

Title: Scandal of the Evangelical Mind: A Biblical and Scientific Critique of Young Earth Creationism

Author: Bruce L. Gordon, Ph.D.
Associate Professor of the History and Philosophy of Science
Houston Baptist University

Senior Fellow
Center for Science and Culture
Discovery Institute

Address: Bruce L. Gordon
Department of Philosophy
Houston Baptist University
7502 Fondren Road
Houston, TX 77074

Email: bgordon@hbu.edu

Phone: 281.649.3648 (office)
425.503.0500 (cell)

Fax: 281.649.3451

Scandal of the Evangelical Mind:

A Biblical and Scientific Critique of Young Earth Creationism

Abstract: Young earth creationism (YEC) is one of the more peculiar manifestations of broader evangelical culture. It continues to be the most common view of the relationship between science and Scripture held in the evangelical community and, unfortunately but understandably, the view most non-Christians associate with evangelicalism. For scientifically literate non-Christians, it presents an obstacle to Christian faith, and for young Christians who have been raised to equate YEC with the teaching of Scripture, it can destroy their faith altogether when its falsity is discovered. With a view toward encouraging a culture of biblical and scientific literacy and overcoming the anti-intellectual legacy of fundamentalism that sustains this particular “scandal of the evangelical mind”, we offer a synoptic critique of young earth creationism while developing and defending an evangelically acceptable alternative for understanding the relationship between God’s works and God’s words.

Prologue

Within evangelical culture, there are two primary questions of concern when evaluating young earth creationism as a view of the relationship between Scripture and science. The first is whether the YEC interpretation is *necessary* to the proper understanding of the Bible, and if it is not, whether it is even the *best* way of understanding what the opening chapters of *Genesis*, in light of the whole of Scripture, teach. It will be argued that it is neither necessary nor the best way to interpret the biblical text. The second issue, of course, is whether the assumptions essential to YEC offer a tenable approach to doing science. As we shall see in some detail, they manifestly do not.

Three crucial points motivate the YEC perspective on the relationship between *Genesis* and the whole of Scripture, along with a number of subsidiary questions that must be addressed. First, young earth creationists believe that faithful interpretation of Scripture requires the six days of creation and the seventh day of rest in the first chapter of *Genesis* be understood as literal 24 hour days and—given the creation of humans on the sixth day and the genealogies and table of nations in the fifth and tenth chapters of *Genesis* respectively—that the earth itself be about six thousand years old. Secondly, they believe that faithful interpretation of Scripture requires Adam and Eve to be literal historical persons who were the unique ancestors of the entire human race. Furthermore, when they fell into sin, they introduced not just spiritual death, but *physical* death into *all* of creation—which is to say, there was no death in the whole of creation prior to the fall of man. Third and finally, they believe that faithful interpretation of Scripture requires Noah’s flood to be understood as global, covering the *entire* planet, so that the highest mountains on Earth were submersed to a depth of more than 20 feet, and recognition of this global flood is essential to understanding the phenomena of geology and paleontology.

Before we address these points, some preliminary remarks are in order. Evangelicals share the belief that *all* of Scripture is inspired by God and, when properly interpreted, completely trustworthy and authoritative in everything it teaches. The key

question, of course, is one of proper interpretation, which is one reason there are so many doctrinal differences among Christians today. These differences can arise even when sound principles of interpretation are followed, but unfortunately, young earth literalism about the early chapters of *Genesis* fails to employ a sound grammatical-historical approach to the text. Classical Hebrew literary devices and the ancient Near Eastern context of biblical revelation are virtually ignored by young earth interpreters. Instead, a naïvely literal modern reading driven by linguistic conventions embedded in a contemporary understanding of the world and what it means to write history is embraced. The result is a bad reading of the text that pays very little attention to the ways in which Hebrew vocabulary and literary devices structure and affect interpretation, and no attention at all to the facts that: (1) the language of Scripture is *never* that of anachronistic scientific description, but rather a report of what human observers directly see (i.e., the language is *phenomenological*) and it is broadly reflective of an ancient Near Eastern cosmology; and (2) the opening chapters of *Genesis* are a *theological* polemic, that is, an argument against the mythology and polytheism of the cultures surrounding ancient Israel. This second point is quite evident when you compare the *Genesis* creation account with that in the Babylonian *Enuma Elish* and the Noahic flood account with that in the Sumerian *Gilgamesh Epic* and the Babylonian *Atrahasis Epic* (Arnold and Beyer 2002; Kitchen 2003; Longman 2005). These ancient stories all predate *Genesis* in composition and provide a general context for understanding the biblical corrective. In the opening chapters of *Genesis*, the Bible is addressing *theological* errors in the worldviews of the surrounding ancient Near Eastern peoples by correcting their interpretation of *real* historical events (the creation of the world and humanity, the fall of humanity into sin that ruptured our relationship with God, the Noahic flood, and the origins of culture and diversification of languages), while not burdening the ancient Hebrew recipients of revelation with the details of a scientific cosmology that they did not need for this corrective purpose and, in any case, would not have been able to understand.

Recognition that the “pre-history” of *Genesis 1-11* is a theological polemic embedded in an ancient world view raises some other questions. Given that the human author/redactor of *Genesis* held a geocentric ancient Near Eastern cosmology from within which, under divine inspiration, he was correcting pagan misconceptions about God, to what extent should we seek concord between the *Genesis* account and modern science? Should we, perhaps, interpret the first eleven chapters of *Genesis* solely in theological terms and reject “concordism” and *any* understanding of Adam and Noah as historical persons? Some evangelical biblical scholars who are advocates of evolutionary creation argue that this is the best approach (Lamoureux 2008; Enns 2012), but a greater majority of evangelical scholars think this perspective goes too far (Collins 2003, 2006, 2011; Gundry, Barrett, and Caneday 2013; Kitchen 2003; Longman 2005; Madueme and Reeves 2014; Moreland and Reynolds 1999; Wright 2014). As we shall see, while many aspects in the biblical creation and flood accounts should *not* be understood literally because they are artifacts both of the literary devices (parallelism, chiasm) structuring the narratives and of the ancient Near Eastern worldview in which these are embedded, nonetheless, there is an *historical core* to these accounts that rests on *real* events in world history that have precisely the theological significance that Scripture ascribes to them (Collins 2003, 2006, 2011). Furthermore, a close grammatical-historical reading of the text reveals that, even though there has been a great deal of divine accommodation to

ancient cosmology, there are lexical, grammatical, and structural indicators that, when the phenomenological language of the ancient observer is appreciated, ground a broader interpretation that goes beyond what the human author/redactor of *Genesis* could have understood. This broader interpretive structure, inherent in the Bible itself, renders the core of modern cosmogony and cosmology not just compatible, but at times even anticipated, by a proper interpretation of Scripture (Blocher 1984; Collins 2003, 2006, 2011; Copan and Craig 2004; Dembski 2009; Kline 1996; Lennox 2011). In short, a *limited* concordism set free from a naïvely literalistic embrace of ancient cosmology is both possible, and, from the standpoint of the divinely inspired text, something to be expected. God had more than the original Hebrew recipients of revelation in mind when he inspired the biblical authors; he had us in mind too. Flowing from its character as divinely inspired, the whole of Scripture forms a unity of progressive redemptive-historical revelation under the broad thematic rubric of Creation-Fall-Redemption-New Creation (Dumbrell 1984; Martens 1981; VanGemeren 1988; Vos 1948). Being central to the *historical* unfolding of God's plan for creation, there is an historical core to the ancient Hebrew theological polemic describing creation and the fall of man, just as the work of Christ in redeeming Creation is quite literally historical, and just as there is a future-historical reality (again, not best interpreted by naïvely reading the Bible's apocalyptic literature with the daily newspaper in your other hand) that will constitute the New Creation.

The Days of Creation

With these things in mind, then, let us consider the three crucial motivations for young earth creationism, dealing with relevant subsidiary issues along the way. First of all, how should we understand the first chapter of *Genesis* and, in particular, the days of creation? Most young earth creationists believe that a non-literal understanding of the biblical creation days is an artifact of Christianity's encounter with modern science (Ham 2013; Sarfati 2004). This is not so. Many of the most influential early church fathers did not understand the days of creation to be literal 24-hour periods and they reached this conclusion from examination of Scripture itself. For instance, Justin Martyr (c.100-165) in his *Dialogue with Trypho the Jew*, and Irenaeus (c.130-200) in his work *Against Heresies*, argued, quoting *Ps. 90:4* and *I Pet. 3:8*, that the sixth day of creation was not a literal 24-hour period because Adam was told he would die on the day he ate from the forbidden tree, but he lived almost a thousand years after his disobedience. Whatever one makes of this reasoning—and it *is* problematic—it is clear that the effort to come to a consistent understanding of Scripture on its own terms will inevitably lead to interpretive choices. Later church fathers were more astute in their hermeneutical judgment. Clement of Alexandria (c.150-215), anticipating Augustine, argued in his *Stromata* that the days of creation were indicators of increasing priority in divine thought, but not representative of temporal ordering, for creation could not take place *in* time as time was created *along with* the things that were made. By way of trenchant observation, Origen (c.185-254) argued in his work *Against Celsus* that it would be a mistake to read the days of creation as literal days since the Sun was not created until the fourth day, and there could be no such thing as days before the sky was created on the second day and the sun existed to pass through it on the fourth day. In his work *De Principiis* he goes even further, maintaining not only that it would be foolish to believe that the first, second, and third day existed in any literal sense prior to the creation of the sun, moon, and stars, but also,

boldly, that the story of the Garden of Eden was an allegorical representation of the historical events by which God created human beings and the circumstances by which they fell into sin. Finally, and perhaps most profoundly, Augustine (354-430)—in *City of God* and *On the Literal Meaning of Genesis*, when reflecting on the implications of God’s creation of time in light of his view that God *remains* outside of time—regards God as having brought all of creation, from inception to the full realization of the New Jerusalem, into being at once. In short, from the perspective of eternity, divine creation was not a successive series of creative acts, but a once-and-for-all speaking-into-being of everything that exists *including* every moment of time. In light of this, he remarks of the days of *Genesis* that “what kind of days these were it is extremely difficult, or perhaps impossible for us to conceive, let alone explain in words” and “at least we know that [they are] different from the ordinary day with which we are familiar.” Whether this is the right view of God’s relationship to time remains a matter of biblical, theological and philosophical discussion, but if it is, Augustine is surely correct about its implications.

This much said, it must also be granted—despite the fact that the most profound among the church fathers recognized the non-literal character of the creation days—that from *within* a temporal framework these men *still* understood the earth to be quite young. This is not surprising, for they had no reason to believe otherwise and the non-literal character of the creation days as opposed to the actual *age* of creation form logically separate issues. The key point to recognize, however, is that if the days of creation are *not* literal days, then creation itself could be *any* age at all, for there is no telling how much time has passed if the days are not literal. In such case, we must look not to Scripture, but to creation itself to decide how long it has been around, and we will do precisely this when we consider the dismal prospects for young earth science.

First, however, we need to take a close look at the biblical text. Taking Scripture solely on its own terms, the first two chapters of *Genesis* raise some important interpretive questions. (1) The first day of creation does not occur until *Genesis 1:3*, yet in *Genesis 1:1* it is proclaimed that “in the beginning God created the heavens and the earth.” What is the significance of this? (2) The first six days of the creation week conclude with the phrase “and there was evening and there was morning, the *n*th day” (*Genesis 1:5, 8, 13, 19, 23, 31*), but the seventh day, on which God rested, there is no mention of an evening and a morning. What does this mean? (3) The creation account in the second chapter of *Genesis* seems significantly different from the creation account in the first. What is going on here? (4) The Hebrew name of God in the first chapter (*Elohim*) is different from that in the second chapter (*Yahweh*). Why? (5) How is it that God created all manner of plants on the *third* day (*Genesis 1:11-12*), yet on the day he creates man in *Genesis 2*, which is the *sixth* day according to *Genesis 1*, “no shrub of the field had yet appeared on the earth and no plant of the field had yet sprung up” (*Genesis 2:5, NIV*)? (6) What is the significance of the fact that the sun, moon and stars are not “made” until the fourth day (*Genesis 1:14-19*)? And finally, (7) What is the significance of the parallelism between days one and four, two and five, and three and six? Does this have implications for whether the succession of days should be understood chronologically? Reasonable answers to these interpretive questions lead us away from a literal understanding of the days of creation and any necessity for a young earth.

The first two verses of *Genesis* confront us with an interpretive choice: are they a description of all that happened *before* the first day of creation (*Gen. 1:3*) on which God began to order our earthly environment, or are they a *partial summary* of the creative activity that follows, in which case *Genesis 1:3* describes the actual beginning of all things? Both choices have knowledgeable advocates, but the first choice allows an unspecified length of time to have passed before the creation week gets underway, opening the possibility that the universe is quite old. What should we make, then, of the creation week that follows? Let us begin with the seventh day, which lacks the phrase “and there was evening and there was morning.” What is the significance of this omission? Jack (C. John) Collins (2003, 2006, 2011) and others argue that it implies we are *still in the seventh day* of the creation week. Referencing *John 5:17* and *Hebrews 4:3-11*, Collins makes a convincing case that God’s Sabbath rest from creating continues through today, though God continues to act in a providential and redemptive capacity and invites us, by way of obedience to God’s commands, to enter into the spiritual peace of his Sabbath rest as well. Of course, all of this entails that the seventh day of the creation week is *not* a literal 24-hour day.

