other considerations. The shift to "thinner" versions of discourse has been particularly evident in the United States, where the creation of genetic advisory commissions were apparently set up to avoid the possibility of more stringent regulatory bodies that might interfere with scientific research.<sup>12</sup> The ends that were assumed were respect for persons (that is, autonomy), beneficence, and justice. Bioethics was perceived as simply about how to arrive at such ends. This may be one reason why health care provision has apparently lacked any real reference to virtue ethics,<sup>13</sup> for it has relied on policy making that has taken up this "thinner" bioethical discourse.

Given these presumptions, it is not surprising that some of the most critical voices about genetic practice come from outside the discipline of bioethics. Francis Fukuyama has voiced particular concerns about the dangers of genetic engineering in terms of changing our identity as human beings.<sup>14</sup> This is not so much the narrow issue of whether someone who has been genetically changed is the same person or not, as discussed above, but wider questions about whether human power over nature has changed the meaning of what it is to be human.

Even stronger is the suggestion made by C. S. Lewis in his book, *The Abolition of Man*, that humanity's attempt to subjugate nature actually leads to its own subjugation. In other words, when humans are treated as artefacts, those acting cease to be human.<sup>15</sup> Or do they? Certainly, there are those who believe, correctly in my view, that treating humans as "objects" is wrong, but the bor-

der between the artificial and the natural is becoming much more blurred in our present century. Is this invasion of the natural by the artefact necessarily to be resisted?

While we need to guard against treating human persons as experimental objects rather than subjects, some theologians have warmed to the idea that we live in a technological age. In this sense, technology becomes the means to express creativity, to become made in the image of God, and to find meaning through that technology rather than in pitting against it. Philip Hefner puts forward the following proposals:

(a) Technology is a sacred space.

(b) Technology is a medium of divine action as it involves the freedom of imagination that constitutes self-transcendence.

(c) Technology is "one of the major places today where religion happens. Technology is the shape of religion, the shape of the cyborg's engagement with God."

(d) Technology is the place where we wrestle with the God who engages with human cyborgs.<sup>16</sup>

Hence, rather than fear technology, Hefner suggests that we should welcome it as an aspect of our human identity and meaning, a place where God can act.

Yet I am uncomfortable with this seemingly blanket endorsement of all things technological. In the first place, it seems to lack ethical analysis, bringing religious language into technology in such a way to reinforce such goals, without challenging whether such goals are desirable. If bioethics works without a proper analysis of goals, then theology's contribution needs to be to challenge such presumptions and to seek both a critique of means and ends. Hefner seems to avoid such critique other than speaking in somewhat vague terms about a "wrestling" with God.

## A Virtue Approach to Genetics

The virtues<sup>17</sup> are those aspects of character formation that help to provide those human strengths needed in seeking what might be the good and in deciding what might be the principles needed in areas where such principles and goods are in dispute.<sup>18</sup>

There are other dangers as well that one might identify with a strong liberalist approach to ethics and its focus on rights language. James Keenan, for example, believes that many of the so-called principles that are arrived at in bioethical discourse are "nothing more than the claims of conservatives who have accepted the context of liberalism."<sup>19</sup> Rights language is evident in the heated discussion over reproductive technologies, where the rights of parents or mothers are opposed to the rights of the foetus, though in law the foetus has no such rights. These debates fail as both are reliant on the same premises, namely, that the discernment of rights is the proper way to approach moral reasoning. An alternative approach, which moves away from the almost exclusive focus on rights, autonomy, and conflicts of interests, is represented by virtue ethics. Virtues look more deeply not just at actions of agents, but also at the agents themselves.<sup>20</sup>

Alasdair MacIntyre defines virtue as "an acquired human quality the possession and exercise of which tends to enable us to achieve those goods which are internal to practices and the lack of which effectively prevents us from achieving such goods."<sup>21</sup> If virtue is acquired, then it can be learned, and becomes a habit of mind leading to particular patterns of behavior. Some might even say that such patterns actually begin to alter the psychological structure of the brain in certain ways, hence reinforcing the patterns built up through constant practice.<sup>22</sup> The goods are both internal in character formation, but also external in outcomes, leading to particular actions. Hence, even public virtue is valuable not simply for its instrumental value in leading to a particular good, but also because of the internal goods for leaders in a given community.

## A Recovery of Prudence as Practical Wisdom

One of the first myths that needs to be overcome in any discussion of prudence is that it amounts to a form of restraint, a conserving of resources for one's own use. This version of prudence is a far cry from the medieval concept that is associated with a proactive concern with the good. It is also important to understand the place of prudence in Aquinas's scheme. Prudence, or practical wisdom, is one of two virtues of *practical reason*, the other is art or right judgment. Wisdom *in itself* is related to prudence, where wisdom is one of three virtues of *speculative reason*. The others are *understanding*, or grasping, first principles and *scientia*, which denotes the comprehension of the causes of things and the relationship between them. In other words, wisdom is the understanding of the fundamental causes of everything and their relationship to everything else. Human wisdom is a virtue directed toward the wisdom of God, for while wisdom can be learned, it cannot be grasped or used for human aggrandizement (Proverbs 16). In the fullest sense, human wisdom is only possible

through the gift of the Holy Spirit, by the grace of God. The Christian vocation includes developing the virtue of wisdom.

In this tradition, all virtue is prudent or informed by practical wisdom and prudence supplies that way of thinking about virtue that assists in assessing what it means to be just, to have temperance, to show charity, and so on. Sins are always in opposition to prudence. Prudence "helps the other virtues and works through them all," and it is only by *participating* in prudence that a virtuous action can be considered virtuous at all.<sup>23</sup> Josef Pieper argues that prudence is not simply an optional extra, rather it serves to express what it means to be human:

the intrinsic goodness of man, and that is the same as saying, his true humanness—consists in this, that "reason perfected in the cognition of truth" shall inwardly shape and imprint his volition and action.<sup>24</sup>

Yet it would be succumbing to the temptation of the Enlightenment if we assumed that reason simply meant rational understanding. Rather, Pieper argues that reason needs to be thought of in this context as "regard for and openness to reality" and "acceptance of reality."

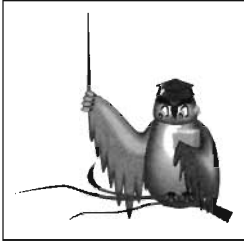
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*Prudence, or practical wisdom ...  
is the understanding  
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to everything else.*

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How does prudence express itself? Aquinas considered that *deliberation*, *judgment*, and *action* are the three phases of prudence. Prudence may be distorted at any of these stages. If the goal is faulty, this is "sham prudence." This might include action against the needs of the community. If the goal is only beneficial to a few individuals, this is "incomplete prudence." Distortions can be avoided by acting according to "the fear of the Lord," that is, respect for the Divine Law. For biblical writers, wisdom and discernment are intimately linked with the fear of the Lord. Forms of discernment that go against the good of a community amount to folly. Prudence, for Aquinas, has eight elements: memory, insight, teachableness, acumen, reasoned judgment, foresight, circumspection, and caution.<sup>25</sup>

Prudence in the mode of cognition has three elements, namely *memoria*, *docilitas*, and *solertia*. *Memoria* is more



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than just the natural capacity for recollection. Rather, it is a memory that is "true to being," which means that "it contains in itself real things and events as they really are and were."<sup>26</sup> This task is one that shapes the historical mind, where memory reaches back into history even further than individual experiences. If such recollections are falsified in some way, then prudence is no longer possible, as error insidiously establishes itself in a way that is hard to eradicate. Of course, some might say that such an ideal is impossible to attain, that we can never really know what happened because of the distance between past events and present ones. However, the importance of this element is the attempt at least to aim as far as possible to recall truthfully what happened, without embellishments or omissions and shifts of accent.

Memory of the past includes the shadow of eugenics, the way genetics has been abused to justify the exclusion of those who were deemed "mentally retarded" and "unfit" members of the human community. Openness to being taught includes listening to those who have learning difficulties. How do they feel about screening programs designed to eliminate those fetuses which share their condition? A recent survey suggests that they find such actions abhorrent, as it seems to reinforce social and cultural prejudice against them.<sup>27</sup> Prudential living requires learning to move beyond social barriers that have ensnared human society through absorption of unchallenged cultural prejudices.

A second element of prudence is *docilitas* (teachableness), or open-mindedness. Such a desire is essential in order for prudential decisions to be made. Someone who refuses to listen to advice, or assumes that they know it all, will not be able to make prudential decisions. This characteristic also secures the communal element in prudential decision making; it is never simply just about one's own decisions in detachment from the views of others.

The third element of perfection in cognition is *solertia* (acumen), that is, the ability to act clearly and well in the face of the unexpected. Such actions are not rash judgments, but informed by *docilitas* and *memoria* in such a way that prompt decisions are possible.

Irresoluteness, that is, unable to act, or rash and fickle actions do not show the quality of *solertia*. It is, as it were, the other side of the coin to *docilitas*, which includes an element of stillness and contemplation. *Solertia* draws on this experience and is able to act rightly although the time for such deliberation is no longer present. It goes without saying that acts that require *solertia* are not the norm, but are a result of an unexpected event. Aquinas also includes *insight* and *reasoned judgment* in his list of components of prudence related to cognition.

What might be the elements of prudence as imperative? The first element here is *foresight*, which Aquinas links with providence. Foresight is the ability to know if certain actions will lead to a desired goal. Aquinas believed that this element was one of the key characteristics of prudence, for it always points in some sense to the future. Yet the judgments of prudence are not fixed or certain in ways that might be the case if it were a rigid application of rules or principles. Rather, "because the subject matter of prudence is composed of contingent individual incidents, which form the setting for human acts, the certitude of prudence is not such as to remove entirely all uneasiness of mind."<sup>28</sup>

Aquinas also includes *circumspection* and *caution* in the list of those components of prudence that are concerned with putting knowledge to action. *Circumspection* is the ability to understand the nature of events as they are now, while foresight is the ability to understand events as they might be in the future. Caution has to do with imprudent acts that are too hasty in their execution, and avoiding obstacles that might get in the way of sound judgments, though clearly a form of caution that leads to inaction is not what Aquinas had in mind. In addition, Aquinas also recognizes the place of *gnome*, that is, the wit to judge when departure from principles is called for in given situations.

Aquinas was clear that while the moral virtues on their own will incline themselves toward right action, this inclination is not sufficient, which is why prudence is so important for all the moral virtues.

The bent of moral virtue toward the mean is instinctive. Yet because the mean as such is not found after the same manner in every situation, the bent of nature which works uniformly

is not enough, and requires to be complemented by the reasoning of prudence.<sup>29</sup>

Hence, prudence helps to recognize those subtle differences that lead to a different course of action in given circumstances.

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*Just as individual prudence sets  
the mean for the moral virtues,  
so political prudence sets the mean  
for distributive justice.*

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Prudence as setting the mean of the moral virtues has more to do with individual prudential decisions. Aquinas also wanted to extend the consideration of prudence not simply to individual acts, but beyond this to inform political governance. While Aquinas's discussion of prudence bears some relationship to that in Aristotle, in this respect it is different, for Aristotle confined his attention to individual prudence. Aquinas's view of political prudence relates to justice, but is certainly not identical with it, so he can claim that "such prudence bears the same relation to legal justice that ordinary prudence does to moral virtue."<sup>30</sup> In other words, political prudence helps to situate what it means to demonstrate legal justice in given situations, with reference to the various elements of prudence discussed above. He is also ready to admit that there are varieties of prudence appropriate for the good ends fitting for domestic care of the family, "monastic" care of an individual in a monastery, and the common good of the state.<sup>31</sup> He names these as prudence, as applied to individuals; economic prudence, as applied to families or households; and political prudence, as applied to the state.

Jean Porter suggests that "the very substance of distributive justice is so intimately linked with the determinations proper to political prudence that it would seem that political prudence and distributive justice are in effect two components of one virtue by which rulers govern wisely and well."<sup>32</sup> Yet, if this was the case, why did Aquinas argue specifically for political prudence to be included in considerations of prudence, unlike Aristotle, who believed that prudence was confined to individual decision making? Just as individual prudence sets the mean for the moral virtues, so political prudence sets the mean for distributive justice. Distributive justice is that concerned with the relationship between the whole and individuals, but what this distributive justice might mean is not self-evident in all cases, and needs to be supplemented by political prudence in much the same way as correct decision making for the moral virtues with individual prudence.

It seems to me that this is a crucial point, for if political prudence is simply equated with distributive justice, then prudential reasoning as such is no longer allowed into the political and public forum. Political prudence is one way of helping to heal the rift between public and private morality, and the false divide between a "subjective" virtue ethic that is concerned with individuals, and principled "objective" approaches that are more often concerned with wider social contexts.

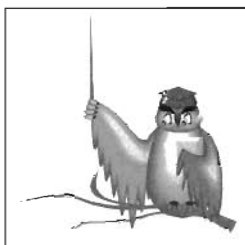
## The Role of Divine Grace

Aquinas also departed from Aristotle in that he situated the good attained by prudence in the context of the Divine Law. In addition, prudence could be acquired by learning, but he also insisted that it could be received or infused by divine grace. These give qualities to prudence which are not simply those arrived at through innate capacities. For "The prudence of grace, however, is caused by God's imparting."<sup>33</sup> This allows Aquinas to argue for prudence being present in children and those whose reasoning is impaired. However, he is also ready to admit that prudence can be spoiled in all kinds of ways, and where truths are forgotten prudence no longer flows into action, and becomes "blocked."<sup>34</sup> Hence, the virtue of charity in one sense even trumps that of prudence, for without charity prudential decision making becomes disconnected from its source as rooted in the love of God and neighbor.

The theological virtues of faith, hope, and charity are necessary prerequisites for all of the infused virtues. Gifts come through the working of the Holy Spirit, and as Romano Cessario suggests,

The gifts of the Holy Spirit complete the practice of Christian moral theology, for they ensure that each virtuous action of the believer conforms perfectly to the will of God.<sup>35</sup>

While Aquinas lists the *affective* gifts as fortitude, piety, and fear of the Lord, the *intellectual* gifts are wisdom, understanding, knowledge, and counsel. The gifts are associated with virtues, so that fortitude is gift and virtue, piety is linked with justice, hope and temperance with fear of the Lord. The virtue of charity is associated with wisdom, the virtue of faith is associated with understanding and knowledge, and the virtue of prudence with the gift of counsel. How helpful are these associations? In the first place, they are reminders that the life of virtue is not simply about straining to reach a goal in independence of God or faith in Christ. In order to be perfect, a life of virtue flows from the experience of a graced existence that enables the believer to attain a higher level of goodness than would otherwise be the case. The gift of counsel as associated with prudence also makes sense in the context of prudence as encompassing *docilitas*.<sup>36</sup> The Holy Spirit, as divine Counselor, still preserves the freedom of the individual. Faith as associated with understanding and



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knowledge is also reminiscent of faith seeking understanding as the task of theology. While Aquinas had theological understanding more in mind in this context, it also applies to scientific understanding in the sense that understanding is only possible when there is a degree of commitment.

Wisdom as gift will issue in the virtue of charity, though the relationship is somewhat circular, for without charity wisdom becomes dysfunctional. Aquinas also gives charity primacy over faith and hope, even though he recognized that faith precedes hope and charity "in the sequence of coming to be." He also believes that hope as act is prior to an act of charity, but

in the precedence of value, however, charity comes before faith and hope, because both faith and hope come active through charity, and reserve from charity their full stature as virtues. For thus charity is the mother and root of all virtues, inasmuch as it is the form of them all.<sup>37</sup>

Hence the kind of linkages between gifts and virtues is just one strand of the relationships between virtues and their expression in particular acts. It is clear that charity is a fundamental virtue that informs the other virtues, including the four cardinal virtues discussed above. Yet the correlations suggested above also seem to coalesce in wisdom, for

piety makes wisdom manifest, too, and because of that we can say that piety is wisdom, and for the same reason also is fear. If a man fears and worships God he shows he has a right judgment about divine things.<sup>38</sup>

Such judgment needs to be integrated with practical wisdom in those difficult and complex questions arising out of the new genetic technologies.

## Conclusions

The above discussion leads to some interim conclusions. In the first place, liberalism understood as a reification of individual moral autonomy dominates present discussion of genethics. Secondly, there is a need to recover a sense of common good in order to counter this trend. I have suggested that the classic appropriation of the virtues is one means to achieve this. In particular, prudence or practical wisdom is a crucial qual-

ity of agents, but it also includes political dimensions. Prudence can be learned, but it also may be infused with divine grace. On the other hand, wisdom as virtue is concerned with theological understanding and is linked with charity. Prudence as virtue is concerned with human affairs in relationship to the good understood in Christian terms. The classical notion suggested that different elements of prudence work together in order to achieve the good, and that good is understood as being in accordance with the Divine Law. In the Christian community, the gifts of the Holy Spirit work with acquired virtues in serving to shape decision making. I suggest that this needs to become a way of embedding Christian values in the practices of science and technology, and shaping its direction in particular ways according to the common good of the community and in alignment with an understanding of God as wisdom.<sup>39</sup> \*

## Notes

<sup>1</sup>This article is a modified and abridged version of chapter 1 in C. Deane-Drummond, *Genetics and Christian Ethics* (Cambridge: Cambridge University Press, 2006.)

<sup>2</sup>See T. L. Beauchamp and J. F. Childress, *Principles of Biomedical Ethics*, 5th ed. (New York: Oxford University Press, 2001).

<sup>3</sup>Walter Glannon, "Genetic Intervention and Personal Identity," in B. Almond and M. Parker, eds., *Ethical Issues in the New Genetics* (Aldershot: Ashgate, 2003), 69–80. Pilar Ossorio makes similar arguments in P. N. Ossario, "Inheritable Genetic Modifications: Do We Owe Them to Our Children?" in A. Chapman and M. S. Frankel, eds., *Designing Our Descendants* (Baltimore: John Hopkins University Press, 2003), 252–71.

<sup>4</sup>Derek Parfit, *Reasons and Persons* (New York: New York University Press, 1984).

<sup>5</sup>For further discussion, see C. Dennis, "Deaf by Design," *Nature* 431 (October 2004): 894–6.

<sup>6</sup>John Harris' position is discussed in M. Häyry, "There is a Difference Between Selecting a Deaf Embryo and Deafening a Hearing Child," *Journal of Medical Ethics* 30, no. 5 (October 2004): 510–2.

<sup>7</sup>*Ibid.*, 511.

<sup>8</sup>Dennis, "Deaf by Design."

<sup>9</sup>This also applies to other instances of screening, such as Down syndrome. Of course, those engaged in such screening will deny that this casts a slur on those with such a condition. The point here is that society is seen to be making judgments that act in favor of one community rather than another.

<sup>10</sup>I am not suggesting that screening in itself in all cases automatically leads to a lack of acceptance of resulting children. Rather, where parental control is such as to avoid less severe diseases, it implies a lack of acceptance of weaknesses and drive for perfection that goes against welcoming children as gifts.



- <sup>11</sup>Gilbert Meilaender, "The Thinning of Bioethical Discourse," *Medical Humanities Review* 16, no. 2 (2002): 71-5.
- <sup>12</sup>J. H. Evans, *Playing God: Human Genetic Engineering and the Rationalization of Public Bioethical Debate* (Chicago: University of Chicago Press, 2002).
- <sup>13</sup>N. Messer, "Health Care Resource Allocation and the Recovery of Virtue," *Studies in Christian Ethics* 18, no. 1 (2006): 89-108.
- <sup>14</sup>F. Fukuyama, *Our Posthuman Future* (London: Profile, 2002).
- <sup>15</sup>C. S. Lewis, *The Abolition of Man* (Glasgow: The University Press, 1943).
- <sup>16</sup>P. Hefner, *Technology and Human Becoming* (Minneapolis, MN: Fortress Press, 2003), 88.
- <sup>17</sup>Other authors have considered Christian virtues in medical practice more generally as applied to professional decision making for medical practitioners, rather than focused specifically on genetics. See Edmund Pellegrino and David Thomas, *The Christian Virtues in Medical Practice* (Georgetown: Georgetown University Press, 1996).
- <sup>18</sup>William May, "The Virtues in a Professional Setting," in K. W. M. Fulford, G. Gillett and J. M. Sossice, *Medicine and Moral Reasoning* (Cambridge: Cambridge University Press, 1994), 75-90.
- <sup>19</sup>J. Keenan, "What is Morally New in Genetic Manipulation?" *Human Gene Therapy* 1 (1990): 289-98, esp. 291.
- <sup>20</sup>For a review of virtue ethics approaches, see, for example, R. Crisp, ed., *How Should One Live? Essays on the Virtues* (Oxford: Clarendon Press, 1996); D. Statman, ed., *Virtue Ethics: A Critical Reader* (Edinburgh: Edinburgh University Press, 1997); R. Crisp and M. Slote, eds., *Virtue Ethics* (Oxford: Oxford University Press, 1997); R. Hursthouse, *On Virtue Ethics* (Oxford: Oxford University Press, 1999); S. Darwell, ed., *Virtue Ethics* (Oxford: Blackwell, 2002).
- <sup>21</sup>A. McIntyre, *After Virtue: A Study in Moral Theory*, 2d ed. (London: Duckworth, 1985), 178.
- <sup>22</sup>For more detailed discussion of this aspect, see C. Deane-Drummond, *The Ethics of Nature* (Oxford: Blackwell, 2004), 136-61.
- <sup>23</sup>Aquinas, *Summa Theologiae*, 2a2ae, vol. 36, *Prudence*, trans T. Gilby (London: Blackfriars, 1974), Qu. 47.5.
- <sup>24</sup>J. Pieper, *Prudence* (London: Faber and Faber, 1955), 16.
- <sup>25</sup>Aquinas, *Summa Theologiae*, 2a2ae, *Prudence*, Qu. 49.
- <sup>26</sup>Pieper, *Prudence*, 26.
- <sup>27</sup>See, for example, Ann Kerr and Tom Shakespeare, *Genetic Politics: From Eugenics to Genome* (Gretton, Cheltenham: New Clarion Press, 2002).
- <sup>28</sup>Aquinas, *Summa Theologiae*, 2a2ae, *Prudence*, Qu. 47.9.
- <sup>29</sup>Ibid., Qu. 47.7.
- <sup>30</sup>Ibid., Qu. 47.10.
- <sup>31</sup>Ibid., Qu. 47.11.
- <sup>32</sup>Jean Porter, *The Recovery of Virtue* (London: L SPCK, 1994), 104.
- <sup>33</sup>Aquinas, *Summa Theologiae*, 2a2ae, *Prudence*, Qu. 47.14.
- <sup>34</sup>Ibid., Qu. 47.16.
- <sup>35</sup>R. Cessario, *Introduction to Moral Theology* (Washington, DC: Catholic University of America Press, 2002), 211.
- <sup>36</sup>For further discussion of the relationship between prudence and the gift of counsel, see Deane-Drummond, *The Ethics of Nature*, 13.
- <sup>37</sup>Aquinas, *Summa Theologiae*, 1a2ae, vol. 23, *Virtue*, trans. W. D. Hughes (London: Blackfriars, 1969), Qu. 62.4.
- <sup>38</sup>Aquinas, *Summa Theologiae*, 2a2ae vol. 35, *Consequences of Charity*, trans. T. R. Heath (London: Blackfriars, 1972), Qu. 45.1.
- <sup>39</sup>Practical examples of how this might be achieved in particular instances, such as genetic screening, genetic counseling, etc. is discussed in detail in Deane-Drummond, *Genetics and Christian Ethics*. This article has the limited task of attempting to set out an alternative way of considering the place of virtues in genetic practices.

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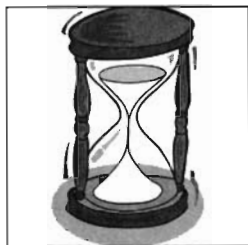
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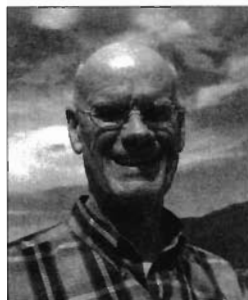


## Article

*How Old Is It? How Do We Know? A Review of Dating Methods –  
Part Two: Radiometric Dating: Mineral, Isochron and Concordia Methods*

# How Old Is It? How Do We Know? A Review of Dating Methods— Part Two: Radiometric Dating: Mineral, Isochron and Concordia Methods

Davis A. Young



Davis A. Young

*This second in a three-part series on dating methods reviews important radiometric dating methods that are applicable only to geological situations. The basic theory behind radiometric dating is outlined. Details of the  $^{40}\text{K}$ - $^{40}\text{Ar}$ ,  $^{87}\text{Rb}$ - $^{87}\text{Sr}$ ,  $^{238}\text{U}$ - $^{206}\text{Pb}$ ,  $^{87}\text{Rb}$ - $^{87}\text{Sr}$  whole-rock isochron,  $^{147}\text{Sm}$ - $^{143}\text{Nd}$  whole-rock isochron, and U-Pb concordia methods are outlined and examples of results are provided.*

*We know that  
extremely large  
quantities of  
any radioactive  
isotope will  
disintegrate in  
accord with  
a radioactive  
decay law ...*

**W**ithin a decade of the discovery of radioactivity in 1896, the chemical elements uranium, radium, polonium, and thorium were recognized as radioactive; the basic theory, mechanisms, and mathematics of radioactive decay were established; decay rates of some radioactive chemical elements were determined; and the ages of two mineral specimens were calculated for the first time from their uranium and helium contents.<sup>1</sup> Soon thereafter, isotopes were discovered, the decay constants of a few specific isotopes were determined, and mass spectroscopy was developed.<sup>2</sup> Ever since these early heady days in the study of radioactivity, numerous radiometric dating methods have been proposed. Some methods were eventually discarded,<sup>3</sup> but many others have not only withstood critical scrutiny but have been refined and improved.<sup>4</sup>

## Radiometric Dating

To understand how radiometric dating works, consider a crystal of pure rubidium chloride ( $\text{RbCl}$ ). Rubidium ( $\text{Rb}$ ) consists of 72.2%  $^{85}\text{Rb}$ , an isotope that is not radioactive, and 27.8%  $^{87}\text{Rb}$ , an isotope that is radioactive. A cubic crystal of  $\text{RbCl}$  with a volume of  $1\text{ cm}^3$  contains approximately  $10^{18}$  atoms of  $^{87}\text{Rb}$ . Although we cannot predict exactly when any specific atom of  $^{87}\text{Rb}$  will undergo spontaneous radioactive decay, we know that extremely large quantities of any radioactive isotope will disintegrate in accord with a radioactive decay law that is expressed by the equations:

$$dN/dt = -\lambda N \quad (1)$$

$$N = N_0 e^{-\lambda t} \quad (2)$$

where  $dN/dt$  is the rate of decay of a radioactive isotope,  $N$  is the present amount of a radioactive isotope (called the *parent*) in a sample,  $N_0$  is the amount of parent isotope in the sample at the time of its formation,  $t$  is the age of the sample, and  $\lambda$  is the *decay constant* of the parent isotope. Equation (1) indicates that the decay rate,  $dN/dt$ , is proportional to the amount of radioactive isotope in a sample, an amount that decreases with time as indicated by the minus sign. Equation (2) is derived from equation (1) by rearrangement and integration. Decay constants (Table 1)

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have now been measured by a variety of methods. To date, experimental evidence indicates that decay constants vary by no more than a very small fraction of one percent, if they vary at all.<sup>5</sup> Decay constants are virtually independent of the chemical composition of compounds containing the radioactive isotope and of the effects of temperature, pressure, gamma radiation, x-rays, high energy particles, and electrical and magnetic fields. *No geologically or archeologically important radioactive isotope shows any significant variation in its decay constant.*

Closely related to the decay constant is the *half-life* ( $\tau_{1/2}$ ) of a radioactive isotope, defined as the amount of time during which the amount of parent radioactive isotope in a sample decreases by one half. The amount of isotope into which the parent is transformed (the so-called *daughter*) increases as the parent decreases. If the amount of parent isotope in a sample equals half the original amount ( $N = \frac{1}{2} N_0$ ), then the age equals one half-life ( $t = \tau_{1/2}$ ). By substitution of these expressions into equation (2), we obtain

$$\frac{1}{2} N_0 = N_0 e^{-\lambda t \frac{1}{2}} \quad (3)$$

an expression from which we can calculate that  $\tau_{1/2} = 0.693/\lambda$ . The half-life, therefore, is inversely proportional to the decay constant of a radioactive isotope. Table 1 also lists half-lives of several important radioactive isotopes.

Figure 1 graphically shows the amount of decay of parent and increase in amount of daughter isotopes in a sample containing no initial daughter as a function of the number of half-lives of the parent isotope that have elapsed. For example, after one half-life has elapsed, the amount of parent has decreased to one half of the original amount, and the amount of daughter has increased from zero to an amount equal to that of the parent. After two half-lives have elapsed, the amount of parent has decreased to one half of one half, that is, one quarter of the original amount. The amount of daughter will now be three times as much as that of the parent. After a third half-life has elapsed, the amount has decreased to one half of one quarter, that is, one eighth of the original amount, and so on.

Table 1. Decay Constants and Half-Lives of Some Geologically Important Radioactive Isotopes		
Radioactive Isotope	Decay Constant (years <sup>-1</sup> )	Half-Life (years)
<sup>14</sup> C	$0.1209 \times 10^{-3}$	5730
<sup>40</sup> K	$0.581 \times 10^{-10}$	$1.19 \times 10^{10}$
<sup>87</sup> Rb	$1.42 \times 10^{-11}$	$48.8 \times 10^9$
<sup>147</sup> Sm	$0.654 \times 10^{-12}$	$1.06 \times 10^{11}$
<sup>232</sup> Th	$4.9475 \times 10^{-11}$	$14.01 \times 10^9$
<sup>235</sup> U	$9.8485 \times 10^{-10}$	$0.7038 \times 10^9$
<sup>238</sup> U	$1.55125 \times 10^{-10}$	$4.468 \times 10^9$

Radioactive isotopes with extremely large half-lives and correspondingly low decay constants are useful in dating extremely old materials, because it takes a very long time for the parent isotope in a sample to diminish to extremely small amounts that would be difficult to analyze. Moreover, in a brief span of time, an insufficient amount of daughter isotope would be formed to permit its precise measurement. For example, <sup>238</sup>U with a half-life of nearly 4.5 billion years is eminently suitable for dating minerals and rocks that are hundreds of millions to billions of years old. Isotopes with short half-lives and correspondingly larger decay constants are useful in dating very recent materials. Such isotopes cannot be used to date old material because the parent isotope decreases sufficiently rapidly that it may be virtually immeasurable in a matter of years. By way of example, <sup>14</sup>C with a half-life of 5,730 years is suitable for dating materials that are only hundreds to a few tens of thousands of years old, but not millions of years.

To determine when a mineral or rock sample originally crystallized, the sample must have remained closed to both parent and daughter isotopes subsequent to its crystallization. In other words, neither parent nor daughter isotope should have entered into the sample from its environment or escaped from the sample into its environment during the course of the sample's post-crystallization history. If a quantity of parent isotope escaped from, or a quantity of daughter isotope entered into, a sample, then the calculated age would be higher than the actual age. Conversely, if a quantity of parent entered, or a quantity of daughter escaped from, the sample, the calculated age would be lower than the actual age. To improve the chances of dating a sample that acted as a closed system, geochronologists collect specimens that lack evidence of chemical weathering, are not extensively fractured, and are not associated with faults or shear zones. If the speci-

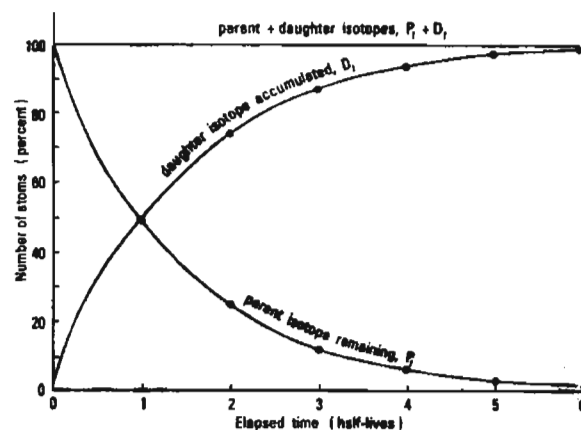
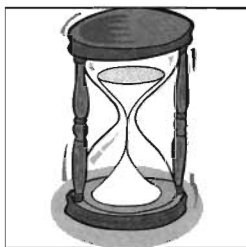


Figure 1. The decay of radioactive parent isotope and accompanying growth of daughter isotope in terms of half-life of the parent. Reproduced from Figure 3.2, p. 85 in G. B. Dalrymple, *The Age of the Earth* (Stanford, CA: Stanford University Press, 1991) by permission of Stanford University Press; © 1991 by the Board of Trustees of the Leland Stanford Jr. University.



Consider  
a crystal of a  
potassium-rich  
mineral like  
potassium  
feldspar or  
biotite in  
a volcanic ash  
deposit or  
a rhyolitic  
lava flow.  
We can  
ordinarily date  
the mineral by  
the  $^{40}\text{K}$ - $^{40}\text{Ar}$   
method.  
In this case,  
the problem of  
knowing the  
initial isotope  
ratios or  
amounts is  
avoided because  
essentially no  
daughter isotope  
is initially  
present ...

## Article

### *How Old Is It? How Do We Know? A Review of Dating Methods – Part Two: Radiometric Dating: Mineral, Isochron and Concordia Methods*

men acted as a closed system experiencing no gains or losses of the relevant isotopes, then the sum of parent and daughter in a sample at present must equal that sum at the time of formation. Thus, we may express the closed system condition by the equation

$$N + D = N_0 + D_0 \quad (4)$$

where  $D$  is the present amount of daughter isotope in a sample at present and  $D_0$  is the amount of daughter isotope in the sample at the time of formation. By rearranging equation (4) to the form  $N = N_0 + D_0 - D$ , substituting that form of equation (4) into equation (2), and further rearranging, we obtain

$$D = D_0 + N(e^{\lambda t} - 1) \quad (5)$$

Equation (5) is the fundamental equation for radiometric dating methods that assume a closed system and for which concentrations of the relevant isotopes can either be measured directly or calculated from appropriate measurements. Because absolute numbers of atoms of some isotopes are difficult to measure, and because ratios of isotopes with very similar atomic masses can be measured accurately and precisely with a mass spectrometer, equation (5) may be modified while preserving the equality of both sides of the equation by dividing each side by the identical amount of a stable non-radiogenic isotope ( $d$ ) of the same element as the daughter isotope. A stable non-radiogenic isotope is not radioactive, and it is either not produced by decay of a radioactive isotope at all or else it is produced at an exceedingly slow rate by a radioactive isotope with a half-life that far exceeds the age of the universe. For example, in rubidium-strontium ( $\text{Rb-Sr}$ ) dating,  $^{86}\text{Sr}$  in a sample will serve as the stable non-radiogenic (see equation 8). For purposes of isotope analysis,  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios are measured. The amount of the stable non-radiogenic isotope in the sample does not change through time in a closed system so that the amount of the stable non-radiogenic isotope in the sample now is the same as it was when the sample was formed ( $d = d_0$ ). Thus, when we divide both sides of equation (5) by  $d$ , we obtain

$$D/d = D_0/d_0 + (N/d)(e^{\lambda t} - 1) \quad (6)$$

This is a perfectly valid general equation for the radioactive decay of a specific isotope within a closed system.

How do we use this equation to obtain the age of a sample? We can measure both

the present-day ratios of  $D/d$  and  $N/d$  in a sample, and we know the value of the decay constant. But that leaves us with *two* unknowns,  $t$ , the age of the sample, and  $D_0/d_0$ . To calculate the age of the sample, therefore, we must also know  $D_0/d_0$ , the ratio of daughter isotope and the stable non-radiogenic isotope in the sample at the time of its origin. But if no analyst was present when a mineral was formed millions of years ago, how can we possibly know the value of the initial ratio? We shall soon see.

