

Is there Science in the Bible?

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Conservative Christian confessions of faith affirm that the Bible is true in all that it teaches. This confidence leads some evangelicals to apply a concordist approach to the Bible, whereby they harmonize Biblical statements about the natural world with our modern scientific understanding of it. Moreover, there are Christian apologists who argue that some Biblical statements reflect scientific truths that were unknown at the time the text was written, suggesting divine authorship for the Bible.

Other evangelical scholars have recently challenged this concordist approach by asserting that the Bible contains no knowledge about nature that was not commonly available in the ancient near east.

This paper will review the strengths and merits of these claims, and conclude that a moderate concordism seems valid and of apologetic value.

Introduction.

Is there science in the Bible? To clarify this question: Does the Bible show a knowledge of the natural world – what today we call ‘science’ – that agrees with our modern understandings, but differs from the views about the natural world which are found in neighboring ancient cultures? For well over a century, liberal theologians have answered “No” to this question and produced critical works such as “Babel and Bible” to attempt to prove that the Israelites knew nothing more, and probably a whole lot less about the world, than their neighbors did.¹ Such pessimistic views are typical of liberal theologians’ skeptical approach to Biblical studies and traditional theology, which merely sees the Hebrew and Christian religions as products of their primitive, superstitious times.

However, this “No” answer has recently been picked up by a number of evangelical scholars, most notably by John Walton in *The Lost World of Genesis One*. In order to justify rejecting the exegetical practice of scientific concordism (harmonizing the Bible with modern science), Walton asserts:

“The Israelites received no revelation to update or modify their [ancient] “scientific” understanding of the cosmos.”²

¹ Friedrich Delitzsch, C. H. W. Johns. *Babel and Bible*. New York, G.P. Putnam's Sons; London, Williams and Norgate, 1903.

² John H. Walton, *The Lost World of Genesis One: Ancient Cosmology and the Origins Debate* (Downers Grove, IL: InterVarsity Press, 2009), p. 16.

“Through the entire Bible, there is not a single instance in which God revealed to Israel a science beyond their own culture. No passage offers a scientific perspective that was not common to the Old World [i.e., Ancient Near Eastern] science of antiquity.”³

Bold, sweeping generalizations like this, which brush aside the work of conservative scholars, are intimidating when they come from someone with the stature of Walton. However, his assertions are testable. My goal in this paper is to evaluate his claim: Is there really no science in the Bible beyond what was common to the ancient world?

1. The Stability of Physical Laws.

In ancient near eastern (ANE) cosmology, the regular operations of the world could not be assumed, even though the gods controlled them. In Mesopotamia the god who held the “Tablet of Destinies” ordered the universe and the affairs of mankind. Generally this was the highest-ranking god in the pantheon, but if the Tablet was stolen, as happened in the Anzu Epic, the result was cosmic chaos.⁴ Cosmic uncertainty is also evident in the Babylonian Akitu or New Year’s Festival, which was conducted annually to reestablish the kingship by divine authority and secure the life and destiny of the people for the coming year.⁵ The instability of nature is an inherent weakness of polytheism, because personality conflicts between the gods lead to bickering and ‘working around’ decrees. This unpredictable ‘rule by committee’ is painfully well attested in ANE literature.⁶

In contrast, the workings of the world are seen as fixed and unchanging in the Bible. This is implied on the fourth day of creation, where the sun, moon and stars are established for marking days, seasons and years, and it is explicitly affirmed a few chapters later in the Noachic covenant:

“While the earth remains, seedtime and harvest, and cold and heat, and summer and winter, and day and night shall not cease.” (Gen. 8:22, NASB)

God later emphasizes the fixity of these laws in Jeremiah:

³ Walton, *Lost World*, p. 19.

⁴ A. R. George. ‘Sennacherib and the Tablet of Destinies,’ *Iraq* 48 (1986), pp. 133-146. <<http://www.jstor.org/stable/4200258>> See also J. Black and A. Green, *Gods, Demons and Symbols of Ancient Mesopotamia: An Illustrated Dictionary*, London: British Museum Press 1992, s.v. “Tablet of Destinies.”

⁵ Walter Harrelson, “Worship.” *Encyclopædia Britannica*. 2010. Encyclopædia Britannica Online. <<http://www.britannica.com/EBchecked/topic/649187/worship>>.

⁶ Cf. The Atra-hasis epic, where Enki repeatedly thwarts Enlil’s attempts to destroy mankind.