What of the sixth day of creation, then? Let us approach this topic indirectly by considering the relationship between the first two chapters of *Genesis*, which appear to offer two different accounts of creation. Many evangelical biblical scholars see these two chapters as originating from different Hebrew sources (oral traditions) that were brought together under the inspiration of the Holy Spirit by an artful editor, quite reasonably taken to be Moses. Are these different stories in conflict, as some scholars assert, or is there a deeper underlying harmony? Collins directs our attention to the chiasmic structure (abc – c’b’a’) of *Genesis 2:4*, which he makes clear as follows:

These are the generations
of the heavens and the earth when they were created
 a b c
in the day that the Lord God made the earth and the heavens.
 c’ b’ a’

The intention communicated here is that the first creation account is to be integrated with the second. *Genesis 1:1-2:3* gives the “big picture”, a majestic view of the sweeping scope of all creation, whereas *Genesis 2:4-25* reveals God’s particular investment in humanity as his crowning work, intended for relationship with him. This understanding is further reinforced by the fact that the name used for God in the first account, *Elohim*, refers to God in his capacity as creator and ruler of the universe, whereas God’s name in the second account is *Yahweh*, his personal name, the one by which he introduced himself to Moses (*Ex. 3:13-15*). In transitioning from calling God “*Elohim*” to calling him “*Yahweh*,” the purpose of the author of *Genesis* is to identify the covenant God of Israel (*Yahweh*) as the creator of the heavens and the earth. The message is that the Creator of the universe desires to be in relationship with man.

All of this sets the stage for realizing that *Genesis 2:4-25* is a more extended description of the sixth day of creation, a conclusion that is reinforced by understanding how *Genesis 1:11-12* is reconciled with *Genesis 2:5*. As noted, there appears to be a contradiction here, since in *Genesis 1*, God created plants on the third day before the

creation of man on the sixth day, but when God creates man in *Genesis 2*, no shrubs had appeared “on the earth” nor had any plants of the field sprung up. The key to resolving this tension, as Collins notes, lies in understanding the range of meaning in the Hebrew word *’erets*, which is often translated as simply “earth”. In fact, this Hebrew word has three uses—it can mean the whole earth, or it can mean the dry land as opposed to the oceans, or it can mean a particular region of land—and which use is intended must be discerned from the context. It is taking *’erets* to mean “the whole earth” that creates the problem; realizing that the reference is to a particular region of land resolves the issue (see the way the *ESV* renders this verse as opposed to many other translations). What these verses are describing is a particular region of land at a time of year when the summer had been dry and the plants had not been growing because God had not yet brought the rain. The rains are about to arrive, and God is about to create man to take care of the land. So the context is that of the ordinary cycle of seasons before the creation of humans. We are intended to understand that the cycle of seasons—with dryness, rain, and plant growth—had been going on for an indefinite period of time prior to God’s creation of humanity. And this reveals that the sixth day is *not* a literal 24-hour day either, for in *Genesis 2* it encompasses several things: the cycle of seasons, the confirmation of man’s stewardship over creation and its animal life (*Gen. 1:28*) as symbolized by his the naming of the animals (*Gen. 2:19-20*), Adam’s realization that he had no partner, God’s provision of Eve and establishment of the institution of marriage, and Adam’s proclamation that “at long last” he had a suitable companion.

But if neither the seventh nor the sixth day of creation are literal 24-hour days, what of the remainder, and how should we understand the biblical picture of the sun, moon, and stars not being created until the *fourth* day? One possible approach to these questions harks back to the observation, first made by Johann Gottfried von Herder (1744–1803), that there is a parallel structure in the days of *Genesis 1* that forms a literary framework dividing the narrative into two corresponding triads relating days 1 through 3 to days 4 through 6 (Herder 1833; Blocher 1984). The biblical and theological implications of this have been developed extensively by evangelical Old Testament scholars Meredith Kline (1958, 1996, and elsewhere) and Mark Futato (1998). In Kline’s description, “the six days fall naturally into two triads, one dealing with creation kingdoms, and the other with the creature kings given dominion over them.” The parallelism in the Hebrew narrative is therefore:

<u>Creation Kingdoms</u>		<u>Creature Kings</u>
1. Kingdom of light and darkness	↔	4. The sun, moon, and stars
2. The oceans and the sky	↔	5. The fish and the birds
3. The fertile earth	↔	6. The land animals and humans
7. Rest and satisfaction		

In light of these correspondences, Kline interprets days one and four as different perspectives on the same event, and likewise days two and five, and three and six. He concludes that while the creation account is historical, historicity and narrative sequence

are *not* the same thing, so the account need not – indeed, *should* not – be read as chronological at all. And, of course, this nicely addresses Origen’s observation that days one, two and three could not be literal days before the sun, moon and stars existed to mark them and it also obviates the anachronistic modern question, relevant to all six days if they are literal, of the time zone by which God measured his evenings and mornings (Garden of Eden Standard Time?), since at any given moment, half the planet on which he was working was in darkness.

Of course, Kline’s interpretation has its scholarly detractors. For instance, Collins (2006), while recognizing the validity of the parallel structure in the days of creation and appreciating the implication that the precise lengths of time involved and the precise historical ordering of events was not the author’s focus and is not a matter of deep biblical importance, nonetheless resists Kline’s effort to condense the divine “workweek” into three days (told from two different perspectives) rather than six. The fourth commandment in *Exodus 20:9,11* refers to the creation account in this way: “Six days you shall labor and do all your work... for in six days the Lord made heaven and earth, the sea, and all that is in them, and rested on the seventh day.” As Collins points out, both references to “six days” in these verses use the Hebrew accusative of time indicative of a temporal period over which the work was distributed. Furthermore, use of the Hebrew *wayyiqtol* verb form is prevalent in *Genesis 1* and, since its ordinary narrative use is to indicate sequential events (Collins 1995), the implication seems to be that *some* sort of sequence—whether logico-metaphysical, teleological, or chronological—is intrinsic to the author’s portrayal. Adopting this viewpoint, however, leaves Collins with the problem of interpreting how the fourth day of creation fits into this sequence. He resolves it by noting that when God says “Let there be (*yehî*) lights in the expanse of the heavens to separate the day from the night...” (*Gen. 1:14*) followed by “And God made (*‘asâ*) the two great lights... and the stars” (*Gen. 1:16*), there is no requirement from the context that the verb *‘asâ* be understood to mean “create”; it can equally well be understood to mean that God “appointed” these lights for the very purpose he stated in verse 14, namely to *function* as luminaries that would differentiate day from night and mark the flow of time for the sentient creatures he would create on days five and six. This interpretation is further bolstered by the fact that verse 14 is focused on the *function* of these lights rather than their *origin*, lending credence to Collins’ argument that *Genesis 1:14-18* should be understood as saying that God declared there should be lights in the heavens that would enable sentient creatures to distinguish day from night and to mark time, so on the fourth day he appointed the already existing sun, moon, and stars to this task. Understanding the text this way resolves Origen’s problem *grammatically*. Others have resolved it *phenomenologically* within a limited concordist framework by noting that the transparency of earth’s atmosphere to light (electromagnetic radiation) in the visible spectrum is due to its gaseous composition, which changed substantially with the creation of the photosynthetic (plant) life that made animal respiration possible. From the perspective of earth’s surface, therefore, the fourth day may refer to the clearing of the atmosphere that rendered the sun, moon, and stars distinctly visible.

Regardless of whether Origen’s problem with the fourth day is resolved grammatically or phenomenologically (or both), Collins’ interpretation of the divine workweek as describing activities that are in *some* sense sequential and which provide an *analogical rather than an identical basis* for the human workweek is well grounded.

Collins (2003, 2006) calls this the “analogical days” position, contrasting it with the day-age theory, the intermittent day theory, and the framework hypothesis. He finds precedent for it in the work of earlier conservative evangelical theologians, most notably the American, William Shedd (1820-1894), and the Dutchman, Herman Bavinck (1854-1921). As he summarizes the view, it is the position that “the [creation] days are God’s workdays, their length is neither specified nor important, and not everything in the account needs to be taken as historically sequential.” The divine workweek thus establishes a pattern *analogous* to the *chronological* human workweek, replete with the “evening and morning” representative of each night’s rest, thereby giving divinely instituted structure to human labor, rest, and worship. Beyond this, while there is certainly some sense of historical chronology inherent in *Genesis 1:1-2:3*, it could be argued that it is derivative of a more fundamental logico-metaphysical priority in which an arena for light versus darkness must exist before it can be populated by the sun, moon and stars, and the oceans and skies must exist before there can be fish and birds, and the dry land and vegetation must exist before there can be land animals and human beings. In this latter sense, the ordering of the creation days, to appropriate William Dembski’s (2009) description, is more *kairological* than *chronological*, that is, it is a teleological (purposive) ordering in accordance with the fullness (appropriateness) of time in God’s eternal plan for creation, rather than a temporal ordering in strict chronological sequence. In the kairological unfolding of the creation week, we see the sequential implementation of divine purposes, and may understand them within the rubric of a limited concordism:

- The first two verses of *Genesis*—“In the beginning, God created the heavens and the earth...”—describe events prior to the first day of the creation week, indicating by way of a binary plenitude that God brought *everything* (space, time, matter and energy in modern parlance) into existence where once there was *nothing* and developed it to the point where the earth itself was created, yet void of life and fluid of form, poised to be transformed into an environment hospitable to life.
- The first “day” of creation manifests God’s division of light and darkness from the phenomenological standpoint of an observer on the surface of the earth: in modern terms, day is distinguished from night as earth’s obliquity (axis tilt) and rotation speed are stabilized.
- With the universe in place and the earth rendered stable, the second and third “days” portray God’s intentional ordering of the Earth to provide a suitable home for sentient life in general and humanity in particular.
- On the fourth “day”, the earth is situated in a context revelatory of cosmic time, the heavenly lights become clearly visible from the surface of the earth, and God appoints the sun, moon, and stars to the task of marking the days and nights and seasons that will govern the ebb and flow of Earth’s sentient life.
- On the fifth “day”, God creates the sentient inhabitants of the oceans and the skies.

- On the sixth “day”, God creates the animals that inhabit the dry land, and most notably, he creates human beings in his image, as his crowning work, to exercise stewardship over creation (*Gen. 1:28*).
- On the seventh “day”, God rests from creating, taking satisfaction in the results of his labor.

So we see that a more sensitive grammatical-historical reading of Scripture dispels the naïve expectation that the “days” of the creation week are the literal 24-hour days of our experience, and opens our minds to the real biblical possibility that the Ancient of Days is the Lord of *deep time*—and just *how* deep, creation must tell us, for Scripture does not.

The Origin of Humanity and the Historicity of the Fall

But young earth concerns have not yet been fully answered, for quite apart from the age of the universe and the earth, we have yet to consider the extent to which biblical genealogies constrain the antiquity of humanity, we have yet to respond to objections based on the biblical effects of the fall, and we have yet to deal with young earth claims about the nature and extent of the Noahic flood. Let us begin with a consideration of the antiquity of humanity and the uniqueness of Adam and Eve. The Bible and the science of paleoanthropology both tell us that modern humanity did not always exist on the earth. The question that must concern us first is whether Scripture teaches that all of modern humanity descends from *one* aboriginal couple that it names “Adam” and “Eve”. It has been a common observation that *Genesis 4* requires there to be *many other human beings around at the time of Cain and Abel*, Adam and Eve’s first-recorded progeny. We see this in that Cain, after murdering Abel, feared his life would be taken by *another*, and that he wandered off, found a *wife*, and built a *city* (*Gen. 4:14-15, 17*). Traditionally, this tension is taken as being resolved by *Genesis 5:4*, where along with the birth of Seth, it is noted that Adam and Eve had other sons and daughters. Rather distastefully, this interpretation requires that all of humanity have its genesis in rampant incest, a practice that God later explicitly condemns as a sin of the utmost seriousness (*Leviticus 18:1-29, 20:7-24*). Regardless, then, whether modern genetics implies greater diversity among the ancestors of modern humanity than a single aboriginal couple would allow—a claim that can be challenged on a scientific basis (Gauger, Axe, and Luskin 2012: 105-122)—the fact remains that *it would be preferable morally and theologically* to avoid this interpretation. The key question, therefore, is whether Scripture *requires* the uniqueness of Adam and Eve. It does not. It is entirely consistent with the biblical account of human origins that, just as God created a multiplicity of creatures of various kinds in *Genesis 1*, so, when he created Adam and Eve as the *first* and *representative* divine image bearers, he also created a variety of other human beings. When Adam and Eve fell into sin, this disobedience and its consequences spread through the entirety of aboriginal humanity, so that, as the Apostle Paul put it, “death spread to all men *because* all sinned” (*Rom. 5:12*), even as this same verse affirms that Adam and Eve were the *first to fall* and that “*sin came into the world through one man, and death through sin.*” Thus the symmetry between Adam and Christ (as the Second Adam who brings life) that Paul emphasizes is not compromised by God’s initial creation of many human beings, and at the same time, the distasteful prospect of rampant incest is avoided.