## Mineral Dating

Let's now look at some examples of various dating methods. In the process, we will see how the determination of original isotope ratios is addressed. Consider a crystal of a potassium-rich mineral like potassium feldspar or biotite in a volcanic ash deposit or a rhyolitic lava flow. We can ordinarily date the mineral by the  $^{40}\text{K}$ - $^{40}\text{Ar}$  method. In this case, the problem of knowing the initial isotope ratios or amounts is avoided because essentially no daughter isotope is initially present ( $^{40}\text{Ar}_0 = 0$ )<sup>6</sup>. Very little radiogenic daughter  $^{40}\text{Ar}$  is incorporated into most minerals when they crystallize because argon is an inert gas that is typically excluded from their crystal structures. Known exceptions are avoided in routine K-Ar dating. Any  $^{40}\text{Ar}$  already present in a cooling magma is also likely to be degassed during eruption or trapped in glass. Most  $^{40}\text{K}$  atoms decay to  $^{40}\text{Ca}$  by  $\beta$  emission, but a small percentage of  $^{40}\text{K}$  atoms decays to  $^{40}\text{Ar}$  by electron capture.<sup>7</sup> The operative equation based on equation (5) is

$$^{40}\text{Ar} = ^{40}\text{Ar}_0 + (\lambda_{\text{ec}}/\lambda) ^{40}\text{K} (e^{\lambda t} - 1) \quad (7)$$

where  $\lambda_{\text{ec}}/\lambda$  is the fraction of decays to  $^{40}\text{Ar}$  by electron capture. As noted, we assume that  $^{40}\text{Ar}_0 = 0$ .  $^{40}\text{K}$  is determined by measuring the total K concentration in the mineral by flame photometry or x-ray fluorescence and multiplying by 0.01167, the  $^{40}\text{K}$ /total K ratio in all K-bearing materials. The concentration of radiogenic  $^{40}\text{Ar}$  is calculated from argon isotope ratios that are measured by mass spectrometry.<sup>8</sup>

The K-Ar method is also useful for dating biotite, muscovite, hornblende, and feldspar in coarse-grained igneous rock bodies such as granite or gabbro that solidify far beneath Earth's surface. The coarse grains of such rocks result from the very slow cooling of

magma in the subsurface. The rocks continue to cool very slowly after crystallization. As these rocks cool,  $^{40}\text{Ar}$  produced by radioactive decay of  $^{40}\text{K}$  easily diffuses out of the mineral structure in which it originally forms thanks to intense thermal vibration of atoms at high temperature. Consequently, an insignificant amount of Ar accumulates in minerals at very high temperatures. Not until the rock cools to a so-called *closure (or blocking) temperature* does a mineral begin to retain  $^{40}\text{Ar}$  atoms that were generated by  $^{40}\text{K}$  decay, because the atoms are no longer vibrating with sufficient energy to diffuse out of the mineral grains in significant quantities. *Therefore, K-Ar ages of minerals in plutonic igneous rocks generally represent cooling ages that are somewhat younger than the age of original crystallization.* Normally the cooling ages of different minerals in the same igneous rock body differ from one another because the closure temperatures for Ar retention are different in different minerals.<sup>9</sup>

As examples of K-Ar ages, potassium feldspar crystals in pumice fragments from the Bishop Tuff in California, a volcanic ash deposit, consistently yield ages of approximately 725,000 years.<sup>10</sup> K-Ar ages on biotite crystals from the Mount Givens Granodiorite and El Capitan Granite in the Sierra Nevada of California are 84, 86, and 89 million years for the former and 92 and 94 million years for the latter.<sup>11</sup>

Geochronologists formerly dated feldspar and the K-bearing mica minerals biotite, muscovite, and lepidolite by the  $^{87}\text{Rb}/^{87}\text{Sr}$  method.<sup>12</sup> By substitution of  $^{87}\text{Rb}$  for N,  $^{87}\text{Sr}$  for D,  $^{87}\text{Sr}_0$  for  $D_0$ , and  $^{86}\text{Sr}$  for d and  $d_0$  into equation (6), we obtain

$$^{87}\text{Sr}/^{86}\text{Sr} = (^{87}\text{Sr}/^{86}\text{Sr})_0 + (^{87}\text{Rb}/^{86}\text{Sr})(e^{\lambda t} - 1) \quad (8)$$

$^{87}\text{Sr}/^{86}\text{Sr}$  is determined by mass spectrometry, and  $^{87}\text{Rb}/^{86}\text{Sr}$  is calculated from the measured Rb/Sr ratio and relative abundances of  $^{87}\text{Rb}/\text{total Rb}$  and  $^{86}\text{Sr}/\text{total Sr}$ , the latter determined by mass spectrometric measurements of several Sr isotope ratios. Again, how can we determine the original Sr isotope ratio? To address the problem, geochronologists commonly *assumed* an initial  $(^{87}\text{Sr}/^{86}\text{Sr})_0$  ratio such as 0.704, a ratio that is commonly found in recently erupted oceanic lava flows. Because the initial ratio was assumed, the resulting ages were not as reliable as desired. In addition, Rb and Sr are sufficiently mobile elements that the closed system condition is not always met. As a result, this method is rarely if ever used today. Zircon grains, which are especially resistant to both chemical and physical weathering, are commonly dated by the U-Pb method.<sup>13</sup> Via a long chain of decays,  $^{238}\text{U}$  ultimately decays to  $^{206}\text{Pb}$ , and  $^{204}\text{Pb}$  is used as the stable non-radiogenic isotope. By substitution of  $^{238}\text{U}$  for N,  $^{206}\text{Pb}$  for D,  $^{206}\text{Pb}_0$  for  $D_0$ , and  $^{204}\text{Pb}$  for d and  $d_0$  into equation (6), we obtain

$$^{206}\text{Pb}/^{204}\text{Pb} = (^{206}\text{Pb}/^{204}\text{Pb})_0 + (^{238}\text{U}/^{204}\text{Pb})(e^{\lambda t} - 1) \quad (9)$$

The  $^{206}\text{Pb}/^{204}\text{Pb}$  ratio in zircon grains is typically measured by mass spectrometry.<sup>14</sup>  $^{238}\text{U}/^{204}\text{Pb}$  is calculated from mea-

sured  $^{238}\text{U}/\text{total U}$  and  $^{204}\text{Pb}/\text{total Pb}$  ratios. But how do we find the original lead ratio,  $(^{206}\text{Pb}/^{204}\text{Pb})_0$ ? Consider that zircon ( $\text{ZrSiO}_4$ ) invariably contains some U because  $\text{U}^{4+}$  ions are sufficiently similar in size to  $\text{Zr}^{4+}$  ions that they can substitute for Zr during crystallization of zircon. In contrast,  $\text{Pb}^{2+}$  has a significantly different charge and is too large to substitute for  $\text{Zr}^{4+}$ . Consequently, the initial lead content of most zircons would have been inconsequential. The original Pb isotope ratio term  $(^{206}\text{Pb}/^{204}\text{Pb})_0$  can, therefore, normally be ignored. But what if we attempt to date a mineral other than zircon? Other U-bearing minerals, such as uraninite, may contain some initial Pb. How do we assess the initial Pb isotope ratio in such cases? Here we may reasonably assume that the initial lead isotope ratio was identical to the lead isotope ratio in minerals such as feldspar and galena that coexist in the same rock with the mineral we wish to date. We can do this because both feldspar and galena lack radioactive uranium and would not have produced any  $^{206}\text{Pb}$  during their history. Consequently, the initial  $^{206}\text{Pb}/^{204}\text{Pb}$  ratio would not increase through time.

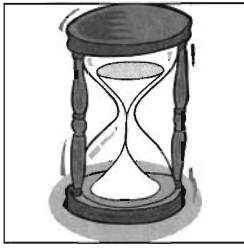
As examples of  $^{238}\text{U}/^{206}\text{Pb}$  dating, zircon from the Mount Givens Granodiorite in the Sierra Nevada yielded ages of 87.9 and 87.6 million years, and zircons from the El Capital Granite in Yosemite National Park have ages of 102.8 and 96.9 million years.<sup>15</sup> Note that these U-Pb ages are higher than the K-Ar ages mentioned above, a finding that is consistent with the idea that the U-Pb data represent crystallization ages and the K-Ar data represent cooling ages.

## Isochron Methods

To obtain crystallization ages, geochronologists also commonly employ the graphical isochron and concordia methods. We begin with the isochron method. The  $^{87}\text{Rb}/^{87}\text{Sr}$  and  $^{147}\text{Sm}/^{143}\text{Nd}$  decay systems are particularly amenable to treatment by the isochron method.<sup>16</sup> With  $^{87}\text{Rb}/^{87}\text{Sr}$  as an example, let's rearrange equation (8) slightly by switching the terms on the right side to obtain

$$^{87}\text{Sr}/^{86}\text{Sr} = (^{87}\text{Rb}/^{86}\text{Sr})(e^{\lambda t} - 1) + (^{87}\text{Sr}/^{86}\text{Sr})_0 \quad (10)$$

This equation has the same form as the equation for a straight line:  $y = mx + b$ . Thus, if we plot a straight line on a diagram with  $^{87}\text{Sr}/^{86}\text{Sr}$  as the vertical y-axis (ordinate) versus  $^{87}\text{Rb}/^{86}\text{Sr}$  as the horizontal x-axis (abscissa),  $(^{87}\text{Sr}/^{86}\text{Sr})_0$  is the y-intercept, b, and  $(e^{\lambda t} - 1)$  is the slope, m, of the straight line (Figure 2). Notice that the slope of the straight line for equation (10) is a function of t, the age of a sample containing Rb and Sr. Obviously then it would be nice to generate a straight line based on information about Rb and Sr so that we could obtain an age from the slope of the line. How do we do that? We produce this line by determining the present  $^{87}\text{Sr}/^{86}\text{Sr}$  and  $^{87}\text{Rb}/^{86}\text{Sr}$  ratios of several rock samples from an igneous intrusion or a mass of metamorphic rocks such as gneiss and then plotting these ratios on a diagram of  $^{87}\text{Sr}/^{86}\text{Sr}$  versus  $^{87}\text{Rb}/^{86}\text{Sr}$ . The straight line that is generally obtained is termed



To obtain crystallization ages, geochronologists also commonly employ the graphical isochron and concordia methods. ... Attainment of a straight line plot from the analytical data suggests that the rocks ... were essentially closed to Rb and Sr diffusion and that all samples had the same initial ratio at the time of igneous or metamorphic crystallization.

## Article

### *How Old Is It? How Do We Know? A Review of Dating Methods – Part Two: Radiometric Dating: Mineral, Isochron and Concordia Methods*

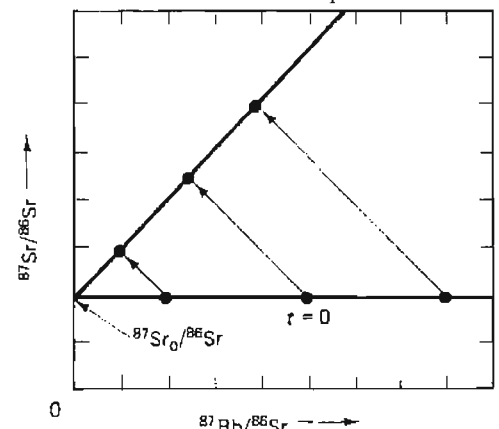
a whole-rock isochron. Attainment of a straight line plot from the analytical data suggests that the rocks we analyzed were essentially closed to Rb and Sr diffusion and that all samples had the same initial ratio at the time of igneous or metamorphic crystallization.

To understand why the whole-rock isochron method works and why we might obtain a straight line that yields age information, let's try to visualize the major geologic process of magmatic crystallization. Envision a mass of magma, that is, intensely hot molten (normally silicate) rock, in Earth's crust that contains trace amounts of  $^{87}\text{Rb}$ ,  $^{87}\text{Sr}$ , and  $^{86}\text{Sr}$ . Different isotopes of a chemical element are likely to fractionate during geologic processes such as evaporation, crystallization from magma, or diffusion in a temperature gradient in a magma if the masses of the isotopes differ from one another significantly. For example, hydrogen isotopes strongly fractionate during evaporation of water on Earth's surface. Light hydrogen ( $^1\text{H}$ ) atoms are preferentially incorporated into water vapor whereas heavy hydrogen atoms known as deuterium ( $^2\text{H}$ ) are preferentially incorporated into liquid water. As a result, the  $^1\text{H}/^2\text{H}$  ratio in water vapor that coexists with liquid water is much higher than the  $^1\text{H}/^2\text{H}$  ratio in the liquid water. This strong isotopic fractionation occurs because of the great difference in mass between the two isotopes of hydrogen. A heavy hydrogen isotope is twice as massive as a light hydrogen isotope.

In contrast, the atomic masses of  $^{87}\text{Sr}$  and  $^{86}\text{Sr}$  are very similar. Because a  $^{87}\text{Sr}$  atom is only 1.2% heavier than a  $^{86}\text{Sr}$  atom, Sr isotopes should fractionate only very slightly during geologic processes. Therefore, the ratio of these two isotopes should normally have much the same value throughout a body of cooling magma. As the magma cools, minerals eventually begin to crystallize. Each mineral has a different chemical composition and crystal structure.  $\text{Rb}^{1+}$  ions readily substitute for  $\text{K}^{1+}$  ions in growing crystals because the two ions have similar sizes (ionic radii) and identical electrical charges, and  $\text{Sr}^{2+}$  ions likewise substitute for  $\text{Ca}^{2+}$  ions. There will be variation in  $^{87}\text{Rb}/^{86}\text{Sr}$  ratios throughout the newly crystallized igneous rock mass because of variation in mineral abundances. For example, K-rich and Ca-poor domains of a magma body will crystallize to rocks with high

$^{87}\text{Rb}/^{86}\text{Sr}$  initial ratios, and K-poor and Ca-rich domains will produce rocks with low  $^{87}\text{Rb}/^{86}\text{Sr}$  initial ratios. If we could analyze the isotope ratios of several chunks of rock as soon as the magma crystallized and plot the results on an isochron diagram, we would normally obtain a virtually horizontal line (Figure 2). The slope of a horizontal straight line is zero, indicating a zero age for a suite of rocks that have just crystallized.

As the granite becomes older,  $^{87}\text{Rb}$  in each volume of rock spontaneously decays to  $^{87}\text{Sr}$ . The  $^{87}\text{Rb}/^{86}\text{Sr}$  ratio of each volume of granite decreases and the  $^{87}\text{Sr}/^{86}\text{Sr}$  ratio increases in each sample through time because  $^{87}\text{Sr}$  is being added to the rock by decay of  $^{87}\text{Rb}$ . Data points on the isochron diagram would shift their positions as shown by the lines with arrows in Figure 2. All data points would shift through time along paths with the same slope. Points representing rock samples with the highest initial  $^{87}\text{Rb}/^{86}\text{Sr}$  ratios would shift the most because they have higher  $^{87}\text{Rb}$  contents, and a greater amount of  $^{87}\text{Rb}$  decays into a greater amount of  $^{87}\text{Sr}$ . As the granite body ages, the farther the data points would shift. Through time, the isochron would pivot around the y-intercept,  $(^{87}\text{Sr}/^{86}\text{Sr})_0$ , and the slope of the isochron would become steeper, indicating that the rocks are getting older. Although we cannot observe this shift in position of the



**Figure 2.** Idealized Rb-Sr isochron diagram illustrating the isotopic development of three samples in time. All samples had the same initial strontium isotope ratio at the time of formation. The isotope composition of each sample moves along lines with arrows having a slope of -1 as  $^{87}\text{Rb}$  decays to  $^{87}\text{Sr}$ . The slope of the isochron is  $(e^{\lambda t} - 1)$ . The initial Sr isotope ratio can be ascertained from intersection of the isochron with the abscissa. Reproduced from Fig. 12.6, p. 386 in Steven M. Richardson and Harry Y. McSween, Jr., *Geochemistry: Pathways and Processes* (Englewood Cliffs, NJ: Prentice Hall, 1989) by permission of Harry Y. McSween, Jr.

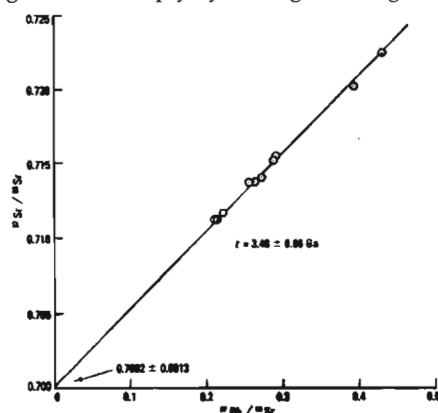


isochron in real time (we have not lived long enough!), we can obtain information about the age of the granite from knowledge of the isotope ratios that we analyze today. From the diagram, we can calculate the time of crystallization of the granite from the slope of the whole-rock isochron, find the initial  $^{87}\text{Sr}/^{86}\text{Sr}$  ratio from the y-intercept, and infer lack of significant diffusion of Rb or Sr from strong co-linearity of points. Significant scatter of analytical data points suggests that there may have been substantial diffusion and that the age calculated from the slope of a poorly defined isochron is somewhat suspect. Some variation in initial Sr isotope ratio may also produce slight scatter of data points that nonetheless define a straight line with reasonably good fit.

As an example, a Rb-Sr whole-rock isochron for the Stolzberg pluton in the Barberton Mountains of South Africa, indicates a probable crystallization age of 3.48 billion years (Figure 3).<sup>17</sup> The slight scatter of data points in this isochron plot suggests possible minor diffusion or slight variation in initial Sr isotope ratios. As another example, a remarkably tightly constrained whole-rock Rb-Sr isochron for 38 samples of several different stony meteorites indicates a meteorite crystallization age of 4.498 billion years (Figure 4).<sup>18</sup>

Internal or mineral isochrons are constructed from isotopic analyses of individual minerals that have been extracted from a single large rock sample. Such isochrons sometimes include an analysis of the whole-rock sample. Internal isochrons are especially useful for determining crystallization ages of individual meteorite fragments and fragments of returned lunar samples. Figure 5 shows an internal isochron from a lunar basalt fragment that indicates an age of 3.09 billion years.<sup>19</sup>

Conceivably, straight lines on an isochron diagram could be generated simply by mixing two magmas in vari-

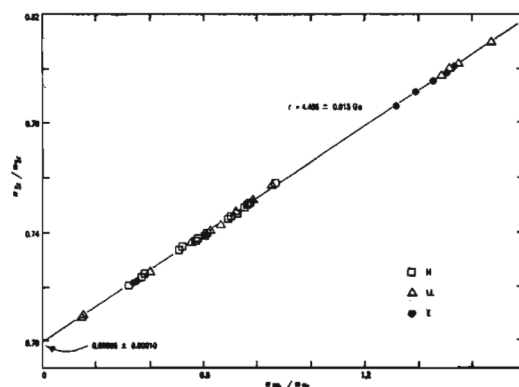


**Figure 3.** Rb-Sr whole-rock isochron from samples of Stolzberg Pluton, Barberton Mountains, South Africa. Reproduced from Figure 3, p. 67 in "Geochronologic and Sr-isotopic Studies of Certain Units in the Barberton Granite-Greenstone Terrane, South Africa" by J. M. Barton, Jr., L. J. Robb, C. R. Anhaeusser, and D. A. Van Nierop in *Contributions to the Geology of the Barberton Mountain Land: National Geodynamics Programme Barberton Project*, Special Publication no. 09. C. R. Anhaeusser, ed. (Johannesburg: Geological Society of South Africa, 1983): 63–72 by permission of Professor J. M. Barton for the Geological Society of South Africa.

ous proportions and allowing them to crystallize. If so, the resulting straight line would tell us nothing about the age of the rocks. The vast majority of straight lines of an isochron plot, however, cannot be explained by simple mixing for several reasons. We mention only two. For example, evidence of extensive magma mixing can generally be detected from variations in chemical composition of an igneous rock body as well as from field evidence. For most igneous rock bodies, however, field and chemical evidence of significant mixing of two or more magmas is lacking. In addition, the mixing hypothesis fails to account for the very wide range of values of Sr isotope ratios that have been observed on all isochron diagrams of igneous rocks.

The Sm-Nd decay is also amenable to treatment by isochron methods. Sm-Nd isochrons have an advantage over Rb-Sr isochrons in that rare-earth elements (REE) like Sm and Nd are relatively immobile during geologic heating events, and, therefore, are unlikely to diffuse into or out of rocks. As a result, the isotope ratios of these elements are not significantly changed during geologic disturbances such as metamorphism. Evidence of the original crystallization age of an igneous intrusion, therefore, is normally preserved even though that body may have been metamorphosed subsequently. This characteristic feature means that Sm-Nd whole-rock isochron dating is especially important for dating exceptionally old rocks in the one to four billion year range. As an example, Sm-Nd whole-rock isochron data obtained from metamorphosed volcanic rocks in the Barberton Mountains indicate an age of 3.53 billion years (Figure 6).<sup>20</sup>

Several additional isochron methods have been developed in recent decades based on the  $\beta$  decay of  $^{138}\text{La}$  to  $^{138}\text{Ce}$ , of  $^{187}\text{Re}$  to  $^{187}\text{Os}$ , and of  $^{176}\text{Lu}$  to  $^{176}\text{Hf}$ .<sup>21</sup> Although none of these methods is as widely useful as Sm-Nd or Rb-Sr, they offer promise in the investigation of igneous rocks rich in iron-magnesium minerals, iron meteorites,



**Figure 4.** Rb-Sr whole-rock isochron of 38 samples of undisturbed chondritic meteorites. Reproduced from Figure 4, p. 414 in "Absolute Age of Formation of Chondrites Studied by the  $^{87}\text{Rb}$ - $^{87}\text{Sr}$  Method" by J. F. Minster, J. L. Birck, and C. J. Allégre, *Nature* 300, no. 5891 (1982): 414–9; by permission of Nature Publishing Group.



## Article

### How Old Is It? How Do We Know? A Review of Dating Methods – Part Two: Radiometric Dating: Mineral, Isochron and Concordia Methods

or certain ore samples—geological materials that are not so readily datable by the Rb-Sr and Sm-Nd isochron method.

## The Concordia Method

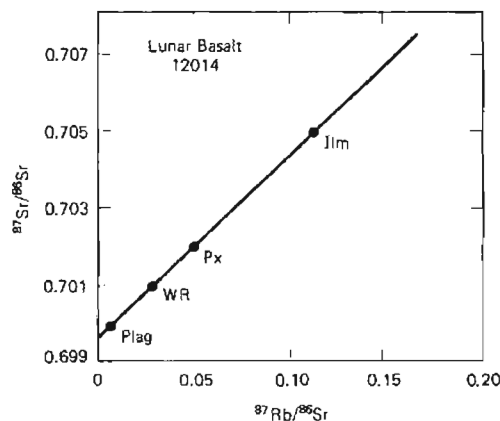
The concordia method, another powerful graphical method, is very useful in evaluating radiometric data for the U-Th-Pb system. U- and Th-bearing minerals can be dated by analyzing  $^{238}\text{U}$  and its ultimate daughter product  $^{206}\text{Pb}$ ,  $^{235}\text{U}$  and its ultimate daughter product  $^{207}\text{Pb}$ , and  $^{232}\text{Th}$  and its ultimate daughter product  $^{208}\text{Pb}$ . In addition, the lead-lead method provides another calculation that is based on the ratio of radiogenic  $^{207}\text{Pb}$  to radiogenic  $^{206}\text{Pb}$ .<sup>22</sup> There are, therefore, four independent methods for calculating the time of crystallization of a U-Th-bearing mineral such as zircon in an igneous rock body. The difficulty is that *most U-Th-Pb analyses of the same sample yield discordant, i.e., different, ages by the four different methods* because lead can be lost from U-bearing minerals either by slow continuous leakage or in discontinuous episodes, most likely caused by heating. The Pb/Pb method typically yields higher ages than those obtained by the other three methods. The reason is that the  $^{207}\text{Pb}/^{206}\text{Pb}$  ratio of any lead that is lost from a U-bearing sample should be virtually the same as the isotope ratio of lead that is retained in the sample. The masses of the two Pb isotopes are so similar that there would be negligible isotope fractionation during lead loss. Because the age in this method is calculated from the  $^{207}\text{Pb}/^{206}\text{Pb}$  ratio, a reliable age should be obtained even

if some lead is lost. In the other three methods, however, if lead is lost at all, a mineral will yield a spuriously young age because a daughter isotope, either  $^{208}\text{Pb}$ ,  $^{207}\text{Pb}$ , or  $^{206}\text{Pb}$ , is lost, and the ages are based on the ratios of  $^{238}\text{U}/^{206}\text{Pb}$ ,  $^{235}\text{U}/^{207}\text{Pb}$ , or  $^{232}\text{Th}/^{208}\text{Pb}$ .

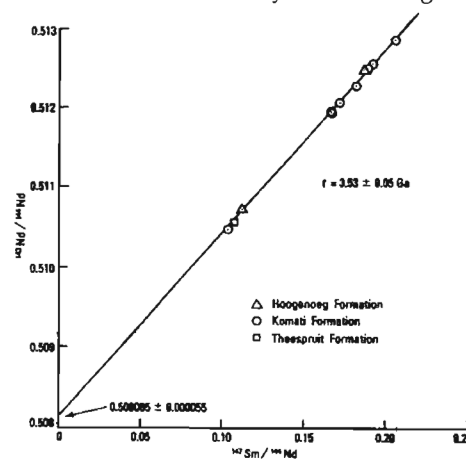
The concordia method was developed to deal with these problems of lead loss and discordance among ages obtained for the same sample by different U-Th-Pb methods.<sup>23</sup> The most important concordia diagram plots  $^{206}\text{Pb}/^{238}\text{U}$  (y-axis) versus  $^{207}\text{Pb}/^{235}\text{U}$  (x-axis). The diagram (Figure 7) includes a curve, termed *concordia*, that shows how the values of these two ratios change continuously over time for any hypothetical sample that has been completely closed to U and Pb and for which all of the Pb is radiogenically derived from U decay. Because both  $^{238}\text{U}$  and  $^{235}\text{U}$  decrease and  $^{206}\text{Pb}$  and  $^{207}\text{Pb}$  increase through time due to radioactive decay, the  $^{206}\text{Pb}/^{238}\text{U}$  and  $^{207}\text{Pb}/^{235}\text{U}$  ratios must both increase in a closed system, resulting in the positive slope of concordia.

Now suppose that a U-bearing zircon is analyzed for U and Pb, that any necessary correction is made for original Pb isotopes in the sample, that the appropriate Pb/U ratios are plotted on the diagram, and that the data point for the sample analysis plots exactly on concordia. A reasonable conclusion would be that the position of the point on concordia indicates the crystallization age of

The concordia method, another powerful graphical method, was developed to deal with [the] problems of lead loss and discordance among ages obtained for the same sample by different U-Th-Pb methods.



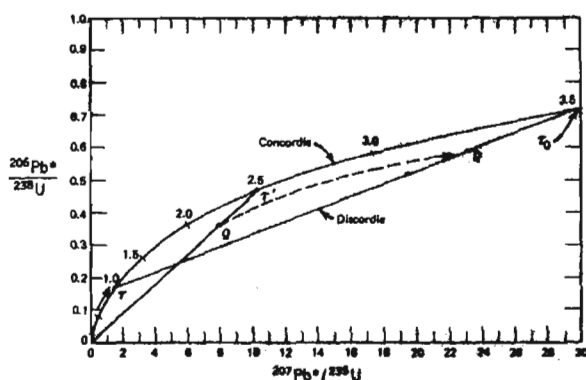
**Figure 5.** Rb-Sr internal isochron for lunar basalt 12014. WR = whole rock, ilm = ilmenite, px = pyroxene, and plag = plagioclase feldspar. The age determined from the slope is 3.09 billion years. Reproduced from Fig. 12.7, p. 387 in Richardson and McSween, *Geochemistry* by permission of Harry Y. McSween, Jr.



**Figure 6.** Sm-Nd whole-rock isochron for volcanic rocks from the Onverwacht Group, Barberton Mountains, South Africa. Reproduced from Figure 2, p. 299 in "Sm-Nd Dating of Onverwacht Group Volcanics, Southern Africa" by P. J. Hamilton, N. M. Evenson, R. K. O'Nions, H. S. Smith, and A. J. Erlank, *Nature* 279 (24 May 1979): 298–300 by permission of the Nature Publishing Group.

the zircon. In many studies, however, data points obtained from several analyses of a suite of zircons from a rock body define a straight line, called *discordia* that intersects concordia at two points (Figure 7). Even if no data points lie on concordia, the upper intercept of discordia indicates the time of original crystallization of the zircons, and the lower intercept of the straight line with concordia presumably indicates a time of disturbance when Pb was lost in varying amounts from the analyzed zircons. If lead had been lost from individual zircons during some geologic event in the past, their Pb/U ratios would decrease, and the more lead that they lost, the lower their Pb/U ratios would become even though the ratio of lead isotopes ( $^{207}\text{Pb}/^{206}\text{Pb}$ ) would not change. If the zircons were analyzed immediately after an episode of lead loss, the data points would define a line intersecting the origin where both Pb/U ratios are zero. Any zircon that lost all of its lead ( $\text{Pb} = 0$ ) would plot at the origin because the Pb/U ratios would both be zero. After the episode of lead loss is over, the radioactive decay of U continues and accumulation of Pb in the zircons resumes, and both Pb/U ratios of all zircons begin to increase again. Through time, the straight line representing the time of lead loss rotates into the position defined by the zircon analyses at present (Figure 7). In this scenario, we obtain the original crystallization age and the age of lead loss episode.

There are other instances in which lead may have been lost continuously or in two or more discrete episodes of lead loss. These cases are much more complex and will not be treated here. Suffice it to say, however, that the concordia method demonstrates that, for U-Th-Pb systems, the closed system condition does not always have to be met to make use of it for dating purposes.

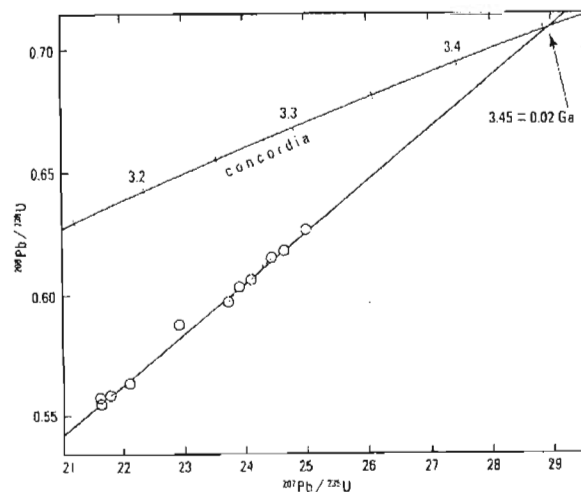


**Figure 7.** Schematic U-Pb concordia diagram illustrating episodic lead loss at time  $\tau'$  when the system was 2.5 billion years old. Because of varying degrees of lead loss, the Pb isotope composition of various samples moved toward the origin. Point Q represents one sample that suffered partial Pb loss. A sample that lost all of its Pb would be represented by a point at the origin. Following the time of Pb loss to the present, a period of 1.0 billion years, discordia would rotate into position  $\tau$ - $\tau'$ . Discordia indicates that the samples originally crystallized 3.5 billion years ago and that the episode of Pb loss occurred 1.0 billion years ago. Reproduced from Fig. 18.5, p. 292 in G. Faure, *Principles of Isotope Geology*, 2d ed. (New York: John Wiley and Sons, 1986) by permission of John Wiley and Sons, Inc.

As examples of the concordia method, consider the following. Zircon separates from the Duffer Formation in Western Australia (Figure 8) define a discordia that intersects concordia at 3.45 billion years.<sup>24</sup> Five zircon separates from the Gamitagama Lake Complex, an igneous intrusion in southern Canada, define an excellent straight-line discordia that intersects concordia at 2.67 billion years, and five zircons from another intrusion, the nearby Kasubeck Creek Granodiorite, also define a very good straight line that intersects concordia at 2.67 billion years.<sup>25</sup> These ages are close to those of volcanic rocks in the area. One additional example concerns the Qôrqu Granite from western Greenland.<sup>26</sup> Seventeen zircon separates define a very good straight line discordia that intersects concordia at 2.53 billion years, whereas zircons from the Amitsoq gneisses that were intruded by the granite give an intersection age of 3.595 billion years.

Geologists now have at their disposal a wide array of radiometric methods that are capable of yielding highly reliable information about the ages of igneous crystallization, metamorphic recrystallization, cooling, lead-loss, and other events for many kinds of samples *provided that the methods are used in conjunction with careful sample collection, precise analysis, understanding of the geologic conditions that affected the samples being dated, and judicious interpretation of the geologic significance of the age that is obtained.*

My final article, to appear in the September 2007 issue, will examine thermochronometric methods as well as methods based on the radioactive decay of cosmogenically produced isotopes. It will conclude with a brief reflection on the theological implications of belief in a very ancient Earth. \*



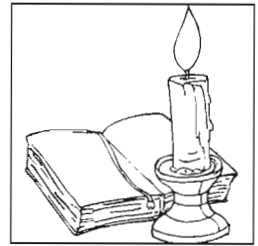
**Figure 8.** U-Pb concordia diagram plotting analyses of zircons separated from rocks of the Duffer Formation, Pilbara Supergroup, Western Australia. The zircon analyses define an excellent discordia indicating an original crystallization age of 3.45 billion years. Reproduced from Figure 2 in R. T. Pidgeon, "3450-m.y.-old Volcanics in the Archaean Layered Greenstone Succession of the Pilbara Block, Western Australia," *Earth and Planetary Science Letters* 37, no 3 (January 1978): 421-8 by permission of Elsevier Publishing.