“Thus says the Lord, Who gives the sun for light by day and the fixed order of the moon and the stars for light by night, ... ‘If this fixed order departs from before Me,’ declares the Lord, ‘Then the offspring of Israel also will cease from being a nation before Me forever.’” (Jer. 31:35-36, NASB)

“Thus says the Lord, ‘If you can break My covenant for the day and My covenant for the night, so that day and night will not be at their appointed time, then My covenant may also be broken with David My servant....’” (Jer. 33:20, NASB)

“Thus says the Lord, ‘If My covenant for day and night stand not, and the fixed patterns of heaven and earth I have not established, then I would reject the descendants of Jacob and David My servant....’” (Jer. 33:25, NASB)

Thus it appears that Walton is too hasty in asserting that “Through the entire Bible, there is not a single instance in which God revealed to Israel a science beyond their own culture. No passage offers a scientific perspective that was not common to the Old World [i.e., Ancient Near Eastern] science of antiquity.”⁷ That the patterns of nature are unchangeable and fixed was not a common assumption in the ancient near east. Interestingly, these Biblical proclamations about the regularities of nature were some of the insights which motivated Galileo, Kepler, Newton and others to search for them, and to develop modern science.⁸ If Walton is correct, then Christians have no scriptural basis to presume that the natural world operates according to fixed laws: That definitely would be reading something into the Bible that was not common to the ancient near eastern mind. I’m not sure that this is something that most conservative theologians and Christians in science would go along with.

2. Animal Breeding.

An excellent example of ‘ancient scientific reasoning’ in the Bible shows up in the conflict between Jacob and Laban. After Jacob agrees to tend his father-in-law’s herds in exchange for the speckled, spotted, or black sheep and goats among them, Jacob intentionally tries to get Laban’s flocks to bred discolored offspring:

“Then Jacob took fresh rods of poplar and almond and plane trees, and peeled white stripes in them, exposing the white which was in the rods. He set the rods which he had peeled in front of the flocks in the gutters, even in the watering troughs, where the flocks came to drink; and they

⁷ Walton, *Lost World*, p. 19.

⁸ David C. Lindberg, Ronald L. Numbers, eds. *God & Nature: Historical Essays on the Encounter between Christianity and Science* (Berkeley, CA: University of California Press, 1986), p. 462. An excellent extended discussion of these issues is available in John Hedley Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge University Press, 1991).

mated when they came to drink. So the flocks mated by the rods, and the flocks brought forth striped, speckled, and spotted.” (Gen. 30: 37-39, NASB)

By only using the rods with the stronger animals, Jacob was able to increase both the size and strength of his own discolored flocks, to Laban’s detriment.

Although this practice is not attested at this early a date in other ancient literature,⁹ Jacob is clearly drawing from the best ‘science of his day’ – sympathetic magic and maternal impression – to manipulate breeding outcomes.¹⁰ To think that what animals see when they mate could influence the color of their offspring certainly bears no resemblance to modern genetics.

Is this an example of a Bible passage where the ‘science’ described is common to that of other ancient near eastern cultures of the time? It certainly appears to be. However, if we keep reading in the text instead of leaving this passage in isolation, we find that God corrects Jacob’s folk-science. Jacob later tells Rachel and Leah:

“And it came about at the time when the flock were mating that I lifted up my eyes and saw in a dream, and behold, the male goats which were mating were striped, speckled, and mottled. Then the angel of God said to me in the dream.... ‘Lift up now your eyes and see that all the male goats which are mating are striped, speckled, and mottled; for I have seen all that Laban has been doing to you.’” (Gen. 31:10-12, NASB)

The vision which God shows Jacob makes sense genetically: Homozygotic mottled males breeding with heterozygotic white females (as about two-thirds of Laban’s herd would be, since Jacob had removed all of the mottled animals earlier) will yield a large fraction of mottled offspring. Jacob’s dream thus appears to refute Walton’s claim that, “The Israelites received no revelation to update or modify their ‘scientific’ understanding of the cosmos.”¹¹ God shows Jacob in a dream that his folk-science is incorrect, that breeding outcomes depend on the characteristics of the animals themselves, and of course that God is in control. Thus it appears that God will correct the ‘scientific’ understanding of Biblical characters when an incorrect understanding of nature obscures His actions or misleads His people.