The only verses in Scripture that might directly challenge this interpretation are *Genesis 3:20* and *Acts 17:25-26*. The *Genesis* passage states that “[t]he man called his wife’s name Eve [life-giver], because she was the mother of all living.” *Must* this assertion be interpreted as teaching that Eve was the female ancestor of the entire human race? Not necessarily. A similar grammatical construction is used in *Genesis 4:20-21*, which states that “Adah bore Jabal; he was the father of those who dwell in tents and have livestock. His brother’s name was Jubal; he was the father of all those who play the lyre and pipe.” Clearly these verses do not mean that everyone who dwells in a tent and owns livestock has biologically descended from Jabal, or that everyone who plays the lyre and pipe can trace his genetic ancestry back to Jubal. What is meant is that these men were the first to perform these activities and those who subsequently did the same are following in the footsteps of these men. In short, the lineage is functional and archetypal, not material and genetic (Old Testament scholar John Walton (2009) makes much—perhaps *too* much—of this distinction in his treatment of *Genesis 1*). The role of Eve as life-giver may be understood similarly as being the female archetype for all that live, and subsidiarily, of course, the first and archetypal life-giver (mother) among women. As for the passage from *Acts*, it occurs in the Apostle Paul’s Mars Hill discourse, where he states, “...he [that is, God] himself gives to all mankind life and breath and everything. And he *made from one man* every nation of mankind to live on all the face of the earth...” (*Acts 17:25-26*). If we take this verse to imply that Paul thought all of humanity descended from Adam—and it is not perfectly settled that this is in fact what he meant—then the question becomes whether we should attribute any more significance to this belief of Paul’s than we attribute to the fact that all the biblical writers were geocentrists in their cosmology. What the trustworthiness and authority of Scripture require in this instance is that the account be a suitable representation of what Paul *actually said* to the Athenians. But Paul was a human being, just as we are, and not every word from his mouth was authoritative revelation from God. There is no indication in the passage that Paul was speaking to the Athenians under the inspiration of the Holy Spirit, let alone that the Spirit was guiding his speech so that the words he spoke were also authoritatively God’s words. So Paul may just have been *expressing his own understanding* of human origins, a traditional Jewish one, while the Bible itself admits of other interpretations, even as it accommodates situated historical understanding.

Having averted original incest by establishing the possibility that God initially created many human beings—among whom the representative couple that the Bible calls “Adam and Eve” were the first to exist and the first to fall—we may now ask whether the genealogies in *Genesis 5* and *11*, and the table of nations in *Genesis 10*, constrain us, as many young earth creationists would assert, to Bishop James Ussher’s (1581-1656) chronology, whereby God created humanity around 4004 BC. The answer is they do not, because genealogy in Scripture does *not* imply chronology—the genealogies in Scripture are often dramatically compressed, skipping over multiple generations. As Collins (2003) observes, the biblical genealogical formula has the standard expression:

When *A* had lived *X* years, he fathered *B*. *A* lived *Y* years after he fathered *B* and had other sons and daughters. Thus all the days of *A* were *Z* ($= X + Y$) years, and he died.

As Collins says, unless there are other indications to the contrary, the proper conclusion to draw from the phrase “*A* fathered *B*” is that “*A* fathered an ancestor of *B*,” or, as Francis Schaeffer (1972) put it “the word *begat* in Genesis... does *not* require a first-generation father-son relationship. It can mean *fathered someone who led to*.” And the reason for this understanding is obvious once genealogies within Scripture are compared, for both the Old and New Testaments make use of this convention. For example, *Exodus 6:14-17* recounts three generational intermediaries between Jacob and Moses over a period in excess of 400 years, which is problematic if read literally, but makes sense when it is realized that some links have been omitted—as is obvious by comparison with the genealogy of Joshua in *I Chronicles 7:23-27*, which includes 11 generational intermediaries between Jacob and Joshua. Consider also the fact that *I Chronicles 26:24* states that “Shebuel, the son of Gershom, the son of Moses, was ruler of the treasures.” Shebuel was in charge of David’s treasury and David lived around 1000 BC. Moses lived at least 400 years earlier, so the chronological gap between Gershom, the first generation son of Moses, and Shebuel, is about 400 years. The point at issue in the passage is not chronology, but rather that Shebuel held his position on the basis of genealogical descent. Such examples abound in Scripture. When we turn to the early *Genesis* genealogies, then, the purpose of these genealogies is not to allow a calculation of elapsed time—this is an abuse of them—rather, it is to establish lines of descent and also to emphasize the fact, drummed home by the recurrent phrase “and he died,” that death was a consequence of the sin of Adam and Eve (see *Gen. 3:19* and *Rom. 5:14*). When this is properly understood, we can agree with Benjamin Warfield (1851-1921), the conservative evangelical theologian and Bible scholar, who remarked “it is to theology, as such, a matter of entire *indifference* how long man has existed on earth” (quoted in Schaeffer 1972).

When we seek to answer the question of how long humanity has existed, we must turn to an examination of nature again to answer this question. When we do so, we find that modern humans (*Homo sapiens*) have existed for about 200,000 years, and while we are now the only extant human species, there were a variety of hominids closely resembling us that no longer exist but whose existence overlapped our own as recently as 35,000 years ago. We need not be troubled by the existence of these other hominids. Adam was an historical representative of aboriginal modern humanity, not another kind of hominid. The Bible is the story of God’s relationship with modern humanity. The extent to which these other human-like species bore the divine image and had spiritual sensibilities is a matter independent of the history of God’s relationship with us. Their story is not our story and the purpose of it, if there even *is* a story to be told of their relationship with God, is a matter between them and the Creator, lost to us in the mists of time long before recorded history. If it helps, one might think of these human-like beings as analogous to the rational species on Malacandra or Perelandra in C.S. Lewis’s space trilogy, or as one of the intelligent races of creatures in Tolkien’s Middle Earth. Their story is independent of ours and the Bible is *our* history and *our* story, *not* theirs.

In dealing with the extended lifespans of the earliest humans in the biblical account, we have two choices. One is to interpret them literally and seek a physiological and environmental basis for early human longevity (this is the approach taken by Rana and Ross 2005). The other approach, which in my view is preferable, is to understand these human ages symbolically, not in terms of their specificity, but in terms of their

decline from numbers approaching 1000 (see *Genesis* 5) to an average of 120 (see *Genesis* 6:3) and finally to an average of 70-80 years around the time of Moses (*Psalms* 90:10). In this regard, it is a well-known fact that ancient Near Eastern convention enhanced the age of ancestors as a symbolic expression of their greatness. *The Sumerian King List*, for example, famously lists eight kings that ruled for a total of 241,000 years “before the Great Flood.” In the biblical case, however, human ages decline from being close to a millennium—a span used in Scripture to represent symbolically the kairological fullness of time and proximity to the glory of God—to an average of 70-80 years, which is, quite literally, an average human lifespan even today. Interpreted in reference to standard biblical numerology, therefore, this progressive decline in human lifespan represents humanity’s fall from the untarnished greatness of the divine image and relational proximity to God into the state of sin and death in which we find ourselves today. In short, we are not compelled by biblical authority to take these ages literally, especially when standard biblical symbolism allows them to be understood as expressing a theological truth about human nature.

All of this leads us to a consideration of the biblical view of death and its relationship to the fall of man. Young earth creationists see all death in the natural world—save, presumably, those green plants that were given to animals and human beings for food in *Gen. 1:29-30*—as the result of the sin of Adam and Eve. There are two ways to respond to this interpretation. The first is to argue that it is fundamentally incorrect. Death and suffering in the animal kingdom are not intrinsically evil because non-human animals are not made in the image of God, are not moral and spiritual creatures capable of treating others well or badly, and were thus never intended for immortality; their death therefore is not now, nor was it ever, a consequence of human sin. Justification of this viewpoint usually proceeds by referring to passages in Scripture speaking of the goodness of God’s creation yet mentioning death in the animal kingdom (for example, *Psalms* 104:21, 27-28). Furthermore, it is evident from Scripture that human beings, as they were originally created, were not intrinsically immortal either. In the biblical account, immortality was the reward of obedience (eating of the Tree of Life) and death was the fruit of disobedience (eating of the Tree of the Knowledge of Good and Evil). Having eaten the fruit of disobedience, the rewards of obedience were no longer available, and the path to a life that did not taste of physical or spiritual death was barred. What is more, advocates of this interpretation frequently argue that the death following from disobedience was not primarily that of the body, but more importantly, the spiritual death of estrangement from God, as is obviously intended by passages like *Proverbs* 12:28 and 23:13-14. Adam did not physically drop dead when he ate the fruit of disobedience, but he *was* immediately estranged from God. This first strategy of response finds able defenders in C. John Collins (2003, 2006, 2011), John Lennox (2011), and David Snoke (2006).

There is much to be said for these arguments, but we can go deeper into a biblical-theological understanding of the original goodness of creation by pursuing a second avenue of response to the young earth contention that *all* death is a consequence of the fall. This second avenue acknowledges the biblical force of this perspective, but understands it *not* in terms of a chronological cause-effect relationship by which there was no death in creation before the fall’s occurrence, but rather as a *trans-temporal effect* that God incorporated into creation from the beginning of time. While not the first to

propose this interpretation, William Dembski (2009) is certainly its most serious and original defender by way of extended argument. In articulating this perspective, however, Dembski calls the effects of the fall “retroactive”, as if we were dealing with a form of backward causation, whereas as “anticipatory” seems a better description. Additionally, his narrative often implies an Augustinian perspective involving God’s essential *timelessness*, though the fundamental idea can also be defended on a Molinist basis invoking God’s knowledge of what human beings would freely choose to do in any and all *future* circumstances in which they might find themselves. These minor quibbles aside, the position Dembski defends obviates young earth concerns by placing them in a more profound biblical-theological framework. To see this, we begin with a parallel question: what is the scope of Christ’s redemption and on what basis were the saints in the Old Testament counted as righteous? The answer, of course, is that Christ, as the Second Adam (*Romans 5:12-21*), came to redeem all of creation (*Romans 8:18-23*), and it was on the basis of their faith in God’s promises, particularly in the promise of the Messiah who would come to crush the head of the serpent (*Genesis 3:15; Romans 16:20*), that the Old Testament saints were credited as righteous (see *Hebrews 11*, especially vv.39-40). In other words, the scope of Christ’s redemptive work is *trans-temporal*—it applies to *all* creation for *all* time, since its power to redeem extends into the past to the very beginning of the universe (*Romans 8:19-22*), and into the future to the realization of the new heavens and the new earth (*Revelation 21*). The universal scope of Christ’s redemption leads us to ask about the scope of the fall. As Dembski points out, the “Garden of Eden” is portrayed in Scripture as a *localized* paradise (*Genesis 2:8*). If the whole earth were a paradise, there would have been no need for a special environment untouched by the “natural evils” of death, predation, parasitism and disease. That the rest of creation was *not* untouched by these natural evils is evident from the fact that when Adam and Eve were driven from the Garden they encountered a world *already bearing* the effects of the fall (*Genesis 3:23-24*). Furthermore, *Romans 8:20-22* admits the interpretation that *creation was subjected to futility by God for his purposes long before the advent of man*, and that it has been groaning for the redemption that was an essential part of God’s plan and purpose for creation from the start:

For the creation was subjected to futility, not willingly, but because of him who subjected it, in hope that the creation itself will be set free from its bondage to corruption and obtain the freedom of the glory of the children of God. For we know that *the whole creation has been groaning together in the pains of childbirth until now*.

And this realization opens the door to a broad biblical theodicy that enlarges our conception of the goodness of creation. After all, what does it mean when Scripture says of what God made, that “God saw it was good” (*Genesis 1:10, 12, 18, 21, 25*), and after creating humanity and surveying all of Creation, he saw that “it was very good” (*Genesis 1:31*), especially if the effects of the fall were trans-temporal and extend to the beginning of the universe?

The ultimate purpose of creation is to reflect the *fullness* of who God is. This is what is meant in *Genesis 1* when God declares creation to be “good.” As *Romans 1:20* proclaims, “[God’s] invisible attributes, namely, his eternal power and divine nature, have been clearly perceived, ever since the creation of the world, in the things that have

been made.” It is furthermore clear that the *range* of God’s attributes reflected in Creation includes more than just his ontological attributes of transcendence, aseity, eternality/everlastingness, omnipotence, omniscience, omnipresence, and incorporeality; it also includes his moral attributes of justice, love, mercy, forgiveness, generosity, grace, goodness, and peace, for example. The perfect goodness of Creation is therefore *derivative* of the full goodness of God, and the full range of the goodness of God includes his attributes of justice and mercy and grace. But for God’s justice to be displayed in creation there must be wrongdoing by free moral creatures that deserves punishment as a consequence, and for mercy and grace to be displayed, there must be a means provided for these creatures not to receive the punishment they deserve, but rather the forgiveness and reconciliation they do not deserve. While God bears no moral responsibility for the fall—indeed, by way of this free-will theodicy, it is logically possible that there is no world he could have created in which we were free (morally responsible) yet did not sin—nonetheless, without the fall, both divine justice and divine mercy would lack an occasion for expression. As Alvin Plantinga (2004) has helpfully argued by way of a greater-good theodicy—where one world that God could create is *better* than another if God would prefer its actuality to that of the other—*any* universe that God could have created that includes *both* the incarnation and the atonement is *better* than one he might have created without these things. A world that is moral in virtue of containing creatures with the freedom that grounds moral responsibility is preferable to a world that is amoral from the lack of such creatures, but a world which God himself *enters* to redeem such creatures from the sins issuing from their free choices is greater by far. In short, a world in which God permits evil yet redeems it by way of incarnation and atonement is better by far than a world in which there is no evil. Thus it is that God purposed to create free creatures, whom he knew would fall, and to redeem them by the death of his Son, even before the world began. As Paul says in his letter to the Ephesians (see *Ephesians 1:3-14* for the full context):

Blessed be the God and Father of our Lord Jesus Christ, who has blessed us in Christ with every spiritual blessing in the heavenly places, *even as he chose us in him before the foundation of the world*, that we should be holy and blameless before him. In love, he predestined us for adoption as sons through Jesus Christ, according to the purpose of his will, to the praise of his glorious grace, with which he has blessed us in the Beloved... *as a plan for the fullness of time*, to unite all things in him, things in heaven and things on Earth (*Ephes. 1:3-6, 10*).