# Article

## How Old Is It? How Do We Know? A Review of Dating Methods – Part Two: Radiometric Dating: Mineral, Isochron and Concordia Methods

### Notes

- <sup>1</sup>Henri Becquerel discovered radioactivity in 1896 while working with uranium compounds. Marie and Pierre Curie discovered the radioactive nature of the chemical elements thorium, radium, and polonium, and Pierre Curie coined the term “radioactivity.” In 1903, Ernest Rutherford and Frederick Soddy worked out the general theory and mathematics of radioactive decay, recognized the mechanisms of  $\alpha$  and  $\beta$  particle emission, and postulated that helium is an important by-product of radioactive decay. Two years later, Rutherford calculated the ages of two mineral samples from measurements of their uranium and helium contents.
- <sup>2</sup>In 1907, Bertram Boltwood separated “ionium,” a substance chemically indistinguishable from thorium but with a different atomic mass. In 1912, Soddy applied the term “isotope” to such apparently different forms of the same chemical element, and J. J. Thomson provided experimental confirmation of the existence of isotopes. In 1919, Frederick Aston constructed the first mass spectrograph and by 1927 had determined the isotope composition of more than fifty chemical elements.
- <sup>3</sup>For a discussion of some of the earlier, but now abandoned, methods see Henry Faul, ed., *Nuclear Geology: A Symposium on Nuclear Phenomena in the Earth Sciences* (New York: John Wiley and Sons, 1954).
- <sup>4</sup>For details on geologically important radiometric dating systems, see Gunter Faure and Teresa M. Mensing, *Isotopes: Principles and Applications*, 3d ed. (Hoboken, NJ: Wiley, 2005) and Alan P. Dickin, *Radiogenic Isotope Geology* (Cambridge: Cambridge University Press, 1997). Also of great value are the summaries in G. Brent Dalrymple, *The Age of the Earth* (Stanford, CA: Stanford University Press, 1991) and G. Brent Dalrymple, *Ancient Earth, Ancient Skies: The Age of Earth and Its Cosmic Surroundings* (Stanford, CA: Stanford University Press, 2004).
- <sup>5</sup>For reviews of experimental studies of changes in rates of radioactive decay, see G. T. Emery, “Perturbation of Nuclear Decay Rates,” *Annual Review of Nuclear Science* 22 (1972): 165–202 and H.-P. Hahn, H. J. Born, and J. I. Kim, “Survey on the Rate Perturbation of Nuclear Decay,” *Radiochimica Acta* 23 (1976): 23–37. As early as 1903, Rutherford and Soddy performed experiments under a wide range of chemical and physical conditions and detected no change in rates of radioactive decay.
- <sup>6</sup>On K-Ar dating, see G. Brent Dalrymple and Marvin A. Lanphere, *Potassium-Argon Dating: Principles, Techniques, and Applications to Geochronology* (San Francisco: W. H. Freeman, 1969). See also chapter 6 in Faure and Mensing, *Isotopes: Principles and Applications*.
- <sup>7</sup>In  $\beta$  decay, a neutron of a radioactive isotope such as  $^{40}\text{K}$  is transformed to a proton plus an electron ( $\beta$  particle) which is emitted from the nucleus. As a result, the atomic number ( $Z$ ) of a daughter isotope such as  $\text{Ca}$  ( $Z = 20$ ) is one more than that of the parent  $\text{K}$  ( $Z = 19$ ) whereas the atomic mass remains the same (40) because the sum of protons and neutrons remains constant, a neutron being replaced by a proton. In electron capture, an electron in an inner shell is captured by the nucleus. The combination of electron with a proton creates a neutron. As a result, the atomic number of the daughter is reduced by one with the loss of the proton but the atomic mass remains the same as the proton is replaced by a neutron. Thus,  $^{40}\text{Ar}$  produced by decay of  $^{40}\text{K}$  due to electron capture has  $Z = 18$ .
- <sup>8</sup>In mass spectrometry, isotopes of interest in either gaseous or solid samples are ionized. The beam of positively charged ions is deflected by a magnetic field as it is passed through a curved electromagnet. The radius of curvature of beam paths of each isotope is dependent on isotopic mass. The paths of heavier isotopes are deflected less than those of lighter isotopes. The magnetically separated ion beams are focused onto a collecting cup where beam intensities are measured. Mass spectrometric analysis of isotope ion beams is carried out in a near vacuum. Older mass spectrographs measured isotope abundances photographically.
- <sup>9</sup>The K-Ar closure (blocking) temperature of biotite is approximately 325°C and that of hornblende is approximately 475°C.
- The closure temperatures are a function of the rate of cooling and grain size of the mineral. In actuality, as a K-bearing mineral cools, it passes through a temperature range during which Ar retentivity increases until below the closure temperature the Ar retention is 100%.
- <sup>10</sup>G. Brent Dalrymple, “K-Ar Ages of the Friant Pumice Member of the Turlock Lake Formation, the Bishop Tuff and the Tuff of Reds Meadow, Central California,” *New Mexico Bureau of Mines and Mineral Resources, Isochron/West*, no. 28 (1980): 3–5.
- <sup>11</sup>T. W. Stern, P. C. Bateman, B. A. Morgan, M. F. Newell, and D. L. Peck, “Isotopic U-Pb Ages of Zircon from the Granitoids of the Central Sierra Nevada,” *California United States Geological Survey Professional Paper* 1185 (1981).
- <sup>12</sup>For fundamentals of Rb-Sr dating, see Louis H. Ahrens, “Measuring Geologic Time by the Strontium Method,” *Geological Society of America Bulletin* 60 (1949): 217–66.
- <sup>13</sup>For details of the U-Pb method, see Chapter 10 in Faure and Mensing, *Isotopes: Principles and Applications*.
- <sup>14</sup>Small mineral grains such as tiny zircon crystals can be analyzed with the aid of a Sensitive High-Resolution Ion Microprobe (SHRIMP), an instrument that bombards a mineral surface with high-energy ions that cause atoms to be sputtered from the surface of the sample. These atoms are then analyzed by mass spectrometry.
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- <sup>16</sup>For details on the Rb-Sr and Sm-Nd isochron methods, see chapters 5 and 9 in Faure and Mensing, *Isotopes: Principles and Applications*.
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- <sup>22</sup>On various U-Th-Pb methods, see Chapters 10 and 11 in Faure and Mensing, *Isotopes: Principles and Applications*. Both the U and Th decay chains include  $\alpha$  and  $\beta$  decays. An  $\alpha$  particle consists of two protons and two neutrons, in essence the nucleus of a helium atom. Consequently, helium is an important by-product of both U and Th decay. The initial step in the decay chain of  $^{238}\text{U}$  is the decay of  $^{238}\text{U}$  to  $^{234}\text{Th}$  in which the atomic number of the daughter is two less than that of the parent (90 vs. 92) because of the loss of two protons, and the atomic mass decreases by four (234 from 238) because of the loss of two protons and two neutrons.
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# Concordism and a Biblical Alternative: An Examination of Hugh Ross's Perspective

Paul Seely

*Unlike the bulk of concordist writings which deal primarily with Genesis 1, Hugh Ross's book The Genesis Question deals with all of Genesis 1-11 and hence presents a rare opportunity to see how a leading concordist deals with the conflicts which these chapters have with modern science. The attempts to harmonize these chapters with modern science are examined and found wanting. After seeing how Ross's explanations, which are typical of the concordist approach, fail to harmonize Creation, Adam, the Flood, and the Tower of Babel with the findings of modern science, an alternative yet fully biblical approach is presented.*

**H**ugh Ross, president of Reasons to Believe, has used his professional knowledge of astronomy to produce some valuable apologetical books supporting biblical Christianity, particularly regarding the Big Bang and the anthropic principle. He supports old earth creationism, and he has a good evangelistic ministry revolving around science and the Bible.

Since some of the most serious conflicts between science and the Bible occur in Genesis 1-11, he wrote *The Genesis Question* to show how Genesis 1-11 agrees with modern science. The book refutes many of the arguments of young earth creationism in a viable way, but since Ross is out of his field of expertise, it is perhaps not surprising that much of what he wrote about Genesis 1-11 does not stand up to close examination.<sup>1</sup> After looking at Ross's attempts to make the major events in these chapters agree with science, I will lay out an alternative which, I think, is a more biblical approach to science and Scripture.

## Ross and Genesis One

I have written earlier showing that Ross and other concordists have removed Genesis 1 from its historical and biblical context and have effectually rewritten it in order to make it agree with modern cosmology. That article, "The First Four Days of Genesis in Concordist Theory and in Biblical Context,"

is available on the ASA website.<sup>2</sup> I will not, therefore, go over Ross's interpretation of Genesis 1 here. It will suffice to point out that there is a virtually unanimous agreement among qualified Old Testament scholars that the sun, moon, and stars were *created* on the fourth day, not just made to *appear* as the concordist interpretation requires.<sup>3</sup> So at the very heart of the concordist interpretation of Genesis 1 is a *private* interpretation. And, as can be seen in the above mentioned article, concordism also takes other verses in Genesis 1 out of context and reinterprets them in a private manner. Concordism's approach to Genesis 1 is thus resting upon a foundation no firmer in principle than that of creation science, which rests upon private interpretations of the scientific data.

## Ross and Adam

Ross recognizes that in the Bible Adam is the first human being on earth; and unlike some concordists he does not attempt to establish a pre-Adamite theory. He admits that hominids go back over a million years and that Neanderthals existed in their usual time slot, but he argues that the Neanderthals were not true human beings nor ancestors of Adam.

**Paul H. Seely** graduated from Westminster Theological Seminary. Based on his extensive knowledge of the historical background of the Bible, he has published a book, *Inerrant Wisdom*, and numerous articles on the relationship of science to Scripture. He has two grown sons and resides in Portland, Oregon, with his wife Anita.



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## Dialogue: Article

*Concordism and a Biblical Alternative:  
An Examination of Hugh Ross's Perspective*

Ross rightly discerns that the difference between animals, even bipedal hominids, and Adam is that Adam had a spiritual capacity to be aware of God and converse with him. In order to date Adam, he cites two scientific papers published in 1981 and 1986 which claim that religious relics and altars, which would indicate the presence of truly spiritual beings, date back "twenty-four thousand years at most."

One problem with this is that since 1986, other altars have been found, two of which were made by Neanderthals. One was found at Bruniquel, France, which dates back at least 47,600 years.<sup>4</sup> Similarly there is good evidence of Neanderthals sacrificing a deer in a Mousterian cave shelter in Lebanon.<sup>5</sup> If altars signify the presence of truly spiritual beings, Neanderthals would have to be considered true human beings whether they are ancestral to *Homo sapiens sapiens* or not.

Ross also looks at research done on the Y-chromosome, and concludes from it that *Homo sapiens sapiens* have a common male ancestor at 35,000 to 47,000 BP. On the basis of mitochondrial DNA, he concludes that *Homo sapiens sapiens* have a common female ancestor that dates a few thousand maybe up to tens of thousands of years earlier. In the end, Ross does not explicitly date Adam in the book, but on the basis of the above data and that *Homo sapiens sapiens* have ancestors in Europe c. 30,000 BP, he is certainly concluding that Adam must be dated at least 35,000 years ago. And he seems to be open to a date as early as 50,000 years ago. He has, in fact, a news item on his website which says humans originated c. 50,000 BP.<sup>6</sup>

Anatomically *Homo sapiens sapiens* are usually thought to have originated 100,000 or more years ago; but perhaps a true human corresponding to Adam did not arise until 50,000 BP. Yet even that date for Adam stretches the genealogy in Genesis 5 to unrealistic dimensions as shall be discussed more fully below. A more serious problem with this early date is the culture of Adam. Adam is clearly portrayed as a farmer with domesticated crops (Gen. 2:5, 15; 3:23). In addition, Gen. 4:1, 2 in the light of 4:25 imply that Cain and Abel were contemporaries of Adam, and they raised domesticated crops and domesticated cattle, respectively. Adam's culture is thus clearly Neolithic.

The culture of humans 50,000 or even 35,000 years ago, on the other hand, is clearly Paleolithic, having neither domesticated crops nor domesticated cattle. Indeed, domesticated crops and cattle do not show up in the archaeological record until 9000–10,000 BC at the earliest. Nor did Paleolithic humans build cities in even a reduced sense of the word, yet Cain built a city (Gen. 4:17). If then Genesis is giving us an accurate picture of Adam's culture, there is no way that Adam can be dated before c. 12,000 BP. Adam's culture precludes dating him to 50,000 or even 35,000 years ago as would be necessary to bring concord between the biblical account and the scientific evidence.

In a short article, one of Ross's associates, Fazale Rana, faces this problem but claims that "small-scale agricultural practices were established long before the Neolithic revolution."<sup>7</sup> He based this claim on excavations near the Sea of Galilee which found that humans c. 23,500 BP were preferentially harvesting wild grasses that had larger seeds. They were also grinding the grasses into flour. No one doubts that the origin of agriculture sprang from the harvesting of wild grasses, but the cited evidence only supports the presence of *wild* grasses, not domesticated grasses. The cited evidence, as the authors of the original scientific article indicate, fits a hunting and gathering culture, not one with domesticated crops such as are implied in the biblical narrative of Adam and Cain.<sup>8</sup> In addition, the date of these finds is c. 12,000 years *after* Ross's earliest date for Adam. The finds also do not fit the biblical picture in that there is no evidence of domesticated fruit trees nor of a city at this early date, as the biblical narrative demands.

Ross could argue, as some have, that Adam's Neolithic culture was lost, and Paleolithic culture arose after that and reigned until c. 9000 or 10,000 BC when Neolithic culture was reinvented. Thus Adam can be dated at 50,000 BP. Admittedly, cultures can go backward, but this suggested scenario seems *ad hoc* in that no evidence of a Neolithic culture preceding the Paleolithic has ever been found. Also this scenario ill fits the biblical data. In the Genesis 5 genealogy, the first two persons, Adam and Seth, are clearly contemporaries (Gen. 4:25), and the last two persons, Lamech and Noah, are clearly contemporaries (Gen. 5:29) and date



to c. 5000 BC (see below). That leaves seven generations to cover around 40,000 years of Paleolithic culture.

Not only does this unduly stretch the idea of gaps in the genealogies, it offers a genealogy covering an unparalleled extraordinary length of time. Further, since writing had not been invented, one must believe this genealogy was kept intact for tens of thousands of years by oral transmission. I think this is quite improbable. It seems particularly improbable when we see that Lamech remembers not only the name of Adam but the words God spoke to Adam some supposed 45,000 years earlier (Gen. 3:17; 5:29). Also, the genealogy in Genesis 4 is usually understood to be parallel to the one in Genesis 5, yet because Enoch near the top is Neolithic and so is Lamech at the bottom, only four generations (Gen. 4:18) are left to cover some 40,000 years of Paleolithic culture. And again, we find Lamech, who by means of mere oral transmission can accurately remember the words of God spoken to Cain some 45,000 years earlier! I think we must conclude that this approach is without empirical evidence, contrary to probability, and most probably *ad hoc*.

If Genesis 2–4 is accurate in a literal way, as Ross in fact interprets these chapters, the Bible's Neolithic Adam is in serious chronological discord with the Paleolithic first *homo sapiens* of modern anthropology.<sup>9</sup>

## Ross and the Flood

Ross recognizes that the scientific data from a number of sciences indicate there was no global Flood. He accordingly defines the biblical Flood as a local event. While I fully agree that the Flood was not global, I also recognize that concordist theories of the Flood are less than biblical and not always scientifically sound. The theory which Ross presents illustrates some of the main problems with the concordist approach.

## The Date of the Flood

To accommodate the fact that there were true human beings in Europe c. 30,000 BP, Ross placed the dispersion of humankind mentioned in Gen. 11:1–9 at c. 30,000 BP (cf. p. 187). He, therefore, must date the Flood earlier than 30,000 BP.

This presents the same problem as occurred with his dating of Adam. The culture of 30,000 years ago is Paleolithic. Yet the Bible describes the pre-Flood culture as being even more advanced than in the time of Adam. It not only had agriculture, domesticated cattle, and cities, it had “implements of bronze and iron” (Gen. 4:22). The culture described is late Neolithic or Chalcolithic (c. 4500 BC). In addition, shortly after the Flood, Noah planted a vineyard (Gen. 9:20), yet domesticated grapes do not show up in the archaeological record until c. 4000 BC, thus again dating the Flood to late Neolithic times.<sup>10</sup> If the biblical

data in Genesis 4 and 9 are accepted as accurate, the earliest possible date for the Flood is c. 5000 BC. Ross's date of before 30,000 BP is, therefore, out of the question since he wants to accept the biblical account at face value.

## The Depth of the Flood

Ross says the statement in Gen. 7:19 that “all the high mountains under all the heavens were covered” with water just means that Noah could see nothing but water from his vantage point on the upper deck of the ark. He says, “If the ark were floating anywhere near the middle of the vast Mesopotamian plain on water as deep as two or three hundred feet, no hills or mountains would be visible from it” (pp. 149–50). Ross says the ark landed in the foothills of the Ararat mountains, “a few hundred feet above sea level” probably 20 to 50 miles north of Ninevah's ruins (p. 170).

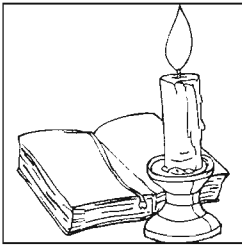
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The meaning of Gen. 7:19, however, is quite different if it is left in context. The preceding verses paint a picture of the flood waters ever increasing in depth until they covered “all of the high mountains under all the heavens.” The phrase “under *all* the heavens” necessarily includes the country of Ararat since that country is part of the context (Gen. 8:4).<sup>11</sup> And, the phrase, “all the high mountains” includes the *high* mountains of Ararat, not just the foothills. Hence, Gen. 7:19 means that the high mountains of Ararat were covered by the flood waters. On average, these mountains are 8,000 feet high and encircle a plateau one mile high. Consequently, the narrator is describing the flood waters as being over one mile high.

Such an extraordinary depth is implied again in the fact that after the ark grounded, it took two and one-half more months of receding flood waters “until the tops of the mountains became visible.” The ark is portrayed as landing at a very high elevation. If the ark came to rest on the Ararat foothills, the tops of the mountains in the vicinity would have been visible *before* the waters began to recede, not as a *result* of ten more weeks of the waters receding, as Gen. 8:15 tells us.



## Dialogue: Article

### *Concordism and a Biblical Alternative: An Examination of Hugh Ross's Perspective*

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To prevent Gen. 7:19 from referring to the high mountains in the area, Ross ignores the fact that the verse contextually includes the high mountains of Ararat, and he interprets Gen. 7:19 as an observation made by Noah while the ark was floating near the middle of the vast Mesopotamian plain. From there Noah could see neither the high Zagros mountains to the east nor the high Ararat mountains to the north. Ross would thus remove the high mountains in the area from being spoken of in Gen. 7:19. But in order to achieve this result, Ross *assumes* that Gen. 7:19 is based on Noah's observations even though Gen. 8:13 implies that Noah did not see outside the ark until the surface of the ground was completely dried up. Noah would not have needed to send out birds to see if the waters had dried up if he could have seen outside the ark for himself.

Worse still, Ross places the ark in the middle of the Mesopotamian plain, which is well south of the Ararat mountains. He places the ark there at the time of Gen. 7:19, which is close to the peak of the Flood but before the waters began to recede. Because Mesopotamia is topographically an inclined plane sloping to the south, when the waters did begin to recede, they would create a current flowing south which would pull the ark further and further away from the mountains of Ararat. So in Ross's scenario, the ark could never even land on the foothills of Ararat, thus contradicting Scripture.<sup>12</sup>

There is yet another problem with Ross's depth of the Flood. By putting the landing place of the ark twenty miles north of Ninevah, Ross does get the ark just over the border of Assyria into the land of Ararat (ancient Urartu). But at even this low end of the country of Ararat, the ark would be more than a few hundred feet above sea level. Ninevah, modern Mosul, is at an elevation of over 700 feet above sea level, and it would take another several hundred feet of water to get the ark into the foothills of Ararat. Hence Ross's two or three hundred feet of water would not be half high enough to get the ark into the foothills of Ararat.

There is one final problem with Ross's depth of the Flood, a problem which all Mesopotamian flood theories face. Mesopotamia is topographically an inclined plane

with mountains only on the east and north sides. For a flood to reach a depth of several hundred feet, there would have to be a free-standing wall of water or some other such miraculous barrier hundreds of feet high on the south and west sides to keep the water in place for the year of the Flood.<sup>13</sup> Mesopotamian flood theories, therefore, require the same kind of *ad hoc* miracle at this point as creation science invents in order to make its theories work.

### The Extent of the Flood

Genesis 8:9 says, "the water was on the surface of *all the earth*." Other verses make similar statements. But how big is "all the earth"? Since the words "all" and "earth" can have limited meanings, concordists regularly define the extent of the flood as limited to a local area. Ross argues that the "whole world" that was inundated by the Flood refers only to Mesopotamia (p. 146).

The words "all the earth," however, should be defined contextually, not just on the basis that the words "all" and "earth" can refer to a limited area. The author of Gen. 8:9 uses the words "all the earth" again in Gen. 9:19, which is part of the context of the Flood, saying that after the Flood, "all the earth" was populated by the three sons of Noah. In chapter 10, the author delineates the various nations of the earth populated by the three sons of Noah and thereby tells us all of the nations which he included in the phrase "all the earth." The nations of Genesis 10 extend from around Sardinia<sup>14</sup> to Afghanistan and from the Black Sea to the Gulf of Aden. So, contextually, "all the earth" that was flooded encompassed the entire Near East, obviously a much greater area than just Mesopotamia.

Further, although the biblical account is not describing a global flood, it is important for concordists to realize that the consensus of evangelical Old Testament scholars is that the Flood is described in Genesis 6-9 as a cosmic event which returned the earth essentially to its pre-creation state of being completely covered with water as described in Gen. 1:2.<sup>15</sup> The Bible is thus not describing a Flood limited to Mesopotamia but a universal flood, a Flood that was as extensive as the created earth in Genesis 1.

## The Destructiveness of the Flood

To his credit, Ross does not try to make the biblical Flood less than anthropologically universal. He freely admits the Flood is described in the Bible as eradicating all humanity except Noah and his family. But since a global flood has been falsified by science, Ross has the problem of explaining how a local flood could have destroyed all of humanity. His solution is the solution of a century ago, which said that at the time of the Flood, all humanity lived in Mesopotamia (p. 146). Unfortunately, this solution no longer works. If the Flood is dated in accordance with the culture described in Genesis 4 and 9, it occurred no earlier than c. 5000 BC. We know that genuine human beings were spread all over the globe by then. Even if the Flood could be dated at 30,000 BP, true human beings were very probably in Australia long before that.<sup>16</sup>

If Ross is correct that all humanity except Noah and his family were destroyed in the Flood (and this is the historic interpretation of the Church and the consensus of modern biblical scholars), the Flood must have covered all the earth. The "whole earth" of Genesis 6–9 is not a globe, but the greater Near East, as Gen. 9:19 and Genesis 10 show. However, if the mountains of Ararat were covered as Gen. 7:19 and 8:3–5 indicate and a modern knowledge of geography is illegitimately forced into the account in order to include all humanity in it, the Flood would have been global.<sup>17</sup>

If Genesis 6–9 is literally true and the scientific data are taken in a straightforward way, the Flood would have to have covered at least the entire Near East, been over one mile high in depth, and occurred no earlier than c. 5000 BC. This is utterly contrary to the scientific evidence. Since Ross's attempted harmonization fails to harmonize the biblical account with the scientific data, there is strong discord here between science and the Bible.<sup>18</sup>

## Ross and the Tower of Babel

Ross follows the findings of modern anthropology that true human beings were in Europe 30,000 years ago and people were spread all over the earth by 11,000 BC, so he dates the Tower of Babel and the dispersion of humanity from c. 30,000 to 11,000 BP (p. 187). However, as shown above, even the Flood cannot be dated before c. 5000 BC, so the Tower of Babel cannot be as early as 30,000 or even 11,000 years ago. It must, in fact, be subsequent to 5000 BC, and that is exactly what archaeology shows.

Because of its location in Shinar (southern Mesopotamia) and the mention of the top of the tower rising into heaven (Gen. 11:2, 4), which was typically said of ziggurats, most scholars have identified the Tower of Babel as a ziggurat. When do ziggurats first appear in the archaeological record? Not before c. 3500 BC.<sup>19</sup> And building a city with a ziggurat that would bring fame, as was the goal of

the builders in Gen. 11:4, indicates the beginning of monumental architecture, which also did not begin until c. 3500 BC.<sup>20</sup>

Similarly, although there are archaeological sites throughout the Near East which from around 10,000 BC on contain the remains of buildings made of sun-dried brick, buildings made of *baked* brick, as specified in Gen. 11:3, do not appear in the archaeological record until c. 3500 BC.<sup>21</sup> Mortar of various kinds is also used with the earlier sun-dried bricks, but asphalt for mortar, as specified in Gen. 11:3, does not appear until c. 3500 BC.<sup>22</sup>

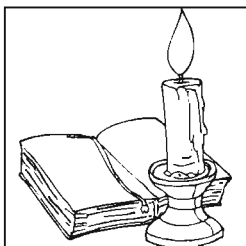
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The ziggurat, the associated city, the baked brick, and the asphalt for mortar all agree archaeologically in telling us that the Tower of Babel did not antedate c. 3500 BC.<sup>23</sup> Yet by 3500 BC, people had been scattered all over the earth for millennia, and the study of historical linguistics tells us they were speaking many different languages by that time.<sup>24</sup>

Ross is again to be commended for not backing off from the biblical statement in Gen. 11:1 that before the Tower of Babel was built *all* people on earth were speaking the same language. Most concordists try to make the statement refer only to a local event, but I have shown elsewhere that their varied explanatory scenarios conflict with each other, with Scripture, and even with some archaeological data.<sup>25</sup> Further, as was the case with the sun being created on the fourth day, there is a strong consensus of



## Dialogue: Article

### *Concordism and a Biblical Alternative: An Examination of Hugh Ross's Perspective*

Old Testament scholars that Gen. 11:1 means that *all of humankind* was speaking the same language.<sup>26</sup> This is also the historic interpretation of the Church.<sup>27</sup>

The Bible is saying that all humanity was speaking the same language at the time the Tower of Babel was built, which archaeology dates as being no earlier than c. 3500 BC. It is quite clear from archaeology and historical linguistics, however, that people were spread all over the world by that time and speaking numerous languages. We have then again discord between the findings of science and the story of the Tower of Babel. Ross tried to make concord by dating the Tower of Babel sometime between 30,000 and 11,000 BP; but as shown above such dating is utterly anachronistic. The Tower of Babel cannot be dated earlier than c. 3500 BC.

We see then that as far as Genesis 1–11 is concerned, Ross's concordism rests upon either a private interpretation of the Bible (Genesis 1), or an anachronistic dating of the events (Genesis 2–4 and 11:1–9), or a combination of both (Genesis 6–9). From the standpoint of either Scripture or science or both, Ross's concordism fails, and it fails not just on the periphery, but with regard to the major events in Genesis 1–11. Looked at from a different perspective and to Ross's credit, his concordism failed because he was either too honest with Scripture or science or both. In any case, a different approach is needed.

### **A Biblical Approach to Science and Scripture**

Many evangelicals expect biblical history to be in accord with the actual facts simply because it is inspired by God. The Scriptures teach, however, that inspiration is not the same thing as revelation, and as far as I know all evangelical theologians acknowledge this. This distinction is particularly relevant to biblical history because biblical historians never claim to have received their historical facts by revelation. Biblical history is always presented as based on human sources, not divine revelation, which is in contrast to the claims of the prophets. Biblical historians often refer to their human sources, such as the Book of Jasher (Josh. 10:13; 2 Sam. 1:18) or The Book of the Chronicles of the Kings of Israel or of Judah (1 Kings 14:19, 29). Luke's

preface to his Gospel is a prime example of this (Luke 1:1–4).

Accordingly, if a human source which a biblical historian is using has a mistake in it, such as the Septuagint's mistranslation of *mtth*, "bed," in Gen. 47:31 as "staff," we see from Heb. 11:21 that the resulting historical misrepresentation of the facts will not necessarily be corrected by the inspired writer. The idea that inspiration will correct or avoid all factual errors in a biblical historian's sources is not taught in Scripture nor borne out by the phenomena of Scripture.

In addition, even in the case of revelation, it is usually overlooked by evangelicals that God sometimes accommodated his revelation to culturally pre-ingrained ideas. Jesus taught that the law of divorce given directly by God in Deut. 24:1–4 was accommodated to the Israelites' hardness of heart (Matt. 19:8). A culturally pre-ingrained idea about divorce was incorporated into Scripture by God—even though it was rooted in human hardness of heart and was below God's perfect standards (Matt. 19:8; Mark 10:5). Although God's perfect standard was not to allow divorce except in cases of adultery (Matt. 19:9), Deut. 24:1–4 allowed divorce for other reasons even down to a husband's just "hating" his wife (Deut. 24:3; cf. Deut. 21:14). Calvin and other theologians have seen other Old Testament laws like those regarding slavery as also being accommodations to culturally pre-ingrained ideas.<sup>28</sup>

Why would God accommodate his revelation to things he did not believe in such as easy divorce or the ownership of slaves? The answer is that these things were too deeply rooted in the culture of the times to be suddenly uprooted by fiat. God communicates revelation in a way that is organically related to the people to whom it comes.<sup>29</sup>

In the light of these facts about biblical history and biblical revelation, we can come to some understanding as to why Genesis 1–11 does not agree with the facts of modern science. In the first place, the sources which the writer of Genesis 1–11 had to base his history upon, had come down to him from over one thousand years earlier. The Mesopotamian coloring of all eleven chapters suggests that these sources were Mesopotamian traditions and motifs probably first brought into the Israelite culture by the

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Ross's  
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rests upon either  
a private  
interpretation  
of the Bible  
(Genesis 1), or  
an anachronistic  
dating of  
the events  
(Genesis 2–4  
and 11:1–9), or  
a combination  
of both  
(Genesis 6–9).  
From the  
standpoint of  
either Scripture  
or science or  
both, Ross's  
concordism  
fails ...*

patriarchs. The fact that the second day of creation is much closer to the Babylonian creation story than to any other creation story<sup>30</sup> and that the Flood account is much closer to the Babylonian flood story than to any other flood story<sup>31</sup> make it clear that the writer of Genesis 1–11 was relying at least in part on Mesopotamian sources.<sup>32</sup>

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*The Scriptures teach ... that inspiration is not the same thing as revelation ... Even in the case of revelation ... God sometimes accommodated his revelation to culturally pre-ingrained ideas.*

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By the time of the writing of Genesis, the Israelites already had these ideas about creation, the flood, and the post-flood world deeply ingrained in their culture. As with their ingrained beliefs about easy divorce and slavery, these beliefs about early human history were too imbedded to be summarily contradicted. The original false theology in these traditions was radically revised in the light of the revelation given to Abraham and his descendants, and historical details could be altered in part, but the pre-embedded historical outline could not be changed.

### Good Communication Demands Accommodation

It should also not be overlooked that when speaking to people from a different cultural background, the lines of communication can close down if you present ideas too far different from their worldview. When the English school-teacher, Anna Leonowens, tried to tell the children of Siam that water in her country froze and came down from the sky as white flakes of snow, her students would not listen to anything more she had to say.<sup>33</sup> The idea of frozen water falling from the sky as white flakes was so radically different from anything known to the culture of Siam, her students and adult helpers were insulted that she expected them to be so gullible as to believe such far-fetched things. She only regained her authority when the King of Siam, who was educated in England, assured the students that her statement was true.

The effective communication of divine revelation may even require changing facts in order to adapt them to a very different culture. In the Chinese culture, the dragon is associated with good luck and blessing. If a missionary insists on speaking of the “dragon” in the book of Revelation, the cultural background of the hearers will automati-

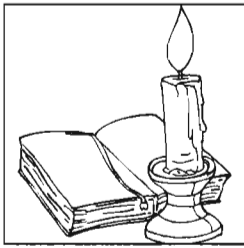
cally associate good things with Satan. If the missionary adheres strictly to the facts of the text, the message will be distorted. In Korea, white robes are only worn for funerals and mourning. If a missionary sticks strictly to the facts of the text when translating Rev. 7:9, the great multitude of saints in heaven will all be in mourning as far as the Koreans are concerned. In parts of Africa, if you strew branches in the path of an official, it is an insult to the official. If then a missionary translates Matt. 21:8 according to the actual text, the Africans will be very confused about Palm Sunday.

One might ask, Can a missionary be perfectly moral yet make the book of Revelation say “tiger” when it really says “dragon” or say “red robes” when it really says, “white”? If the missionary does, the translation will not be speaking in accord with the facts. Would the missionary be guilty of lying if the translation did not agree with the facts? Must the translation be absolutely true to the facts even if it causes misunderstanding or stumbling? Is that God’s will and way? Would it not be perfectly moral for a missionary or God to accommodate the message to the culture of the people to whom he is speaking? Does the Bible not have a supra-cultural message which can be best communicated by departing from the facts and clothing the message in the cultural terms of the people to whom it is given?

### The Discovery of Natural Truth Has Been Delegated to Humankind

I think it is evident that God can morally accommodate his message to the pre-ingrained cultural ideas of the people to whom he is speaking, even when that accommodation does not agree with the actual facts. In addition, there is another factor bearing upon this issue. Scripture was given to make humans wise with regard to salvation, not science (2 Tim. 3:16, 17). Neither Jesus nor any of the apostles or prophets ever set forth a teaching aimed to teach science or to correct the science of the times. Genesis 1:26–28 teaches that God has delegated the discovery of natural truth to humankind, to *all* humans, to unbelievers just as much as to believers. This is built into creation, and the history of science corroborates this revelation. It shows that even atheists can make great scientific discoveries, and that believers and unbelievers can build upon each other’s work because they have common ground in the realm of natural knowledge.

Because God has delegated the responsibility for the discovery of natural knowledge to humankind, he does not reveal such knowledge. He is not like a foolish executive who delegates responsibility, and then does the job himself. He has delegated this responsibility to humankind, and he leaves it completely in the hands of humankind. Because the delegation of this responsibility has been given to *all* of humankind, when God gives divine revelation in Scripture, he does not reveal scientific truths which would advance the scientific understanding of his chosen people beyond that of the rest of humankind. Rather, in



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does not agree  
with the  
findings  
of modern  
science because  
the science  
per se which  
he has  
incorporated  
into Scripture  
is not  
a revelation  
from God but  
is simply an  
accommodation  
to the science  
of those times.

## Dialogue: Article

### *Concordism and a Biblical Alternative: An Examination of Hugh Ross's Perspective*

deference to his own commitment to delegate the discovery of scientific truth to all humankind, he accommodates his revelation to the science of the times.<sup>34</sup> God is not lying or erring, therefore, when his Word does not agree with the findings of modern science because the science *per se* which he has incorporated into Scripture is *not a revelation from God* but is simply an accommodation to the science of those times.

We must not forget that the various revelations in the Old Testament did not come to a people whose minds were a *tabula rasa*. Rather, *they came to a people who had cultural ideas which were deeply ingrained before God's revelation in the Old Testament ever came to them*. These pre-ingrained cultural ideas invited and even sometimes demanded adaptations, which, like a missionary's translation, may depart from strict adherence to the facts. In the case of Genesis 1-11, I have shown elsewhere that some of the content is certainly accommodated to the science of the times.<sup>35</sup>

To summarize, divine inspiration does not change the fact that biblical history, according to Scripture, is based on human sources, not divine revelation, and Genesis 1-11 reflects sources of outdated Mesopotamian traditions. This contrasts with the Gospels which are based on eyewitness accounts written down within a generation of the events and hence worthy of high historical credence. The failure of Genesis 1-11 to be reliable history because of its poor sources in no way negates the historicity of other biblical accounts based on better sources.

Secondly, the discovery of natural knowledge has been delegated by God to humankind, and hence God has no intention of revealing such knowledge in Scripture. Consequently, references to science in Scripture are regularly accommodated to the science of the times. Further, this means that the apparent belief of Jesus and the apostles that Genesis 1-11 was actual history means nothing more than does their probable belief that the sun literally moved around the earth and stopped in the time of Joshua. It simply means their scientific knowledge was too limited to make them depart from the beliefs of the times.

Thirdly, God's revelation is organically related to the people to whom it is given and

consequently is sometimes accommodated to culturally pre-ingrained ideas. As a result, Scripture contains accommodations not only to moral standards which were culturally pre-ingrained though contrary to God's perfect standards of righteousness, but also to culturally pre-ingrained traditions about early human history which do not correspond with God's perfect knowledge. Important revelations about faith and morals are given in Genesis 1-11 but for the above reasons as well as for the sake of facilitating communication and preventing the rejection of the message unnecessarily, they are packaged in the science and human traditions of the times.

In light of the above, I think we can see why Ross could not make concord between Genesis 1-11 and modern science. The divine revelation in Genesis 1-11 is packaged in outdated Mesopotamian traditions and the science of the times. We are reading the divine revelation given to a people from a historically distant and far different cultural background. We need to appreciate the cultural context of those first readers and of God's condescension to them. Instead of insisting that God and Scripture live up to *our* expectations that the Bible fit the findings of modern science, we would do better to accept and learn from what God has actually done, read the Bible strictly for the purposes for which it was given, and pursue science with an eye to uncovering the truths of creation to the glory of God. \*

## Notes

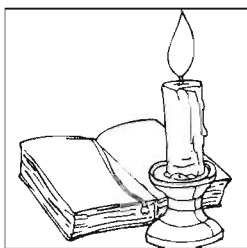
<sup>1</sup>Although I am exposing the inadequacy of the arguments in Hugh Ross's book, *The Genesis Question* (Colorado Springs, CO: Nav Press, 2001), it is concordism in general which I am opposing, not Ross or his ministry, which apart from diversions outside of his area of expertise is a genuine contribution to Christianity. In addition, Ross has consistently displayed an admirable Christian character particularly in his refusal to rail at those who have railed at him. That manifestation of Christ-likeness is a precious evidence of genuine Christianity, which causes me to hold him in the highest esteem.