⁹ The history of “maternal impression” is discussed by Anna Mayer, “The Monstrous Birth: The Theory of Maternal Impression and Congenital Malformations,” *Proceedings of the 10th Annual History of Medicine Days* (Faculty of Medicine, University of Calgary). WA Whitelaw ed., 2001, p. 48-52. <<http://www.ucalgary.ca/uofc/Others/HOM/Dayspapers2001.pdf>> Accessed 3/1/2010. The earliest explicit attestation other than Genesis 30 occurs in Plato (400 B.C.), but Mayers calls the idea “ubiquitous.”

¹⁰ Wm. F. Batman, “Maternal Impressions,” *Journal of the American Medical Association* 1896;XXVII(20):1031-1032. doi:10.1001/jama.1896.02430980003001a

¹¹ Walton, *Lost World*, p. 16.

3. Nature is Impersonal.

My hypothesis that God corrects the 'scientific' understanding of Biblical characters when it obscures His actions or misleads His people is seen in another passage:

“Thus says the Lord, ‘Do not learn the way of the nations, and do not be terrified by the signs of the heavens although the nations are terrified by them; for the customs of the peoples are delusion....’” (Jer. 10:2-3a, NASB)

Babylonian astronomical omens date back at least to the Old Babylonian period (*circa* 2000-1600 BC), and many are preserved in the *Enuma Anu Enlil* series of about seventy tablets. For centuries Babylonian and Egyptian priests recorded their systematic observations of the heavens, river water levels, and weather, and used this scientific knowledge¹² in their agriculture, calendars, and in discerning the will of their gods. Since non-Israelites viewed the objects in the heavens as gods, it was only logical that eclipses, the varying shape of the moon, comets, meteors, and planetary positions would give clues to the gods' disposition and man's fate.

The God of the Bible dispenses with this application of the 'science of the day' with one sentence: Ignore it. The objects in the sky are not beings to be feared. Such a de-personification of nature is not found in any surrounding cultures. Moreover, it is even evident in Genesis one, where the sun and moon are described but not named, because their names are associated with Canaanite gods. This Biblical view of physical objects as things, not persons, was also foundational to the rise of modern science.⁸

4. Divination Banned.

Interpreting signs in the sky was but one form of divination in the ancient near east: Extispicy (the inspection of the internal organs of sacrificed animals), abnormal births, the flight patterns of birds in the sky, or the way smoke drifted up from a fire, provided other means to discern the will of the gods. The importance of omens in guiding royal affairs is evident in that one-third of Ashurbanipal's massive royal library in Nineveh consisted of omen texts. Ezekiel 21:21-22 mentions that Nebuchadnezzar used several methods of divination to decide between attacking Rabbah in Ammon or Jerusalem during a western campaign.

In Israel, divination and omen reading was strictly forbidden (Lev. 19:26, Deut. 18:10) and considered a capital offense (1 Sam. 28). While the high priest could inquire of God using the Urim and Thummin, this very limited tool is a stark contrast to the

¹² Science is defined as “systematic knowledge of the physical or material world gained through observation and experimentation.” s.v. "science." Dictionary.com Unabridged. Random House, Inc. 20 Oct. 2010. <Dictionary.com <http://dictionary.reference.com/browse/science>>.

extensive omen-reading industry and control that divination exerted over the leaders of surrounding cultures. Like the reading of signs in the heavens, this ‘science of the day’¹³ is absent from the Bible. This contrast is something that Walton’s position would not anticipate.

5. Medical Laws.

Walton’s view that the Bible contains nothing beyond the ‘science’ of surrounding cultures also sweeps under the rug the many effective and unique medically-related laws in the Old Testament.

Extensive passages dealing with quarantine (the isolation of people who are ill with contagious diseases), the proper handling and disposal of dead humans or animals, toxic mold, the distinction between clean and unclean, basic sanitation practices, washings, and sexual purity are recognized as unique insights compared to the medical and social practices found elsewhere in the ancient near east.¹⁴ Sadly, their continuing value in modern times is generally learned the hard way, as in the famous case of Dr. Ignaz Semmelweis, who dramatically reduced death rates in the maternity wards of Vienna hospitals during the mid-1800's by requiring simply that his colleagues wash their hands after performing autopsies.¹⁵