So we see, as a final point, that from the kairological standpoint of eternity, logically prior to Creation, God’s plan as a whole included incarnation and redemption and the eschatological goodness of the Kingdom of God, brought to fruition in Christ in complete fullness (*Revelation 21*). This is why, *inclusive* of the fall and the tragedy of human sin and its trans-temporal consequences, creation is not just good, but *very* good (*Genesis 1:31*).

Noah’s Flood

When we turn to the account of Noah we must again keep in mind that the language of the Bible is phenomenological—it speaks of what a human observer would see, not of the earth as a planet abstracted from human experience. Furthermore, when the

Bible speaks of the waters covering the earth “under the entire heavens” (*Gen. 7:19*), two things must be noted. The first is that from a phenomenological perspective, this means not the entire planet, but rather the extent of the earth under the visible vault of the sky. In short, it is a description of what Noah would have *seen*. The second point is that this interpretation is confirmed by the fact that the Hebrew word used for the land that was covered by Noah’s flood is, again, *’erets* (*Gen. 6:17, 7:4, 7:10, 7:17, 7:18, 7:19*), which, as we have seen, can mean either the whole earth, or the dry land as opposed to the oceans, or a particular region of land. It is therefore consistent with the phenomenological perspective of Scripture to understand the flood waters as covering the land known to Noah as far as his eyes could see. If God had wished to make it clear that the entire planet was covered with flood waters, as Gleason Archer (2007) points out, there was a Hebrew word for the whole earth—*tēbēl*—that would have achieved this. Also, in speaking of Noah’s flood in the New Testament context, Peter makes reference to the fact that “*the world of that time* was deluged and destroyed” (*II Peter 3:6*). The Greek phrase used here—*tote kosmos*—is indicative of *the world known to Noah when the events that happened took place*. In other words, “the world of that time” should be understood as the one known to its local inhabitants rather than in terms of universal geography. Peter’s choice of words makes it clear that the world known to Noah and his contemporaries was *different* in extent than the world known at a later time. The Ancient Israelites had a highly constrained geographical understanding and God’s revelation to them is best understood as *accommodating* their view of world so as to be intelligible to them. What is more, there are indications in other passages of Scripture addressing God’s original creation of the world that would *preclude* an understanding of Noah’s flood as global. In speaking of God’s original creative acts in *Psalms 104:5-9*, Scripture declares of God:

You set the earth on its foundations,
so that it should never be moved.
You covered it with the deep as with a garment;
the waters stood above the mountains.
At your rebuke they fled;
at the sound of your thunder they took to flight.
The mountains rose, the valleys sank down
to the place that you appointed for them.
You set a boundary that they may not pass,
so that they might not again cover the earth.

There are other passages (see *Job 38:4, 8-11* and *Proverbs 8:22-29*, for instance) that have similar import. The implication of these biblical descriptions of *creation* is that, after God caused the dry land to appear (*Gen. 1:9*), waters would *never again* cover the whole earth. In short, the evidence from the Bible tends to favor Noah’s flood being *local* rather than global, and it seems not just hermeneutically possible, but in fact *preferable*, to understand its effect to be the destruction of the people *living in the region of land* where Noah and his family lived.

When we turn to archeology to understand where and when this historical event may have occurred, we are confronted with two basic scenarios related to the parallel flood accounts in the *Atrahasis Epic*, the *Gilgamesh Epic*, and *Genesis*. One is a huge

flood in the Mesopotamian River Valley in the neighborhood of 3000 BC discovered by Sir Charles Woolley (Keller 1980). The other, perhaps more likely, is a cataclysmic event that happened about 5600 BC, definitive evidence for which was discovered by marine geologists William Ryan and Walter Pitman (Ryan and Pitman 1998; Wilson 2001). In this latter event, the waters of the Mediterranean poured through the Bosphorus Strait into what is now the Black Sea, turning a fresh water lake into a salt water sea, destroying everything around for hundreds of miles, and killing tens of thousands of people. This latter event also permits a geographical connection to the “mountains of Ararat” (*Gen. 8:4*) referenced in the biblical account as the place where the ark came to rest. Nonetheless, with respect to this broad time frame and limited concordist sensibilities, there are some factual concerns that must be addressed. *Genesis 4:19-22* states that “Lamech [the father of Noah; see *Genesis 5:28-29*] married two women, one named Adah and the other Zillah. Adah gave birth to Jabal; he was the father of those who live in tents and raise livestock. His brother’s name was Jubal; he was the father of all those who play the harp and flute. Zillah also had a son, Tubal-Cain, who forged all kinds of tools from bronze and iron.” The archeological evidence regarding these human activities places the earliest appearance of animal domestication among humans at around 11,000 BC, evidence of large permanent settlements around 8000 BC, the earliest flutes around 30,000 BC, the earliest harps around 3000 BC, the widespread use of bronze around 3200 BC, and the widespread use of iron only after 1200 BC (e.g., Feder 2004). Under the assumption that the Ryan-Pitman event is, in fact, Noah’s flood, how should we think about the archeological dates for these activities and artifacts in relation to the biblical account of these pre-flood achievements?

The problem of reconciling the archeological dates with the biblical account (along with other perceived difficulties we have already addressed) has led some evangelicals to eschew concordism altogether and embrace the view that *Genesis 1-11* expresses timeless theological truths through texts constrained by accommodation to commonly held but historically fictive ancient Hebrew beliefs (see Lamoureux 2008). Many evangelical scholars are reticent to go this far. From the standpoint of a limited concordism, there are a number of factors to be kept in mind. The first is that while there are universal theological dimensions to the *Genesis* account, not just the natural history, but the human history it tells is *phenomenological* in character. The human authors of Scripture often communicated divine revelation about human nature, universally considered, through the vehicle of the human history *known* to them, not through the history of *all* humanity in an absolute sense. Conjoining this divine accommodation with the recognition that there are multiple generational gaps in biblical lines of descent, the picture that emerges is one in which Cain’s “city” (*Gen. 4:17*) may have been a larger multi-generational settlement of cave-dwellers, and that one of the lines of descent through Lamech and Adah led to a man named Jabal, who was the first known domesticator of animals, and another led to his “brother” Jubal, who made musical instruments and was the archetype for those playing the harp and the flute. As regards metal-workers, Tubal-Cain was known to have practiced this craft. In considering whether he lived before or after the flood, both scenarios are possible. While widespread use of bronze dates to 3200 BC and iron to 1200 BC, it is possible that Tubal-Cain discovered these techniques before 5600 BC and that any evidence of their existence now lies buried under sediment at the bottom of the Black Sea. A more likely scenario,

however, is that Noah's mother was Zillah, not Adah, and that Tubal-Cain was Zillah's "son" through Noah's line of descent, but *after* the flood. This understanding is by no means an extraordinary interpretive stretch, for the treatment of chronology in Scripture is highly malleable and instances of dischronologization are common. It is furthermore notable that Tubal-Cain is *not* described as the father of all those working in bronze and iron, but merely as an *exemplar* of someone who did so. Properly understanding the phenomenological nature of biblical history and the biblical treatment of genealogical relationships thus preserves the core historicity of the biblical account in relation to independent archeological evidence.

Before we look specifically at the relationship among the *Atrahasis* and *Gilgamesh* epics and the biblical flood account, it should be noted that hundreds of flood stories have been discovered from around the world (Bierlein 1994, Dundes 1988, Frazer 2013, Lang 1985). Some have argued that these different stories of a great flood, details of which are sometimes similar, provide convincing anthropological evidence that there was a universal flood that wiped out all humanity except Noah and his family (Martin 2009). They do not. Aside from the fact—as will be clear when we discuss the scientific case against young earth creationism—that geological evidence renders a global flood at any point during human history an impossibility, these differing flood accounts invariably have their origin in coastal areas susceptible to tsunamis, or flood plains subject to flash floods, or along major river systems that repeatedly overflow their banks. Given the fact that the ancient perspective on events derived from *local appearances*, not global knowledge, it is not surprising that these accounts speak of widespread devastation and anthropomorphize the effects of nature in terms of the anger of various "gods." Differences of detail and of geographical and temporal distribution, however, plus the absence of geological evidence for a global flood, all point to the *independent* origins of these various myths. The experience of floods is universal to humanity and explains the existence of flood stories all around the world, but these stories do *not* provide collective evidence for a universal cataclysm.

This much settled, we may now inquire what relationship the *Atrahasis Epic* and the *Gilgamesh Epic* bear to the biblical account of the flood. When we compare the three flood narratives we see both strong similarities and theologically significant divergences. The *Atrahasis Epic* dates from about 1700 BC, but is reflective of an older oral tradition. It portrays humans as slave laborers to the gods who, taking displeasure in human complaints about their enslavement, are condemned by the god Enlil to be destroyed by a flood. Atrahasis, with the help of the god Ea, builds a large boat in which to save humanity. The *Gilgamesh Epic* is also named after its main character, a king of the Sumerian city of Uruk and an actual historical figure who lived sometime between 2800 and 2500 BC. The story was modified over time, but the earliest copies are Sumerian and date from the third millennium BC well after the reign of Gilgamesh. The earliest versions of this epic did not even contain a flood story, but one quite obviously adapted from *Atrahasis* was added toward the end of the second millennium BC. The basic story is as follows: after the death of his friend Enkidu, Gilgamesh undertakes a journey to discover the secret of immortality. His quest leads him to his immortal ancestor, Utnapishtim, who in the course of conversation tells Gilgamesh how, at the behest of the god Enki (Ea), he saved humanity from a flood that would have destroyed it. When we compare these stories to Genesis, there are a number of common elements that indicate

the three accounts are related in some way. It seems clear that all three accounts derive from a catastrophic flood that took place at an earlier time. We need *not* interpret this to mean that the biblical account is *derivative* of these other accounts; they could have a common cause in the historical event itself and constitute different oral traditions, with *Atrahasis* and *Gilgamesh* reflecting pagan polytheistic mythologizations while *Genesis* retains not just the historical core, but the correct monotheistic understanding of the event (Longman 2005). In any case, the three accounts have the following points in common:

- A catastrophic flood occurred that was an act of divine judgment
- A boat was built by divine command to escape the flood (Noah's ark was the by far the largest)
- Clean and unclean animals were taken aboard
- The principal figure and his family were saved (Gilgamesh includes some others as well)
- The boat came to rest on a mountain
- A raven and doves were sent out (Gilgamesh includes a swallow)
- Sacrifices of thanks were offered afterward
- A sign of oath was given (a lapis lazuli necklace for Gilgamesh; the sign of the rainbow for Noah)

Theologically, however, the accounts are very different:

- The reason for divine judgment in the biblical account is that, from a moral standpoint, humanity was (with the exception of Noah) *morally depraved* (see Genesis 6:5).
- By their *disobedience* to God's commands, their sexual immorality (*Gen. 6:1-4*), and their refusal to accept their appointed responsibility to rule over creation as caretakers in accordance with the divine mandate (*Gen. 1:28*), humanity was *undoing* the creational order established by God.
- In response, God *unmade* this unnatural order and *began anew*.
- From a literary standpoint, the Noahic flood is a *theological polemic* against the *wickedness* and *polytheistic paganism* of other Ancient Near Eastern cultures.
- Additionally, as the early church fathers—Tertullian, Jerome, Ambrose, Cyril of Jerusalem, Augustine, and others—emphasized, a major theological purpose of the flood story is the *encouragement of moral conduct*.
- The story of Noah is one in a recurring biblical motif of *divine judgment against wickedness* and the *encouragement of the righteous to live by faith* in God and his promises (see Hebrews 11:7).
- The ark itself is a type of Christ and the biblical floodwaters represent both the cleansing from sin and, in the waters of baptism, the dying of the old self and the raising to new life (*I Pet. 3:18-22; Rom. 6:3-11*).
- Finally, the story of Noah is the first biblical archetype for God's literal eschatological cleansing and redemption of the *whole* of Creation (*Mt. 24:36-47; Rom. 8:19-25; II Pet. 3:1-13; Rev. 21:1-7*).