<sup>2</sup>Paul H. Seely, "The First Four Days of Genesis in Concordist Theory and in Biblical Context," *PSCF* 49, no. 2 (June 1997): 85-95 and [www.asa3.org/ASA/PSCF/1997/PSCF6-97Seely.html](http://www.asa3.org/ASA/PSCF/1997/PSCF6-97Seely.html)

<sup>3</sup>To cite just evangelical Old Testament (OT) scholars: Keil and Delitzsch, *Biblical Commentary on the OT* 1 (Reprint, Grand Rapids, MI: Zondervan, 1951), 51; H. C. Leupold, *Exposition of Genesis* (Grand Rapids, MI: Baker, 1950), 52; John Walton, *Genesis* (Grand Rapids, MI: Zondervan, 2001), 79;



- Victor Hamilton, *The Book of Genesis Chapters 1–17* (Grand Rapids, MI: Eerdmans, 1990), 121; Bruce Waltke, *Genesis* (Grand Rapids, MI: Zondervan, 2001), 61; Kenneth Mathews, *Genesis 1–11:26* (Nashville, TN: Broadman & Holman, 1996), 145, 153; Gordon Wenham, *Genesis 1–15* (Waco, TX: Word, 1987), 18.
- <sup>4</sup>G. Bednarick, "Neanderthal News," *The Artefact* 19 (1996):104.
- <sup>5</sup>Alexander Marshack, "Early Hominid Symbol and Evolution of the Human Capacity," in Paul Mellars, *The Emergence of Modern Humans* (Ithaca, NY: Cornell University Press, 1990), 481.
- <sup>6</sup>Fuz Rana, "New Y Chromosome Studies Continue to Support a Recent Origin and Spread of Humanity," [www.reasonstobelieve.org](http://www.reasonstobelieve.org). Last accessed January 2007.
- <sup>7</sup>Fazale Rana, "Agriculture's Origin Fits RTB Human Origins Model," *Connections* 7, no. 2 (2005): 2–3.
- <sup>8</sup>Dolores R. Piperno, et. al., "Processing of Wild Cereal Grains in the Upper Paleolithic Revealed by Starch Grain Analysis," *Nature* 430 (2004): 670–3.
- <sup>9</sup>John Jefferson Davis understands the story of Adam not as literally true but as analogically true. See his paper on Adam in *Inerrancy and Common Sense*, ed. Roger R. Nicole and J. Ramsey Michaels (Grand Rapids, MI: Baker, 1980). As I have argued with regard to matters in Genesis 1, I think the revelation in Genesis 2–4 is accommodated to the scientific knowledge available at the time. Regarding Genesis 1, see 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; "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; Paul H. Seely, "The Geographical Meaning of 'Earth' and 'Seas' in Gen. 1:10," *Westminster Theological Journal* 59 (1997): 231–55.
- <sup>10</sup>Naomi F. Miller, "Viticulture," *Oxford Encyclopedia of the Ancient Near East* 5, p. 305; Daniel Zohary, "The Domestication of the Grapevine *Vitis Vinifera* L. in the Near East," in *The Origins and Ancient History of Wine*, ed. Patrick McGovern, Stuart Fleming, and Solomon Katz (Amsterdam: Gordon Breach, 1996), 28, 29; Daniel Zohary and Maria Hopf, *Domestication of Plants in the Old World: The Origin and Spread of Cultivated Plants in West Asia, Europe, and the Nile Valley* (New York: Oxford University Press, 2001), 148–9.
- <sup>11</sup>The phrase, "under all the heavens" by itself includes all of the known earth. See Paul H. Seely, "Noah's Flood: Its Date, Extent, and Divine Accommodation," *Westminster Theological Journal* 66 (2004): 294–5.
- <sup>12</sup>Ross could argue that between the time of Gen. 7:19 and the beginning of the waters receding the ark drifted to the north of the Ararat foothills, but this would entail a water height thousands of feet deep.
- <sup>13</sup>Glenn Morton makes these same points in his "Why the Flood Cannot Be in Mesopotamia" at <http://home.entouch.net/dmd/mflood.htm>
- <sup>14</sup>Although Tarshish may be used later in Scripture to refer to Tartessus in Spain, I believe with a number of other scholars that in Genesis 10, it refers to an area closer to the Aegean.
- <sup>15</sup>To cite only leading modern evangelical scholars: Hamilton, *The Book of Genesis*, 291; Mathews, *Genesis*, 351; cf. 376; Walton, *Genesis*, 331; Waltke, *Genesis*, 139; Wenham, *Genesis 1–15*, 181.
- <sup>16</sup>"Australian Aboriginal," *The New Encyclopedia Britannica* 1 (2002): 714.
- <sup>17</sup>The biblical picture of the entire Near East covered with water is portrayed in Genesis as being dependent upon ancient Near Eastern cosmology with its unfathomable ocean above the firmament and below the earth to supply the water (Gen. 7:11). Consequently, our modern knowledge of a global earth cannot be fitted into the account. See notes 9 and 18.
- <sup>18</sup>For a full discussion of all the biblical data bearing on the extent of the Flood, major scientific data bearing on its extent, and the way the extent depends upon ancient cosmology, see my paper, "Noah's Flood: Its Date, Extent, and Divine Accommodation," 291–311.
- <sup>19</sup>H. W. F. Saggs, *The Greatness that Was Babylon* (New York: New American, 1962), 45; *Cambridge Ancient History* 1, 3d ed. (Cambridge: Cambridge University Press, 2006), 226, 228; Harriet Crawford, *The Architecture of Iraq in the Third Millennium B.C.* (Copenhagen: Akademisk Forlag, 1977), 27; Singer, *History*, 1:461. Some today would place the beginning of Uruk 5 at 3600 BC.
- <sup>20</sup>Nissen, "Mesopotamia," *OEANE* 3: 478; Hans J. Nissen, *The Early History of the Ancient Near East – 9000–2000 B.C.* (Chicago: University of Chicago Press, 1988), 56–9; Jean-Louis Huot, "The First Farmers at Oueili," *Biblical Archaeologist* 55 (1992): 188, 190. Cf. Seton Lloyd, *Ancient Architecture* (New York: Rizzoli, 1986), 12, 13.
- <sup>21</sup>Jack Finegan, *Archaeological History of the Ancient Middle East* (Boulder, CO: Westview, 1977), 8; Armas Salonen, *Die Ziegeleien im Alten Mesopotamien* (Helsinki: Suomalainen Tiedakatemia, 1972), 7; Charles Singer, *The History of Technology* 1 (Oxford: Clarendon, 1954), 462; Lloyd, *Ancient Architecture*, 9–13; Pinhas Delougaz and Seton Lloyd, *Pre-Sargonic Temples in the Diyala Region* (Chicago: University of Chicago Press, 1942), 46, 121.
- <sup>22</sup>Maurice Daumas, ed., *A History of Technology and Invention: Progress through the Ages* 1 (New York: Crown, 1969), 117. See also Bertrand Gille, *The History of Techniques* 1 (New York: Gordon & Breach, 1986), 211. Cf. R. J. Forbes, *Studies in Ancient Technology* 1, 2d ed. (Leiden: Brill, 1964), 71,72.
- <sup>23</sup>For a more detailed discussion of these points, see Paul H. Seely, "The Date of the Tower of Babel and Some Theological Implications," *Westminster Theological Journal* 63 (2001): 15–38.
- <sup>24</sup>The *Cambridge Ancient History* (p. 133) dates the existence of different languages back to 100,000 BC.
- <sup>25</sup>Seely, "Tower of Babel," 20–5.
- <sup>26</sup>Ibid.
- <sup>27</sup>The story is about the immediate descendants of the eight people who survived the Flood. Everyone else perished in the Flood, so, of course, they were all speaking the same language.
- <sup>28</sup>See David F. Wright, "Accommodation and Barbarity in John Calvin's Old Testament Commentaries" in *Understanding Poets and Prophets*, ed. A. Graeme Auld (Sheffield: Academic Press, 1993), 413–27; David F. Wright, "Calvin's Pentateuchal Criticism: Equity, Hardness of Heart, and Divine Accommodation in the Mosaic Harmony Commentary," *Calvin Theological Journal* 21 (1986): 37; James Orr, *Revelation and Inspiration* (New York: Charles Scribner's Sons, 1910), 102–3.
- <sup>29</sup>Cf. Peter Enns, *Inspiration and Incarnation* (Grand Rapids, MI: Baker Academic, 2005).
- <sup>30</sup>W. G. Lambert, "A New Look at the Babylonian Background of Genesis," *Journal of Theological Studies* 16 (1965): 293.
- <sup>31</sup>Derek Kidner, *Genesis* (Downers Grove, IL: InterVarsity, 1967), 96; Bruce K. Waltke, *Genesis* (Grand Rapids, MI: Zondervan, 2001), 132.
- <sup>32</sup>Some have suggested that the biblical account represents a pure account which came down to Moses while the Babylonian account is a distortion, but the solid sky of the second day with its ocean above is outmoded ancient Babylonian science and since the flood was local, the descriptions of the flood in the Babylonian accounts are closer to the historical truth than in the biblical account. It is the theology of Genesis 1–11 which is pure, not the science or the history.
- <sup>33</sup>Anna Leonowens, *Anna and the King of Siam* (New York: John Day, 1943), 229.
- <sup>34</sup>In all cases where a corresponding knowledge of the times is available, I have found that the science in Scripture always matches the science of the times. I give a number of examples in my book, *Inerrant Wisdom* (Portland, OR: Evangelical Reform, 1989).
- <sup>35</sup>See notes 9, 11, 23.



## Dialogue: Response

*Additional Explanations on Concordism: A Response to Paul Seely's Critique*



Hugh Ross

*Perhaps our greatest point of disagreement has to do with divine revelation. I take literally the Bible's explicit claim that God has spoken to humanity through both the words of the Bible and the world of nature.*

**Hugh Ross** is founder and president of Reasons To Believe (RTB), an institute that provides research and teaching on the harmony of God's revelation in the Bible with God's creative expression in the facts of nature. After earning a B.Sc. in physics from the University of British Columbia and a Ph.D. in astronomy from the University of Toronto, Ross continued his research on quasars and galaxies as a postdoctoral fellow at the California Institute of Technology. During that time he began serving on the pastoral staff at Sierra Madre Congregational Church, where he still teaches. Today, in addition to writing books and overseeing RTB, Ross lectures around the world and hosts a weekly live Webcast, Creation Update.

# Additional Explanations on Concordism: A Response to Paul Seely's Critique

Hugh Ross

**P**aul Seely's charitable comments about my work (and that of other "concordists") are much appreciated. I am also grateful to the PSCF editor for allowing me this opportunity to respond to the critique.

Seely takes exception to my assertion that God's two books of revelation, one verbal (the Bible) and one expressed in action (nature), are totally truthful. Perhaps our greatest point of disagreement has to do with divine revelation. I take literally the Bible's explicit claim that God has spoken to humanity through both the words of the Bible and the world of nature. If God, by his nature, does not lie, deceive, or contradict, then the record of biology, for example, will not contradict the record of physics, nor will the message in Genesis contradict that in Romans. Neither do I see any possibility for contradiction between what God reveals in the Bible and what he reveals in nature's record.

However, I do expect disagreements between Christian theology and science. Christian theology is humans' attempt to interpret the Bible's words. Science is humans' attempt to interpret nature's record. Given that human knowledge remains incomplete and human interpretation potentially flawed, conflicts between Christian theology and science can be expected. One

value of a concordist hermeneutic is this: As scholars seek to reconcile apparent conflicts, they often ferret out faulty interpretations and push back the curtains of ignorance. A concordist hermeneutic is the heart and soul of the scientific method, and concordism gave significant impetus to the scientific revolution.

One fallacy in Seely's critique lies in his presumption that a proven failure on my part (or another interpreter's part) to concord Genesis 1-11 perfectly with nature's record would prove the fallibility of Genesis 1-11. Such a proof would simply document my fallibility, however, not (necessarily) the Bible's inaccuracy. But I must go on to ask if Seely truly has identified my various "failures" to concord Genesis 1-11 with scientific facts. Let me address his primary charges in the order they appear:

**Charge 1:** "There is a virtually unanimous agreement among qualified Old Testament scholars that the sun, moon, and stars were created on the fourth day, not just made to appear." The "made-to-appear" interpretation is an unsupported "private interpretation" (p. 37).

**Response 1:** A look at four of the most extensive and widely popular commentaries on the opening chapters of Genesis<sup>1</sup> says otherwise. Only two address *when* the sun, moon, and stars were created. Of those two, one embraces my interpretation,<sup>2</sup> the other Seely's.<sup>3</sup> Of the three best-selling books targeting Bible difficulties,<sup>4</sup> only two take up the issue; both support my interpretation.<sup>5</sup> A fairer assessment would be that many reputable Old Testament commentaries omit discussion of *when* God created the sun, moon, and stars—most likely because they see Genesis 1 by itself as insufficiently specific.

Another distortion appears in Seely's discussion of the word "created." Whereas Gen. 1:1 says, "God created (*bara*) the heavens and the earth," Gen. 1:14 says, "Let there be (*haya*) lights." Old Testament scholars agree that the phrase "the heavens and the earth" represents the entire physical universe, so I concluded that the creation of the sun, moon, and stars occurred before the six creation days. Thus, these objects' appearance on day four meant they became visible from Earth's surface for the first time on that day. This interpretation seems consistent with Gen. 1:16. The verb translated "made" takes the form for action completed in the past.<sup>6</sup> I also tested this interpretation against the twenty or more other creation-themed passages in the Bible. None contradicted it, and one provided support: "I made the clouds its garment and wrapped it in thick darkness."<sup>7</sup> This verse, from a creation account in Job, comments on each of the six creation days. It explains the "darkness ... over the surface of the deep" (Gen. 1:2) as the result of Earth's opaque atmosphere (which initially allowed no light through), not of the sun's nonexistence.

**Charge 2:** "Neanderthals would have to be considered true human beings" (p. 38).

**Response 2:** Seely's citations are out of date and were disputed even at the time of their publication. An abundance of recent research findings link spiritual activity only to *Homo sapiens sapiens*.<sup>8</sup> Further, while evidence points to several "cultural big bangs" (virtual explosions of clothing, jewelry, art, music, and tool use) coincident with the emergence of *Homo sapiens sapiens*, no undisputed evidence for clothing, jewelry, advanced tools, "worship" activity, or advanced art and music has been found for Neanderthals.<sup>9</sup>

Stronger evidence that Neanderthals were not human comes from DNA. Mitochondrial DNA has been analyzed from the remains of twelve Neanderthal specimens. The variation in this DNA is remarkably low, indicating Neanderthals experienced little change over time.<sup>10</sup> When compared to human mitochondrial DNA, the difference is so stark as to persuade researchers Neanderthals made no contribution to the human gene pool.<sup>11</sup> Recently, researchers announced the recovery of intact Y-chromosome DNA from Neanderthals.<sup>12</sup> I predict this DNA will add to the evidence that Neanderthals are primates, not humans.

**Charge 3:** *The Genesis genealogies cannot be "stretched" to accommodate Adam's creation roughly 50,000 years ago* (p. 38).

**Response 3:** Given probable systematic effects, the conservative scientific date for Adam and Eve would be 50,000  $\pm$  30,000 years ago.<sup>13</sup> That error bar is significant and suggests that more research is needed. Second, no Bible scholar can claim to know how many gaps occur in the Genesis genealogies. The theological literature includes attempts to push the Genesis genealogies back far enough to accommodate the first *Homo erectus* species (circa 1.8 million years ago).

Most conservative evangelical scholars object to this extreme stretching, and yet they appear to have no problem with dates as far back as 100,000 years. I have confirmed this point firsthand in my lectures on seminary campuses.

The book, *Who Was Adam?* proposes a calibration for the Genesis 5 and 11 genealogies.<sup>14</sup> Given the fairly accurate historical date for Abraham (4,000 years ago) and the carbon-14 date for the breaking of the Bering land bridge ("in his [Peleg's] time the earth was divided"<sup>15</sup>), and estimating the actual time between each pair of recorded patriarchs as proportional to the recorded life spans for that pair, the date for the creation of Adam would be roughly 50,000 years ago.

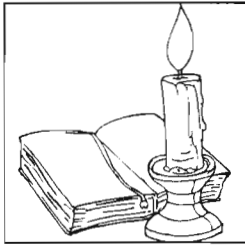
**Charge 4:** *There is a time gap between the biblical assertion crops and animals were domesticated at the time of Adam's immediate offspring and the scientific evidence such domestication occurred about 10,000 years ago* (p. 39).

**Response 4:** As yet, a big difference exists between the level of domestication the Bible implies for the earliest humans and the level scientists can measure. The scientific detection of domestication requires a significant shift in the DNA or in the skeletal/morphological statistics for the domesticated species. As *The Genesis Question* explains, these scientific tools do not measure the beginning of domestication but rather the beginning of large-scale organized agriculture, with intense breeding selection continuously practiced for many generations.<sup>16</sup> For this reason, such tools would be unable to detect the kind of plant and animal domestication practiced by twentieth-century Stone Age tribes.

Contrary to what Seely claims, the taming of wild mammal herds and the cultivation and processing of wild cereal grains is consistent with the statement, for example, in Genesis 4 that "Abel kept flocks and Cain worked the soil." Likewise, there is nothing in Genesis 4 that would demand Cain's city be large or constructed of materials capable of surviving 40,000-plus years of natural erosion and human exploitation.

**Charge 5:** "If the biblical data in Genesis 4 and 9 are accepted as accurate, the earliest possible date for the Flood is c. 5000 BC" (p. 39).

**Response 5:** Seely's claim rests on the biblical references to pre-Flood agriculture, domesticated cattle, and cities and implements of bronze and iron. As noted above, there is no biblical imperative to interpret agriculture, domesticated cattle, and cities in such a modern context. Moreover, the pre-Flood passages mention only one "city," the one built by Cain. As for bronze and iron, archeology demonstrates that ancient nations frequently gained and lost metallurgy as a consequence of invasion and genocide. It seems plausible that the lengthy life spans of pre-Flood peoples spurred isolated instances of technological



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## Dialogue: Response

### *Additional Explanations on Concordism: A Response to Paul Seely's Critique*

advance, but the reported wickedness of these same peoples would likely have destroyed such advance, as well as any evidence of it.

Seely's comment that "true human beings were very probably in Australia long before" 30,000 BP (before the present) seems questionable.<sup>17</sup> For example, recent carbon-14 analysis shows the Jinmium relics' (thermoluminescence) date of 50,000-75,000 BP as too ancient by a factor of twenty.<sup>18</sup> Without some kind of calibration, luminescence dates simply provide upper limits. Nevertheless, I see no basis for disputing other measurements indicating Aboriginal settlement of Australia 25,000-40,000 years ago.<sup>19</sup>

**Charge 6:** *The Bible claims that Noah's flood was at least 8,000 feet deep and global in extent* (p. 39).

**Response 6:** Genesis 7 is not the only biblical text addressing the depth and extent of the Flood. Psalm 104 (in addition to Job 38-42) comments on all six creation days. Concerning creation day three, it says:

You [the Creator] covered it with the deep as with a garment; the waters stood above the mountains. But at your rebuke the waters fled, at the sound of your thunder they took to flight; they flowed over the mountains, they went down into the valleys, to the place you assigned for them. You set a boundary they cannot cross; never again will they cover the earth.<sup>20</sup>

The last sentence virtually eliminates the possibility that Noah's flood covered the globe. Other Old Testament texts (Job 38:8-11; Ps. 33:7-9; and Prov. 8:23-29) also make this point. In the New Testament, Peter offers additional comment: "... the world of that time was deluged and destroyed" (emphasis added).<sup>21</sup> Peter's word choice implies Noah's world was not the same as the (his) current world (the Roman Empire<sup>22</sup>).

The meaning of Gen. 7:19 is clarified within the text. One can compare Noah's view of the receding waters with that of the dove he releases. (Note that Gen. 8:6 explicitly refutes Seely's assertion, "Noah did not see outside the ark until the surface of the ground was completely dried up" [p. 40].) From Noah's vantage point the mountains (or hills) were visible (Gen. 8:5), but the dove

saw only "water over all the surface of the earth" (Gen. 8:9). At first Noah (Genesis 7), like the dove in Genesis 8, could see nothing but water "over all the surface of the earth."

Seely argues that a flood depth of only two or three hundred feet would be inadequate to move the ark to the base of the mountains of Ararat (about 700 feet above sea level). He misunderstood my point. My reference was to two or three hundred feet above the Mesopotamian Plain, not above sea level,<sup>23</sup> and in saying the base of the Ararat hills is "a few hundred feet above sea level,"<sup>24</sup> I meant that to be understood (quite normally) as between 300 and 900 feet. Anticipating my response to this point, Seely claims that floodwaters flowing out to the Persian Gulf would generate a current too strong to allow the ark to come to rest on the foothills of Ararat. As the map in *The Genesis Question* shows, the slope of the Mesopotamian Plain from the base of the mountains of Ararat to the Persian Gulf averages only 0.02 percent.<sup>25</sup> Thus, water in the Mesopotamian Plain would tend to stand rather than flow, a situation similar to what happens when the lower Mississippi Valley floods. The Genesis text bears out this scenario when it reports God removed the water by sending a wind.<sup>26</sup> That same wind may have driven the ark toward the base of the Ararat foothills. One reason for the floodwaters' slow (nearly year-long) recession may have been the addition of runoff and snow melt from the hills and mountains surrounding the Mesopotamian Plain.<sup>27</sup>

**Charge 7:** *Use of "baked brick" and "asphalt for mortar" proves the Tower of Babel incident could not have occurred any earlier than 3500 BC* (p. 41).

**Response 7:** His point may seem reasonable at first, in that the earliest (large) brick-and-tar structures unearthed by archeologists date back to about 3500 BC. However, the Hebrew text is unclear as to exactly what kind of brick-making and brick-laying technology is implied. In any case, a lack of evidence does not constitute proof. There is no basis for determining whether anyone attempted to build such structures. Moreover, the biblical text does not specify the size of either the city or the tower, the latter of which was never completed. The text says only that the building project had begun. Given the effects

of erosion, the limitations of archeological research, and the common practice among ancient peoples of exploiting building materials from ruins, the lack of evidence cannot be claimed as proof of conflict between the text and science.

**Charge 8:** *The contradiction between the "bed" in Gen. 47:31 and "staff" in Heb. 11:21 proves the Bible contains historical errors* (p. 42).

**Response 8:** The original Hebrew manuscripts of Genesis did not include vowels. Without vowels there is no distinction between the Hebrew words for "staff" and "bed." Noting this fact, the NIV linguistic team translated the word in Genesis as "staff," with a footnote referencing its possible meaning as "the head of his [Jacob's] bed" (also an object used for support). However, even if in some instances a small translation error were to creep in (and such errors have been detected, though none significantly affect the meaning of the text), that occurrence does not negate what is meant by "inerrancy."<sup>28</sup> Biblical inerrancy does not claim all translations are without error only that the original autographs accurately communicate what God by his Spirit inspired the various writers to record.

**Charge 9:** *Genesis 1-11 accommodates early Mesopotamian beliefs and traditions about early human history—even to the point of "departing from the facts and clothing the message in the cultural terms of the people to whom it is given"* (p. 43).

**Response 9:** In *The Genesis Question*, I provide a side-by-side comparison of Genesis 1-11 with the Mesopotamian *Enuma Elish* and the *Gilgamesh Epic*. That comparison shows that the Bible in no way borrows from, acquiesces to, or accommodates early Mesopotamian beliefs and traditions.<sup>29</sup> In fact, so different are the agendas, motives, chronologies, and scientific and historical details that most conservative Old Testament scholars view Genesis 1-11 as a bold polemic against the creation and flood myths of the early Middle Eastern world.<sup>30</sup>

I must also question Seely's premise that Bible texts are aimed exclusively (or primarily) at their writers' contemporaries. As Peter points out, the human authors themselves recognized that much of what they recorded was not for their own or their contemporaries' comprehension but rather for future generations.<sup>31</sup> The same Peter says, "For prophecy never had its origin in the will of man, but men spoke from God as they were carried along by the Holy Spirit."<sup>32</sup> Since the Holy Spirit reveals truth, not falsehoods,<sup>33</sup> Peter's statement affirms Scripture's historical and scientific accuracy.

**Charge 10:** *"Neither Jesus nor any of the apostles or prophets ever set forth a teaching aimed to teach science or correct the science of the times." God "does not reveal scientific truths which would advance the scientific understanding of his chosen people beyond that of the rest of humankind," leaving it "completely in the hands of humankind"* (p. 43).

**Response 10:** This is where I take personal exception to Seely's position. God brought me to faith through the abundant and up-to-date scientific accuracy of the Bible's content vis-à-vis the sparseness and inaccuracy of such content in other "holy" books. The quantity and specificity of the Bible's commentary on nature's record stunned me. Much of what I found proved valid thousands of years ahead of its time.

A good example of science in advance of its time would be Bible passages describing the big bang cosmology. As *The Creator and the Cosmos* documents,<sup>34</sup> the Bible repeatedly and explicitly identifies (1) a single cosmic beginning, including the beginning of space and time; (2) fixed physical laws; and (3) continuous expansion of the universe. Until the twentieth century, *only* the Bible revealed all these cosmic features. As I described in *The Fingerprint of God*, for several decades many astronomers resisted the big bang model precisely because of its biblical implications.<sup>35</sup>

The Genesis creation accounts also accurately predicted Earth's primordial conditions: opaque atmosphere, universal surface water, and conditions unfit for life. Genesis teaches that God created life in a progression from simpler to more complex. It says God ceased creating life after God created Eve. That is, the Bible predicts a specific history of life on Earth and a specific, dramatic change in speciation.

Finally, because no one can claim *complete* and *perfect* understanding of either the Bible or nature's record, the concordist's job is never done. For that reason, I continue to revise and update books, such as *The Creator and the Cosmos* and *The Genesis Question*. Readers interested in my response to those parts of Seely's critique not addressed here are encouraged to call our weekly live Web broadcast, *Creation Update*,<sup>36</sup> and to visit our website, which includes archives of past episodes.<sup>37</sup> \*

## Notes

<sup>1</sup>Victor P. Hamilton, *The New International Commentary on the Old Testament: The Book of Genesis, Chapters 1-17* (Grand Rapids, MI: Eerdmans, 1990): 126-8; Gordon J. Wenham, *Word Biblical Commentary: Genesis 1-15* (Waco, TX: Word Books, 1987): 21-3; Bruce K. Waltke with Cathi J. Fredricks, *Genesis: A Commentary* (Grand Rapids, MI: Zondervan, 2001): 56-60, 62-3; Allen P. Ross, *Creation & Blessing: A Guide to the Study and Exposition of Genesis* (Grand Rapids, MI: Baker Book House, 1988): 110-1.

<sup>2</sup>Allen P. Ross, *Creation & Blessing*, 110-1.

<sup>3</sup>Wenham, *Word Biblical Commentary*, 21-3.

<sup>4</sup>Gleason L. Archer, *Encyclopedia of Bible Difficulties* (Grand Rapids, MI: Regency Reference Library, Zondervan, 1982): 61-2; Walter C. Kaiser Jr., et al., *Hard Sayings of the Bible* (Downers Grove, IL: InterVarsity Press, 1996): 88-9; Norman Geisler and Thomas Howe, *When Critics Ask: A Popular Handbook on Bible Difficulties* (Wheaton, IL: Victor Books, Division of Scripture Press Publications, 1992): 30.

<sup>5</sup>Archer, *Encyclopedia of Bible Difficulties*, 61-2; Geisler and Howe, *When Critics Ask*, 30.

# Dialogue: Response

## Additional Explanations on Concordism: A Response to Paul Seely's Critique

- <sup>6</sup>Archer, *Encyclopedia of Bible Difficulties*, 61–2.  
<sup>7</sup>Job 38:9 (NIV).  
<sup>8</sup>Fazale Rana with Hugh Ross, *Who Was Adam?* (Colorado Springs, CO: NavPress, 2005): 77–95, 179–97.  
<sup>9</sup>Rana with Ross, *Who Was Adam?* 179–97. The “Neanderthal flute” from a Slovenian cave has been shown more likely to be a leg bone perforated by the teeth of a large carnivore (Richard G. Klein with Blake Edgar, *The Dawn of Human Culture* [New York: Wiley, 2002]: 192–6). We respond to the Chatel Peronian controversy over late Neanderthal technology on p. 196 of *Who Was Adam?*  
<sup>10</sup>Matthias Höss, “Neanderthal Population Genetics,” *Nature* 404 (2000): 453–4; Igor V. Ovchinnikov, et al., “Molecular Analysis of Neanderthal DNA from the Northern Caucasus,” *Nature* 404 (2000): 490–3; Matthias Krings, et al., “A View of Neanderthal Genetic Diversity,” *Nature Genetics* 26 (2000): 144–6; Ralf W. Schmitz, et al., “The Neanderthal Type Site Revisited: Interdisciplinary Investigations of Skeletal Remains from the Neander Valley, Germany,” *Proceedings of the National Academy of Sciences, USA* 99 (2002): 13342–7; David Serre, et al., “No Evidence of Neanderthal mtDNA Contribution to Early Modern Humans,” *PLoS Biology* 2, no. 3 (2004): e57; Rana with Ross, *Who Was Adam?* 185–6.  
<sup>11</sup>Serre, et al., e57; Matthias Krings et al., “Neanderthal DNA Sequences and the Origin of Modern Humans,” *Cell* 90 (1997): 19–30; Rana with Ross, *Who Was Adam?* 183–90.  
<sup>12</sup>Rex Dalton, “Neanderthal DNA Yields to Genome Foray,” *Nature* 441 (2006): 260–1.  
<sup>13</sup>Rana with Ross, *Who Was Adam?* 55–95.  
<sup>14</sup>*Ibid.*, 46–7.  
<sup>15</sup>Genesis 10:25 (NIV).  
<sup>16</sup>Hugh Ross, *The Genesis Question*, 2d ed. (Colorado Springs, CO: NavPress, 2001): 185–7.  
<sup>17</sup>Roger Lewin and Robert A. Foley, *Principles of Human Evolution*, 2d ed. (Oxford, UK: Blackwell Publishing, 2004): 497–9; James F. O’Connell and Jim Allen, “When Did Humans First Arrive in Greater Australia and Why Is It Important to Know?” *Evolutionary Anthropology* 6 (1998): 132–46.  
<sup>18</sup>Richard Roberts, et al., “Optical and Radiocarbon Dating at Jinnium Rock Shelter in Northern Australia,” *Nature* 393 (1998): 358–62.  
<sup>19</sup>Bruno David, et al., “New Optical and Radiocarbon Dates from Ngarrabullgan Cave, a Pleistocene Archeological Site in Australia: Implications for the Comparability of Time Clocks and for the Human Colonization of Australia,” *Antiquity* 71 (1997): 183–8.  
<sup>20</sup>Psalms 104:5–9 (NIV).  
<sup>21</sup>Peter 3:6 (NIV).  
<sup>22</sup>Romans 1:8 (NIV).  
<sup>23</sup>Hugh Ross, *The Genesis Question*, 149–50.  
<sup>24</sup>*Ibid.*, 170.  
<sup>25</sup>*Ibid.*  
<sup>26</sup>Genesis 8:1 (NIV).  
<sup>27</sup>More detailed explanations of the geography of Noah’s flood can be found in Carol A. Hill, “Qualitative Hydrology of Noah’s Flood,” *Perspectives on Science and Christian Faith* 58 (June 2006):

120–9; Alan E. Hill, “Quantitative Hydrology of Noah’s Flood,” *Perspectives on Science and Christian Faith* 58 (June 2006): 130–41; Steve Sarigianis, “Noah’s Flood: A Bird’s-Eye View,” *Facts for Faith*, Quarter 3 (2002): 16–25; Hugh Ross, “Water-Level Math,” *Facts for Faith*, Quarter 3 (2002): 23.

<sup>28</sup>The New International Version does note that both “bed” and “staff” are permissible translations.

<sup>29</sup>Hugh Ross, *The Genesis Question*, 59–62, 171–2.

<sup>30</sup>For example, all the sources cited in note #1 take this position.

<sup>31</sup>1 Peter 1:10–12 (NIV).

<sup>32</sup>2 Peter 1:21 (NIV).

<sup>33</sup>Numbers 23:19; Pss. 12:6, 119:160; Prov. 30:5; John 10:35; Heb. 6:18, (NIV).

<sup>34</sup>Hugh Ross, *The Creator and the Cosmos*, 3rd ed. (Colorado Springs, CO: NavPress, 2001): 23–9. A slightly abridged form of chapter 3, “Big Bang—The Bible Taught It First,” is posted on the Reasons To Believe website: [www.reasons.org/resources/fff/2000issue03/index.shtml#big\\_bang\\_the\\_bible\\_taught\\_it\\_first](http://www.reasons.org/resources/fff/2000issue03/index.shtml#big_bang_the_bible_taught_it_first).

<sup>35</sup>Hugh Ross, *The Fingerprint of God*, 2d ed. (New Kensington, PA: Whitaker House, 1991): 53–138.

<sup>36</sup>Every Tuesday from 11 AM–1 PM Pacific time, three or more members of the Reasons To Believe scholar team describe how a few of the past weeks’ scientific discoveries provide more evidence for the Christian faith. *Creation Update* is broadcast over the Living Way Radio Network and live on the Web at either [www.reasons.org/resources/multimedia/rtradio/](http://www.reasons.org/resources/multimedia/rtradio/) or [www.oneplace.com/ministries/creation\\_update/](http://www.oneplace.com/ministries/creation_update/). Listeners are encouraged to call in with their questions at 866-RTB-RADIO.

<sup>37</sup>Archives of past *Creation Update* broadcasts along with detailed show notes and hotlinks to the cited literature may be found at: [www.reasons.org/resources/multimedia/rtradio/cu\\_archives/index.shtml](http://www.reasons.org/resources/multimedia/rtradio/cu_archives/index.shtml).

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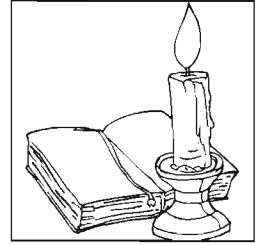
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# Reading Modern Science into Scripture

Paul Seely

**R**oss has rightly seen that we have differing views of Scripture. However, it is misleading to say I question the total truthfulness of Scripture (and by implication the total truthfulness of God). Let me make it clear that I agree with Ross that God has spoken to humanity through both the words of the Bible and the world of nature. And, certainly God by his nature, does not lie, deceive,<sup>1</sup> or contradict.<sup>2</sup> Neither do I see any possibility for contradiction between what God *reveals* in the Bible and what he reveals in nature's record. However, there is good evidence that God has sometimes made gracious accommodations to the prior beliefs of the Israelites, and since these are not revelations, there is no reason to expect them to be absolutely true.

Ross does not realize that his view of Scripture as totally inerrant rests upon a view of God derived ultimately from human reason, not from Scripture. It is reasonable to assume that God would not say anything that was not absolutely true. To turn this natural assumption into a necessary dogma, rationalistic Christians argue that since God cannot lie, deceive, or err, the only option he has left is to tell the absolute (non-contradictable) truth. Hence the Bible, being God's words, will necessarily be inerrant, not only for faith and morals, but also for history and science. This conclusion, however, does not logically follow from the premises. It commits the fallacy of the excluded middle because according to Scripture, God has other options besides those which rationalistic Christians have allowed him.

We can see from Scripture that the most important of these options is that of accommodating his revelation to the prior beliefs of the Israelites, as Jesus implied God had

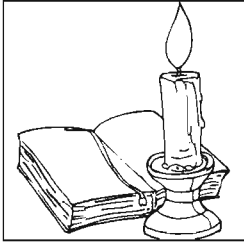
sometimes done (Matt. 19:8), and Calvin recognized in various parts of Scripture.<sup>3</sup> Because accommodations are not revelations, there is no reason to expect them to be inerrant.

Unfortunately, rationalistic Christians try to protect the Bible's authority by lifting it up into an extra-biblical, rationalistic philosophy similar to Platonism.<sup>4</sup> Like an idealistic philosophy, it demands absolute logical coherency and hence absolute biblical inerrancy. Although this philosophy is *a priori*, resting upon human reason rather than revelation, the validity of its *absolutely* inerrant Bible is regularly rationalized by appealing to biblical proof-texts which few seem to notice have all been taken out of context.<sup>5</sup>

Having thus convinced themselves that their rationalistic philosophy of the Bible is really biblical, rationalistic Christians feel justified in excluding the possibility of divine accommodation, not because divine accommodation is not biblical, but because it would bring merely human ideas into the Bible and thus destroy the absolute coherency and validity of their rationalistic philosophy. As a result, when God's accommodations conflict with modern science, rationalistic Christians only have two ways to save the coherency of their rationalistic philosophy: either force the scientific data to conform to Scripture or force the biblical data to conform to science. Creation science mostly follows the first path. Concordism mostly follows the second. Both rationalize away relevant data, leaving the believer in a world that is logically consistent but neither biblically nor empirically valid.

**Reply to Response 1:** Ross says I distorted the facts by claiming there was a virtually

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truthfulness  
of Scripture  
(and by  
implication  
the total  
truthfulness  
of God).*



## Dialogue: Reply

### *Reading Modern Science into Scripture*

*Just as  
there is  
a minority of  
qualified  
evangelical  
geologists and  
astronomers  
who agree  
the earth  
is not  
more than  
~6000 years old,  
there is  
a minority of  
qualified  
Old Testament  
scholars  
who support  
concordism.*

unanimous agreement among qualified Old Testament scholars that the sun was created on the fourth day, not just made to appear. I cited seven evangelical scholars as documentation. Ross apparently did not read the endnote as he ignored four of the scholars, and of the three he consulted, he failed to see that not just Wenham but Hamilton and Waltke also agree with me. Had he read the pages I cited, he would have found that Hamilton explicitly says the author of Genesis 1 "affirms the existence of light (and a day for that matter) without the existence of the sun." The comments of Waltke are not as explicit but he does say that "Let there be" with regard to the creation of light on Day One means to "bring into existence what was not." If light was not in existence before Day One, then Waltke is agreeing with the others that the sun was not created before Day One and hence not at the time of Gen. 1:1, but on the fourth day.

Allen Ross said that it was *possible* to understand the fourth day as saying the sun *appeared* rather than was created, but he made no commitment to this interpretation, and he took a firm stand against interpreting the days of Genesis as ages. In a book not intended to expound the meaning of the author of Genesis, Archer accepted the Day-Age theory in order to save the "conservative" philosophy of an absolutely inerrant Bible. The purpose of Geisler and Howe's book is the same, and they are not qualified Old Testament scholars.

Nevertheless, just as there is a minority of qualified evangelical geologists and astronomers who agree the earth is not more than ~6000 years old, there is a minority of qualified Old Testament scholars who support concordism. So, Ross is right: my statement of "a virtually unanimous agreement among qualified Old Testament scholars" is not accurate. It is only the majority who agree with me. The fact that my view is the majority view and also the historic view of the Church is, however, evidence that it arises naturally from the text, and reading in the Day-Age theory distorts the text.

**Reply to Response 4:** Although with a little stretching, the words, "worked the earth" and "shepherd," might be able to be interpreted as Paleolithic, the words, "God planted a garden" (Gen. 2:8), strongly suggest

fully domesticated crops and fruit trees. And even though Adam leaves the garden, there is no indication he had to start over with wild plants. On the contrary, Gen. 3:19 says he will eat the "herb of the field," which refers to domesticated plants (Exod. 9:22, 25), and Gen. 2:5 may very well show that it refers to domesticated plants *as opposed to wild ones*.<sup>6</sup> The most natural interpretation of the biblical data is that the culture of Adam was Neolithic.

Cain's city also testifies that the culture of that time was Neolithic. Ross says it was Paleolithic but that all evidence of Cain's city has disappeared. Possibly so, but given Cain's city and later generations remembering him (Gen. 4:24), it seems unlikely that no one in the next 20,000 years thought of building a city. Or must we believe later cities also disappeared?

**Reply to Response 5:** Ross wants to date the "cutting instruments of bronze and iron" (Gen. 4:22) ~30,000 BP even though there is no evidence of metallurgy until ~9000 BP. Ross's answer again is that all evidence of such technology disappeared. Maybe so, but repeated appeal to evidence disappearing suggests special pleading.

**Reply to Response 6:** There is not room to answer all of Ross's response. I have, however, in a previous paper given all of the biblical reasons for saying Scripture describes the Flood as covering the entire Near East.<sup>7</sup> The strongest reason for saying the Flood is not described as local is that it involved the reversal of the second day of creation, thus sending the earth virtually back to its condition in Gen 1:2.<sup>8</sup> (The pages cited must be read.)

The reason the statement that the ocean waters will "not return to cover the earth" (Ps. 104:9b) does not exclude a universal flood is because it is a rhetorical statement as I fully explain in my article, "Creation Science takes Psalm 104:6-9 Out of Context."<sup>9</sup>

Ross is technically correct that Gen. 8:6 [Noah opening a window in the ark] "explicitly refutes Seely's assertion 'Noah did not see outside the ark until the surface of the ground was completely dried up.'" However, as Wenham notes, the window was probably in the roof of the ark, giving Noah a view only of the sky.

**Reply to Response 7:** Ross's answer to the fact that buildings made of baked brick using asphalt for mortar do not show up in the archaeological record before c. 3500 BC is that they disappeared. Dating the tower of Babel ~30,000 BP, however, is so far out of sync with the archaeological record—which shows a natural progression from hunting and gathering in northern Mesopotamia to city building, which did not reach the area of Babylon until 5000 BC—that Ross's suggested dating can only be considered improbable speculation. I doubt that his dating would fare any better with consensual archaeology and anthropology than creation science does with consensual geology and astronomy. Four evangelical scholars besides myself have dated the Tower of Babel, and they all dated it after 3500 BC.<sup>10</sup>

**Reply to Response 9:** Ross does not seem to understand the connection between Genesis and the Babylonian traditions. The fact that all scholars emphasize the contrast between the biblical and Babylonian *theologies* and reject a *direct* dependence upon any *particular* extant Babylonian text does not change the fact that there is evidence the Bible used pre-scientific Mesopotamian concepts, motifs, and traditions in areas other than theological.<sup>11</sup>

Regarding 2 Peter 1:21, the verse specifically refers to "prophecy," the messages which biblical prophets received directly from God by revelation. The inspired writers of biblical history, however, never claim to have received their historical facts directly from God by revelation, so 2 Peter 1:21 does not apply to them. Also, Peter is talking about Messianic prophecy (faith and morals), not science, thus his statement does not apply to science. Finally, even a direct revelation from God (e.g., Deut. 24:1–4) can incorporate divine accommodation (Matt. 19:8). Therefore, 2 Peter 1:21 does not prove absolute biblical inerrancy. So, far from being inerrant, the science in the Bible evidences being the science of the times.<sup>12</sup>

Concordists have two basic ways to make the Bible agree with modern science: (1) take the words of the Bible out of context and redefine them<sup>13</sup> or, (2) read modern science into the biblical words as a second meaning unknown to the human author. To justify the latter approach, they often appeal to 1 Peter 1:10–12. These verses, however, do not support the concordist approach. Peter, as scholarly commentaries agree, was saying the prophets were searching to find out *under what circumstances* and *when* the things they had *foretold* would come to pass. This is not at all the same thing as supposing that the words of the prophets have a second meaning beyond the one the author intended.

**Reply to Response 10:** It is true that the biblical accounts of creation are more easily coordinated with modern science than the accounts in other "holy" books, but the reason for this is because of the theological differences: one tran-

scendent sovereign God vs. mythological warring nature-gods. Lacking the background to read the biblical accounts within their historical context, Ross missed the fact that their science qua science is the science of the times.<sup>14</sup> He naturally read them through the grid of modern Western science and unknowingly read that modern science into them.

God used a partial mistranslation in the King James version of the Bible to bring me to the Lord, but that does not justify the mistranslation. I do not doubt God used Ross's misinterpretations to bring him to the Lord, but that does not justify his misinterpretations. Supposed meanings of Scripture based on words interpreted out of context are not equivalent to "what the Bible says."

I enjoyed Ross's book, *The Fingerprint of God*, and believe the Big Bang is a majestic testimony to the God of the Bible. The testimony of the Big Bang, however, stands on its own two feet. It bears a tremendous witness to the Creator completely apart from supposedly being revealed in the Bible. The three cosmic features of the Big Bang, which Ross sees as revelations of modern science long before their time, are found in the Bible only because Ross reads them in from modern science. Let us look at them.

Ross sees "a single cosmic beginning, including the beginning of space and time" in verses saying that God created the heavens and the earth, e.g., Gen. 1:1 (*The Creator and the Cosmos*, 24). Genesis 1:1 is legitimately *applied* to the Big Bang, but interpreted in context, the "heavens" are a solid sky-dome with a literal ocean above it,<sup>15</sup> so it is *not a revelation* of the Big Bang. One could just as easily read the Big Bang into the earlier Mesopotamian text, "When An, Enlil, and Ea, the great gods, had created heaven and earth ..."<sup>16</sup>

Ross also sees "fixed physical laws." It is not clear to me which verses he sees these in, but the ancient Sumerians, long before the Bible, had the idea that their gods "guide and control the cosmos in accordance with well-laid plans and duly prescribed laws."<sup>17</sup> One could, therefore, just as easily read the concept of fixed physical laws into the Sumerian literature.

Ross sees the continuous expansion of the universe in verses which speak of God "stretching out the heavens," e.g., Isa. 42:5. Seven of these verses seem particularly apposite because their verb is a Qal active participle, which supports the idea of "continual or ongoing stretching" (*The Creator and the Cosmos*, 24). According to E. J. Young, who was a master of the Hebrew language, the participle in Isa. 42:5 expresses "not only the original act of creation but also the creative power of God as exercised in the continual existence of his works."<sup>18</sup> Isaiah 42:5, like the similar verses Ross cites, means God is continually upholding the stretched out heavens, not that he is physically increasing their size year by year. Ross is reading



## Dialogue: Reply

### Reading Modern Science into Scripture

Concordists  
think  
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in order to  
save the  
coherency  
of an  
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philosophy  
of the  
Bible.

modern science into the account. It is not there. He might just as well have argued that the Qal active participle used in the following phrase, he "spreads out the earth," means the Bible is saying that the spreading out of the earth is "continual and ongoing." But the earth is not literally increasing in size year by year, so Ross does not see this as a revelation of modern science before its time—although the grammar and context are the same! It could scarcely be clearer that Ross is picking and choosing according to what modern science dictates.

## Epilogue

Concordists think they are exalting and saving the Bible. In reality, they are suppressing it in order to save the coherency of an a priori rationalistic philosophy of the Bible. It is all so unnecessary. The revelations of the nature of the true God, creation, sin, judgment, grace, and relationships which God gave to Israel in Genesis 1-11, though graciously adapted to *their* ways of viewing history and science, are perfectly clear to us. Though not meeting every demand of an autonomous human reason, Scripture bears eternal witness to God's condescending grace and inerrant wisdom. \*

## Notes

PreNote: If anyone is interested in serious dialogue, the literature cited must be read.

<sup>1</sup>Humans' sinfulness, however, may require inspired deception (1 Sam. 16:1-5). Cf. Josh. 2:4.

<sup>2</sup>However, the superseding of the Old Covenant involves negating "not's" and hence by definition involves logical contradictions, e.g., cannot eat unclean foods becomes can eat unclean foods.

<sup>3</sup>David F. Wright, "Calvin's Pentateuchal Criticism: Equity, Hardness of Heart, and Divine Accommodation in the Mosaic Harmony Commentary" *Calvin Theological Journal* 21 (1986): 33-50; D. F. Wright, "Accommodation and Barbarity in John Calvin's OT Commentaries" in *Understanding Poets and Prophets*, ed. A. Graeme Auld (Sheffield: Academic Press, 1993), 413-27. For more discussion of Calvin's concept of accommodation, see the latter part of my paper, "The Date of the Tower of Babel and Some Theological Implications," *Westminster Theological Journal* 63 (2001): 25, note 52. [www.occasioncameras.com/creationdays/pdf/seely.babel.wtj.2001.pdf](http://www.occasioncameras.com/creationdays/pdf/seely.babel.wtj.2001.pdf)

<sup>4</sup>Cf. the Platonic definition of biblical inerrancy given in Norman L. Geisler, ed., *Inerrancy* (Grand Rapids, MI: Zondervan, 1979), 294. Note its "when all facts are known" and "original autographs," both of which are unattainable in this world.

<sup>5</sup>James D. G. Dunn, "The Authority of Scripture According to Scripture," *Churchman* 96 (1982):

104-22 and 201-25; Paul H. Seely, *Inerrant Wisdom\** (Portland, OR: Evangelical Reform, 1989). See 2 Peter 1:21 in Reply 9 as an example.

<sup>6</sup>Gordon J. Wenham, *Genesis 1-15* (Waco, TX: Word Books, 1987), 57-8; Umberto Cassuto, *Commentary on the Book of Genesis 1* (1961, reprint, Jerusalem: Magnes Press, 1972), 101-2.

<sup>7</sup>Paul H. Seely, "Noah's Flood: Its Date, Extent, and Divine Accommodation," *Westminster Theological Journal* 66 (2004): 291-311.

<sup>8</sup>Victor Hamilton, *The Book of Genesis Chapters 1-17* (Grand Rapids, MI: Eerdmans, 1990), 291; Kenneth Mathews, *Genesis 1-11:26* (Nashville, TN: Broadman & Holman, 1996), 351; cf. 376; John Walton, *Genesis* (Grand Rapids, MI: Zondervan, 2001), 331; Bruce Waltke, *Genesis* (Grand Rapids, MI: Zondervan, 2001), 139; Wenham, *Genesis 1-15*, 181. Even Allen Ross (*Creation and Blessing* [Grand Rapids, MI: Baker, 1997], 190) and Gleason Archer (*Encyclopedia of Bible Difficulties* [Grand Rapids, MI: Zondervan, 2001], 82) agree that the Flood was not local.

<sup>9</sup>Paul Seely, "Creation Science Takes Psalm 104:6-9 Out of Context," *PSCF* 51, no. 3 (1999): 172-3. See [www.asa3.org/ASA/PSCF/1999/PSCF9-99Seely.html](http://www.asa3.org/ASA/PSCF/1999/PSCF9-99Seely.html) about two-thirds of the way down the document.

<sup>10</sup>See Seely, "The Date of the Tower of Babel and Some Theological Implications."

<sup>11</sup>See Peter Enns, *Inspiration and Incarnation* (Grand Rapids, MI: Baker, 2005), 53-6; Wenham, *Genesis 1-15*, xli; W. G. Lambert, "A New Look at the Babylonian Background of Genesis," *Journal of Theological Studies* 16 (1965): 287-300.

<sup>12</sup>John Walton, "Ancient Near Eastern Background Studies," *Dictionary for Theological Interpretation of the Bible*, ed. K. I. Vanhoozer (Grand Rapids, MI: Baker, 2005), 41; My book, *Inerrant Wisdom*,\* gives examples of the New Testament using the science of the times.

<sup>13</sup>Paul H. Seely, "The First Four Days of Genesis in Concordist Theory and in Biblical Context," *PSCF* 49, no. 2 (June 1997): 85-95, also available at [www.asa3.org/ASA/PSCF/1997/PSCF6-97Seely.html](http://www.asa3.org/ASA/PSCF/1997/PSCF6-97Seely.html)

<sup>14</sup>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; "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; "The Geographical Meaning of 'Earth' and 'Seas' in Gen. 1:10," *Westminster Theological Journal* 59 (1997): 231-55. See also notes 10 and 11.

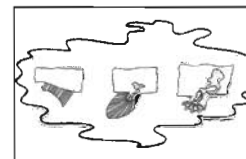
<sup>15</sup>Ibid.

<sup>16</sup>Richard J. Clifford, *Creation Accounts in the Ancient Near East and in the Bible* (Washington, DC: Catholic Biblical Association, c1994), 68.

<sup>17</sup>Samuel Noah Kramer, *History Begins at Sumer* (Garden City, NY: Doubleday, 1959), 78, cf. 80. These plans and laws were called "me's," often translated "decrees."

<sup>18</sup>Edward J. Young, *Commentary on Isaiah 3* (Grand Rapids, MI: Eerdmans, 1972) 117.

\*Copies of *Inerrant Wisdom* are available from Evangelical Reform, 1544 SE 34th Avenue, Portland, OR 97214 for a donation of any size.



# Is Intelligent Design "Scientific"?

Loren Haarsma

*A central activity of science is the construction and testing of empirical models, utilizing known natural mechanisms, of parts of the natural world. Occasionally, some scientists tentatively conclude that some particular phenomenon is unexplainable in terms of any known natural mechanisms. I discuss some historical examples which have been resolved (e.g., the energy source of the sun) and some modern examples still under discussion (e.g., the Big Bang, first life) where at least some scientists have concluded that a phenomenon is unexplainable in terms of known natural mechanisms. In such circumstances, individual scientists have advocated a range of scientific and philosophical conclusions (e.g., unknown natural mechanisms, multiple universes, divine intervention).*

*The modern Intelligent Design (ID) movement can be understood as one particular instance of this. Some activities of ID are clearly "scientific" even under narrow definitions of that term, including modeling of evolutionary population dynamics, investigating the adequacy of known evolutionary mechanisms to account for specific instances of biological complexity, and investigating the general conditions under which self-organized complexity is possible. Other activities of ID clearly go beyond science into philosophy and theology; however, this fact does not render the scientific activities of ID any less scientific. Rather than debating the demarcation of science, the real questions we should be asking are: Are the scientific arguments of ID good science? Are the philosophical arguments of ID good philosophy? Are the theological arguments of ID good theology?<sup>1</sup>*

**T**he majority of modern arguments for Intelligent Design (ID) fall into one of two categories. The first category is that "biological complexity" (that is, the development of first life, plus some subsequent increases in complexity during biological history) cannot be explained via natural evolutionary mechanisms alone, and is best explained in terms of the actions of some intelligent agent. Sometimes, attempts are made to formalize this claim via probability arguments. The second category of arguments for ID is that the fundamental laws of nature appear to be "finely tuned" for life. This argument is typically left as an intuitive appeal, without attempting any formal probability calculations.

Within the past decade, considerable energy has been spent debating whether these sorts of arguments should be considered "scientific." I believe these debates over the demarcation of science have been unproductive because ID, as a whole package, is partly scientific, partly philosophical, and partly religious. So rather than debating

whether ID as a whole should be entirely included in or entirely excluded from science, the real questions we should be asking are: Are the scientific parts of ID good science? Are the philosophical parts of ID good philosophy? and Are the theological parts of ID good theology?

## Scientific Arguments

I will turn to the philosophical and religious parts of ID toward the end of this article, but start with the scientific questions. I believe that it is useful to have a broad picture of science which includes at least all of the following questions:

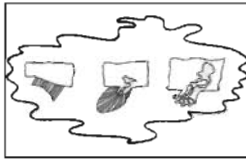
(B1) *The basis for science:* Can we discover new truths about nature, and if so, why?

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Loren Haarsma

*The real questions we should be asking are: Are the scientific parts of ID good science? Are the philosophical parts of ID good philosophy? and Are the theological parts of ID good theology?*



*This narrower definition of science [to explain events in nature exclusively in terms of immediate, natural causes] is sometimes used by opponents of ID to argue that ID should not be considered "scientific." I do not agree that science must always, by definition, restrict itself in this way. I do, however, agree that models which restrict themselves to natural causes play a critical role in science.*

## Dialogue: Article

### *Is Intelligent Design "Scientific"?*

(B2) *The processes of science:* What are effective scientific methods for learning about nature?

(B3) *The discoveries of science:* What do we learn about nature when we apply these methods?

(B4) *The inferences of science:* Do scientific discoveries have implications for society, philosophy, religion?

(B5) *The human aspect of science:* What are our motives, ethics, and goals for doing science?

Questions B2 and B3 typically are answered by scientists with little or no input from philosophy, religion, or other academic disciplines. The other questions in the list, however, are properly asked by scientists in conjunction with other disciplines, including philosophy and religion. Imagine telling a historian that the discipline of history should devote itself exclusively to discovering raw facts about the past—what events happened, where, and when. All questions about the psychological, social, philosophical, and religious implications of historical events belong outside the discipline of history, therefore they should be excluded from professional historical scholarship. Most historians would laugh at such a suggestion. History overlaps with other disciplines, and it is appropriate for historians to speak on these areas of overlap. In the same way, scientists who feel motivated and competent to do so should not be shy about addressing questions where science overlaps with sociology, philosophy, and religion.

Although such a broad definition of science can be useful, it is also helpful to acknowledge that there is a narrower definition of science—one which most people today think of when they hear the word "science"—that restricts itself to questions B2 and B3 and acknowledges the critical role in science of constructing and testing explanatory models which refer only to natural causes. If we look at the history of science, we see that one important factor in the advancement of science was when scholars stopped thinking about natural events in terms of the activity of "nature spirits" or in Aristotelian terms, "final causes," and started trying to explain events in nature exclusively in terms of immediate, natural causes.

This narrower definition of science is sometimes used by opponents of ID to argue

that ID should not be considered "scientific." I do not agree that science must always, by definition, restrict itself in this way. I do, however, agree that models which restrict themselves to natural causes play a critical role in science. Advocates of ID should agree with this point, because they themselves routinely construct scientific models which restrict themselves to natural causes—as a step toward trying to show that such models are inadequate.

When scientists confront a puzzling event in nature and try to explain that event using models which rely only on known natural mechanisms, their models can meet varying levels of success. Scientists can reach one of three general types of conclusions:<sup>2</sup>

(D1) *The event is explainable.* Good empirical models predict that known natural mechanisms can explain the event.

(D2) *The event is partially explainable.* Our empirical models are not sufficiently thorough to explain the event entirely. However, based upon what we know so far, we believe that known natural mechanisms are sufficient to account for the event. We believe that future advances will allow us to explain the event fully.

(D3) *The event is unexplainable via known natural mechanisms.* In fact, there are good, empirical reasons for ruling out any model which relies only on known natural mechanisms.

Many things in science are now in category D1—explainable in terms of known natural laws, e.g., the regular orbital motion of planets, the fuel source for the sun, how cold fronts cause rainfall. Perhaps the majority of things in science fall into category D2—partially explainable, e.g., how the first galaxies formed, how a tree can grow from a single seed into a mature plant, how birds learn when and where to migrate. We know some of the mechanisms in these processes, but we know that we do not know other mechanisms. We expect that future research will turn up some interesting facts, concepts, and surprises. However, even though we can only partially explain these things right now, it looks to us like known natural mechanisms will do the job. We do not expect that further research into these questions will show us anything which cannot be explained in terms of known natural processes.



Most scientific work consists of trying to move things from the category “partially explainable” to the category “fully explainable.” Scientists make models, trying to explain events in terms of understandable natural processes. They test their models experimentally and theoretically, and usually they find that their models do not match the data. Very occasionally, when there are strong theoretical and experimental reasons, scientists hypothesize new natural laws which are consistent with known natural laws. Most of the time, however, scientists who confront a failed scientific model go back to work and make better models using only known natural mechanisms. This is how we make progress in science, most of the time.

There are, however, those rare occasions in science when an event seems to fall into the category of “unexplainable.” Not only are we currently unable to construct a model of the event in terms of known natural laws, but we can even come up with good quantitative arguments why any model which relies only on known natural laws would seem to be excluded. A historical example of this occurred in the late 1800s when the energy source of the sun was a mystery. At that time, there was good evidence that the earth, and therefore the sun, was at least hundreds of millions of years old. But the known energy sources of chemical burning and gravitational collapse could be shown to be inadequate to fuel the sun for that long a period. The energy source of the sun was unexplainable in terms of natural mechanisms known at that time. The solution to this puzzle was the discovery of an entirely new natural process—nuclear fusion.

Today, the source of the Big Bang falls into category D3—unexplainable in terms of known natural laws. Scientists can and do hypothesize new natural laws, acting in some primordial vacuum or mother universe, which might cause a Big Bang. This is an ongoing area of research. However, there are no currently known natural laws, for which we have independent evidence, which could explain the source of the Big Bang.

Individual scientists could reach one of many different conclusions about the cause of a scientifically unexplained event. Five examples follow:

- (E1) *An as-yet unknown natural law is responsible for the event.*
- (E2) *A supernatural event occurred—caused by an intelligent being of an entirely different reality than our universe.*
- (E3) *Super-human technology brought about the event—caused by intelligent beings who are contained in and limited by our universe but with superior technology.*
- (E4) *A very improbable event simply happened.*
- (E5) *There are many universes, and we just happen to live in one where this improbable event happened.*

Consider again the source of the Big Bang combined with the apparent fine-tuning of fundamental laws of

nature for life, which are currently unexplainable in terms of known natural laws. A search through popular books and articles written by scientists turns up examples of each of these five types of conclusions. Although these five conclusions are very different from each other philosophically and religiously, empirical science alone cannot distinguish among the five. When someone selects one of these five options as being the most likely one, that selection goes beyond the narrow definition of science into the broader definition of science. The decision is based in part upon philosophical, historical, and religious considerations.

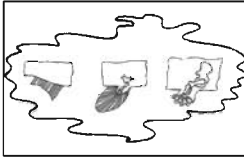
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*Some people believe that first life and biological complexity should be considered “partially explainable,” and some believe that they should be considered “unexplainable.”*

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There are other historical scientific puzzles which, at one time, at least some scientists claimed were scientifically “unexplainable” in terms of known natural laws. These instances are rare in the history of science, but they do happen. In light of this, we can examine the scientific puzzles of most interest to ID: the formation of first life on earth, and some subsequent increases in complexity during biological history.<sup>3</sup> The majority of scientists today, myself included, believe that the development of first life and of biological complexity belong in category D2 (partially explainable). There are many steps—perhaps some very important steps—which we do not understand in detail because the problem is so difficult; but we expect that the development of life and biological complexity ultimately will be explainable in terms of natural mechanisms. However, there are some people who believe that the formation of first life, in particular, belongs in category D3 (unexplainable in terms of known natural laws). Again, a survey of popular literature shows that all of hypotheses E1–E5 have been proposed to explain the formation of first life on earth.

Some people believe that first life and biological complexity should be considered “partially explainable,” and some believe that they should be considered “unexplainable.” How can we make progress? We make progress the way we always do in science: by trying to construct models for these phenomena, models which rely only on known natural mechanisms. We then test these models theoretically and experimentally. Advocates of evolution



## Dialogue: Article

### Is Intelligent Design “Scientific”?

*If advocates of ID and advocates of evolution would limit themselves to ... restrained statements, when they make public pronouncements to general audiences, I believe we could avoid some of the emotional heat which sometimes accompanies these debates.*

try to show that biological complexity belongs in category D2, partially explainable, by arguing that the best natural mechanism-based models for the evolution of complexity—while, of course, incomplete—are compatible with the known data and suggestive of how to make progress. Advocates of ID try to show that biological complexity belongs in category D3, unexplainable, by arguing that the best natural mechanism-based models for the evolution of complexity are incompatible with the known data. Scientists on both sides are doing just what they are supposed to do; they are constructing competing models, testing them, and seeing which models work and which ones do not.

When advocates of ID try to show that some phenomenon belongs in the category of “unexplainable”—that is, when they attempt to show that conventional evolutionary models which rely only on known natural mechanisms do not match the data in some respects—they are definitely doing science, even under a narrow definition of science. Such arguments might be good, solid scientific arguments, or they might be poorly done, flawed scientific arguments, but they definitely fall into the category of “science.”<sup>4</sup>

When advocates of ID try to argue that biological complexity is unexplainable in terms of known natural mechanisms, they face the special challenge of being as thorough as possible in accounting for known natural mechanisms. Failure to be thorough is one of the easiest ways to make flawed scientific arguments. Here are three examples.

1. We could imagine a warm pond of water with various simple molecules dissolved in it in various concentrations, and then calculate the probability that the right molecules will just randomly collide together, all at once, to spontaneously form a living cell. The probability of that happening is extremely low. Now, if we were to conclude on the basis of this calculation that first life on earth probably did not form *via that mechanism*, that would be a solid scientific conclusion. But if we were to conclude on the basis of this model that first life on earth probably did not form *via any* natural mechanisms, that would be a flawed scientific conclusion. Scientists who are researching the origin of life long ago rejected the idea that the first cell was formed

via a single, random collision of millions of molecules. Scientists today have other natural mechanisms in mind for the origin of first life. If we are going to attempt a meaningful probability calculation, those other mechanisms need to be studied and taken into account.

2. Suppose we are trying to make an argument about biological complexity based on the concept of “information.” It turns out that the idea of “information” has been defined in a number of different ways, in different contexts. We need to be careful how we define and use the term.

One definition of information has to do with how many bits of information are required to describe an environment. A simple environment requires only a few bits of information to specify, while a complex environment requires many bits. Under the right conditions, a combination of deterministic laws plus random processes can change a simple environment into a complicated environment. So under one definition of information, it really is possible to produce new information, *de novo*, via a combination of deterministic and random processes. This can be simulated on computers, and it happens constantly in the real world in various physical processes.

A second definition of information refers not to the environment as a whole, but to how many bits of information are required to specify an object within an environment. It is possible, under the right circumstances, to have simple components self-organize into a more complex object via a combination of deterministic and random processes.<sup>5</sup> Under this second definition of information, it can be argued that the deterministic and random processes are not producing new information, but rather, the information required for self-organization is already contained in the initial fine-tuning of the deterministic and random processes themselves.

Yet a third definition of information refers not to the total information required to describe an object, but only to the genomic information in a self-replicating object like a biological cell. This measures how much genomic information the self-replicator requires to survive and reproduce in a particular environment. Again, there are circumstances under which the genomic informa-

tion in a self-replicator can increase through processes of mutation and natural selection. In this case, the increased genomic information is not so much created *de novo* as transferred from the complicated environment into the self-replicator. From these examples, we see that if researchers want to have sound scientific conclusions about evolution and information, they will need to be careful in how they define and use critical terms such as “information.”

3. The simplest version of biological evolution—and this is how evolution is often presented in the popular literature—looks something like this: each gene produces only a single protein; each protein has only a single function in the cell; the only kinds of mutations are point mutations; and the only way in which a mutation can be fixed in a population is through natural selection. We can build a mathematical model of evolution using just that limited set of natural mechanisms, and we can calculate that, under those conditions, the evolution of certain kinds of biological complexity—the kind which Michael Behe called irreducible complexity—is extremely improbable. On the basis of this model, a solid scientific conclusion would be that biological complexity probably did not evolve via that limited set of mechanisms. A flawed scientific conclusion would be to claim that this model proves that biological complexity cannot evolve at all. We know that biological evolution is a lot more complicated than the simplified model which I just presented. A more thorough model of evolution would include an accounting of all the natural mechanisms of evolution which have been discovered and presented in the professional literature.<sup>6</sup>

Given how much we have yet to learn about the mechanisms of evolution, it seems to me that two limited types of scientific conclusions are accessible to advocates of ID. The first type would be:

On the basis of specific models with well-defined assumptions, we can rule out certain limited sets of natural mechanisms as being adequate, by themselves, to account for first life or to account for specific examples of biological complexity. Any evolutionary account will need to make use of additional natural mechanisms that are not included in our initial models.<sup>7</sup>

A second type of scientific conclusion which I think is defensible would be for an advocate of ID to say,

It seems to me (that is, it is my scientific intuition) that once all natural mechanisms are accounted for in detail, we will be able to show that first life and certain types of biological complexity (e.g., bacteria flagella) truly are unexplainable in terms of all known natural mechanisms. We cannot prove it for sure right now, but I believe that is where the data is pointing.

These are conservative claims, but given our current state of knowledge, it seems unwise for advocates of ID to claim that current scientific evidence warrants anything stronger. However, advocates of evolution should make similar sorts of restrained conclusions. One type of conclusion which an advocate of evolution could reach is,

Using known natural mechanisms, we can construct plausible models for certain specific examples of biological complexity.<sup>8</sup>

This is not a claim that we currently can explain all biological complexity via evolution, only that we can currently explain certain specific instances of biological complexity.

A second type of restrained conclusion which an advocate of evolution could make is,

It seems to me (that is, it is my scientific intuition) that once all natural mechanisms are accounted for in detail, we will be able to show that first life and all types of biological complexity can be explained in terms of known natural mechanisms. We cannot prove it for sure right now, but I believe that is where the data is pointing.

If advocates of ID and advocates of evolution would limit themselves to these sorts of restrained statements, when they make public pronouncements to general audiences, I believe we could avoid some of the emotional heat which sometimes accompanies these debates.

## Philosophical Arguments

In addition to scientific arguments, ID includes philosophical and religious arguments. I will start by listing five arguments, paraphrased from the writings of advocates of ID, which go beyond narrowly defined science and overlap into philosophy.<sup>9</sup>

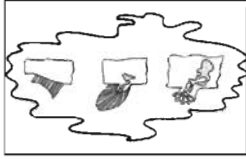
(G1) *When we see an event which had a very low probability of happening and for which there could plausibly be a beneficiary, we generally conclude the event was planned and executed by an intelligent agent.*

(G2) *Taking into account various philosophical, historical, and religious arguments, the most likely explanation for the fine-tuning of natural laws is that they were supernaturally planned.*

(G3) *If we can show that first life and biological complexity is unexplainable (highly improbable) in terms of known natural mechanisms, we will have proven that it was brought about by an intelligent agent.*

(G4) *If we can show that first life and biological complexity is unexplainable (highly improbable) in terms of known natural mechanisms, then if we also take into account various philosophical, historical, and religious arguments, the most likely explanation is that it was brought about by a supernatural agent.*

(G5) *“Intelligent Design” is a very good term to associate (equate) with the idea that biological complexity is unexplainable in terms of natural evolutionary mechanisms.*



## Dialogue: Article

### *Is Intelligent Design "Scientific"?*

*Listen to  
church  
members and  
school boards  
and scientists.  
The message  
they have  
heard is,  
"evolution  
or design,  
one or  
the other."  
Philosophically,  
that is  
a flawed choice.  
Religiously,  
it is  
a dangerous  
message.*

Each of these philosophical arguments can be debated as to its merits. Some of them seem sound. For example, I believe that strong arguments have been made in favor of G1. While G1 is not a rigorous proof, I believe it adds weight to ID arguments. I also agree with statement G2, which states that supernatural planning seems to be the strongest explanation for the fine-tuning of natural laws. The two main contenders for explaining the fine-tuning of the laws of nature are supernatural-creation and many-universes. I do not, however, believe that many-universes really solves the problem of fine-tuning. If there is some sort of mother universe which has a physical process that spawns off many baby universes, of which our universe is just one, then it seems to me that the laws of nature probably would need to be finely tuned in that mother universe as well.

The main reason that I think the laws of nature were created by God is that I believe Christianity is true. As I noted earlier, when we confront a scientifically unexplainable event and try to decide which option, among E1-E5, we believe is most likely to be true, it is appropriate—and even inevitable—that our worldview beliefs play a role in our selection. I believe that all of the historical and experiential and philosophical arguments which can be given in favor of theism in general, and Christianity in particular, add weight to the idea that the laws of nature were supernaturally planned. To put it more simply, because I believe in the God of the Bible, I am also inclined to believe that the best over-all explanation for our scientific observation of the fine-tuning of natural laws is that those fundamental laws were designed by God.

I disagree with the way argument G3 is phrased because it makes a strong claim about proving the activity of an intelligent agent. I noted earlier that events which are scientifically unexplainable allow for multiple explanations, not just intelligent agent activity. Claim G3 is, I think, particularly vulnerable to a version of the many-universes argument which notes that we now have some good evidence that the universe started by our Big Bang is probably much bigger than our visible universe.

However, if we rephrase statement G3 into something like statement G4, then I would be inclined to agree with it. Theologically, I believe that it is possible that God chose to design the laws of nature in such a way that certain kinds of biological complexity could not evolve, and then acted at certain points during biological history to overcome those limitations and assembled those complexities. So if biological complexity is ultimately shown to be unexplainable in terms of known natural laws, then—because I believe in the God of the Bible—I would be inclined to attribute biological complexity to God's miraculous activity.

I understand that some advocates of ID would like to have argument G3 classified under the rubric of "science" rather than the rubric of "philosophy." While I agree that G3 falls under science-defined-broadly, it is still the case that arguments like G3 fall outside of science-defined-narrowly, as most people understand the term "science" today. The demarcation lines between science and philosophy have shifted from time to time throughout the history of science. If biological complexity defies evolutionary explanation and if ID becomes a useful tool for guiding empirical studies of biology—in other words, if many scientists start to find ID useful for doing their science—then the demarcation lines around science will evolve to encompass ID. But in the meantime, my advice to advocates of ID is to be patient. Be content for now to have arguments like G3 discussed under the heading "philosophy" rather than "science," if that is what it takes to get opponents of ID to discuss the issue at all.

Of the various philosophical arguments around ID, some of my biggest concerns are with statements like G5, which involve the close association—indeed, the near equation—of the word "design" with the idea that biological complexity could not evolve. I can illustrate my concern as follows. Imagine a plastic bag containing the parts of an ordinary watch which I have disassembled. I could shake that bag 24 hours a day for years, and the watch would never reassemble itself. Now imagine a second bag with the parts of a disassembled watch that is designed to self-assemble. When I shake the second bag, a little spring hooks onto a little

screw and latches into place. The battery snaps into the battery holder and stays there. All the pieces of the watch are constructed so that, when two pieces that belong together collide with the right sort of trajectory, they hook together and stay hooked together. So if I shake the second bag for an hour or so, in the end, I will have an entire working watch—working, but with some tiny scratches here and there which indicate its history of being shaken together.

Now consider the ordinary watch and the watch which can self-assemble, and ask the following question: Which watch is more cleverly designed? I believe that most people would answer that the self-assembling watch is more cleverly designed. My point with this illustration is not to argue that God creating life-forms through evolution is somehow “better” than God creating life-forms through miracles. My point, rather, is that self-assembly is not the opposite of “design.” Watches and biological life-forms can, in principle, be designed to self-assemble from simpler component pieces.

This illustration raises a potential conflict between the fine-tuning argument for ID and the biological complexity argument for ID. The laws of nature are finely tuned not only for the existence of atoms and stars and planets. The laws of nature are so finely tuned that atoms and stars and galaxies self-assemble out of the fundamental particles produced by the Big Bang. And after nucleosynthesis in first-generation stars, the laws of nature bring about the self-assembly of heavier elements, like carbon and oxygen, and simple molecules, and planets with dry land, atmospheres, and water oceans. This self-assembly of all the physical forms of the universe is possible because of the fine-tuning of the laws of nature. I believe this a powerful intuitive argument in favor of the fundamental laws of nature being designed. But suppose the fine-tuning does not stop there. Suppose the laws of nature are fine-tuned not only for the self-assembly of molecules and stars and planets, but also for the self-assembly of biological life and biological complexity. If the laws of nature are so exquisitely fine-tuned that life and complexity can self-assemble, should that be considered evidence for design, or evidence against design? It seems to me that it should be considered as evidence for design. But that is not how it is presented by most advocates of ID. Most advocates of ID essentially argue that if biological life and biological complexity can self-organize, then that should be counted as evidence against design.