While there is thus an historical core to the story of Noah, as a whole, its primary function is a prophetic revelation of God's judgment and redemption of humanity. What is more, the Noah story is a gem of Hebrew literary art, its entire compass forming one large chiasm (Lamoureux 2008):

- A Noah and His Sons Shem, Ham, and Japheth (6:9-10)
 - B Promise of the Flood and Establishment of Covenant (6:12-18)
 - C Preservation of Life and Food for Sustenance (6:19-22)
 - D Command to Enter the Ark (7:1-3)
 - E **7 Days** Waiting for the Land to Flood (7:4-10)
 - F **40 Days** Waters Increase on the Land and Ark Rises (7:11-17)
 - G **150 Days** of Waters Prevailing on the Land (7:18-24)
 - PIVOT: GOD REMEMBERS NOAH (8:1)**
 - G' **150 Days** of Waters Abating on the Land (8:2-4)
 - F' **40 Days** Waters Decrease on the Land and the Ark Comes to Rest (8:5-6)
 - E' **7 Days** (3 Periods of) Waiting for the Land to Dry (8:7-14)
 - D' Command to Leave the Ark (8:15-22)
 - C' Multiplication of Life and Food for Sustenance (9:1-7)
 - B' Promise Never Again to Bring Divine Judgment by Flood & to Remember the Covenant (9:8-17)
 - A' Noah and His Sons Shem, Ham, and Japheth (9:18-19)

This highly symmetric structure is *not* a literal representation of chronology or specific detail, but rather a literary framework artfully conveying the theological significance of a cataclysmic historical event. Aside from the clues to non-literality provided by the perfect symmetry of the narrative, we see various aspects of symbolic numerology in the account as well—seven is a biblical number of perfection and completion; forty denotes completion or fulfillment and is the traditional Hebrew number for the duration of a trial of any sort; one-hundred fifty is three times fifty, that is, the number representative of divine completion times the number associated with jubilee and deliverance. There are seven pairs of each clean animal and bird on the ark, and so on. These numbers are symbolic of divine purposes, not literal representations of historical fact, and they provide artful continuity with the biblical account of the exodus from Egypt, the ceremonial laws in Leviticus, and other aspects of ancient Israel's understanding of its relationship to God. Furthermore, the size of the ark is symbolic, not in terms of its precise dimensions, but in relation to the fact that it is so much *larger* than the arks in other ancient Near Eastern flood narratives. Its size communicates that the God of Israel, the one true Creator, is *greater* than the false deities in the surrounding lands, and God's plan of judgment and salvation supersedes all the pretensions of pagan culture. So what we see is that Noah's story communicates not only the divine significance of a cataclysmic historical event, but, just like the biblical account of creation, it plays the role of a theological polemic against Israel's idolatrous neighbors. As if these textual signals pointing to the non-literal character of the narrative details were not enough, there are also practical calculations and considerations demonstrating the impossibility of taking the details of the flood account as precisely literal. We will confront these concerns when we discuss the untenability of young earth science.

The Tower of Babel

The final components of the proto-historical chapters of *Genesis* are the table of nations (*Genesis 10*) and the story of the Tower of Babel (*Genesis 11*). There is a dischronologization in the narrative here as well, since the biblical catalyst for the diversification of languages and spread of nations is the Tower of Babel incident, but the Babel story is *preceded* by a description

of the different languages and spreading of nations associated with the various clans descended from the sons of Noah (see *Gen. 10:5, 10-12, 18b-19, 20, 30-32*). We emphasize again that the perspective of the human author of Scripture here is phenomenological. He is describing the post-5600 BC (assuming that the Ryan-Pitman event is the biblical flood, otherwise the relevant date would be around 3000 BC) origin of the language-groups associated with the peoples present in the ancient Near East at the time the text was composed, roughly around 1400 BC. The necessity of this phenomenological understanding is made evident by the data of paleoanthropology, which has definitive evidence of the existence of modern humanity on *every* continent except Antarctica and the Americas by 40,000 years ago, and every continent except Antarctica by 20,000 years ago. The “genealogy” of *Genesis 10* is unusual in that, more than mere genealogy, its purpose is to provide a phenomenological ancient linguistic map describing languages that would have sounded similar to the ancient ear, even though modern linguists would group the languages differently (Longman 2005). In regard to the Tower of Babel incident itself, we are again presented with a biblical example of Hebrew high literary art, for the story abounds in rhymes and palindromic Hebrew puns and is presented as a mirror-image chiasm reflecting the fact that God’s judgment reversed the intentions of human rebellion (Fokkelman 1975; Longman 2005). There are numerous words and phrases in the story that have the consonant cluster *lbn*, all of which refer to human rebellion against God. When God executes the judgment that reverses their plans, however, he confuses (*nbl*) their language. This reversal of the consonants mirrors the reversal effected by divine judgment, an about-face also reflected in the chiasmic structure of the story (Longman 2005):

- A: Unity of language (11:1)
- B: Unity of place (11:2)
- C: Unity of communication (11:3a)
- D: Plans and inventions (11:3b)
- E: Building (11:4a)
- F: City and tower (11:4b)
- PIVOT: God’s intervention (11:5a)
- F’: City and tower (11:5b)
- E’: Building (11:5c)
- D’: Counter-plans and inventions (11:6)
- C’: Disruption of communication (11:7)
- B’: Disruption of place (11:8)
- A’: Disruption of language (11:9)

The symmetric lexical and literary form of the story again counsels against a naïve literal interpretation of the passage, but there is undoubtedly an historical core to it that grounds the theological lessons it teaches. Babylon (Shinar) is the location where the tower was built, and the contemporaneous architectural illustration of humanity’s prideful attempt to scale the heavens was the stepped pyramid structure of the Mesopotamian ziggurat. While Scripture uses Babylonian ziggurats as an architectural metaphor for the social manifestation of sinful hubris—drawing explicit attention to the fact that human sin has *social* dimensions as well as a *personal* dimension—it is plausible that the historical core of the story involves the construction of such a tower. The story also draws attention to the fact that the unparalleled human capacity for language is divine in origin. Even though the *global* diversity of languages arose historically *because* of geographical separation (not vice-versa), there is nothing that stands in the way of believing that the situated phenomenological perspective of the biblical author derives from an incident in which God confused human language as divine judgment on a collective effort to force human will on heaven and to give divine impetus to the cultural mandate (*Gen. 1:28*) for

humanity to populate the earth and exercise stewardship over it. That, under the old covenant, human language was supernaturally diversified in a local context (*Genesis 11:1-9*) in an act of divine judgment to advance the cultural mandate, and then, under the new covenant, supernaturally unified in a local context (*Acts 2:1-11*) in an act of divine grace to advance the gospel, speaks to the divine unity of the biblical corpus and God's sovereign direction of human history.

Scripture is *necessary* for an explicit understanding of salvation history and God's reconciliation of the world to himself in Christ, and it is *perspicacious* in that even a naïve reading of it yields this knowledge and opens the pathway to a relationship with God. But a mature understanding of the nature of biblical *inspiration* and *authority* requires moving beyond a naïve literal hermeneutic into a robust grammatical-historical examination and exegesis of the text. Failure to do so prevents recognition of the way in which literary devices and forms affect issues of interpretation and renders impossible an understanding of the phenomenological perspective of the human authors of Scripture. These shortcomings can lead, in turn, to incorrect and anachronistic interpretations of Scripture that—by rational evaluation and to the detriment of the very biblical authority they purport to respect—would have the Bible asserting falsehoods. Sadly, much of the “young earth science” that purports to be derivative of Scripture falls into this category. Having divested ourselves of a naïve approach to Scripture, therefore, let us press on to divest ourselves of an untenable approach to science.

The Untenability of Young Earth Science

Young earth science, or “scientific creationism” as it is sometimes called, is mostly a phenomenon of the twentieth century that was given impetus, in part, by the fundamentalist movement of the 1920s. Geological evidence collected in the nineteenth century pointed consistently toward the great antiquity of the earth and ran contrary to the traditional biblical understanding that there had been a universal flood at the time of Noah. As we have seen clearly, a close reading of Scripture does *not* mandate this understanding and points perhaps even more strongly to the correctness of a *local* rather than global interpretation of the Noahic flood. Nonetheless, in the early twentieth century, George McCready Price (1870-1963), a Canadian Seventh Day Adventist and self-taught amateur geologist decided on biblical grounds to attempt a revamping of geology on the hypothesis of a universal flood and a young earth. His books *Illogical Geology* (1906) and especially *The New Geology* (1923) explained the concept of flood geology with a sophistication of style and terminology that captured the imagination of the average evangelical in the pew, who lacked the training to discern its faults. The fundamentalist mindset of the 1920s also provided fertile ground for the ideas that Price presented. What he started eventually bloomed into a cottage industry and then a major movement within evangelicalism after Henry M. Morris (1918-2006) and John C. Whitcomb (1924-) revised and updated Price's 1923 tome with the release of their book, *The Genesis Flood* (1961). Morris's and Whitcomb's book argued on the basis of their interpretation of the Bible that the earth (and hence all of creation) was about 6000 years old, that the fall of man transformed nature by initiating the operation of the second law of thermodynamics, and that Noah's flood was the correct explanation for most of the geological strata and fossilization we observe today. Since the early 1960s two major “young earth creationist” organizations have come to dominate the evangelical landscape: *The Institute for Creation Research (ICR)*, which was founded in 1972 by Henry Morris and is now run by his son John (1946-), and the much larger ministry

organization, *Answers in Genesis* (AiG), which was founded by the Australian Ken Ham (1950-) in 1994 after he had worked with Morris at ICR for many years.

The disparate and *ad hoc* nature of the theories and alleged evidences offered by YEC scientists for their young-earth views permit of no unified scientific response because YEC science is not unified on scientific grounds; rather, it finds its unifying themes in a specific, anachronistic, and deeply problematic interpretation of the opening chapters of *Genesis*. As a consequence, responses to YEC arguments must be offered on a time-consuming case-by-case basis that can get a bit wearisome, taking on the character of an endless game of *Whac-A-Mole*, as new arguments or new variants of old arguments pop up. Given this endless variety, we cannot attempt an exhaustive discussion of the difficulties associated with each and every YEC argument, and even if we could, new ones would be waiting for us around the next corner. The best that can be done is to give the flavor of some standard YEC arguments and polemical strategies in a variety of fields, demonstrate as clearly and succinctly as possible the difficulties that render these arguments and evidences untenable, and hope this sample discussion will demonstrate to the satisfaction of most readers that the whole YEC enterprise is ill-conceived, since we have already seen that it has been rendered unnecessary by a superior biblical hermeneutic, and we are about to see that it is rendered unsustainable by better scientific theories, observations, and methodologies. In short, there is a better way to practice science than that pursued in the YEC subculture—a way that honors God and does not alienate scientifically literate unbelievers. If the level of biblical and scientific literacy of the average evangelical can be raised sufficiently, perhaps this particular “scandal of the evangelical mind”—as Mark Noll (1994) once called the broader phenomenon that YEC views exemplify—can mostly be laid to rest.

Cosmological and Astrophysical Difficulties with Young Earth Science

The speed of light is a universal constant that physicists represent by the letter *c*. While it is tremendously fast—186,282.397 miles per second in the vacuum of space—it is still finite. This means that even at the speed of light vast distances take a long time to travel. Here is the fundamental problem for young earth science: ignoring the expansion of space itself, the most distant observable objects in the heavens are 13.7 billion light years away. This means that—unless God created the universe with the appearance of age by creating the light across the intervening space—we are seeing these objects as they existed 13.7 billion years ago. In other words, the universe is at least 13.7 billion years old, which is considerably older than the 6000 years constraining the young earth hypothesis. How have young earthers addressed this issue? Two approaches dominate. The first is Barry Setterfield’s theory of *c*-decay (Setterfield and Norman 1987) and the second is Russell Humphreys’ gravitational well hypothesis (Humphreys 1994).

Setterfield’s theory of c-decay

Setterfield proposes to resolve this difficulty by claiming that the speed of light has not been constant since the beginning of the universe, but rather has decayed from a speed millions of times faster than it is today. The problem with this contention, aside from the fact that the speed of light in a vacuum shows no genuine signs of variability, is that it would require changing the rest of physics in an attempt to compensate for the fact that a much faster speed of light would render the earth uninhabitable. Why? The answer is found in Einstein’s famous

equation, $E = mc^2$. Our sun is powered by nuclear fusion converting hydrogen into helium at a rate upwards of 400 million tons per second, which, given the mass of the sun and the fact that this nuclear fusion process is confined to its core, means that it is about half-way through a “hydrogen-burning” phase of around 11 billion years. The amount of energy released by this fusion process is tremendous and is governed by Einstein’s equation. If the speed of light were increased several million times, however, the amount of energy released by nuclear fusion would be increased by the square of this quantity, which would have catastrophic consequences for earth’s habitability. In short, we would be burned to a crisp.

Humphreys’ gravitational well hypothesis

Humphreys’ view is a bit more complicated. He proposes, without evidence, that the earth was created at the center of a spherical universe and is located in a gravitational well produced by a massive black hole. He argues that, if this were the case, it would follow from Einstein’s theory of general relativity that gravitational time-dilation could allow billions of years to pass outside the gravitational well we are in while only a few days passed on earth. This would allow the earth to be quite young and still enable distant starlight to reach us without introducing a problematic theory of c -decay. However, this suggestion is also untenable, but for different reasons. First of all, gravitational time dilation on this scale would be observable in the periods of Cepheid variable stars, the orbital rates of distant binary star systems, and so on. It is not, which means that it isn’t happening. Furthermore, if the earth were in a huge gravity well, light from distant galaxies would be blue-shifted in accordance with the Doppler effect. It is not. It is red-shifted in accordance with the Doppler effect induced by universal expansion. We are *not* in a gravity well. Furthermore, the heavy elements in our sun indicate that it is at least a second-generation star, which means that well-established astrophysics requires that the universe existed for billions of years before our solar system came to be. But YEC chronology does not permit this, for it insists that the heavenly lights were created on the fourth day, *after* the earth itself. There are other physical and more explicitly mathematical problems with the theory as well (see Conner and Page 1998, Conner and Ross 1999, and Fackerell and McIntosh 2000, for a more extensive discussion). Young earth cosmology and astrophysics, quite simply, does not work on a theoretical level and is demonstrably false on an observational level.

Geophysical Difficulties with Young Earth Science

Young earth creationists have also sought various ways to argue that geophysical processes make it impossible for the earth to be its scientifically accepted age about 4.5 billion years, that the Bible provides the basis for a scientific explanation of the source of the global flood waters, that a global flood is the correct explanation for geological features like the Grand Canyon and the world’s vast oil reserves, and that widely used age-determination techniques, including radiometric dating, are hopelessly inaccurate and unreliable indicators of the age of organic materials and rocks. We will deal with these claims in the order mentioned.