The way that ID is typically presented, by advocates of ID, is that we face a choice: either evolution is true or things were intelligently designed. It is evolution or design, one or the other. It is true that some advocates have made the point that this is a false choice. Some advocates of ID have made the following distinction: if biological complexity cannot evolve, then we have

detected evidence of intelligent design action in biological history; however, if biological complexity can evolve, that neither proves nor disproves design, it merely means that we cannot unambiguously detect it. That is a very good point, and I am glad that a few advocates of ID have made it. However, that point is not being communicated to most audiences. Most audiences are hearing a very simple message: evolution or design; one or the other. Listen to church members and school boards and scientists. The message they have heard is, “evolution or design, one or the other.” Philosophically, that is a flawed choice. Religiously, it is a dangerous message.

## Theological Arguments

Unavoidably, ID includes a religious dimension. ID is sometimes presented as if it could be separated from religion, and I have already acknowledged that parts of ID can be evaluated on their scientific and philosophical merits, apart from religious considerations. However, everybody knows that ID has religious implications. Advocates of ID themselves frequently raise theological arguments when they speak and write to Christian audiences. I will briefly paraphrase six theological arguments from the writings of ID advocates, which go beyond narrowly defined science and overlap into theology.<sup>10</sup>

(H1) *Christians should embrace ID as a way to oppose atheism.*

(H2) *The “theistic” part of “theistic evolution” is essentially meaningless.*

(H3) *Theistic evolution is dangerous to the Christian faith.*

(H4) *God definitely used (scientifically detectable) supernatural events to create biological complexity.*

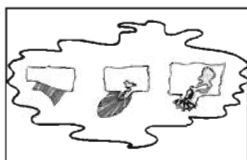
(H5) *It is reasonable to believe that God might have used (scientifically detectable) supernatural events to create first life and biological complexity.*

(H6) *Good theology and hermeneutics should lead us to conclude that ID is more likely to be true than theistic evolution.*

Each of these arguments is worthy of being debated and discussed on its theological merits. Most of them I believe to be seriously flawed. Statement H5, on the other hand, I agree with. I disagree with statement H6; I believe that a strong cumulative case in favor of evolutionary creation can be made using scientific, philosophical, theological and hermeneutical arguments. However, I believe that statement H6 is phrased in a particularly useful way. Phrased this way, it could be the starting point for a spirited but friendly debate among Christian scholars.

## Conclusion

If ID is partly scientific, partly philosophical, and partly religious, how can the debate over ID be conducted most productively?



To advocates  
of ID,  
I recommend  
the following:  
Do not pretend  
that ID can be  
evaluated purely  
as science  
without  
consideration of  
religious  
implications. ...  
To opponents  
of ID,  
I recommend  
the following:  
Do not play  
the demarcation  
game, that is,  
do not insist on  
definitions of  
science which  
try wholly to  
exclude ID.

## Dialogue: Article

### Is Intelligent Design "Scientific"?

To advocates of ID, I recommend the following: Do not pretend that ID can be evaluated purely as science without consideration of religious implications. ID has religious implications, and everyone knows it. If someone asks you, "Who is the designer?" do not try to be coy and say, "I don't know" or "It doesn't matter." Instead answer, "That is a philosophical and religious question and I will be happy to tell you my beliefs and the reasons for my beliefs; however, can we also discuss the scientific arguments on their scientific merits?" If someone tells you that ID is not "scientific," reply by saying, "Yes, it's partly scientific and partly philosophical. But regardless of how you classify it, are the arguments themselves sound or unsound?" If you help your critics separate your scientific and philosophical arguments into categories with which they are comfortable, you can, I hope, avoid the unproductive demarcation argument and instead encourage your critics to confront and evaluate the strengths of your scientific, philosophical, and religious arguments, each in turn.

To opponents of ID, I recommend the following: Do not play the demarcation game, that is, do not insist on definitions of science which try wholly to exclude ID. Do not insist that ID must make specific empirical predictions in order to be "scientific." Understand that in science, it is okay sometimes to challenge the validity of one scientific model without immediately proposing an alternative model in detail. It can be scientifically valid and useful sometimes to argue that some particular event is unexplainable in terms of known natural laws. When advocates of ID are making such scientific arguments, do not try to trap them or shift the terms of the debate by asking, "Who is the designer?" Instead, evaluate the scientific parts of ID on their scientific merits; evaluate the philosophical parts of ID on their philosophical merits; and evaluate the theological parts of ID on their theological merits. \*

#### Notes

<sup>1</sup>Originally given as a lecture at the American Scientific Affiliation Annual Conference, Aug. 5–8, 2005, Messiah College, Grantham, PA.

<sup>2</sup>L. Haarsma, "Does Science Exclude God? Natural Law, Chance, Miracles, and Scientific Practice" in *Perspectives on an Evolving Creation*, ed. K. B. Miller (Grand Rapids, MI: Eerdmans, 2003).

<sup>3</sup>Leaders of the ID movement have argued for this in numerous books and articles. Some of the most widely known are: Phillip Johnson, *Darwin on Trial* (Downers Grove, IN: InterVarsity Press, 1993); Michael Behe, *Darwin's Black Box* (New York: Touchstone Press, 1996); William Dembski, *The Design Inference* (Cambridge: Cambridge University Press, 1998); Charles B. Thaxton, Walter L. Bradley, and Roger L. Olsen, *The Mystery of Life's Origin* (New York: Philosophical Library, 1984); William Dembski, *No Free Lunch: Why Specified Complexity Cannot Be Purchased without Intelligence* (Lanham, MD: Rowman & Littlefield, 2001).

<sup>4</sup>A carefully reasoned book which discusses the interplay of science and philosophy in the area of design—and in particular what additional features might lead one to conclude that something is the result of supernatural activity—can be found in Del Ratzsch, *Nature, Design, and Science* (Albany, NY: Statue University of New York Press, 2001).

<sup>5</sup>L. Haarsma and T. Gray, "Self-organized Complexity and Design" in *Perspectives on an Evolving Creation*.

<sup>6</sup>A partial and illustrative list of additional evolutionary mechanisms include reproductive isolation, founder effects, neutral drift, sexual selection, environment-dependent gene expression, gene duplication, horizontal gene transfer, allopolyploidy, endosymbiont capture, differential RNA editing, ambiguous tRNA sequences, multiple proteins encoded by the same gene, and multiple functions for a single protein.

<sup>7</sup>A published example in which I believe the authors did a good job of specifying their models and their assumptions at the outset of the paper, and in which the authors reached just this sort of limited conclusion, is Michael Behe and David Snoke, "Simulating Evolution by Gene Duplication ..." *Protein Science* 13 (2004): 2651.

<sup>8</sup>From my own area of research, I would say that there is strong evidence that certain types of ion channels which display biochemical irreducible complexity evolved into their present forms via gene duplication.

<sup>9</sup>These arguments, in various forms, can be found in many books, published articles, and web articles written by advocates of ID. They also have been discussed many times on the American Scientific Affiliation e-mail discussion list, archived at [www.asa3.org/archive/asa/](http://www.asa3.org/archive/asa/), and it is primarily from this source that I paraphrased these statements.

<sup>10</sup>*Ibid.*

#### Upcoming ASA Conferences

##### August 2–5, 2007

Location: University of Edinburgh  
Edinburgh, Scotland  
Theme: "New Frontiers in Science  
and Religion"

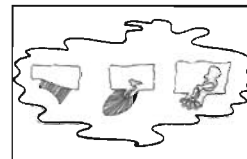
##### August 1–4, 2008

Location: George Fox University  
Newberg, Oregon

##### July 31–August 3, 2009

Location: Baylor University  
Waco, Texas





# The Positive Side of Intelligent Design: A Response to Loren Haarsma

Michael J. Behe

I appreciate Haarsma's cordial attitude in discussing a topic which too often engenders hostility. There is much in his article with which I agree, and some with which I disagree. I will confine my remarks to just a few points.

The most serious problem of the article in my view is that Haarsma appears to focus only on negative arguments for design. He repeatedly characterizes it as an argument from ignorance: "If we can show that first life and biological complexity is unexplainable (highly improbable) in terms of known natural mechanisms," we will have proven that "it was brought about by an intelligent agent" (p. 55). No, that is decidedly not the argument for design. Rather, the argument is a positive one.

As William Paley wrote two hundred years ago in his famous example about finding a watch on a heath,

When we come to inspect the watch, we perceive ... that its several parts are framed and put together for a purpose, e.g., that they are so formed and adjusted as to produce motion, and that motion so regulated as to point out the hour of the day ... The inference we think is inevitable, that the watch must have had a maker.

Notice that there is nothing in Paley's example about "known natural mechanisms" — the phrase that keeps popping up in Haarsma's essay. Rather, in essence, Paley says we infer design when we see a finely-tuned system put together for a purpose. That is still the positive argument for design. Of course, Darwinists, self-organization theorists, and others claim they know of unintelligent mechanisms that can mimic design, so an important part of the job of an ID proponent is to rebut those claims. But one should

be careful not to confuse the rebuttal of Darwinian claims with the positive argument for design.

I strongly concur with Haarsma that the message "evolution or design, one or the other" is a flawed choice. To the extent that the public has gotten that impression, it is regrettable. There is nothing in the idea of intelligent design that precludes the design being unfolded over time, and I myself judge that scenario to be the most consistent with all of the data we currently have. What's more, I am mostly happy with his statement, "Suppose the laws of nature are fine-tuned not only for the self-assembly of molecules and stars and planets, but also for the self-assembly of biological life and biological complexity" (p. 61).

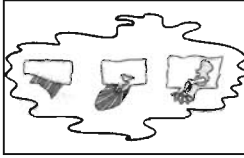
Nature may indeed be fine-tuned for the assembly of life, but I think the word "law" is quite inadequate to capture the extent of fine tuning that would be required. Rather, much more than just simple laws are necessary to account for the highly specified life we see in the universe, just as much more than simple laws of friction and momentum are necessary to account for, e.g., a highly specified trick pool shot that sinks a dozen balls at one stroke. Although laws may play their parts in the cases of both trick pool shots and the unfolding of life over time, in both cases, rather than to law, we should attribute the results to intentional design. \*



Michael J. Behe

*We infer  
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That is  
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for design.*

**Michael J. Behe** graduated from Drexel University in Philadelphia in 1974 with a B.S. in chemistry. He did his graduate studies in biochemistry at the University of Pennsylvania and was awarded the Ph.D. in 1978 for his dissertation research on sickle-cell disease. From 1978 to 1982, he did postdoctoral work on DNA structure at the National Institutes of Health. From 1982 to 1985, he was assistant professor of chemistry at Queens College in New York City, where he met his wife. In 1985 he moved to Lehigh University, where he is currently professor of biochemistry. He and his wife reside near Bethlehem, Pennsylvania, with their nine children.



*There are several versions of the argument for design. Behe emphasizes a "recognition" version of the argument ... Much of the writings of William Dembski, Paul Nelson, and other ID supporters, however, emphasize a "filter" version ... This version starts with, and depends upon, a negative argument that known natural mechanisms cannot account for something.*

## Dialogue: Reply

*The Filter Aspect of Intelligent Design: A Reply to Michael J. Behe*

# The Filter Aspect of Intelligent Design: A Reply to Michael J. Behe

Loren Haarsma

**T**here are several versions of the *argument for design*. Behe emphasizes a "recognition" version of the argument. In this version, advocates first make a positive argument for design by observing that an object has multiple parts which work together to perform an identifiable function, noting that this is a hallmark of designed objects. They then add secondary negative arguments that these parts could not have come together via known natural processes. These secondary arguments are intended to add weight to the design argument, but the initial positive argument for design is not necessarily intended to be dependent on those secondary negative arguments.

Much of the writings of William Dembski, Paul Nelson, and other ID supporters, however, emphasize a "filter" version of the argument for design. This version starts with, and depends upon, a negative argument that known natural mechanisms cannot account for something. Once known natural mechanisms and chance are eliminated as explanations for the object or event, a second argument is made that "design" is the most reasonable or compelling remaining explanation. (Many ID advocates construct the filter version of the design argument using, as their prime example, the contention that irreducibly complex biochemical structures cannot be explained by known Darwinian natural mechanisms.)

In my talk, I focused on this filter version of the design argument because I was scheduled to speak with Dembski, and because this version makes it easier to highlight which portions of the Intelligent Design theory are "scientific" even under narrow definitions of "science."

Atheists make similar two-part arguments *against* design in biology:

*Scientific claim:* Biological complexity can evolve via natural processes.

*Philosophical claim:* If biological complexity can evolve, then it was not designed.

When ID proponents focus all of their efforts on rebutting the scientific claim, they appear to be granting the philosophical claim of this argument. Evolutionary creationists believe that the philosophical claim is the real source of the problem, and that this is where the real battle lies.

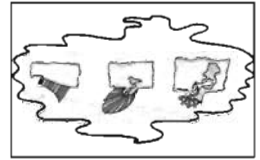
I would love to see, henceforth, every argument supporting ID start with a vigorous rebuttal of the atheists' philosophical claim before proceeding to attack the scientific claim. And I would love to see, henceforth, that every evolutionary creationist on their way to argue against the atheists' philosophical claim would also acknowledge that ID raises valid scientific questions which can be studied scientifically. \*

### Bookstore

#### ASA's Book Service

Our newly designed website  
[www.asa3.org](http://www.asa3.org)

offers a **Bookstore** with a monthly featured book and a list of recommended books that may be purchased online. These works are chosen to serve a broad range of interests in the field of science and Christianity.



# Intelligent Design and Evolution: Do We Know Yet?

John A. Bloom

**A**t its 2005 Annual Meeting, the ASA hosted a symposium on *Models of Creation: Intelligent Design and Evolution*. A number of people thought that Haarsma's contribution was especially worthy of wider dissemination, so we asked him to submit it as an article to this journal. I also asked Behe to offer some brief comments in response to it. He makes the very important clarification here about positive and negative arguments for ID.

I especially appreciated Haarsma's balanced insights on the scientific, philosophical, and theological aspects of ID, and his call for advocates of ID and advocates of evolution to avoid sweeping generalities in their conclusions. Too often the stark picture of "either ID or evolution" is painted, yet there are ID theorists (such as Behe) who recognize that design can be evident in a system which has no obvious casual gaps. So there is the real possibility that *both* ID and evolution are valid inferences from the data.

Let me say that it is critical that we be very careful with our definitions of "science" and "scientific." Haarsma writes that the goal of science is to seek naturalistic explanations, but since our culture equates "science" with "truth," and supernatural explanations by his definition are outside the realm of science, many would conclude that supernatural explanations are untrue by definition. To avoid this truth = science = naturalism trap, many scientists and philosophers say that the goal of science is to seek the best possible explanation, without presuming a naturalistic limitation.

It is also important to remind ourselves that, like ID, evolution itself includes scientific, philosophical, and religious arguments. To many, "evolution" by definition is a process that is random, unguided, and undirected—something God would not do. "Evolutionary creationists" must be careful

in their use of these terms, because to many they appear to form an oxymoron. Moreover, atheists assert that evolution intellectually supports their belief that a creator is not necessary, and that any compromising positions with theism or deism are unwarranted. Against such hostility all Christians, no matter what their beliefs may be about the specific actions of God in creation, need to take a clear and united stand. Too often we squabble over details among ourselves and leave the atheists unchallenged in the public square.

My hope is that the symposium and these articles will reduce the "either/or" tensions and focus our future discussions on the most critical questions related to origins issues: In order to be scientific, are we restricting ourselves to naturalistic explanations and papering over real casual gaps in nature because we can *imagine* scenarios that may bridge them? Are we assuming the burden of proof to actually demonstrate what we imagine? Is the burden of proof unnecessary because our model is more scientific? Or, in order to have the clearest proofs for God's existence, are we seeking dramatic gaps in nature when the real picture is more subtle? Are we looking for God's actions in the wrong places?

Perhaps the best answer here is one that we least like to hear: "We don't know ... yet." There is certainly something about the universe that cries out to us that it is created, but many of the details of how God intervened/guided/established it remain open questions. As Christians, our calling is to pursue truth with a spirit of humility. Let's keep an open mind, be aware of our personal biases, and study this further. ★



John A. Bloom

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Let's keep  
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**John A. Bloom** is a professor of physics at Biola University and director of Biola's new Masters Degree Program in Science and Religion. He holds Ph.D.'s in physics from Cornell University and in Ancient Near Eastern studies from the Annenberg Research Institute (now part of the University of Pennsylvania).



## Art Eyes Science

*Sand Castles; Or, Ode to Charlie*

### Sand Castles; Or, Ode to Charlie

*Harry Lee Poe*

The *foolish man* built his house upon the sand  
in the dunes on an ocean front lot  
(purchased from the man who developed the land  
from wild jungle into suburban sprawl).

Once an island, remote and alone,  
covered by myrtle and live oak  
with a seasoning of palmetto trees  
and a fringe of sea oats and marsh grass  
populated by white tail deer, raccoons, and snowy egrets,  
it is now transformed into a profitable resort,  
a haven of golf carts.

Where gulls and herons once flocked by the marsh,  
the smart set gather for cocktails,  
the tangle of sea island plants replaced  
by a landscape architect's design.

The tribute to prosperity rests beside the ever rolling sea  
that piled up the little spit of sand  
with all the stability of a sand castle  
before the rising tide—  
the sea that sits crouched  
waiting for its next meal.

Hurricane season 2004

After dodging Charlie at Pawley's Island

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**Harry Lee Poe** serves as Charles Colson Professor of Faith and Culture at Union University in Jackson, Tennessee. He has published several books on science and religion, including *Designer Universe and Science and Faith: An Evangelical Dialogue with Jimmy Davis* and *What God Knows: Time and the Question of Divine Knowledge with Stan Mattson*. In his spare time, Poe serves as president of the Edgar Allan Poe Museum of Richmond, Virginia.



## The Arrow of Time

*Harry Lee Poe*

**T**he arrow of time is  
a one-way street,  
a moving train,  
a passing breeze,  
a dream after waking  
that is never dreamed again.

**T**he arrow of time flies  
a steady course,  
a certain flight,  
a perfect arc,  
an airborne token set in motion  
that never will return.

Jackson, TN  
February 19, 2006



## Art Eyes Science

Salvaged Stone

# Salvaged Stone

(John 21)

Paul Arveson

**B**y palm trees swaying  
In balmy breezes,  
With spineless, pineless  
Coldless sneezes,  
Seven missing, fishing,  
Wishing, sorry sailors  
Seated in the sea.

**B**y sandy smoky  
Campy beachfire,  
Whiteclothed one-man,  
Beard and sandal  
(Bruise and scandal)  
Waving sadly.

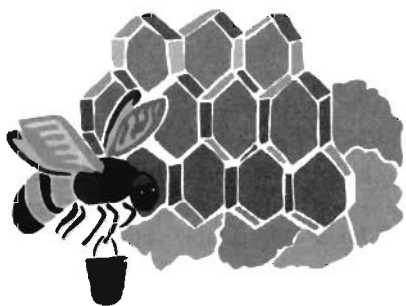
**I**n the seaboat  
Saw the sailors  
One-man waving  
(Seashore waving).  
Immersed boldly,  
Swimming strongly  
Cephas shoreward.

**F**ishes sizzling,  
Smoking skyward,  
Sandy barefoot  
Spikewounds sealed!  
Standing—handing,  
His healed handholes  
Served the sailors fish.

**T**hese healed handholes  
Held the sins  
Of seven sailors  
With iron pins.  
Then the Servant  
Said in the breeze,  
“Do you love me  
More than these?”

**Paul Arveson** has a B.S. in physics and an M.S. in computer systems management. He has served as a physicist in the Navy, a web developer for NASDAQ, a technology architect in the Office of Science, and is now a strategic planning consultant. His wife Kathy is a pastoral counselor, and he has two daughters: one is a nurse and the other just received her BA (cum laude). Paul joined ASA in 1974.





## Hives Save Lives

*Linda Whitby, c/o Chapel & York, PMB #293, 601 Pennsylvania Ave. NW, Ste. 900, South Bldg., Washington, DC 20004*

**A**frica is the only continent poorer now than it was twenty-five years ago. In many African countries, life expectancy is now less than thirty-three years. There are 34 million orphans in Africa, 30 million people are facing starvation, and 30,000 children die from largely preventable diseases daily. Statistics on this scale take humanity out of the equation, and contribute to the "compassion fatigue" of potential donors. They create a sense of helplessness in terms of effecting any real change. Individual human beings are overlooked in the debate raging around debt relief, trade barriers, and corrupt governance.

But what do the men, women and children suffering under the burden of poverty see as a solution? Many of them simply need, and want, the opportunity to earn their own living. A sustainable solution for Africa is to provide support directly to those who need it most by creating self-employment.

### Driving the economy from the bottom up. Replacing aid dependency with economic activity.

Hives Save Lives—Africa (HSLA) works toward the creation of self-employment and income generation through apiculture. We believe that debt relief will only be effective if translated into development, driven internally. The raising of trade barriers is only effective if the people have something of value to trade. The demise of corruption will only occur when marginalized communities have the education and the voice to speak out against it.

Beekeeping can be a very powerful tool in income generation. It is a traditional activity in many parts of Africa and is culturally and environmentally appropriate. Income is generated not only from honey and hive products, but also from increased crop yields as a result of the pollination activities of the bees. Beekeeping can also be practiced by the most marginalized communities in Africa because it does not discriminate in terms of age, gender, or disability.

HSLA is currently working in Uganda, where we provide a "package" of hives, training, and equipment to groups prepared to take a commercial approach to beekeeping, to maintain records, and to repay the cost of the hives over a five-year period. Training and support therefore are focused on helping people with business as well as beekeeping skills.

The hive we are using has been designed for use in Africa to improve the quality and quantity of honey produced. A prototype was shipped to Uganda, and is now being made by local contractors, along with the protective clothing, to boost local employment. A single hive costs \$60.00 to make and can generate over \$70.00 every year from honey and other hive products.



Beekeeper lifts a frame from hive.

A typical beneficiary project is the Uganda Gospel Rehabilitation Centre (UGRC), a three-hour drive from Kampala. The centre was started in the aftermath of the civil war to give shelter to hundreds of orphans, and has developed today into a school which serves a large parish. It still supports orphans, although now they are more likely to be the victims of HIV/Aids than armed conflict. The school is typical of many rural schools with no electricity, water that has to be pumped daily from the borehole, and basic necessities such as books and bedding in short supply.

Initially, they were given twenty hives, and two staff members attended a seven-day training course. There were many teething problems to overcome, such as ants invading the hives, but every setback created a learning opportunity. They persevered until the hives were colonized and productive. They have now trained three more staff members and have taken delivery of another forty hives. The long-term plan, proposed by the school itself, is to extend the project to families in the parish and to use the school as a collection point during harvesting periods.

## News & Views

*Hives Save Lives*

The entire community will ultimately benefit.

The children are learning a life skill that they can take with them when they leave. The school can plough income into basic necessities without being dependent on hand-outs. Crop production is on the increase; and local farmers are seeing firsthand the benefits of diversifying into bee farming, rather than "honey hunting."



### Challenges remain.

There are logistical problems because roads are in poor condition posing substantial transport difficulties. There are security concerns in some parts of the country, and this very fact makes these the areas most in need of alternative income streams. Above all, there is the need to generate funds to keep the manufacturing and training on track.

While current production levels are too low to make export viable, there is plenty of capacity on the domestic market to guarantee a ready market for the honey produced, and when production levels rise there is excellent potential for organic certification to boost the market value. Above all, however, there is the determination of the people themselves to seize the opportunity to work their way out of the poverty spiral.

*For more information, and to find out how you can support the work of HSLA, please log on to [www.hivessavelives.com](http://www.hivessavelives.com), or email [info@hivessavelives.com](mailto:info@hivessavelives.com).*

Hives Save Lives—Africa Inc is a 501(c)(3) nonprofit organization. Donations to HSLA are tax deductible to the extent allowed by law. EIN: 30-0202601



## CiS/ASA Meeting Field Trips August 2, 2007

### **The Royal Botanic Garden Edinburgh**

The Royal Botanic Garden Edinburgh was founded in the seventeenth century as a "Physic Garden," growing medicinal plants. This first Garden was in St Anne's Yard, part of the Holyrood Palace grounds, and occupied an area the size of a tennis court. It now extends to four sites and is the second richest collection of plant species in the world. Wear comfortable shoes, water-proof coat.

[www.rbge.org.uk/rbge/web/visiting](http://www.rbge.org.uk/rbge/web/visiting)

### **The Falkirk Wheel**

Almost 100 years ago, a series of eleven locks was used to connect the Forth & Clyde Canal, running from Glasgow, to Edinburgh's Union Canal. To encourage waterway usage, the Falkirk Wheel was designed and constructed to provide a twenty-first century solution to join the canals.

[www.thefalkirkwheel.co.uk/index.asp](http://www.thefalkirkwheel.co.uk/index.asp)

### **The Royal Museum**

The Royal Museum houses the outstanding international collections of Decorative Arts, Science and Industry, Archaeology and the Natural World and contains an extraordinary range of material. Thirty-six galleries of varying sizes present artefacts from around the globe and natural history specimens.

[www.explore-edinburgh.com/museum.html](http://www.explore-edinburgh.com/museum.html)

### **Scottish Seabird Centre**

Perched on a rocky outcrop at North Berwick Harbour, overlooking the islands of the Firth of Forth and sandy beaches of East Lothian, the Scottish Seabird Centre is a world leader in remote wildlife viewing. With cameras located on these wildlife rich islands, visitors can pan and zoom to see the tiniest details (like the ID ring on a bird's foot) and observe thousands of nesting seabirds and marine mammals, without disturbing the animals in any way. Bring warm waterproof clothes, hat, non-slip shoes.

[www.seabird.org](http://www.seabird.org)

### **Arthur's Seat—Geology**

Hutton's Section at the south end of Salisbury Crags is a prominent landmark on Arthur's Seat and the cityscape of Edinburgh. It was here in the late eighteenth century, that James Hutton, the father of modern geology, found evidence that Salisbury Crags was once molten rock. The evidence drawn from this locality was instrumental in Hutton's *Theory of the Earth* (1788).

[www.scottishgeology.com/outandabout/classic\\_sites/location/huttons\\_section.html](http://www.scottishgeology.com/outandabout/classic_sites/location/huttons_section.html)

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# Book Reviews



## ANTHROPOLOGY & ARCHAEOLOGY

**JESUS AND ARCHAEOLOGY** by James H. Charlesworth, ed. Grand Rapids, MI: Eerdmans Publishing Co., 2006. 740 pages. Paperback; \$50.00. ISBN: 080284880X.

The chapters in this book, in the words of the editor, "disclose how New Testament scholars learn from archaeologists, who are expert stratigraphers of archaeological sites, and how archaeologists garner knowledge from New Testament scholars, who are experts in the stratification of texts" (p. xxiii). They focus on this question: how do archaeological discoveries help shed light on the world, acts, and teachings of Jesus?

This book contains lectures that archaeologists delivered in Jerusalem to celebrate the new millennium. Some presenters came to speak directly from sites where they were carrying on excavations. The thirty-one authors write about locations (i.e., Bethsaida, Mount Tabor, Mount Zion), people (i.e., Pilate, Judas, Antipas), places (i.e., cemeteries, the temple, synagogues), practices (i.e., exorcism, spirituality, baptism), and theology (i.e., John's Gospel, the resurrection, the historical Jesus). The contributors come from Israel, the Netherlands, the United States of America, Ireland, Canada, Australia, and Switzerland.

The editor, James H. Charlesworth, is George L. Collord Professor of New Testament Language and Literature and Director of the Dead Sea Scrolls Project at Princeton Theological Seminary in Princeton, NJ. He has edited other volumes, among them are the *Old Testament: Pseudepigrapha* volumes 1 and 2, *Jesus' Jewishness* and *Jesus and the Dead Sea Scrolls*. In this book, he wrote the preface, the first chapter ("Jesus Research and Archaeology") and conclusion ("The Historical Jesus and Biblical Archaeology: Reflections on New Methodologies and Perspectives").

The book's many helpful features include (1) a list of academic affiliations of all the authors; (2) some black-and-white photographs; (3) a glossary; (4) selected bibliography; (5) geographical, scripture, and ancient text indices; and (6) nine pages of abbreviations for modern publications, ancient documents, ancient writers, apocryphal writings, and pseudepigraphal writings.

Charlesworth, in his conclusion, summarizes some findings of archaeology: (1) a vineyard, winepress, walls, Mary's well, and towers have been found in or near Nazareth; (2) the locations of Cana and Bethsaida may have finally been discovered; (3) findings at Sepphoris shed light on culture and rabbis; (3) many synagogues have been located; (4) Caesarea Maritima and Sebaste in Samaria are being excavated; (5) light is being shed on Jerusalem, the temple, Pilate, Caiaphas, Simon of Cyrene, and the practice of crucifixion.

No book in the world is more studied and revered than the Bible, and the most important person in the Bible is

Jesus. This book describes the methods, results, and implications of digging into the past, and it explains in an interesting and informative way how this all relates to Jesus. The price of *Jesus and Archaeology* seems reasonable when its length is considered. Those who might purchase this book include professionals, libraries, churches, and interested laypersons. I recommend they buy it.

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



## ENVIRONMENT

**SERVE GOD, SAVE THE PLANET: A Christian Call to Action** by J. Matthew Sleeth. White River Junction, VT: Chelsea Green Publishing, 2006. 216 pages. Hardcover; \$25.00. ISBN: 1933392010.

Sleeth writes with a convert's zeal about how he and his family gave up their wasteful American lifestyle for what at times seems like an obsessive pursuit of a more Earth-friendly way of life. Sleeth was a successful physician when he heard God's call to creation stewardship. He now works full-time to convince Christians that caring for creation should be a priority. This book (and his website [servegodsaveplanet.org](http://servegodsaveplanet.org)) is a distillation of what he advocates in his ministry.

While examples are woven into the book, it does not give a systematic account of environmental degradations. Perhaps Sleeth assumes readers are already aware of pollution, global warming, etc. Instead, he starts with an exhortation for individuals to become agents of change for God's purposes. This is followed by a chapter about why Christians should care for God's creation, providing good answers to common questions and objections.

Most of the chapters concern specific areas of life, using the experiences of the author and his family to describe how we can be better stewards of creation. Topics include excessive consumption, our need for physical work and Sabbath rest, television, raising children, food choices, household habits, holidays, energy use, medicine, and population. A final chapter reminds readers that all must be done in love, and that part of loving our neighbors is caring for the planet we all share. Useful appendices contain a personal energy audit, practical advice regarding appliances, and a "Let it begin with me" prayer list with suggested ways to ask God to help us change things for the better.

There is much that is good about this book. It is written in an engaging and accessible style, and it is full of practical advice. The author does a good job of walking the fine line of conveying the seriousness of our problems while encouraging readers that there is hope and that God's people can make a difference. A more difficult line is the one between conviction and guilt; the book is so effective (at least for this reader) in revealing our selfish, wasteful lives that some readers might be overwhelmed by guilt. To his credit, Sleeth mostly takes an encouraging tone rather than promoting guilt trips. Finally, unlike most environmental books (even Christian ones), its evangelical bent is clear throughout. Many Christians will listen to this creation-care message who would never listen to Al Gore.

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Nevertheless, I hesitate to recommend the book because it seemed like every few pages I noticed an erroneous statement, a sweeping unsupported assertion, an oversimplification, or a dubious biblical interpretation. For example, unsubstantiated assertions are made about "chemicals" in the environment being responsible for increased cancers in humans and pets. Sleeth repeats the nonsense that life contradicts the Second Law of Thermodynamics. He says that the Book of Revelations predicts nuclear weapons and television.

As I was shaking my head at this, I was reminded of Rick Warren's *The Purpose Driven Life*. Both books are sometimes shallow, make sweeping overstatements and generalizations, and sometimes use Scripture in questionable ways. Then I thought about how many people read Warren's book. Maybe *Serve God, Save the Planet* is not for readers who value nuance, careful argument, and learned exegesis. But it may well reach a mass audience, and it is the masses who will need to change if the church is to be a positive force in creation care. If just half the people who read *The Purpose Driven Life* would read this book and be moved to live differently, the positive impact on God's Earth would be substantial.

Reviewed by Allan H. Harvey, 1575 Bradley Dr., Boulder, CO 80305.

**DANCING AT THE DEAD SEA: Tracking the World's Environmental Hot Spots** by Alanna Mitchell. Chicago, IL: The University of Chicago Press, 2004. 239 pages, index. Hardcover; \$25.00. ISBN: 0226532003.

Mitchell was formerly an international award-winning senior features writer at the *Globe and Mail*, Canada's national newspaper. In 2000 and 2001, the World Conservation Union and the Reuters Foundation cited her work as the best environmental reporting in North America and Oceania. In 2000, both organizations named her the best environmental reporter in the world. She currently lives and writes in Toronto, Ontario, where she is working on her next book.

*Dancing at the Dead Sea* is the product of her three-year journey to several of the world's most environmentally endangered areas. The journey begins at an international conference on conservation in Amman on the Jordanian bank of the Dead Sea. In a later chapter, Mitchell describes the successful reintroduction of the Arabian oryx to the Jordanian desert. In contrast to this positive symbol of conservation, she also documents the diminishing water levels of the Azraq oasis and the Dead Sea due to unbridled irrigation and industry. This pattern is repeated throughout the book as disturbing descriptions of environmental degradation are contrasted with inspiring examples of conservation.

Examples of environmental problems include the rampant deforestation on the island of Madagascar, the thinning of the sea ice in the Arctic region of Canada, and the loss of biodiversity on the Galapagos Islands. More hopeful examples of conservation come from the country of Suriname, where about 90% of the rainforest in the country remains intact, and from Iceland, which intends to do away with fossil fuels in favor of harnessing geothermal energy and the energy of hydrogen.

The book, however, is more than just a description of a few conservation victories mixed in with a number of environmental problems. At each location, Mitchell introduces the reader to scientists and conservationists who are trying to protect these environmental hotspots. She also describes the dilemmas that people face as they utilize natural resources in ways that not only diminish biodiversity, but also threaten the future existence of local human populations and cultures. Mitchell raises concerns about extinction rates, global climate change, and the worldwide exploitation of natural resources. She also raises questions about the future viability of the human race if we continue on our present path of population growth, overconsumption, and environmental degradation.

The main purpose of the book is to challenge the belief that the earth will keep providing no matter how we stretch its means. The process of changing this "legend" of the earth's inexhaustibility is compared to the difficulties that Charles Darwin faced as he developed and published his ideas about evolution. Just as the people of his day were reluctant to change their thinking about the fixity of species and the compromised status of human beings that evolution implied, so people today are not easily convinced that the earth's resources are finite. Mitchell spends an entire chapter comparing the society of Darwin's day with our own. She writes:

I am convinced that my modern society is facing the same seismic challenge to legend that Darwin's society faced in 1859 when he published *On the Origin of Species*, that in some ways, the modern debate about ecological crisis still revolves around the place of humanity in creation (p. 20).

She firmly believes that just as past attitudes were changed as a result of Darwin's publications, present attitudes can also be changed as people all over the world come to grips with the reality of our planet's exhaustibility.

This book is not only an ecological travelogue to some of the world's environmental hotspots, it is also an impassioned plea for worldwide conservation and sustainable economic development. Above all, it is a challenge to our present, human centered way of thinking. It is a book that will be applauded and appreciated by anyone who is already concerned about the current worldwide ecological crisis. Hopefully it will also be read by many others who presently do not share this concern.

Reviewed by J. David Holland, Biology Instructor, Springfield College in Illinois, 1500 North Fifth Street, Springfield, IL 62702.

**ENVIRONMENTAL STEWARDSHIP: Critical Perspectives – Past and Present** by R. J. Berry, ed. New York: T & T Clark International, 2006. 338 pages, index. Paperback; \$49.50. ISBN: 0567030180.

Berry is a professor emeritus of genetics at University College, London. This book contains twenty-six essays. The core essays are updates of papers from a 2000 conference to explore "the Christian approach to the environment" at Windsor Castle. Berry wrote a very useful introduction in which he states that stewardship is about caring. For some, the idea of a steward is wholly negative, suggestive of subservience and hierarchy, absentee land-

lords and exploitation. This distaste is echoed in some of the essays in this book. Other contributors seek to avoid such negative associations by exploring alternatives: trustee, agent, companion, priest. The authors make clear that "steward" has come to have a very restricted meaning in public relations and much church usage. Commonly it is nothing more than an unconscious synonym for the unavoidable interactions between humans and the physical, biological, social, and cultural environment that surrounds them.

Berry asks if we can improve on this. Some writers insist that a firm theology must underlie any ethic of stewardship while other contributors concentrate on what may be called enlightened self-interest. Berry notes that at this point we could be sidetracked into the range of apocalyptic enthusiasm that could lead some to neglect environmental care—he names James Watt, the US Secretary of the Interior in the early 1980s—but he has resisted a discussion of various forms of premillennarianism.

Stewardship is often used as little more than a formal response to environmental situations, and it is often equated with asceticism and denial, or with diligent recycling. The concept of stewardship involves much more. Several essays are concerned with practical stewarding. Some of the contributors are devotees of stewardship; others are less convinced for a variety of reasons. But there are common themes. One is the recognition that stewardship is the key link between economy and ecology which produces sustainable development.

But the implications of stewardship extend into apologetics and soteriology. The Anglican and other churches have extended their definition of mission to strive to safeguard the integrity of creation and sustain and renew the life of the earth.

Berry writes that creation care is more than pragmatic witness and evangelistic possibility; it is fundamental to our faith in God who is Redeemer and Sustainer as well as Creator. Good theology and good science are essential complements. To ignore God, claiming that stewardship is an option for the few but irrelevant to most Christians, is to misunderstand and endanger people's purpose here on earth. It is sin.

The book contains many riches. I mention two chapters that I found particularly rewarding.

1. H. Paul Santmire contrasts the creation theology in the priestly and Yahwist stories with those in the book of Job. He says that the Yahwist story, with its small-scale agrarian setting, exemplifies what sensitive care for the earth can mean. In this theological drama, the land is a character in its own right. The human's relationship to the animals is depicted in terms of tangible solidarity rather than intervention. Santmire notes that in the Bible there is no doctrine of "cosmic fall." The soil remains innocent; the divine curse rests on it because of the disobedience of humans and because of the fruits of violence that grow from that disobedience. The promise is that, in Christ, with the deep human fault healed and the curse removed, humans can begin to live in Eden again. In contrast, in Job we are led into the experience of a wilderness. We see noble wild creatures nurtured by God, celebrated precisely because they resist human domestication. No longer is conquering and controlling nature part of the equation

for discerning human dignity. Instead there is a complex and rich biblical theology of partnership among God, humans, and all other creatures.

2. Murray Rae goes further in developing a theological framework for human responsibility for the environment. He says that humans cannot make do with a merely secular meaning of the term stewardship or whatever; language must be filled with attentiveness to the action of God through Christ and the Holy Spirit. It is God who is finally responsible for bringing the creation to its fulfillment. Christians look forward in hope, not simply to the maintenance of this present order, but to its transformation.

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

**SCIENCE, SOUL, AND THE SPIRIT OF NATURE: Leading Thinkers on the Restoration of Man and Creation** by Irene van Lippe-Biesterfeld. Rochester, VT: Bear & Company, 2005. 303 pages. Paperback; \$18.00. ISBN: 1591430550.

Irene van Lippe-Biesterfeld, princess of the Netherlands, believes that humans are alienated from nature and must rediscover their connection to the cosmos. She is involved in ecology by managing a nature reserve. This book is the outcome of her visits to twelve visionary thinkers who are involved in ecological issues.

The questions she asked the environmentalists related to how they defined nature, the practical aspects of their love of earth, and the measures they regarded as necessary to prevent further damage to the ecosystem. The environmentalists think anthropocentric beliefs result in overconsumption of nonrenewable resources. In their views, there has been an unacceptable extermination of living things through the destruction of habitats, devastation of wetlands, overgrazing by stock, mismanagement of water reserves, deforestation, and the pollution of the air, rivers, and the sea.

Counteracting these deleterious effects by humans, these ecologists believe that there is a growing number of people who are actively engaged in lobbying governments to bring about a change in attitude. Sometimes greed of individuals, especially those in positions of power, forestalls their efforts.

Accompanied by van Tijn, a journalist, the author interviewed Credo Mutwa, an oral historian and Zulu healer of minds and bodies, who has no place for the Christian God. Credo considers that even inanimate things have feelings and that water can be made alive. Jane Goodall, also interviewed, emphasized the importance of developing sustainable lifestyles and having contact with nature through science. Her studies of chimpanzees indicate that they show emotions and have the ability to think. Her views gained a listening ear only from the child psychiatrists and psychologists; otherwise, her findings met with hostility within the University. Goodall considers humans in the main unfaithful trustees of nature, and she emphasizes the education of children in the care of creation.

The final interview was with Patricia Mische. Her approach is pantheistic where human well-being is linked with the health of the earth community. Patricia thinks

religion is important and that Christianity has not separated itself from nature. She considers love the strongest power exercised by humanity.

Whereas one can fully support the message of this book that human well-being is linked to the health of the earth, some of these visionary thinkers have illusions which cannot be accessed by scientific means. However, the views of those interviewed do support the author's premise that humans in the main have been unfaithful trustees in their care of nature. The book will be useful to ecologists who will be challenged in assessing different and sometimes nebulous viewpoints.

*Reviewed by Ken Mickleson, a member of A Rocha Aotearoa, New Zealand, of Epsom, Auckland.*

**LIVING THE GOOD LIFE ON GOD'S GOOD EARTH**  
by David S. Koetje, ed. Grand Rapids, MI: Faith Alive Christian Resources, 2006. 85 pages. Hardcover; \$9.50. ISBN: 1592552927.

This book results from a 2003 workshop on "Christian Environmentalism With/out Boundaries." Its ten chapters by ten different authors give practical advice, as foreword author Ronald Sider notes, "on what we should eat, what clothes we should wear, and even what kind of house we should live in" (p. 7). The authors also write about Christians' relationships to energy, vegetation, work, rest, and enjoyment. Each chapter has questions for reflection and discussion. There is also a list of books for additional reading.

The book's intention is to demonstrate that authentic Christian faith is not anti-ecological, involves caring for the earth, and is demonstrated by living a life of ecological obedience and thanksgiving to God. The authors believe that Christians who live as God intended will experience joy, freedom, and shalom.

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



## FAITH & SCIENCE

**QUARKS, CHAOS AND CHRISTIANITY** by John Polkinghorne. New York: The Crossroads Publishing Company, 2005. 122 pages. Paperback; \$14.95. ISBN: 0824524063.

Polkinghorne hardly needs an introduction to ASA members. The former theoretical physicist and has now been an Anglican priest for about twenty years was knighted in 1997 and awarded the Templeton Prize in 2002. He has written about twenty books in the last twenty years aimed at a general audience mostly on the relation between science and Christianity.

The author describes this book as an "overview" while many of his other books offer more detailed discussions of aspects of the science/religion topic. This book contains no equations or figures and provides some suggestions for further reading, including other books by Polkinghorne.

The content of the book is indicated by the titles of the eight chapters: Fact or Opinion, Is There Anyone There? What's Going On? Who Are We? Can a Scientist Pray? What About Miracles? How Will It End? and Can a Scientist Believe?

In explaining the parallel approaches to truth, Polkinghorne points out that science does not address the "whole truth" and religion involves necessarily a "leap into the light, not the dark," i.e., faith. Furthermore, God is not subject to experiment.

In supporting the idea of God, he details, as in many current books, the idea of the "impossible universe," the need for incredible fine tuning in cosmology and biology for our universe and humankind to appear. He quotes Paul Davies in a surprising claim that "it may seem bizarre but, in my opinion, science offers a surer path to God than religion." (This brings to mind Rom. 1:20.)

Polkinghorne quotes Hawking's challenge that if the universe has "neither a beginning nor an end then what place for a Creator?" and answers "Everyplace. As the Ordainer and Sustainer of all that is going on." "God of the whole show—not just the beginning." He recognizes the troubling problem of evil and the mystery of suffering of innocent people and resigns himself to the appreciation of this enigma by the Almighty in allowing Jesus to suffer the ignominious end of life on this earth with profound theological meaning.

In "Who Are We?" he presents perhaps the most prominent idea in the book, namely that "chaos," as understood in recent scientific studies, is a powerful tool in rebutting the reductionist (mechanistic) view that we are merely the sum of our parts to be completely explained by the deterministic laws of science. Instead "chaos" with its idea of unpredictability and yet creation of orderly patterns through collective effects, points to emergence of properties, from wetness to possibly "consciousness" and allows God, perhaps, to interact on earth through "information input." (A "top-down physical process" vs. the bottom-up reductionist mode.) However, "Divine action will not be demonstrable by experiment though it may be discerned through the intuition of faith."

Polkinghorne points out that some of the miracles in the Bible may have scientific basis but others are beyond science, e.g., turning water into wine. Still he finds the testimonies of witnesses convincing. He does not reject the controversial thesis that God may not completely know the future (which depends on actions of agents with free will), but is confident in the resurrection of believers because "God will remember the pattern in which we are made and recreate us."

This book discusses many reasons why a scientist may be led to a belief in God. The one point of possible importance that is not given prominence by Polkinghorne is that of religious experience and the vacuity of science as a source of help when someone, even a brilliant scientist, is in the throes of a profound human trauma—like illness, death, crime victim, betrayal, etc. Still one must applaud Polkinghorne for this book and his whole life of service to his God as scientist as well as priest.

*Reviewed by John M. Osepchuk, Full Spectrum Consulting, 248 Deacon Haynes Road, Concord, MA 01742.*



**WONDER AND WISDOM: Conversations in Science, Spirituality, and Theology** by Celia Deane-Drummond. West Conshohocken, PA: Templeton Foundation Press, 2006. 165 pages, notes, bibliography, index. Paperback; \$19.95. ISBN: 1599470918.

Celia Deane-Drummond, a professor of theology and the biological sciences at the University of Chester in the United Kingdom, addresses the complex relationships between religious experience and the natural sciences. She begins with a discussion of the emotion of "wonder," and segues into the Wisdom of God, arguing that incorporating these two can result in a deep spirituality which brings science and theology together.

The author has many useful insights, but her writing style is difficult to follow. The book reads much like lectures. Many times sentences begin with "But," or "Yet," or "However," and she has an irritating (to me) habit of introducing a topic and then saying "I will say more about this later." I found reading the book, at times, quite painful; that is unfortunate because her ideas are worth consideration. Perhaps it is the UK academic writing style; for an American audience, it could have used a good editor.

She does well in tying together wonder and wisdom under the term "imaginative intellect." Focusing on the sometimes neglected human faculty of "paying attention," she observes that elimination of any aspects of teleology from scientific "wisdom" almost necessarily eliminates the wonder of it all. An obsessive devotion to wisdom, she claims, is almost bound to fail as a viable worldview.

A companion book to this, *Wonder* by Robert Fuller, was reviewed by Richard Ruble in *PSCF* 58, no. 3 (2006): 251. From that review, I conclude that Fuller's book is probably the better of the two.

With all the criticism above, the book is recommended for its exploration of novel ideas in the contemporary science-theology dialog. It will remind the reader of the days of childhood when "wonder" was a constant companion. That is not altogether a bad attitude to take.

*Reviewed by John W. Burgess, 36633 Road P.8, Mancos, CO 81328.*



## GENERAL SCIENCES

**WORLDS OF THEIR OWN: Insights into PseudoScience from Creationism to the End Times** by Robert Schadewald. Excelsior, MN: SangFroid Press, 2006. 240 pages plus references, appendices, and bibliography. Hardcover; \$21.95. ISBN: 0917939158.

Schadewald, who passed away in March 2000, was a science writer and former president of the National Center for Science Education. Bob was also my friend. He spent his career writing about various offbeat views. His articles span the range from perpetual motion machines to creationism, the flat-earth theory, and Velikovskisms. This book is his first and is posthumously published.

The book covers a wide range of topics in pseudoscience, beginning with a review of the Immanuel Velikovsky affair. In the early 1950s Velikovsky, a medical doctor, wrote a book which attempted to explain the

miracles in the Old Testament by having the planet Venus ejected from Jupiter and then careening around the solar system causing havoc and producing manna eaten by the Israelites. Unfortunately, contemporary scientists suppressed the book causing Macmillan Publishing Company to sell the bestseller's rights to another publisher. This action made Velikovsky's book sell even better. Schadewald conducted the very last interview with Velikovsky one week before his death.

The book then turns to perpetual motion flim-flam men. Schadewald begins with an April Fools' article he wrote for *Science Digest*, but people took it seriously. Becoming interested in the area, he traced the history of these machines back into antiquity, following their development to the present. The book covers such scams as the Keely Motor, the Jeremiah 33:3 machine, and the 1916 case of Louis Enricht who convinced people he could run a car with water as the fuel. The gullibility and greed of humanity shines through in this section. Many inventors not only obtained patents on their devices; they also raked in millions of dollars from investors before the enterprises collapsed.

The flat-earth section is probably the most fascinating. Presenting several of the flat-earth arguments, Schadewald surprises his readers with how difficult it is to answer some of their arguments. The book is worth buying and reading for just this section. He tells of the Bedford Canal swindle in which Alfred Russell Wallace, co-discoverer of natural selection, defended the round earth, picking up £500 prize for showing the earth's surface was spherical, but then costing him years of lost reputation and legal expenses. The flat-earth belief then jumped the Atlantic, landing in Zion, Illinois, where it was against the law to own a globe or teach children that the earth was round. The Bible, it was said, forbade such nonsense. Schadewald brings the Christian face to face with the fact that the flat-earth movement was a 100% Christian movement with arguments not only brought forth from nature but also from Scripture. In this respect, it appears that the flat-earth movement is analogous with young-earth creationism, even leading to the teaching of the flat-earth theory in the public schools.

Schadewald keeps the reader interested by constantly relating anecdotes. In order to get the flat-earth journals, Schadewald had to join the society. After he wrote articles critical of the flat-earth view, he was thrown out of the society for having "spherical tendencies." Some time later, however, Schadewald was allowed back in, eventually being asked to become its president, which he declined.

There is a section covering young-earth creationism which compares it with the way other advocates of pseudoscience ignore data, make up data and otherwise twist the world to fit preconceptions.

Normally, appendices are not worth reading. This is not the case with this book. Often pseudoscientists claim that the future will vindicate them. They cite Alfred Wagner's advocacy of continental drift as a case in point. Schadewald examines this claim by comparing Velikovsky's *Worlds in Collision* with Wagner's ideas of continental drift. Initially, science rejected both, but came to accept continental drift. Schadewald explains why. Understanding this case gives one counter-arguments to this

old chestnut in which the nut claims that the future will be kind to him.

The book is entertaining, well written, and full of anecdotes useful for the dinnertime raconteur.

*Reviewed by Glenn R. Morton, 10131 Cairn Meadows Dr., Spring, TX 77379.*



## ORIGINS & COSMOLOGY

**CREATION AS SCIENCE** by Hugh Ross. Colorado Springs, CO: NavPress Publishing Group, 2006. 288 pages. Hardcover; \$21.99. ISBN: 1576835782.

This book provides a comprehensive coverage of all issues related to origins, and it also presents a new model, called the RTB (Reasons to Believe). The purpose of this effort is to show that the RTB model is testable and therefore acceptable as a scientific theory. The manuscript contains a wealth of information on the creation-evolution controversy. The only way I can describe it is to label it as Hugh Ross's *magnum opus*!

In a unique way, Hugh Ross uses a multidisciplinary approach for building the RTB model, by factoring in phenomena from cosmology, astronomy, planetary science, geophysics, archeology, and paleontology. These approaches are in addition to the traditional evolutionist one from morphology, biochemistry and genetics. The bottom line of this monumental work is to demonstrate that a scientific model for creation can be developed and tested. To that end, Appendix E gives a comparative analysis regarding the predictive capabilities of the RTB model, the Naturalist model, the Young-Earth model, and the Theistic Evolution model.

The book starts with introductory remarks on the current conflict between creation and evolution as a clash of worldviews, methodology, and politics. Ross then presents his major thesis which is "the uncompromising harmony between facts of nature and the words of Scripture." The book is divided into twelve chapters: chapters 1 and 2 describe the most publicized creation and evolution positions, including strategies used, legal concerns, and public education; chapter 3 compares the "explanatory success of various models for the origin and history of the universe, Earth, life and humanity"; chapter 4 develops the biblical foundations for the RTB creation model and brings out its scientifically testable features; chapters 5-9 cover the latest scientific findings about origins (universe, solar system, life, and *Homo sapiens*). These are covered in great detail and the information provided is encyclopedic, worthy of any ASA-er's library. The purpose here is to examine the RTB model in light of the above findings; chapters 10-12 look to the future to anticipate how the RTB model and other creation-evolution models will fare under careful scrutiny. The goal here is to explore how one can remove or reduce obstacles between the various creation-evolution models. The final chapter attempts to facilitate a more productive pursuit of truth and to engage the public in constructive dialogue on both "scientific and religious enterprises."

The book is very well researched with extensive footnotes and references. I do have a few concerns. Ross tends to stretch the interpretation of some scriptural verses beyond their intended meaning. For example, Ross uses Ps. 104: 28-29 in justifying the mass extinction of species in the animal world during the evolution/creation process.

A second concern is that in his desire to resolve knotty issues in creation, Ross fails to emphasize the fact that God often works in mysterious ways which we cannot and may never comprehend. This is especially true as Ross tackles difficult "why" questions (see chapter 9) that continue to trouble scientists, philosophers and theologians. Some of these concerns are the existence of parasites, deadly microbes, cruelty in the animal world, and large scale extinctions of species. Some people may attribute all of these to an "evil design" that attempts to undermine God's original plan for creation.

After all is said and done, however, I find the RTB model intriguing and salute the RTB team for their carefully researched work, bringing together insights from all disciplines, pertinent to the question of origins. Only time will tell what percentage of scientists, who reject the supernatural, will be willing to give the RTB model a fair hearing.

I recommend this book to every PSCF reader. Even if they disagree with the model itself, the detailed information on origins given in chapters 5-9 will serve as a great source of readily accessible information.

*Reviewed by Kenell J. Touryan, PO Box 713, Indian Hills, CO 80454.*

**PERSPECTIVES ON AN EVOLVING CREATION** by Keith B. Miller, ed. Grand Rapids, MI: William B. Eerdmans Publishing Company, 2003. 526 pages. Paperback; \$36.00. ISBN: 0802805124.

"Controversies over evolution excite every bit as much passion early in the 21<sup>st</sup> century as they have ever done." So say Mark Noll and David Livingston and so say we all! We have plenty of experience of the issue of origins—biblical and scientific—causing an uproar among believers in Jesus. This is a book that I would call "state of the art" in this controversy. The editor, Keith Miller, a geologist, has been deeply engaged in this struggle much of his life. Here he has recruited contributors to the discussion from all the relevant sciences, from history and from theology. Most are ASA members. True, there are no young earth creationists or "ID" (intelligent design) perspectives, but it is an argument encompassing the best thoughts from the perspective of what the book's title suggests: "evolving creation."

The contributors range from astronomers through biochemists, biologists, paleontologists, environmental scientists, historians, geologists, theologians, and psychologists. Indeed, I would say that whatever questions you have had about the origins issue in terms of science-biblical interface have been addressed here. I must confess some of the answers strike me as very speculative, and with some I personally disagree, but I believe they are bravely facing every issue you could think of raising.

It covers the whole of Genesis 1–11, but primarily the creation of the universe, of life on earth, and of human beings in the first relationships with God.

Some of this is quite consonant with a volume of biblical studies on Genesis 1–11 by Henri Blocher, *In the Beginning* (InterVarsity Press, 1984), but *Perspectives on Evolving Creation* is mostly from a perspective of science, very technical in some places, full of good illustrations and tables and references. This book would make an ideal text for a semester or year-long course at the university level. A beautiful feature is that interspersed between the chapters are brief devotionals offered by the various writers of the chapters, many of them focusing on the Psalms but with works of art, photographs, and other opportunities for the eye (as well as the words for the brain), giving us an invitation to lift our hearts and minds to God in the context of what we read.

Here follow some quotes to whet your appetite. From the excellent biblical, theological study of the first chapters of Genesis, this from Conrad Hyers:

When we examine the Genesis account of origins in its own terms and its own historical context, it becomes apparent that we have something that is considerably different from that of the natural sciences. It has a theological agenda aimed at affirming a monotheistic reading of the cosmos and rejecting the prevailing polytheistic reading. None of its phrasing or organization or use of numbers corresponds to the methods and materials of the natural sciences. This does not imply that Genesis is to be seen as unscientific or antiscientific or even prescientific, as if superseded by better methods of understanding the world. The materials of Genesis 1 are nonscientific; they offer a different kind of map of the universe and our place within it (p. 32).

In his chapter, Loren Haarsma comments on the discussions over “methodological naturalism” and has this to say on the general principles:

Is it possible to scientifically prove that God superseded natural laws in a particular event? Or does science rule out any possibility of such things? A practical understanding of what science can and cannot do should warn us against either extreme. Scientists seek to understand puzzling events and puzzling processes. When faced with a particular puzzling event, science can neither prove nor disprove that natural laws were superseded. What can science do? Science tries to build a quantitative, empirical model of the event using its understanding of natural laws plus information about the physical conditions before, during, and after the event (p. 84).

The following interesting footnote responds to some of the comments of the Intelligent Design movement writers. Terry Gray and co-chapter writer Loren Haarsma comment:

...Whatever might be said, good or bad, about the scientific and theological arguments of Intelligent Design theory, we are troubled by the appropriation of the word “design” to exclude evolution. Intelligent Design theory, the way it is typically presented, seems to offer the following choice: either modern life forms evolved or they were designed. That is

a false choice. Christian theology says that modern life forms were definitely designed by God, whether God used ordinary evolution or superseded it” (p. 289, Footnote 2).

The book concludes with two chapters dealing with evolution and original sin and with evolution, cognitive neuroscience, and the soul. In order to be well informed, I recommend that you read this book, pass it on to others, and prayerfully and thoughtfully interact with the many references and arguments contained in it to shape your own perspectives on this issue.

*Reviewed by Terry Morrison, Director Emeritus, InterVarsity Faculty Ministry, PO Box 7895, Madison, WI 53707-7895.*

**A BIBLICAL CASE FOR AN OLD EARTH** by David Snoke. Grand Rapids, MI: Baker Books, 2006. 195 pages plus appendix, references, and index. Paperback; \$14.99. ISBN: 0801066190.

David Snoke is a physicist at the University of Pittsburgh. This book is his first on apologetics, having previously written *Basic Concepts of Condensed Matter Physics* and having edited *Physics and Science Fiction*.

The chapters cover the scientific case for an old earth, animal death, the balance theme in Scripture, the Sabbath, concordistic science, Noah’s flood and how to interpret Genesis 1–2. The book is an easy read, and the author is a good writer, explaining his concepts well. Snoke believes in an old earth but not in evolution, which he emphatically tells his readers on several occasions.

The strength of the book is that it is a good review of the major arguments against the young-earth (YEC) position, but there are no truly novel arguments presented. He raises the usual argument that YEC would make God deceptive, that geologic features are hard to explain with a global flood, and that, biblically, animals had to die before sin. Most of his arguments are theological rather than scientific, and maybe this is what they need to be. One interesting observation he makes is that YEC may take Christianity into an anti-knowledge, anti-expert position in which anything an expert says is automatically rejected. I fully agree with that assessment.

The major weakness of the book lies in the major weakness of Intelligent Design (ID). While rightly chiding the YEC to accept observational evidence in the interpretation of Scripture, this book only allows such external data to go so far and no further, giving an air of hypocrisy. On pages 189–90, Snoke criticizes Setterfield’s declining speed of light theory and notes that anyone who knows physics would find the arguments “laughable.” Yet, Snoke ignores data that make his view of creation and the Flood equally laughable.

One unfortunate mistake is the dual claim that human-kind appears in the archaeological record merely 30 kyr years ago (it is 150 kyr) which logically would mean that the Flood was after that time, and the claim that his local flood killed all but eight people. These claims raise huge problems. It ignores the existence of a religious altar at the *H. erectus* site of Bilzingsleben, Germany dated at 425 kyr and the 47 kyr Neanderthal altar at Bruniquel in which

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a bear was sacrificed deep in a cave where even bears could not live. Who were these nonhuman worshipers?

Snoke also ignores the genetic evidence for an ancient humanity. He tells the YEC not to ignore how deceptive God would be if, on the day Adam was created, Adam had memories of his mother and a house Adam had built earlier. Snoke also notes that it would be equally deceptive if those first trees had tree rings. But Snoke seems not to realize that the human genetic code is much like tree rings, providing its own dating technique for the genome and that the genetic history of humanity cannot fit within the 30,000 years time frame he claims. Thus, Snoke has his own "Adamic memory" problem with an equally deceptive God, in which God makes the human green opsin gene appear to be 5.5 million years old when in fact it is no older than 30 kyr.

In one physics error, Snoke argues against the global flood by claiming that the added weight of water in a global flood would make the continents sink. Since they did not, he claims that the YEC's flood views are wrong. However, this would be true only if the water were piled above the continents alone. Given a flat water surface, more water weight would actually be added over the ocean basins than on top of the continents (hint: think of continental elevation). Telling others to accept observational data, while not doing so oneself, creates problems when writing apologetical books.

One of the big disappointments was that there were actually no positive evidences of the Bible teaching an old age. I had expected that there would be a discussion of *qedem* or *olam* which are Hebrew words for old/ancient used to describe the age of hills and mountains. All of the arguments were basically against YEC theology and because of that, I would recommend this book. It can be of help in dealing with the flaws of YEC theology and an anti-science stance.

*Reviewed by Glenn R. Morton, 10131 Cairn Meadows Dr., Spring, TX 77379.*

**ORIGINAL SELFISHNESS: Original Sin and Evil in the Light of Evolution** by Daryl P. Domning and Monika K. Hellwig. Burlington, VT: Ashgate, 2006. 213 pages. Hardcover; \$89.95. ISBN: 0754653153.

Domning is a paleontologist at Howard University in Washington, DC. He begins this book with a defense of Darwinian evolution, explaining how it works and answering fifteen common objections to it. From this base of understanding, he deduces two theologically relevant facts:

1. "[T]he Adam of the Fall was not responsible for introducing physical suffering and death into the order of nature ... those were well established among evolving organisms long before his and our advent" (p. 139).
2. "[T]he Church has long claimed to know something about our beginnings that it did not know" (p. 190).

Scriptures intended to teach us about original sin, he explains, have been misapplied, as if they are statements about our historical origins.

Catholic theologian Monika Hellwig (at Georgetown University), who died while this book was at press, used her brief portion of the book to explain Adam's story as myth—in the best sense of that term. "People who shape myths are not naive," she writes, "they are using analogical reasoning" (p. 11). She contributes a helpful six-page background on the classic teaching on original sin. She gives even briefer responses at the close of each of Domning's major sections.

In the first section, Domning cites evidence against monogenism, the view that all humanity is descended from a single couple. In her response, Hellwig outlines the history of how the Catholic Church became committed to this doctrine, but how its theologians more recently came to view Adam's Fall as the story of how each of us fails morally—and of how we enter a society already filled with temptations.

While dealing with original sin in the sections that follow, Domning lauds Teilhard de Chardin and his followers for bringing evolution into theology, but notes that few have attempted to integrate into it the doctrine of original sin. While the popular "cultural transmission view" explains sin as the result of a sinful human society, it fails to explain where *society's* sinfulness came from. Domning's "original selfishness" model explains why we are sinful by nature (our animal nature) and not just by imitation, thus avoiding the charge of Pelagianism.

Domning defines original selfishness (his preferred term) "biologically as the innate imperative to perpetuate and benefit oneself whatever the cost to others, and theologically as that need for salvation by Christ which is universal to all human beings and acquired through natural generation" (p. 183). He notes that his model fulfills both these requirements, since it excludes no one and is transmitted through natural descent from a common ancestor. This ancestor, however, takes us far deeper into the past than a literal Adam: it begins with the origin of life itself.

The universality of selfishness is explained by our common origin with all life (since natural selection programs each organism to be self-centered), starting with the first living thing; and its moral character is explained by the free choice of each human since moral awareness began.

But does this make God the author of evil? No, argues Domning, evil came into existence only with the free choices made by morally aware, autonomous creatures. Life in the natural world before that certainly behaved selfishly, but this was the necessary condition to bring about those autonomous creatures. Anything other than this evolutionary selfishness would not have been capable of producing God's intended result in us and would not have been "good."

Still, readers will wonder if all the redness in tooth and claw was really necessary. Why not a different system? Domning answers that a universe in which animals did not suffer or die would be impossible under the physical laws we know. Separating animal suffering from a good creation involves a logical contradiction.

After all, Jesus came to join us in the reality of a suffering world for the greatest purpose of all. And Domning reminds us of Jesus' assurance: "You will suffer in the

world. But take courage! I have overcome the world (John 16:33)" (p. 170).

Anyone concerned about reconciling early Genesis (and Romans 5) with a modern understanding of paleontology will find in this book a well-reasoned solution that deserves to be considered.

*Reviewed by Fred Heeren, Day Star Research, Olathe, KS 66061.*

**THE COUNTER-CREATIONISM HANDBOOK** by Mark Isaak. Westport, CT: Greenwood Press, 2005. 368 pages, index, bibliography. Hardcover; \$65.00. ISBN: 031333305X.

Isaak has long been associated with the moderated Usenet discussion forum, Talk.origins, and the TalkOrigins.org website, basic components of a twenty-year running debate between mainstream science and creationism. The leaders of the group find common purpose in explaining the theory of evolution, critiquing the claims of the anti-evolution and Intelligent Design movements, and defending the integrity of science and science education.

Isaak has degrees in biology and computer science and additional college-level education in physics and psychology. He has written "Five Major Misconceptions about Evolution" ([www.talkorigins.org/faqs/faq-misconceptions.html](http://www.talkorigins.org/faqs/faq-misconceptions.html)), "What is Creationism?" ([www.talkorigins.org/faqs/wic.html](http://www.talkorigins.org/faqs/wic.html)), and "An Index to Creationist Claims" ([www.talkorigins.org/indexcc/index.html](http://www.talkorigins.org/indexcc/index.html)). The latter have provided the template for this book. *The Counter-Creationism Handbook* is aimed at those who need help in countering creationist claims in the sciences, philosophy, and the Bible.

The major sections of the book are Philosophy and Theology, Biology, Paleontology, Geology, Astronomy and Cosmology, Physics and Mathematics, Miscellaneous Anti-evolution, Biblical Creationism, and Other Creationism. Some 400-plus creationist claims are rebutted under various headings within the major sections. A thorough index takes one quickly to the pertinent material. An introduction provides sage advice about reaching out to anti-evolutionists one-on-one and for public venues such as school board hearings and debates.

While the book contests all *creationisms*, it is the Christian creationism based on particular interpretations of the Bible that receives the most attention. Isaak finds methodological naturalism to be the only "objective standard" for the study of nature, but does not rule out the supernatural, observing however that it "has never led anywhere" (p. 28). The ASA is not mentioned in the index nor is PSCF used as a resource in the 50-page bibliography except to reference the work of Glenn R. Morton.

Having said this, does the book have value for the ASA reader? Yes. First, it offers a broad picture of the arguments that one may encounter. Second, it deals effectively with scientific issues. Third, it provides useful debating strategies for various settings. At the same time, the religious and philosophical arguments may not ring true for the Christian.

One might ask what effect the *secular* effort to counter creationism has had on the creationist movement. Counter

counter-creationist websites, blogs, and ministries continue to appear with great frequency, and the movement goes on unperturbed by "truth." Yet, groups of scientists have joined together at times to successfully counter attempts to include creationist materials and points of view in public schools. The debate over the place of faith in the marketplace whether by symbol or the written word continues.

PSCF has long offered articles countering dubious scientific and biblical claims by these fellow Christians with mixed results—surely the tide has not changed. *Truth* seems trumped by *mission*. Sadly, evangelical leadership provides little encouragement for those who would build a worldview that takes the "two books" seriously.

*The Counter-Creationism Handbook* will appear in a paperback version in 2007. Give it a look for your personal library.

*Reviewed by J. W. Haas, Jr., Emeritus Professor of Chemistry, Gordon College, Wenham, MA 01984.*



## PHILOSOPHY & THEOLOGY

**CREATION SET FREE: The Spirit as Liberator of Nature** by Sigurd Bergmann. Grand Rapids, MI: William B. Eerdmans Publishing Company, 2005. 406 pages, index, bibliography. Paperback; \$38.00. ISBN: 080282224X.

Bergmann is professor of religious studies at the Norwegian University of Science and Technology, Trondheim, Norway. The author and editor of numerous books, he is also a member of the Royal Norwegian Society of Letters and Sciences and an ordained minister in the Church of Sweden. This book was first published in German in 1995. It is a part of an ecumenical series of books sponsored by the Christian Theological Research Fellowship that are grouped under the heading *Sacra Doctrina: Christian Thought for a Postmodern Age*. This series is designed to reap the wisdom of Christian tradition and Scripture while proposing fresh insights that are relevant for the contemporary church.

In the preface, Bergmann describes two important influences which led to the writing of this book. The first relates to the 1968 ecumenical movement's confession in Uppsala, that proposes it is the world that offers the agenda for the church. This confession, along with Jurgen Moltmann's insight into the suffering of the Trinity in *The Crucified God*, fueled Bergmann's interest in building a bridge between the environmental movement and the Christian interpretation of life. The second influence was the writing of the fourth-century Cappadocian theologian, Gregory of Nazianzus. Gregory's central thesis, that love for the poor is the best criterion for the believer's love for God, is expanded by the author to include the suffering creatures of the present day global environmental crisis. This influence is clearly summarized in the subtitle of the earlier German edition of this book, *The Trinitarian Cosmology of Gregory of Nazianzus in the Horizon of an Ecological Theology of Liberation*.

Two groups of texts provide the primary materials for Bergmann's book. The first is the written legacy of the

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early church theologian, Gregory of Nazianzus. The second includes a number of monographs published in the field of systematic theology between 1972 and 2003. All of these monographs attribute theological significance to the ecological problems of our age. Contemporary theologians cited by Bergmann include John Cobb, Jr.; Gunter Altner; Gerhard Liedke and Ulrich Duchrow; Christian Link; Jurgen Moltmann; Sallie McFague; and Rosemary Radford Ruether. Missing from this background material is any reference to the writings of contemporary evangelical theologians. Also, missing is an in-depth study of the biblical text and its potential contribution to the formulation of an ecological theology.

The book is divided into three main parts. Part one, which consists of a single chapter, introduces the present day ecological challenge to theology and the Cappadocian theology of Gregory of Nazianzus. Part two, with two chapters, summarizes Gregory's doctrine of the Trinity and his vibrant pneumatology. One key feature of Gregory's theology is his incorporation of the entire creation into salvation history. As far as he is concerned, no part of creation goes untouched by the Creator's work of redemption. The relationship between God's suffering and the suffering of creation is explored and the role of the Holy Spirit as the liberator of creation is examined in detail. Part three is subdivided into three chapters. Chapter four examines how studies from late antiquity and late modernity are related to the problems of ecological discourse and to each other. Chapter five examines how the understanding of God and nature during these two periods relates to liberation theology. In conclusion, chapter six reflects upon the limitations and possibilities of the method of correlation employed throughout the book. In this chapter, Bergmann attempts to show how connections can be made between the fourth-century theology of Gregory and the theology of a variety of contemporary theologians. His main goal is to connect classical patristic theology and contemporary liberation theology in ways that will further the development of an ecological theology from a Christian perspective.

While Bergmann goes to great lengths to connect the patristic theology of the fourth century with the ecological theology of the twentieth century, his connections exhibit several weak links. One problem with his approach centers upon a difference in starting points. While the theology of Gregory of Nazianzus is developed from a biblical foundation, the perspectives of the twentieth-century theologians cited in the book are more heavily influenced by contemporary science. Another problem is that Gregory never developed anything close to an "ecological" theology. His references to justice for the poor and his belief that all of creation shares in God's redemptive activity are extended by Bergmann in ways that Gregory may not have intended or even contemplated. The connections between Gregory's social understanding of the Trinity and twentieth-century ideas regarding the sociality of nature are also rather tenuous. While Bergmann's connections are certainly thought provoking, in the end, they are not completely convincing.