Is the earth’s magnetic field disappearing?

In his 1973 young-earth monograph *The Origin and Destiny of Earth’s Magnetic Field*, Thomas Barnes advanced the thesis that the observed decay rate of our magnetic field proves that the earth cannot be more than 10,000 years old. Since Barnes’ argument rested on a deeply-flawed attempt to refute the well-confirmed observation that the Earth’s magnetic pole has reversed itself many times in the history of the planet, Russell Humphreys invented a theory

in the 1980s aimed at addressing this problem. His approach is a mixture of physics and *ad hoc* postulations. The most startling of Humphreys' postulations is that God initially created the Sun and the planets out of water (presumably the result of a hyper-literal reading of *Genesis 1:2*). The strong polarity of water molecules would, by natural means, establish a magnetic field with an exponentially decaying current. Humphreys then conjectures that God miraculously transformed this solar system of water into its present constituents, leaving the fields and currents intact. The end result of this speculative and artificial scenario is a physical system similar to the one described by Barnes (Humphreys 1984), except that Humphreys is convinced by the strength of the evidence that the polarity of Earth's magnetic field has reversed many times. On the basis of evidence that it is *possible* for pole reversals, when they happen, to happen quickly, Humphreys also postulates that *all* Earth's field reversals were rapid and took place during the year of the Noahic Flood, which, of course, he understands to be global (see Humphreys 1986, 1988).

It is true that the strength of the Earth's magnetic field is currently weakening; in fact, it has weakened ten percent since the nineteenth century. As troubling as this sounds, however, this fluctuation is mild in comparison to the evidence we have for fluctuations in the past. Earth's present dipole moment (a measure of the intensity of a magnetic field) is 8×10^{22} amps $\times$ m², which is *twice* the million-year average of 4×10^{22} amps $\times$ m². What is more, the field sometimes flips polarity, that is, the north and south magnetic poles swap locations. These reversals are, at present, unpredictable, but we see the record of them in the magnetization of ancient rocks. On average, these reversals have happened about once every 300,000 years, though the last one was 780,000 years ago. Since we do not yet understand the cause of these reversals, we cannot readily say that we're overdue for another one, but magnetic North has been noticeably migrating over the last few years. A recent study by R. Muscheler *et al* (2005) determined, from ice cores drilled in Greenland, that the Earth's magnetic field reached relative maxima 2,000, 8,500, 22,000, 30,000, and 48,000 years ago, but over the last 35,000 years its field intensity has *oscillated* between one-half and twice its present value. These results alone render untenable the claim that the Earth is 10,000 years old or less and that its magnetic field experienced all its dramatic oscillations during the Noahic Flood.

To begin to understand what is going on, we need to understand the composition of the Earth itself and what takes place at its center, where its magnetic field is produced. We are able to infer the composition of the Earth's interior from the study of how seismic (earthquake) waves travel through the earth, and how long it takes for them to get from where the earthquake happens to a recording station. Different materials transmit seismic waves at different speeds. With a lot of earthquakes, a lot of recording stations, knowledge of the relative abundances of elements in the solar system derived from geological and meteorological study, and knowledge of their densities, geophysicists are able to construct a detailed picture of Earth's layered density. Not surprisingly, the heaviest elements are concentrated at the center of the earth and the lightest material at the surface. From this analysis emerges a picture in which the core of our planet is a solid iron ball with a pressure-induced temperature as hot as the surface of the sun. This "inner core" is surrounded by a very deep layer of (mostly) molten iron referred to as the "outer core." The inner core spins at its own rate, which is about 0.2 degrees longitude faster per rotation than the rest of the planet above it. The molten outer core is a roiling ocean of liquid metal, an electrically conducting fluid that is in constant motion due to convection currents and the Coriolis forces arising from the Earth's rotation. These complex motions produce electrical currents that in turn generate our planet's magnetic field through a process called the dynamo

effect. It is possible to model the field produced by such processes using the equations of magnetohydrodynamics and the computational power of supercomputers, then track the development of this model field over hundreds of thousands of simulated years. The results mimic what has been observed about the history of the Earth's magnetic field: the field waxes and wanes and flips, but never vanishes and leaves the Earth without protection against radiation from space and solar storms (see *NASA* 2003). In short, the Barnes-Humphreys contention has *no* scientific credibility.

Alleged sources of the global flood waters

Another difficulty for young earth science arises from attempts to give an account, based on a hyper-literal reading of *Genesis*, of the *source* of the global flood waters. Two hypotheses are prevalent: the “water canopy” theory (Dillow 1982) emerging from a literal reading of *Genesis* 1:6-7, and Walter Brown's (2008) “hydroplate theory” interpretation of the “fountains of the deep” mentioned in *Genesis* 7:11.

The water vapor canopy theory

Before discussing the scientific difficulties with the water canopy hypothesis, it is worth noting that there are biblical problems with it too, since a hyper-literal reading of *Genesis* 1:14-18 along with *Genesis* 1:6-7 leads to the conclusion that the sun, moon, and stars were *under* the water canopy serving as the hypothesized source of the global flood waters. Even if this were not the case, however, the idea of a water canopy of this sort is scientifically untenable. Richard Deem, a medical microbiologist working with the *Reasons to Believe* apologetics ministry, has made a few “back-of-the-envelope” calculations focused on the physical effects of such a vapor canopy (Deem 2007). Air can hold, at most, 55 grams of water vapor per cubic meter. In contrast, liquid water has a density of 1,000,000 grams per cubic meter. The ratio of these two numbers is 1:18,000, which indicates that a flood of one mile thickness—which would cover only one-fifth of Mount Everest—would require a water vapor canopy extending from the earth's surface 18,000 miles into the sky (the actual division between the earth's atmosphere and outer space, the so-called Kármán line, is at a height of sixty-two miles above sea level). Ignoring the fact that gravity would bring the canopy down rather quickly, a layer of cloud this thick would completely block any light from the Sun from reaching the earth. But even a canopy capable of producing only forty feet of flood water, which is not even close to being global, would double the earth's atmospheric pressure and kill many animals, including human beings. Furthermore, this increase in air pressure would raise the temperature on the Earth to a scorching 220°F. Most animals and plants cannot survive long at this temperature. Additionally, getting this water out of the atmosphere and onto the ground without boiling everything on the earth requires a suspension of physical regularities. God could, of course, do this, but if this is what young earthers are claiming, they are no longer doing science, just advancing dubious interpretations of Scripture. If physical regularities are not suspended, however, each gram of water vapor condensing to liquid releases 539 calories of heat. For a vapor canopy to produce a global water layer only *forty* feet deep, 6.22×10^{21} grams of water would be required and would release 3.35×10^{24} calories of heat, which, unless supernaturally dissipated, would raise the temperature of the earth to 810°F. Without question, this would kill all life on earth, including Noah, his family, and all the animals on the ark.

Walter Brown's hydroplate theory

The other young-earth hypothesis regarding the flood waters is based on the notion of the “fountains of the deep” mentioned in *Genesis 7:11*. While many young earth creationists resist the idea of plate tectonics and continental drift because the time scales involved vastly exceed what they believe to be the age of the earth, Walter Brown (2008) decided to kill two birds with one stone by proposing an explanation of the source of the global flood waters that supposedly accelerated continental drift to a speed compatible with a young-earth chronology. According to his “hydroplate” theory, the crust of the Earth once floated on a thin layer of water under great pressure. At the time of Noah’s flood, the crust cracked in various places and the water shot to the surface, rocketing twenty miles into the air and raining down on the Earth for forty days and nights. The part of the crust where the crack began and spread is now the mid-Atlantic ridge. According to Brown, his theory in conjunction with the hypothesis of a global flood at the time of Noah explains a variety of geological features he asserts to be otherwise unexplained: things like ice ages, frozen mammoths, ocean ridges and trenches, oil and coal formations, the Grand Canyon, stratification, the origin of meteorites, asteroids, comets, and so on. On examination, however, these rather startling assertions prove to be ill-founded.

The first thing to note is that *all* of the phenomena Brown lists have quite good scientific explanations; it’s just that none of them fit a young-earth time scale. The relevant question, therefore, is whether Brown’s theory provides an adequate YEC alternative to the standard explanations and their associated time scale. It does not. The current rate of continental drift is about 2-3 centimeters per year and the fact that this drift rate is relatively constant into the past is confirmed by the paleomagnetic studies of ocean-floor spreading we mentioned while discussing the history of earth’s magnetic field. We also can calculate the motion of comets and asteroids back in time and there is *no* evidence at all that they originated from the earth as Brown contends. Furthermore, for there to have been a thin layer of water between the crust and the mantle of the earth prior to Noah’s flood, the crust would have to have been absolutely *impermeable* to water, with no fissures or cracks whatsoever. But evidence of earthquakes, fissures, significant meteorite impacts, etc., is abundantly available throughout geologic history. What is more, the pre-diluvian crust of the earth would have to have been quite smooth, lacking mountains or prominent geological features; otherwise, the differential weight distribution would cause buckling and ruptures that would have released the subterranean waters prematurely. Additionally, there is absolutely *no* seismological evidence of any residual water at such great depths beneath the earth’s surface, nor is there any residual evidence of massive caverns that could have held such water. In short, there is *no* geological evidence (other than an uncorroborated inference on the basis of the explanatory role for it that Brown’s theory requires) that a deep source of subterranean water *ever* existed. Beyond this, unless the crust was anchored into the mantle, there would have been tidal and Coriolis forces that made their relative motion independent. In such case, the friction between the crust and the water layer and between the water layer and the mantle would have caused the crust, which is made of granite and basalt, to heave and buckle and develop fractures and fissures that again would have released the water prematurely as superheated steam. Brown’s false conjecture that comets and asteroids were blasted into orbit by such steam jets does contain one truth, however, namely that the jets would

have velocities in excess of that required to escape the earth's gravity. But this means that most of the moisture also would have shot into space never to return, leaving far too little to account for a global flood. Finally, and perhaps most seriously, if vast amounts of water had been released by such means, the super-heated steam would have boiled the oceans and sterilized the planet of all life, including that of Noah, his family, and the animals on the ark. Without *ad hoc* postulations of divine preservation of the earth's crust prior to the event, divine protection of the ark from super-heated steam, and divine erasure of the causal traces such an event would leave behind, Brown's proposal is irremediably untenable.

Problems with YEC accounts of stratigraphy, fossilization, and salt deposits

The stratigraphic layering in the Grand Canyon—and many other places—is not explainable on the basis of a single flood. The different stratigraphic layers were deposited in different environments and their irregular repetition is the result of *many* geological events, not just one catastrophic event. A key indicator of this is that as water slows in a flood, the coarsest sediment settles first, with successively finer sediment settling later, resulting in a “fining upward” sequence (Davidson and Wolgemuth 2010). If the Grand Canyon were the result of one great flood, this is what we should observe. We don't. What we see is alternating layers of coarse and fine sediment with even smaller layers of alternating coarseness within larger ones. No single flood, not even one with repeating surges of flood water, could explain this effect. What is more, the Grand Canyon contains many massive layers of limestone, which *never* occur in substantial amounts in flood deposits. From a biblical standpoint, it is also exceedingly peculiar that *if* the flood was worldwide flood and so exceedingly powerful as to explain major geological features such as vast canyons, mountain building and marine fossils on mountain tops, and the world's oil deposits (including those in the Middle East), then the pre- and post-flood topography of the Middle East was not substantially changed and, for instance, the Tigris and Euphrates rivers (*Genesis 2:14*) remain intact as do mineral deposits and aromatic resin in geographical areas, such as the land of Cush, described prior to the flood but unchanged at the time of Moses (*Genesis 2:11-13*).

Furthermore, if the fossilization we observe worldwide were caused by a catastrophic global flood, then life forms of every sort would be jumbled together in the fossil record. This is not what we see. What we see is an orderly sequence in which certain fossils occur only in layers of a certain age. For example, trilobite fossils are always in older strata, dinosaurs in newer strata, and mammoths in very recent strata. With plant life, only ferns with no flowers are found in older deposits; flowering plants are in more recent strata. This sequence of fossils, which is observed worldwide, is called the “geologic column.” In those occasional locations where we find rock layers with older fossils displaced relative to younger fossils, there are invariably standard geological processes (*not* a catastrophic worldwide flood!) that explain these displacements. The age of the rocks in which such fossils are found is also ascertainable by radiometric dating techniques (more on these momentarily) that independently attest to the validity of the geologic column.

Finally, there is the matter of salt beds. Salt beds form when salt water evaporates leaving salt deposits behind. Global flood advocates argue that the evaporation of waters from the Noahic flood left behind the salt deposits we observe today. But what about the salt deposits *underneath* the ocean floor in the Gulf of Mexico? Here's the problem: the thousands of feet of sediment on top of the salt would also have to have been deposited by Noah's flood, but the flood waters

cannot *both* have evaporated to leave the salt deposits and still have been present in such force as to have deposited thousands of feet of sediment on top of those salt deposits (Davidson and Wolgemuth 2010). In light of this, some YEC scientists have proposed that these deposits came about through some presently unknown process that does not involve evaporation. The difficulty with this proposal—other than its purely *ad hoc* character—is that such prior salt deposits, supposedly covered by sediment in Noah’s flood, would have *dissolved* on contact with the flood water. The proposed YEC resolution of the difficulty is therefore a non-starter, as is the original suggestion that salt deposits are explained by a universal flood.