The summary on the back cover suggests that this book (and others like it in the *Sacra Doctrina* series) will appeal to "thoughtful pastors, educated laypeople, theological students, and scholars in a quest for faithful understand-

ing of the Christian message." I question whether pastors or laypeople will want to wade through the book as its content is geared more for scholars. Anyone with a particular interest in historical theology or the development of contemporary ecological theology should take the time to read this book as it does contain a wealth of information and interesting insights. Those who are not so inclined should probably leave it for the scholars and theologians to debate.

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## RELIGION & BIBLICAL STUDIES

**CHRISTIANITY AND THE SECULAR** by Robert A. Markus. Notre Dame, IN: University of Notre Dame Press, 2006. 112 pages. Paperback; \$15.00. ISBN: 0268034907.

This book looks at the role the secular plays in Christianity. The author disdains describing social, religious, or cultural trends. Rather, "my aim will be only to contribute to an understanding of the place occupied by the secular in Christian history and within a Christian understanding of society" (p. 4). The crux of this book is that "Christian tradition has a legitimate place for the autonomy of the secular ... despite the perpetual undertow of what we have become accustomed to call 'triumphalism' in Christian political and cultural attitudes" (p. 9).

Markus examines the concept of the secular in the New Testament and traces its development as Christianity emerges as a popular religion and eventually becomes the one adopted by the Roman Empire. In early Christianity, believers saw themselves as separate and distinct from society. However, as this new religion eventually spread throughout the West, Christians were faced with coping with the secular.

The difference between the sacred and the profane, writes Markus, was understood in the first century. The sacred related to the gods, cults, belief, practice, and religious institution. The profane, or pagan, was what occurred outside the religious institution, or in "the sphere of ordinary life" (p. 5). The "secular," identified by Christianity, was a new concept. It was what was shared by all of society and not necessarily antagonistic to religion.

According to Markus, Augustine of Hippo, in the fourth century, was the impetus for the idea that there is a place for the secular in the Christian idea of the world. While the secular was eclipsed by the spread of Christianity during the Middle Ages, it was rehabilitated by Pope John XXIII and the Second Vatican Council who thought Catholicism needed to be freed from its "cultural ghetto" and see the secular world as autonomous and co-extant with religion (p. 11). "With the Blessed Pope John XXIII the Church has come to embrace the secular and to acknowledge its value, its autonomy, and even, if I may add what may seem paradoxical, its sacredness or holiness" (p. 91).

Robert A. Markus, professor emeritus at the University of Nottingham, has also written *The End of Ancient Chris-*



tianity and *Gregory the Great and His World*. He has been preoccupied with the church's relation to the secular for forty years; his erudition has produced this compact, meaty, and insightful volume. This book will appeal to church historians, sociologists interested in religion, lay Christians interested in the relation of their faith to society, and theologians concerned with ecclesiology. It may also be of interest to church leaders, namely evangelists and pastors, who seek to determine the church's role in culture and politics.

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

**THE END OF FAITH** by Sam Harris. New York: W. W. Norton, 2005. 350 pages. Paperback; \$13.95. ISBN: 0393327655.

**LETTER TO A CHRISTIAN NATION** by Sam Harris. New York: W. W. Norton, 2006. 100 pages. Hardcover; \$16.95. ISBN: 0307265773.

Harris has written a book which has caused quite a stir in the erudite and lay world. It has appeared on the *New York Times* bestsellers' list, was the winner of the 2005 PEN/Martha Albrand Award for Nonfiction, and has been widely praised and criticized. It is entitled *The End of Faith* and its subtitle describes its content: Religion, Terror, and the Future of Reason.

This volume is in the genre of Thomas Paine's *The Age of Reason*. Like Paine, Harris thinks religions are irrational, based on falsehoods, anti-scientific, intolerant, and with a notable exception, contradictory. Religions "are in perverse agreement on one point of fundamental importance, however: 'respect' for other faiths, or for other views of unbelievers, is not an attitude that God endorses" (p. 13).

Harris also thinks that the taboo on criticizing religions puts them beyond the scope of rational discourse. That is why, he writes, the religious motive of the suicide bomber is always discounted in favor of economic, personal, or political ones. Technological advances, writes Harris, have made religion a threat to humanity's survival. Harris labels as a myth the belief that religion is the *sine qua non* for goodness. To summarize, Harris rejects religious claims of inspired books, miraculous acts, incarnate messiahs, or a blissful after-life.

Harris complains that various religious beliefs "are all equally uncontaminated by evidence," that exclusivity claimed by a religion "requires an encyclopedic ignorance of history, mythology, and art," that religious myths "float entirely free of reason and evidence," that religious faith is "a desperate marriage of hope and ignorance" and that religious beliefs "should not survive an elementary school education" (pp. 15-17, 21, 25). Additionally, writes Harris, "It is time we admitted ... that there is no evidence that any of our (religious) books was authored by the Creator of the universe" (p. 45). Interestingly, even with such dramatic statements, some atheists have attacked Harris for not being aggressive enough in his denunciation of religion, especially spirituality.

What would Harris substitute for religion? He explains: "It is nowhere written, however, that human beings must

be irrational ... Seeing this, we can begin to divest ourselves of many of the reasons we currently have to kill one another" (p. 43). Harris thinks moderate religionists, because they serve as a cover for extremists, advance evil. Harris argues for a rational world view based on science. "Science will not remain mute on spiritual and ethical questions for long. Even now, we can see the first stirrs among psychologists and neuroscientists of what one day may become a genuinely rational approach to these matters ..." (p. 43).

After Harris wrote *The End of Faith*, he got a lot of mail. He explains its content:

Thousands of people have written to tell me that I am wrong not to believe in God. The most hostile of these communications have come from Christians. This is ironic, as Christians generally imagine that no faith imparts the virtues of love and forgiveness more effectively than their own. The truth is that many who claim to be transformed by Christ's love are deeply, even murderously, intolerant of criticism. While we may want to ascribe this to human nature, it is clear that such hatred draws considerable support from the Bible. How do I know this? The most disturbed of my correspondents always cite chapter and verse (p. vii).

His answers to theists, mainly Christian conservatives, are contained in his follow-up volume entitled *Letter to a Christian Nation*.

Christian apologists from the earliest days of Christianity (e.g., Justin Martyr, Tertullian) have defended Christianity against its critics, and there are many active today (check the Internet for a long list). For believers who like to engage in cognitive pugilism with an adversarial text, Harris's books will provide all the material that is required. Readers may find some of Harris's criticisms of religion right on target. More likely, however, religious readers will find a lot to debate and many assumptions to question. For instance, Harris thinks, considering the history of the world, religion has done far more bad than good. At any rate, readers will have exposure to what a contemporary, secular humanist thinks of religion, science, and the future of humankind.

Harris, a Stanford University graduate, has studied philosophy, religious traditions, and spiritual disciplines. His pursuit of a doctorate in neuroscience focuses on the neural basis of belief, disbelief, and uncertainty.

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

**GOD FROM THE MACHINE: Artificial Intelligence Models of Religious Cognition** by William Sims Bainbridge. Lanham, MD: AltaMira Press, 2006. 179 pages. Paperback; \$24.95. ISBN: 0759107440.

The author intends to simulate religious behavior in a city simulated within a grid, like a chessboard, of 44,100 squares, each square representing a household/person (apparently, in this city each person lives in a separate house). The book describes a series of simulations with purportedly an increasing level of complexity.



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In a simple simulation, an existence of two groups, P and C, is assumed. For each randomly selected square/person, the person moves to another location if, in his immediate neighborhood (= up to 8 squares surrounding him), the majority of the neighbors belong to the opposite group. The new location is chosen randomly, and the person moves to the new location only when outnumbered in his current location and not outnumbered in the new location.

This simple simulation indicates the problems with the entire approach. Groups P and C can represent anything: Protestant and Catholics, Puerto Ricans and the Chinese, potato-and-cheese consumers. The author does not justify why his simulation should relate to religious behavior.

The author relies heavily on random numbers in his simulations. Do people choose their abodes by closing their eyes and throwing darts onto a city map? The use of random numbers is defended with the statement that with them "a hint of free will" is modeled (p. 3). However, the idea that free will can be reduced to randomness is, to use the author's apt phrase, "faintly ridiculous" (p. 13). Also, do people try only one new location and immediately give up the quest after detecting that they would be outnumbered in the new place? Incidentally, total separation, to which the strategy described here leads, is not inevitable if two columns of the simulated city are occupied by C's, then two columns by P's, and so on, interchangeably. But such an orderly arrangement is unlikely to emerge when random numbers are used to determine choices.

A "more intelligible" simulation simulates proselytizing (p. 37). In one version, initial dwellings are selected randomly and when a member of P finds a member of C in his neighborhood, the former gets converted and becomes a member of C, but not vice versa (p. 42). Why even discuss this simulation when it is obvious that C's will outnumber P's in this unrealistic setting? In another version, a new inhabitant counts the number of different denominations in his neighborhood and converts to the most numerous (p. 49). One may wonder what this simulation has to do with the way people accept faith in the real world. It assumes an extreme feeble-mindedness of people since every time a new group becomes more numerous, each person joins this group.

A small ingredient of artificial intelligence is used in chapter 5. Each person is simulated with a neural network with four binary inputs, four hidden units, and a binary output. By trial and error alone, the networks adjust internal weights so that particular inputs give output 0 or 1. It is, however, unclear what would be a real world counterpart of a supervisor that adjusts weights in the process of teaching a neural network.

In an "especially ornate simulation" (p. 120), the author assumes that each person has fifteen memory cells. The persons seek groups that have goods sought by the persons. The persons should guess how many groups there are and which group has the desired good. However, it is puzzling why a person who assumes that there are two groups would seek the good from the third group. Either the assumption should be abandoned right away after not finding the desired good in the group other than one's own or any search should be abandoned since presumably there is no other group that can offer the good. It is also

unclear how the author generates "supernatural numbers" to choose the group representing gods (p. 133).

The book is largely disappointing. Simulations offered are generally so simplistic that they can hardly be considered as shedding any light on social processes. They are certainly enjoyable to do and provide good ideas for an introductory programming course, but, on the whole, it is difficult to treat them as a significant contribution to the sociology of religion.

*Reviewed by Adam Drozdek, Duquesne University, Pittsburgh, PA 15282.*



## SOCIAL SCIENCE

**STUMBLING ON HAPPINESS** by Daniel Gilbert. New York: Alfred A. Knopf, 2006. 280 pages. Hardcover; \$24.95. ISBN: 1400042666.

This book deals with affective forecasting, which is predicting how you will feel—happy or sad—in the future. The author claims that people often make false predictions on how they will feel. When asked how a person finds happiness, he responds: "People have been writing books that promise to answer that question for roughly two thousand years, and the result has been a lot of unhappy people and a lot of dead trees." So this book is not a self-help book on achieving happiness. It is about how well people can imagine and predict which future they will most enjoy. And Gilbert does not take a high view of happiness, anyway: "If someone could offer you a pill that would make you permanently happy, you would be well advised to run fast and run far."

Gilbert gilds his research with humor. On the finding that on successive occasions of an experience, people find it less pleasurable, Gilbert comments: "Psychologists call this habituation, economists call it declining marginal utility, and the rest of us call it marriage."

Gilbert writes that some past psychologists have been proved wrong by their contentions that human beings are unique from (other) animals in using language or tools. However, Gilbert has his own suggestion about humankind's uniqueness: "The human being is the only animal that thinks about the future." And Gilbert will defend this sentence: "Until a chimp weeps at the thought of growing old alone ..." (p. 5). And, "There are many good things about getting older, but no one knows what they are" (p. 196).

The author presents many amusing and some surprising tidbits. For example, most people are unrealistically optimistic about their futures (p. 18); cancer patients are more realistic about their futures than are healthy folk (p. 18); conjoined twins almost always desire to remain together (p. 30); over half of Americans, during their lifetimes, will suffer a rape, physical assault, or natural disaster (p. 152); and the City Council of Monza, Italy, because they thought goldfish in bowls suffered, banned them ... the bowls, not the goldfish (p. 171).

Gilbert, a Harvard College professor of psychology, short-story writer, and frequently published writer, walks

to work in Cambridge, MA. David G. Myers, ASA member, author of *The Pursuit of Happiness*, and an outstanding social psychologist himself, labels Gilbert one of the most talented contemporary social psychologists. This talent shines through in this very insightful, interesting, and empirically researched book. It does not touch on the role religion or Christianity plays in happiness.

This book has received high praise from a Nobel Prize winner, the author of *Freakonomics*, and the author of *All Marketers Are Liars*. An interesting topic, presented from a scientific viewpoint, authored by a skillful writer, this book will prove a worthwhile purchase. Readers will be informed, entertained, and perhaps stimulated to action, or inaction. Whatever their reactions, they will have better insight. If happiness is not coming down the pike, perhaps there is some consolation in knowing why.

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

**ENDING POVERTY: A 20/20 Vision** by Nancy Maeker and Peter Rogness. Minneapolis, MN: Augsburg Fortress, 2006. 112 pages. Paperback; \$10.99. ISBN: 0806680032.

In the Preface, the authors state that the measure of a people and a faith is how well they care for those living in poverty. Therefore, "The first question to be asked and answered before making any decision—either personal or public—is this: 'How will the decision or action affect those living in poverty'" (p. 9).

This book examines the principles contained in "A Common Foundation: Shared Principles for Work on Overcoming Poverty" agreed upon by thirty-four leaders from Jewish, Christian, Muslim, and Hindu faiths in Minnesota. These leaders committed themselves to work so that no person is forced to live in poverty. They believe that each person has dignity and value and an inherent right to share in things producing a healthy life including food, shelter, meaningful work, safe communities, health care, and education (p. 19).

The Global Policy Forum published these findings in 1999: (1) The wealth of the three wealthiest individuals is greater than the GDP of the 48 least-developed countries; (2) A four percent levy on the world's 225 wealthiest people would provide essentials for those in developing countries; (3) those in well-to-do countries, compared to those in the world's poorest 20 percent, were 31 times better off in 1968, 61 times better off in 1996, and 82 times better off in 1998; (4) In the USA, the wealth of the nation's top one percent was greater than the bottom 90 percent (p. 21). These wide disparities should be addressed so that the poor share in the world's goods, according to the stated principles.

Additional stats about the USA show that 37 million people are in poverty and the number is increasing; Blacks (25%) and Hispanics (22%) have the greatest groups in poverty; 46 million are without health insurance; New Mexico, Mississippi, and Arkansas have 17% of their populations living in poverty.

This book contends that labels such as "bleeding-heart liberal" or "compassionate conservative" are pejorative

and insulting to people of faith who seek to address poverty. "No sector, no part, no economic theory stands isolated from the person of faith" seeking to end poverty (p. 22). While eliminating poverty is not the sole responsibility of government, it is essential that government play a part.

This book is directed at those who want to become involved in ending poverty. It can be used by individuals or groups within or among congregations. The four chapters discuss how poverty can be dealt with by different kinds of churches in different locations. The appendix describes what has been done and can be done by mobilizing and engaging congregations in the work of eliminating poverty.

The authors are both associated with the Evangelical Lutheran Church in America (ELCA) and have served as pastors. Maeker has been Dean of Students at Luther Seminary and Rogness is bishop of the ELCA Synod of St. Paul.

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**AMERICAN THEOCRACY: The Peril and Politics of Radical Religion, Oil and Borrowed Money in the 21st Century** by Kevin Phillips. New York: Penguin Group, 2006. 394 pages, notes, index. Hardcover; \$26.95. ISBN: 067003486X.

Phillips, a political and economic commentator for *Harper's Magazine*, *Time*, and the *Los Angeles Times*, is the author of thirteen books over the past thirty years. This book makes three claims: (1) America began the Iraq war because of oil; (2) Radical fundamentalist religion (Christian) is driving current foreign policy; and (3) The USA is existing on borrowed money, with future expenditures much more than are affordable. His conclusion is that a crunch is inevitable, that current tax rates are necessarily going to rise sharply, and perhaps even a Value Added Tax (VAT) is coming. It is somber reading; the claims of impending bad times are well reasoned.

Phillips, a one time Republican Party strategist, contends that every world-dominating power has ultimately failed, sunk by a combination of global overreach, fundamentalist religion, debt that can never be repaid, and exploited resources. This book is not partisan, both Democratic and Republican administrations come under scrutiny for our country's policies—or lack of them.

In Part I, Phillips contends that the US went to war because of oil. This was not because certain politicians wished to get rich, but because the White House genuinely thought that without Iraq back in the oil business, the country would find itself short. "Control energy and you control the nations," said Henry Kissinger. The age of oil has also been the age of US hegemony and both are collapsing, says Phillips. With global oil production peaking, and oil demands continuing their upward trend, energy prices (and probable rationing) are inevitable.

Radicalized religion is Phillip's second focus. In Part II, he discusses this as a major problem. In a land where over 60% of the population (ABC poll, February 2004) disbelieves evolution and thinks humanity co-existed with



## Letters

dinosaurs, radical theories of "the end times" are prevalent, even among some members of Congress. America is becoming "Southernized," Phillips argues. By that he means fundamentalist worldviews are influencing public policy. The Republican Party is already a "church" in Texas (their 2006 platform explicitly rejects church-state separation), and a theocratic country is one of the many possibilities Phillips sees looming on the horizon. Using the word "evangelical" as synonymous with "fundamentalist," he writes that evangelicals believe that the "world is at most ten thousand years old ... In considering stem-cell research ... depleting oil or melting ice caps ... (they) have at best limited openness to any national secular dialog" (pp. 66-7).

Part III, 120 pages long, is the most frightening. We may yet solve the energy problem (not without severe dislocations) and the fundamentalists will probably split ranks, for fighting with one another has been their history. But Phillips sees no solutions to the US's soaring debt; he speaks to history's "unlearned lessons," and sees doom and gloom in the future—the near future. Every year foreign bond and stockholders own more of our country. There will come (there has to come) a tipping point. Today, America dominates the world. We do so on the backs of those who came before us; we are squandering our inheritance. It is only a matter of time until catastrophe arrives. The rich become richer while the poor get poorer and the middle erodes. There is no happy ending.

On page 315, discussing the erosion of America's manufacturing capability, he quotes Randall Isaac, former vice president of IBM Technology and current ASA executive director: "You cannot do effective R&D if you do not have the manufacturing to insure that the R&D is actually relevant. If the United States loses its manufacturing lead, it will lose everything else with it." I do not recommend this book for light reading—only for serious study.

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## Letters

### Author Corrects the "Science or Sience" Article

I thank an astute reader for pointing out two errors in my article, "Science or Sience: The Question of Intelligent Design Theory" (*PSCF* 58, no. 3 [Sept 2006]: 226-34), on p. 233, second column, first full paragraph.

I meant to say that humans have one LESS chromosome than other primates, not the other way around. The general reasoning is still correct, however. If you karyotype their chromosomes and arrange them next to one another as in the picture below, you'll notice a strikingly similar banding pattern between human chromosome 2 and two primate homologs. You may notice the remnants of a second centromere in the G-banding pattern of the human chromosome corresponding to the centromere of one of the primate chromosomes. There is also evidence of

pretelomeric sequences as well as inversion sites, where for example instead of 5' (TTAGGG) it switches to 3' (CCCTAA), which is what you would expect in the fusion of two telomeres. A relevant citation is:

J. W. Ijdo, A. Baldini, D. C. Ward, S. T. Reeders, and R. A. Wells, "Origin of Human Chromosome 2: An Ancestral Telomere-Telomere Fusion," *Proceedings of the National Academy of Sciences USA* 88, no. 20 (1991 Oct 15): 9051-5.

As for the question of genomic differences between humans and chimpanzees, reports provide differences, ranging from 1.2% to 6% and everywhere in between. This number changes depending on what you are looking for, be it single-base measurements, coding region sequencing, inclusion or exclusion of gene duplications and deletions, etc. Regardless, at a minimum, the difference between the human and chimpanzee genome is at least 1.2%, not 0.012%.

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### Life and Energy Are Siblings Entities

Jerry Bergman's article (*PSCF* 58, no. 4 [2006]: 303-9) on "The American Scientific Affiliation Booklet Controversy" is most revealing, amazingly timely, and tells us that when the ASA leadership approached the nation's science teachers they really hit the nerve of spokespersons for the atheistic regime. It is time to remind these teachers that we appreciate their efforts to convey the miracles and mysteries of what it is that tells us a newborn will breathe, a grain of wheat will germinate, a dog will return our affection, a stem cell will show differentiation, and all such events that require the presence of the life entity.

There are other good reasons for giving biology teachers a leg up. The courses they teach are generally required and thus may be the final chance to produce a citizenry that has the ability and is inclined to rely on the logic and methods of science when facing problems and making decisions. In this, today's teachers face intense competition from interests who can afford the services of experts in influencing what people believe and how they arrive at their decisions. It is little wonder that these experts find ways to put down the teaching profession and thereby deny teachers the respect, guidance, and support that this nation provided so abundantly during the first half of the previous century.

It is time to help the teachers of the life sciences to enjoy the success of their compatriots in the physical sciences. Their subject matter is similar. In the physical sciences, the focus is on the properties of the energy entity and the role of these properties in the inanimate world. In the life sciences, the focus is on the properties of the life entity and their role in the animate world. Actually, both life and energy are so similar as to suggest they are sibling entities. Both entities propagate themselves as far as possible in every direction.

Neither entity can be experienced absent interaction with some form of matter. Neither entity can be destroyed and it is equally probable that neither can be created anew.

And there are special satisfactions in looking upon both entities as being infinite in time and space. For biology teachers to think of life and energy as being sibling entities becomes a challenge that holds great promise. And this is not only because such a challenge is consistent with the first chapter of the book of Genesis. It is most inspiring to think of the animate world catching up with the rate of progress in the inanimate world. Were both entities to receive similar treatment, perhaps humanity can give up behaviors that could very well have been left in the cave, or if you prefer, in the Garden. To pass this challenge along to America's 40,000 biology teachers can be an effective way to recognize the role that their profession plays in our society. It will be up to people who can cope with the complexities of communication but I will gladly provide the first one thousand dollars to finance a first class letter that reminds our biology teachers of the central theme of the "Controversy" booklet and includes appropriate versions of the above ideas.

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## Theistic Science: The Metaphysics of Science

A recent letter of mine,<sup>1</sup> which suggests that an entity in nature is either: (1) purely physical, (2) purely nonphysical, or (3) both, viz., physical/nonphysical and considers the existence of the supernatural, was meant to clarify the theistic science put forward by Roy Clouser.<sup>2</sup> In fact, several authors criticized Clouser's attempt of a theistic science.<sup>3</sup> Nonetheless, in a recent letter, Clouser characterizes the "purely physical" as "on a par with talk about square circles."<sup>4</sup>

Clouser's objection that an entity could be purely physical is based on the gedanken experiment of "thinking away the non-physical properties of a thing to see what they have had left when they finished."<sup>5</sup> Clouser adheres to the philosophy of Herman Dooyeweerd,<sup>6</sup> to whom even atoms, clearly purely physical entities, can have "biotic, sensory, logical, linguistic, and many other kinds of properties."<sup>7</sup> Surely, atomic properties, e.g., mass, spin, change, etc., are detected by purely physical devices via physical interactions and such data is ascribed to inherent properties of individual atoms.

Physics deals with the physical aspect of nature. A reasonable start then is to suppose that science is the study of the physical aspect of nature and its subject matter is data that can be collected, in principle, by purely physical devices. Note that only the physical aspects of physical/nonphysical entities are amenable to the study of science. Accordingly, life, rationality, consciousness, etc. are purely nonphysical since purely physical devices cannot detect them. Herein lies the non-reductive aspect of our set-theoretic description of the whole of reality.

Laws of experimental science are generalizations of historical propositions, viz. experimental data. Thus, history is constitutive of experimental science, whereas metaphysics is regulative of it, while formal logic and

mathematics are instrumental to it. Theology is neither constitutive, nor instrumental, nor regulative of science. Hence, theistic science can only be envisioned as supplying the metaphysics that regulates science without creating incompatibility between historical propositions and particular theological propositions.

Consider a book, which is purely physical even if it contains ciphered, rational information. A rational human being, which is a physical/nonphysical entity, together with the book, gives rise to more than just the sum of its parts. By deciphering the information, the human acquires knowledge, which is purely nonphysical.

Similarly, purely physical devices collect data when interacting with other entities, whether purely physical or physical/nonphysical, which the experimenter transforms into purely nonphysical knowledge via data analysis and theory building. Of course, one ought never to forget that human rationality characterizes the whole of reality by nonphysical mental models, abstractions, and constructs that have their counterparts in the real but are not necessarily identical to them.<sup>8</sup>

Scientists deal with secondary causes, not first causes.<sup>9</sup> The latter involves ontological questions.<sup>10</sup> From the standpoint of the order of being, one can say that without the ontological neither the generalizations nor the historical propositions of the experimental sciences would be possible. However, the theistic concept of creation *ex nihilo* is actually impossible for humans to understand or think since prior to creation there is nothingness, which humans cannot conceive. Only an intelligence, infinitely superior to ours, a super intelligence, can be in the presence of nothingness and make something happen.

It is commendable to attempt to develop a theistic science. For the Christian, two verses would have to be central: (1) "All things came into being through him, and apart from him nothing came into being that has come into being" John 1:3; and (2) "... true knowledge of God's mystery, that is, Christ himself, in whom are hidden all the treasures of wisdom and knowledge" Col. 2:2-3. However, I do not know how to use such revealed knowledge to do science except to require a metaphysics that is regulative of it that is consistent with such biblical verses.

Christ, who is the Creator and source of all knowledge, is the ultimate goal of all those seeking truth in any discipline. It is difficult to know God with the puny tools of science. As we get closer and closer to the truth, our science must merge with our theology otherwise we will be following a false end of our scientific inquiry. I think Max Planck said it best: "God is the beginning of every religion and at the end of the natural sciences." All scientists who have any depth to their work will find the hand of God in nature or else a mystery that they refuse to identify with God.

## Notes

<sup>1</sup>Moorad Alexanian, "Set Theoretic Analysis of the Whole of Reality," *PSCF* 58, no. 3 (2006): 254-5.

<sup>2</sup>R. Clouser, "Prospects for Theistic Science," *PSCF* 58 (2006): 2-15.

<sup>3</sup>P. Le Morvan, "Is Clouser's Definition of Religious Belief Itself Religiously Neutral," *PSCF* 58 (2006): 16-7; H. Halvorson, "Comments on Clouser's Claims for Theistic Science," *PSCF* 58 (2006): 18-9; and

D. Ratzsch, "On Reducing Nearly Everything to Reductionism," *PSCF* 58 (2006): 20–2.

<sup>4</sup>Roy Clouser, "Author's Reply to Two Letters Regarding 'Prospects for Theistic Science,'" *PSCF* 58, no. 4 (2006): 333–4.

<sup>5</sup>Ibid.

<sup>6</sup>Clouser, "Prospects for Theistic Science."

<sup>7</sup>R. A. Clouser, "On the General Relation of Religion, Metaphysics and Science," in *Facets of Faith and Science. Volume 2: The Role of Beliefs in Mathematics and the Natural Sciences: An Augustinian Perspective*, edited by J.M. van der Meer (Lanham: The Pascal Centre for Advanced Studies in Faith and Science/University Press of America, 1996).

<sup>8</sup>Moorad Alexanian, "Physical and Nonphysical Aspects of Nature," *PSCF* 54, no. 4 (2002): 287–8.

<sup>9</sup>Alexanian, *Set Theoretic Analysis of the Whole of Reality*, Footnote 14.

<sup>10</sup>"It does not follow, however, that in the order of knowing the ontological is constitutive as evidence for generalizations. To illustrate: From the truth that God created the world, and hence the actual order of nature from among possible orders, there is no enlightenment as to what that order is. The latter may be discovered whether or not one believes in God. This fact constitutes the element of truth in the statement attributed to Laplace, that experimental science has no need of God." William Oliver Martin, *The Order and Integration of Knowledge* (Ann Arbor, MI: The University of Michigan Press, 1957), 215.

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## Clouser's Response to Alexanian

If I understand Alexanian's letter correctly, he agrees with me that the way belief in God should impact theories is neither the fundamentalist program of finding theory content in Scripture nor the idea that biblical teaching is largely walled off from theory-making. He says: "... I do not know how to use ... revealed knowledge to do science except to require a metaphysics that is regulative of it that is consistent with ... biblical verses [about creation *ex nihilo*]." That was precisely my proposal, so it is the outworking of such a metaphysics he objects to rather than the program itself.

The metaphysics I proposed as consonant with the doctrine of creation is a systematically non-reductionist one (in the senses of "reduction" I defined). I argued for a theory of reality that eschews the traditional approach to metaphysics, namely, positing something in creation as exclusively X, where X is a basic kind of properties-and-laws. Alexanian rejects my non-reductionist proposal but neither offers an argument for his rejection of my view nor a critique of the argument I gave for it. He merely says that physics studies the physical aspect of things, which is surely right. But from that it does not follow that things have *only* that aspect. Just as we abstract the physical properties of things for study, we may also abstract their quantitative, spatial, biotic, sensory, logical, etc., properties-and-laws. And I see no reason why the studies conducted of those aspects of things are any the less sciences than physics is.

The pluralistic ontology I advocate recognizes a distinction in the way a thing may possess its properties: actively or passively. A rock, e.g., possesses quantitative,

spatial, and physical properties actively which means its having them does not depend on its relations to other things. But it does not actively possess biotic properties as it is not alive. It can, however, have passive biological properties in relation to things that are alive. For example, a small rock can be swallowed by a bird and take part in its digestive processes, or a larger rock may be the wall of an animal's den. Similarly, a rock does not perceive. It has no sensory capacities and no active sensory properties. But did it not have sensory properties passively, it could not be perceived in relation to creatures who do have active sensory functions. Just so, a rock does not think; it possesses no logical properties actively. But, once again, were the rock not subject to logical laws and in possession of passive logical properties, we could form no concept of it. In this sense, I contend, everything in creation has some properties of every basic kind and is subject to the laws of every kind. And as we cannot so much as frame the idea of any kind apart from the rest, none are plausible candidates for divine status.

The argument I gave for this view still stands: try to form an idea of anything with only X kind of properties and you will see that you cannot do it. Alexanian claims that a book has only physical properties but does not meet the challenge of that argument. What, pray tell, is the idea of a book that is *exclusively* physical? A book that has no quantity, has no shape and is not in space, has no sensory appearance and is not logically distinguishable from anything else, is no book.

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## Are the Products of ANT and SCNT Equivalent? A Response to Peterson

Jim Peterson's article, "The Ethics of the ANT Proposal to Obtain Embryo-Type Stem Cells," (*PSCF* 58, no. 4 [2006]: 294–302), is misinformed about the biological equivalence between altered nuclear transfer (ANT) and cloning, and it fails to provide moral guidance on the ethics of ANT.

Peterson equates ANT and somatic cell nuclear transfer (SCNT, or cloning) on the biological level. According to Peterson, ANT produces an entity that would "function as an embryo except it would not be able to grow into a normal fetus" (p. 294), while SCNT (following McHugh) results in "an embryo-like entity that can form tissue but not organize a fetus ..." (p. 302). Although he equates ANT and SCNT, Peterson prefers SCNT because "it may meet the same moral concerns [as ANT] with fewer technical challenges" (p. 302). Peterson's judgment represents a pragmatic preference based on false biological premises.

Equivalence between the products of ANT and SCNT obscures the biological distinction between transcription factors and coding genes. Transcription factors control the pattern of gene expression, while coding genes contain information necessary to the production of proteins required for cellular function. Transcription factors are ubiquitous, occurring both in the cytoplasm and the nucleus, whereas coding genes are found only in the

nucleus. Therefore, transcription factors already present in the cytoplasm of the female oocyte can activate or suppress coding genes after fertilization or cloning. This is why they are also referred to as epigenetic factors. The *Cdx2* gene regulates transcription factors. Down-regulation of *Cdx2* in the female oocyte before DNA transfer results in an entity incompatible with human life because the missing transcription factors cannot turn on the genes for embryogenesis. To claim, as Peterson does, that ANT produces "an entity which functions as an embryo ..." is therefore misleading. Embryos by definition are multicellular organisms with the capacity to independently develop into a complete, integrated, living being.

What we most want to learn from Peterson about the morality of ANT is veiled in clouds of agnosticism. Because Peterson insists on using the term "embryo" or "embryo-like" whenever he refers to the product of ANT, he misplaces the burden of proof on those who would either affirm or deny that an embryo is a human person. Since ANT does not produce an embryo, the proper moral consideration is whether it is ethically acceptable to manipulate the human genome through nuclear DNA transfer. About this question Peterson has little to say. Indeed, Peterson's moral and biological equation between ANT and SCNT raises serious questions about his moral judgment on this issue. His pragmatic conclusion that "SCNT may meet the same moral concerns [as ANT] with fewer technical challenges" depends on what he means by "technical challenges." While it is true, as Peterson claims, that animals cloned from adult donor cells rarely survive to live birth after implantation, there is a small technical problem with the approximately 4% who do survive. If Peterson really finds SCNT morally equivalent to ANT because it has a low probability of producing life, it would seem more prudent to prefer a procedure that is utterly incompatible with the production of living beings.

Where Peterson is certain, I find perplexity. According to Peterson, the Bible does not establish the point at which individual life begins (p. 297). However, the Gospel of Luke is absolutely clear that Jesus Christ's human life began at conception. While Peterson states that Luke's birth narrative "does not tell how far along Mary was in her pregnancy" (p. 297) when Elizabeth greeted her as "the Mother of My Lord" (Luke 1:42), the chronology is very specific. The annunciation came to Mary "in the sixth month" of Elizabeth's pregnancy (Luke 1:26, cf. 1:24, 36). After the annunciation, Mary made the four-day journey from Nazareth and stayed with Elizabeth "about three months" (Luke 1:56) before John was born. Jesus' personal existence, therefore, coincides with the annunciation, as Mary's question, "How can this be ..." (Luke 1:34) makes clear. Mary's question is also the reason for my perplexity. Where did the other twenty-three chromosomes come from? Is the virgin birth analogous to modern cloning? If so, what are the moral criteria for human cloning and genetic engineering?

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## Peterson's Response to McCallum

First, thanks to J. Bruce McCallum for taking an interest in my article. That is appreciated. I am puzzled by his statement that "Peterson insists on using the term 'embryo' or 'embryo-like' whenever he refers to the product of ANT." Actually, there is no instance in the article where the product of ANT is referred to as an embryo. The one reference where the product of ANT is referred to as "embryo-like" is citing a proposal and the language of Paul McHugh. The word that the article does use throughout for the product of ANT is "entity." The word entity was deliberately chosen out of deference to scholars who are convinced that the product of ANT is not an embryo.

He also charges that I am not able to tell the biological difference between the products of ANT and SCNT. Of course, I do not claim that ANT and SCNT are identical procedures, nor that they have identical results. I did note that each has been touted as a way to produce an entity which can provide pluripotent stem cells without the death of a viable embryo. Whether either succeeds to that end and is morally preferable in how it does so, depends largely on one's definition of embryo and on the moral status of an embryo if one is present.

It is the latter question that is the focus of my article. On the moral status of the embryo, McCallum proposes that the first chapter of Luke is already "absolutely clear" about this. For McCallum, because Elizabeth calls Mary "the Mother of my Lord" four days after the annunciation, Jesus must have been fully present, hence all embryos are fully present persons. Actually, what Elizabeth says to Mary is that Mary will in the future bear a blessed child. Far from hailing the immediate presence of the Messiah, Elizabeth hails the mother of a very important child in the future. There is no statement in this text that Mary is pregnant at that moment. Now Elizabeth does use the phrase "the Mother of my Lord" (a confirmation undoubtedly much to Mary's encouragement), but that title does not tell us that the Holy Spirit had already created the start of the life that would be Jesus or that the Second Person of the Trinity was already incarnate inside Mary at that moment. God's promises are so sure that they are often stated in the Bible as if already accomplished before they chronologically take place. For example, God directed Abram to be called always "Abraham," which means the Father of Multitudes, on the basis of God's trustworthy promise a year before he and Sarah had even one promised child, let alone a multitude (Gen. 17:5, 21). A biblical title can mean that a referenced event is sure to happen, not necessarily that it already has happened.

In sum, the Luke text does not describe precisely when or how the Holy Spirit establishes the Incarnation, let alone that all human beings are fully present persons from conception. As stated in my article, there are no biblical texts that tell us that a person, a soul, is fully present from conception. Arguments to support that particular conviction will have to come from personal revelation, tradition, reason, or some other extra biblical source.

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