Devastating evidence from varves

Varves, which are sediment layers from lakes, operate on a similar principle to counting tree rings to determine the age of a tree. Tabulating the number of tree rings in the cross-section of a tree trunk enables us to determine a tree’s age. Every year there is a wider light-colored ring associated with summer growth and a narrower darker ring associated with the winter. Each set of two such rings represents a year and the total number of them gives the age of the tree. Similarly, in climates where lakes freeze in the winter, fine-grained sediment settles out during the winter when the lake is frozen over, and coarser grained material settles in the summer, so that each winter-spring cycle produces a fine-coarse patterned couplet called a varve. This varve pattern is also produced in many lakes each year by the death of diatoms (single-celled algae) when their light-colored shells sink to the lake floor, creating a light-dark sediment couplet.

Carbon-14 dating, which is only used to date *organic* material, is a radioactive isotope of carbon that decays to normal carbon-12 with a half-life of 5,700 years. Every living organism takes in carbon during its lifetime. Most of this carbon is carbon-12, but a small percentage of it, one part in a trillion, is carbon-14. When an organism dies, its carbon intake ceases, and the carbon-14 in its body is not replenished, but begins to decay into carbon-12. We can measure the time since the death of an organism by comparing the amount of carbon-14 left in its remains with how much it would have contained when it was alive. When an organism died more than 50,000 years ago, however, the amount of carbon-14 left is too small to be measured accurately, so different methods (radiometric or otherwise) must be used. The accuracy of carbon-14 dating has been confirmed many times over with, e.g., historical artifacts from human history made of organic material the age of which is known by other means. Similarly, if we count tree rings or, for longer times, varves, to measure elapsed time up to 50,000 years, these methods yield dates consistent with those determined by carbon-14 levels. Since these dating methods are independent of each other and operate on different physical principles, the fact that they yield dates consistent with each other speaks to the independent trustworthiness of each method.

As Davidson and Wolgemuth (2010) discuss, a textbook example of the utility of varves for chronological measurement comes from Lake Suigetsu in Japan. Varve counts from the bottom sediment of this lake number around 100,000 and yield a highly linear plot confirming the accuracy of independently determined ages on comparison with carbon-14 tests of the first 50,000 or so varve layers. As they point out, however, since the uniformity of varve accumulation in Lake Suigetsu has continued without disruption for the last 100,000 years, there cannot have been a globally disruptive flood any time in the last 100,000 years. The assertion that there was such a flood is therefore false.

Problems with YEC critiques of radiometric dating

Young-earth scientists have criticized radiometric dating techniques as inaccurate and rejected them (Slusher 1973, DeYoung 2005), but before we can respond to these criticisms, we need to understand the basic procedure (Young 1977, Appendix; see also Wiens 2002 and Nave 2014). We have seen that radioactive isotopes of various elements decay at rates that have been measured using multiple samples, found to be constant, and many times independently confirmed in their accuracy. The very simple ordinary differential equation governing the radioactive decay of atoms is

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

where N is the number of atoms of a particular radioactive element in a sample, dN/dt is the rate of decay per unit time of the isotope into its daughter product, and λ is the experimentally measured decay constant. Solving the equation by transposition of variables and integration between definite limits yields

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

where N_0 is the number of atoms of the radioactive element in the sample when it was first formed.

Applying this analysis to the decay of rubidium into strontium in the effort, say, to measure the age of a large block of granite, we rewrite equation (2) as

$$(3) \quad Rb^{87} = Rb_0^{87} e^{-\lambda t}.$$

Now, the initial number Rb_0^{87} of rubidium-87 atoms is going to be equal to the number of rubidium-87 atoms now present (Rb^{87}) in the sample plus the number of Sr^{87} atoms derived radiogenically from the initial Rb_0^{87} . Of course, a problem raises its head—and this is where many YEC critics seek to attack—namely, there is a possibility that some Sr^{87} atoms were also initially present in the block and will artificially inflate its age. We'll deal with this problem when we respond to objections. We must also deal with the problem of gain or loss of Sr^{87} from the block, which we will do shortly. If we designate the initial amount of strontium-87 in the block by Sr_0^{87} , then obviously

$$(4) \quad Sr^{87}_{\text{radiogenic}} = Sr^{87}_{\text{present now}} - Sr_0^{87}.$$

Apart from gain or loss, then

$$(5) \quad Rb_0^{87} = Rb^{87} + Sr^{87}_{\text{present now}} - Sr_0^{87},$$

whence from (3) and (5) we have

$$(6) \quad Rb^{87} = (Rb^{87} + Sr^{87}_{\text{present now}} - Sr_0^{87}) e^{-\lambda t}.$$

It is easier to measure *ratios* of isotopes with mass spectrometers than absolute amounts of a given isotope, so we divide equation (6) through by the non-radiogenic isotope Sr^{86} , which remains constant through time so that $\text{Sr}^{86} = \text{Sr}_0^{86}$. This yields

$$(7) \quad \text{Rb}^{87}/\text{Sr}^{86} = (\text{Rb}^{87}/\text{Sr}^{86} + \text{Sr}^{87}/\text{Sr}^{86} - \text{Sr}_0^{87}/\text{Sr}_0^{86})e^{-\lambda t},$$

which by some algebra gives

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

Inspection of (8) reveals that it is an equation having the mathematical form of a straight line with $(\text{Rb}^{87}/\text{Sr}^{86})$ plotted along the x -axis, $\text{Sr}^{87}/\text{Sr}^{86}$ plotted along the y -axis, $(e^{\lambda t} - 1)$ as the slope, and $(\text{Sr}_0^{87}/\text{Sr}_0^{86})$ as the y -intercept. Addressing the question of gain or loss of isotopes from the block, we note that if there has been significant loss or gain of strontium or rubidium in the granite since its crystallization the data on isotope abundances will *not* yield a well-defined straight line (which geologists called an *isochron* plot). Deviation from a linear plot is therefore evidence of contamination and an unreliable date.

A much more comprehensive development and explanation of radiometric dating techniques, including an extensive discussion of how one can tell how much of a given isotope was originally present at the time of formation, is given in geophysicist Roger Wiens' monograph (2002). His monograph also deals extensively with YEC criticisms. We give brief answers to three common objections, however.

Objection 1: There's no way to know how much of the parent element was originally there.

Reply: All radiometric dating techniques work backwards from present abundances of parent and daughter isotopes and the original amount of parent element can be determined by solving equation (2) for N_0 .

Objection 2: There's no way to tell how much daughter element was originally present, thus leading to anomalously old ages.

Reply: Using more than one sample from a given rock and comparing ratios of parent and daughter elements relative to a stable isotope (as illustrated above using the stable isotope Sr^{86} for the rubidium-strontium dating method) allows determination of how much of the daughter element would have been present if there had been no parent isotope present to decay. While this method is not absolutely beyond the possibility of yielding an anomalous result, independent checks using several dating methods will always give proof of the reliability or unreliability of a given date.

Objection 3: There aren't enough dating methods to be confident of our cross-checks.

Reply: There are more than *forty* different radiometric dating methods in common use as well as a number of non-radiometric methods, all of which allow for independent cross-checks of the date yielded by any given method.

If the reader has concerns other than these about the accuracy of radiometric techniques, Wiens (2002) has provided an authoritative response to *twenty* different YEC objections. These answers, in combination with his extensive discussion of radiometric methodology, should be sufficient to allay the concerns of even the most cautious skeptics.

“Ark-eological” and Biological Difficulties with Young Earth Science

To conclude our discussion of the intractable problems facing young-earth science, we briefly consider some problems specifically related to the ark and the biological species young earth creationists take to have been its passengers. The first problem is a chronological paradox involving the materials used to construct the ark. The pitch used to water-proof the ark is a petroleum product and it was apparently familiar to Noah and readily available *before* the flood. Young earth science hypothesizes, however, that the earth’s petroleum resources were *created* by the flood. In other words, Noah’s pre-flood construction needs could only be satisfied in a post-flood context. The resolution of this paradox, of course, is provided by recognizing that the earth is old, that petroleum was created by conventional geological processes, and that Noah’s flood was local, not global.

Another difficulty arises from the number of species of animals the ark would have to hold. By *conservative* estimate, there are currently anywhere from three to five million species of animal populating the earth today (May 1988), and when extinction is considered, this is a mere fraction of the number of species that have existed historically. Even if we take the massive size of the ark to be literal, it would be impossible to fit seven pairs of every clean animal and a pair of every unclean animal on this vessel. There is not enough room for all of them on a hundred arks, let alone one, even if we leave out the fish (but what about fresh water fish that cannot survive in salt water?) and—since we’re operating on young-earth assumptions—the dinosaurs. In fact, given that we have reptiles today that must, by young earth reasoning, have been taken aboard the ark, if the dinosaurs were contemporaneous with pre-flood humanity, as young earth scientists hold, it seems reasonable that God would also have mandated their inclusion. While young earth advocates frequently maintain that the dinosaurs were wiped out by the global flood, apart from considerations of space on the ark—which are intractable regardless of whether the dinosaurs are included—it’s hard to justify this exclusion on young-earth assumptions and standards for biblical interpretation.

If, to solve the problem of space, it is conjectured (as some young earth creationists have) that the number of animal species on the ark was restricted to representatives of major kinds, then another problem raises its head. There has not been enough time since the flood for micro-evolutionary differentiation of species within these hypothesized kinds to generate the diversity of species we have today. Furthermore, since by young earth assumption all of these species dispersed from one geographic location, there also has not been enough time for them to migrate across mountains and oceans to their current habitats, let alone, in some instances, to become *indigenous* to far-flung geographical regions.

Epilogue

For those of us outside the young-earth community—evangelical or not—who are scientifically literate or even just educated as critical thinkers, it is difficult to overstate how profoundly absurd young earth science strikes us as being. This perception is exacerbated when one realizes that the interpretation of Scripture giving rise to this enterprise is not only rendered

unnecessary but *demonstrably deficient* by sound principles of biblical interpretation respecting the inspiration and authority of the Bible. The opening chapters of *Genesis* use phenomenological language, not anachronistically scientific language, and the literary forms and conventions employed, along with divine accommodation to aspects of ancient Near Eastern cosmology and the function of the text as a theological polemic against ancient paganism, profoundly influence its proper interpretation. The deepest and most influential of the church fathers recognized, on the basis of Scripture alone, that aspects of the creation account were not intended to be interpreted literally. While they had no reason to believe the earth was exceptionally old, they had insightful reasons to believe the creation days were *not* literal, and this very fact renders open the question of creation's antiquity. It is nature itself that tells us how old creation is, not Scripture. What is more, none less than Augustine, in his work *On the Literal Meaning of Genesis*, issued a profound warning against strong attachments to unnecessary interpretations of Scripture, especially where nature was concerned:

Usually, even a non-Christian knows something about the earth [and] the heavens... and this knowledge he holds to as being certain from reason and experience. Now, it is a disgraceful and dangerous thing for an infidel to hear a Christian, presumably giving the meaning of Holy Scripture, talking nonsense on these topics; and we should take all means to prevent such an embarrassing situation, in which people show up vast ignorance in a Christian and laugh it to scorn... If they find a Christian mistaken in a field in which they themselves know well and hear him maintaining his foolish opinions about our books, how then are they going to believe those books in matters concerning the resurrection of the dead, the hope of eternal life, and the kingdom of heaven, when they think their pages are full of falsehoods [regarding] facts which they themselves have learned from experience and the light of reason?

It is time to put an end to this particular scandal of the evangelical mind. Rather than tilting at windmills in areas where the prevailing scientific understanding is almost certainly correct and definitely *not* in conflict with Scripture, we should be focused on critiquing the naturalistic assumptions driving certain conceptions of science (see Gordon and Dembski 2011 and Plantinga 2011 for examples of how to do this) and critiquing scientific hypotheses, driven by this commitment to naturalism, that are almost certainly false (see Copan and Craig 2004, Dembski and Wells 2008, Holder 2004, and Meyer 2009 and 2013, for examples of how to do this in an intellectually responsible way). God has given us two books, the book of his words and the book of his works: Scripture and nature. Properly interpreted, they are not in conflict with each other.

References

- Archer, Gleason L. 2007. *A Survey of Old Testament Introduction* (Revised and Expanded). Chicago: Moody Publishers.
- Arnold, Bill T., and Bryan E. Beyer, eds. 2002. *Readings from the Ancient Near East: Primary Sources for Old Testament Study*. Grand Rapids: Baker Academic.
- Bailey, Lloyd R. 1993. *Genesis, Creation, and Creationism*. New York: Paulist Press.

- Barnes, Thomas G. 1973. *Origin and Destiny of the Earth's Magnetic Field (I.C.R. Technical Monograph #4)*. San Diego: Creation-Life Publishers.
- Barton, John. 1984. *Reading the Old Testament: Method in Biblical Study*. Philadelphia: The Westminster Press.
- Bierlein, J. F. 1994. *Parallel Myths*. New York: Random House.
- Berkhof, Louis. 1950. *Principles of Biblical Interpretation*. Grand Rapids: Baker Book House.
- Blocher, Henri. 1984. *In the Beginning: The Opening Chapters of Genesis*. Downers Grove: InterVarsity Press.
- Blomberg, Craig L. 2014. *Can We Still Believe the Bible? An Evangelical Engagement with Contemporary Questions*. Grand Rapids: Brazos Press.
- Bray, Gerald. 1996. *Biblical Interpretation: Past & Present*. Downers Grove: InterVarsity Press.
- Brown, Walt. 2008. *In the Beginning: Compelling Evidence for Creation and the Flood* (Eighth Edition). Phoenix: Center for Scientific Creation.
- Collins, C. John. 1995. The *Wayyiqtol* as 'Pluperfect': When and Why. *Tyndale Bulletin* 46 (1): 117-140.
- _____. 2003. *Science & Faith: Friends or Foes?* Wheaton: Crossway Books.
- _____. 2006. *Genesis 1-4: A Linguistic, Literary, and Theological Commentary*. Phillipsburg: P&R Publishing.
- _____. 2011. *Did Adam and Eve Really Exist? Who They Were and Why You Should Care*. Wheaton: Crossway Books.
- Conn, Harvey M., ed. 1988. *Inerrancy and Hermeneutic: A Tradition, A Challenge, A Debate*. Grand Rapids: Baker Book House.
- Conner, Samuel R. and Don R. Page. 1998. *Starlight and Time* is the Big Bang. *CEN Technical Journal* 12 (2): 174-194. Available at: http://static.icr.org/i/pdf/news/rh_connpagel.pdf (last accessed 21 Aug 2014).
- Conner, Samuel R., and Hugh Ross. 1999. The Unraveling of *Starlight and Time*. Available at: <http://www.reasons.org/articles/the-unraveling-of-starlight-and-time> (last accessed 21 Aug 2014).
- Copan, Paul, and William Lane Craig. 2004. *Creation out of Nothing: A Biblical, Philosophical, and Scientific Exploration*. Grand Rapids: Baker Academic.
- Craig, William Lane. 2013. *A Reasonable Response: Answers to Tough Questions on God, Christianity, and the Bible*. Chicago: Moody Publishers.

Davidson, Gregg, and Ken Wolgemuth. 2010. Christian Geologists on Noah's Flood: Biblical and Scientific Shortcomings of Flood Geology. Available at: http://biologos.org/uploads/projects/davidson_wolgemuth_scholarly_essay.pdf (last accessed 21 Aug 2014).

Deem, Richard. 2007. The Water Vapor Canopy Theory: Why the Bible (and Science) Says It is False. Available at: <http://godandscience.org/youngearth/canopy.html> (last accessed 21 Aug 2014).

Dembski, William A. 1999. *Intelligent Design: The Bridge Between Science and Theology*. Downers Grove: InterVarsity Press.

_____. 2009. *The End of Christianity: Finding a Good God in an Evil World*. Nashville: B&H Publishing Group.

Dembski, William A., Wayne J. Downs, and Fr. Justin B. A. Frederick, eds. 2008. *The Patristic Understanding of Creation: An Anthology of Writings from the Church Fathers on Creation and Design*. Riesel: Erasmus Press.

Dembski, William A. and Jonathan Wells. 2008. *Design of Life: Discovering Signs of Intelligence in Biological Systems*. Dallas: Foundation for Thought and Ethics.

DeYoung, Don. 2005. *Thousands... Not Billions: Challenging an Icon of Evolution, Questioning the Age of the Earth*. Green Forest: Master Books.

Dillow, Joseph C. 1982. *The Waters Above: Earth's Pre-Flood Vapor Canopy*. Chicago: Moody Press.

Dumbrell, W. J. 1984. *Covenant and Creation: A Theology of Old Testament Covenants*. Nashville: Thomas Nelson Publishers.

Dundes, Alan, ed. 1988. *The Flood Myth*. Berkeley: University of California Press.

Enns, Peter. 2012. *The Evolution of Adam: What the Bible Does and Doesn't Say about Human Origins*. Grand Rapids: Brazos Press.

Fackerell, E. D., and C.B.G. McIntosh. 2000. Errors in Humphreys' cosmological model. *CEN Technical Journal* 14 (2): 77-80. Available at: http://www.trueorigin.org/rh_fackmcin1.pdf (last accessed 21 Aug 2014).

Feder, Kenneth L. 2004. *The Past in Perspective: An Introduction to Human Prehistory*. Boston: McGraw-Hill Publishers.

Fokkelman, J. P. 1975. *Narrative Art in Genesis*. Amsterdam: Van Gorcum.

Frazer, Sir James G. 2013 [1918]. *The Great Flood: A Handbook of World Flood Myths*. Charleston: CreateSpace Independent Publishing.

Futato, Mark. 1998. Because It Had Rained: A Study of *Gen. 2:5-7* with Implications for *Gen. 2:4-25* and *Gen. 1:1-2:3*. *Westminster Theological Journal* 60: 1-21.

- Gauger, Ann, Douglas Axe, and Casey Luskin. 2012. *Science & Human Origins*. Seattle: Discovery Institute Press.
- Gordon, Bruce L. 2013. In Defense of Uniformitarianism. *Perspectives on Science and Christian Faith* 65 (2): 79-86.
- Gordon, Bruce L., and William A. Dembski, eds. 2011. *The Nature of Nature: Examining the Role of Naturalism in Science*. Wilmington: ISI Books.
- Green, Jay P., ed. 1979. *The New Brown-Driver-Briggs-Gesenius Hebrew and English Lexicon*. Peabody: Hendrickson Publishers.
- Gundry, Stanley N., Matthew Barrett, and Ardel B. Caneday, eds. 2013. *Four Views on the Historical Adam*. Grand Rapids: Zondervan Publishing.
- Gundry, Stanley N., J. Merrick, and Stephen M. Garrett, eds. 2013. *Five Views on Biblical Inerrancy*. Grand Rapids: Zondervan Publishing.
- Ham, Ken. 2013. *Six Days: The Age of the Earth and the Decline of the Church*. Green Forest: Master Books.
- Herder, Johann G. 1833. *The Spirit of Hebrew Poetry*, volume 1, translated by J. Marsh. Burlington: Edward Smith.
- Holder, Rodney D. 2004. *God, the Multiverse, and Everything: Modern Cosmology and the Argument from Design*. Burlington: Ashgate Publishing Company.
- Humphreys, D. Russell. 1984. The Creation of Planetary Magnetic Fields. *Creation Research Society Quarterly* 21: 140-49.
- _____. 1986. Reversals of the Earth's Magnetic Field during the *Genesis* Flood. *Proceedings of the First International Conference on Creationism* 2: 113-26.
- _____. 1988. Has the Earth's Magnetic Field Ever Flipped? *Creation Research Society Quarterly* 25: 130-37.
- _____. 1994. *Starlight and Time: Solving the Puzzle of Distant Starlight in a Young Universe*. Green Forest: Master Books.
- Keller, Werner. 1980. *The Bible as History* (Revised Edition). London: Hodder and Stoughton Ltd.
- Kitchen, K. A. 2003. *On the Reliability of the Old Testament*. Grand Rapids: William B. Eerdmans Publishing Company.
- Kline, Meredith. 1958. Because It Had Not Rained. *Westminster Theological Journal* 20: 146-157.
- _____. 1996. Space and Time in the *Genesis* Cosmogony. *Perspectives on Science and Christian Faith* 48 (1): 2-15.

- Lamoureux, Denis O. 2008. *Evolutionary Creation: A Christian Approach to Evolution*. Eugene: Wipf & Stock.
- Lang, Bernhard. 1985. Non-Semitic Deluge Stories and the Book of Genesis: A Bibliographic and Critical Survey. *Anthropos* 80: 605-16.
- Lennox, John C. 2007. *God's Undertaker: Has Science Buried God?* Oxford: Lion Hudson.
- _____. 2011. *Seven Days that Divide the World: The Beginning According to Genesis and Science*. Grand Rapids: Zondervan.
- Longman, Tremper, III. 2005. *How to Read Genesis*. Downers Grove: InterVarsity Press.
- Longman, Tremper, III, and Raymond B. Dillard. (2006) *An Introduction to the Old Testament* (Second Edition). Grand Rapids: Zondervan.
- Madueme, Hans, and Michael Reeves, eds. 2014. *Adam, the Fall, and Original Sin: Theological, Biblical, and Scientific Perspectives*. Grand Rapids: Baker Academic.
- Martens, Elmer A. 1981. *God's Design: A Focus on Old Testament Theology*. Grand Rapids: Baker Book House.
- Martin, Charles. 2009. *Flood Legends: Global Clues of a Common Event*. Green Forest: Master Books.
- May, Robert M. 1988. How Many Species are There on Earth? *Science* (New Series) 241 (4872): 1441-1449.
- Meyer, Stephen C. 2013. *Darwin's Doubt: The Explosive Origin of Animal Life and the Case for Intelligent Design*. New York: HarperOne.
- Moreland, J.P., and John Mark Reynolds, eds. 1999. *Three Views on Creation and Evolution*. Grand Rapids: Zondervan Publishing.
- Morris, Henry M. 1974. *Scientific Creationism* (Public School Edition). San Diego: Creation-Life Publishers.
- Morris, John. 2007. *The Young Earth: The Real History of the Earth—Past, Present, and Future*. Green Forest: Master Books.
- Muscheler, R., J. Beer, P. W. Kubik, and H. A. Synal. 2005. Geomagnetic field intensity during the last 60,000 years based on ^{10}Be and ^{36}Cl from the summit ice cores and ^{14}C . *Quaternary Science Reviews* 24: 1849-60
- NASA. 2003. Earth's Inconstant Magnetic Field. Available at: http://science1.nasa.gov/science-news/science-at-nasa/2003/29dec_magneticfield/ (last accessed 21 Aug 2014).
- Nave, C. R. 2014. Radioactive Dating. *HyperPhysics*. Available at: <http://hyperphysics.phy-astr.gsu.edu/hbase/nuclear/raddat2.html> (last accessed 21 Aug 2014).

Noll, Mark A. 1994. *The Scandal of the Evangelical Mind*. Grand Rapids: William B. Eerdmans Publishing Company.

Plantinga, Alvin. 2004. Supralapsarianism, or ‘O Felix Culpa’. In Peter van Inwagen, ed., *Christian Faith and the Problem of Evil*. Grand Rapids: William B. Eerdmans Publishing Company, 1-25.

_____. 2011. *Where the Conflict Really Lies: Science, Religion & Naturalism*. New York: Oxford University Press.

Price, George McCready. 1906. *Illogical Geology: The Weakest Point in the Evolution Theory*. Los Angeles: The Modern Heretic Company.

_____. 1923. *The New Geology: A Textbook for Colleges* (Second Edition). Mountain View: Pacific Press Publishing Association.

Rana, Fazale, and Hugh Ross. 2005. *Who Was Adam? A Creation Model Approach to the Origin of Man*. Colorado Springs: NavPress.

Ratzsch, Del. 1996. *The Battle of Beginnings: Why Neither Side is Winning the Creation-Evolution Debate*. Downers Grove: InterVarsity Press.

_____. 2000. *Science & Its Limits: The Natural Sciences in Christian Perspective*. Downers Grove: InterVarsity Press.

Richards, Jay, ed. 2010. *God and Evolution*. Seattle: Discovery Institute Press.

Ross, Hugh. 2006. *Creation as Science: A Testable Model Approach to End the Creation/Evolution Wars*. Colorado Springs: NavPress.

Ryan, William, and Walter Pitman. 1998. *Noah’s Flood: The New Scientific Discoveries about the Event that Changed History*. New York: Simon & Schuster.

Sarfati, Jonathan. 2004. *Refuting Compromise: A Biblical and Scientific Refutation of “Progressive Creationism” (Billions of Years) as Popularized by Astronomer Hugh Ross*. Green Forest: Master Books.

Schaeffer, Francis A. 1972. *Genesis in Space and Time*. Downers Grove: InterVarsity Press.

Setterfield, Barry, and Trevor Norman. 1987. The Atomic Constants, Light, and Time. Available at: <http://www.setterfield.org/report/report.html> (last accessed 21 Aug 2014).

Slusher, Harold S. 1973. *Critique of Radiometric Dating* (I.C.R. Technical Monograph #2). San Diego: Creation-Life Publishers.

Snoke, David. 2006. *A Biblical Case for an Old Earth*. Grand Rapids: Baker Books.

VanGemeran, Willem A. 1988. *The Progress of Redemption: The Story of Salvation from Creation to the New Jerusalem*. Grand Rapids: Baker Books.

Vos, Geerhardus. 1948. *Biblical Theology: Old and New Testaments*. Grand Rapids: William B. Eerdmans Publishing Company.

Walton, John H. 2009. *The Lost World of Genesis One: Ancient Cosmology and the Origins Debate*. Downers Grove: InterVarsity Press.

Whitcomb, John C., and Henry M. Morris. 1961. *The Genesis Flood: The Biblical Record and Its Scientific Implications*. Philadelphia: The Presbyterian and Reformed Publishing Company.

Wiens, Roger C. 2002. Radiometric Dating: A Christian Perspective. Available at: <http://www.asa3.org/ASA/resources/Wiens2002.pdf> (last accessed 21 Aug 2014).

Wilson, Ian. 2001. *Before the Flood: The Biblical Flood as a Real Event and How It Changed the Course of Civilization*. New York: St. Martin's Griffin.

Wright, N. T. 2014. *Surprised by Scripture: Engaging Contemporary Issues*. New York: HarperOne.

Young, Davis A. 1977. *Creation and the Flood: An Alternative to Flood Geology and Theistic Evolution*. Grand Rapids: Baker Book House.

Young, Davis A. and Ralph F. Stearley. 2008. *The Bible, Rocks and Time: Geological Evidence for the Age of the Earth*. Downers Grove: InterVarsity Press.