Further, the Bible says nothing about wearing amulets comprised of semi-precious stones in order to ward off or to heal various diseases, or about using omens and incantations to drive the evil spirits out of a sick person, or about applying animal dung to heal wounds. All of these practices are common elsewhere in the ancient near east. Of the many remedies used in Egyptian and Babylonian medical treatments, less than one-third of the identifiable ingredients have any known medical value. These are generally salts or oils with a mild antibiotic or antiseptic effect, or pain relievers. Medical historians think that remedies were first chosen for magical reasons (dung would repel a demon), and those which appeared helpful were retained. What effectiveness these treatments actually may have had is generally attributed to the placebo effect.¹⁶

¹³ Some scientists might object to the reading of animal entrails being called ‘science,’ but the omen texts are systematic knowledge about the natural world gained through careful, professional observation, and as such historians regard them as science or early science. Certainly it is correct to consider the ancient application of this knowledge to be superstitious, but the information itself, and the methods used to gather it, fall within the modern definition of science.

¹⁴ Gian Franco Gensini, Magdi H. Yacoub, and Andrea A. Conti. “The concept of quarantine in history: from plague to SARS,” *Journal of Infection* (2004) 49, 257-261. See also references in the next footnote.

¹⁵ Layman-accessible discussions of Old Testament medical laws include: S. I. McMillen, *None of these Diseases* (Fleming H. Revell, 1984); Kenny Barfield, *Why the Bible Is Number 1: The World’s Sacred Writings in the Light of Science* (Grand Rapids, MI: Baker Book House, 1988).

¹⁶ Michael D. Parkins, “Pharmacological Practices of Ancient Egypt,” *Proceedings of the*

Conclusions.

Within the limited space of this paper, I have sought to remind us that there are some clear distinctions between the 'science of the day' in the ancient near east and what we find in the Bible. These differences provide a basis for valuing the Bible over other ancient literature, and for supposing that it may contain something of spiritual value that is relevant to us today.

In reacting against those who take a concordist approach to science and the Bible, I fear that Walton has fallen prey to a concordism of another fashion: Seeking so much harmony between Israel and other ancient cultures that he misses the significant differences between them. Leaving Israel's views aside, ancient near eastern scholars note that we cannot homogenize ancient near eastern cosmologies: W. G. Lambert remarks that *Enuma Elish* "is not a norm of Babylonian or Sumerian cosmology. It is a sectarian and aberrant combination of mythological threads woven into an unparalleled compositum."¹⁷ Recent extensive works on ancient cosmologies demonstrate that there was considerable variation in how different ancient cultures imagined the cosmos.¹⁸ To assert that everyone in the ancient near east held to a common belief in a three-tiered universe, for example, is a myth of oversimplification. Horowitz notes that the Mesopotamian cosmos consisted of five or six superimposed flat levels separated by open space, tethered together by cosmic bonds or lead-ropes so that they would not drift apart.¹⁹

So, if there really are differences between the Bible and other ancient cultures regarding their understandings of the natural world, how extensive and how significant are they? How much concordism between the Bible and modern science is warranted? We do need to be cautious about this: I hardly think that continental drift was in view when the Bible says that during the days of Peleg "the earth was divided" (Gen. 10:25), or that we need to overly concern ourselves about harmonizing modern science with the language of appearance that we see in many Biblical descriptions of nature. Theologians assure us that the ancient Israelites did not believe that their God was literally a rock, nor that

10th Annual History of Medicine Days (Faculty of Medicine, University of Calgary). WA Whitelaw ed., 2001, p. 5-11. <<http://www.ucalgary.ca/uofc/Others/HOM/Dayspapers2001.pdf>> Accessed 3/1/2010. "Medicine in Ancient Mesopotamia," <<http://www.indiana.edu/~ancmed/meso.HTM>> Accessed 7/23/2010.

¹⁷ W. G. Lambert, "A New Look at the Babylonian Background of Genesis," in *I Studied Inscriptions from before the Flood: Ancient Near Eastern, Literary, and Linguistic Approaches to Genesis 1-11*, Richard S. Hess and David Toshio Tsumura, eds. (Winona Lake, IN: Eisenbrauns, 1994).

¹⁸ Richard J. Clifford, *Creation Accounts in the Ancient Near East and in the Bible* (The Catholic Biblical Quarterly. Monogram Series 26, 1994). See also Horowitz, next note.

¹⁹ Wayne Horowitz, *Mesopotamian Cosmic Geography* (Winona Lake, IN: Eisenbrauns, 1998), note summary on p. xii-xiii; bonds are discussed on p. 264-5.

he had physical hands, feet, wings, and eyes, although the Bible often describes God using these terms. If we know that the ancient Israelites did not think that God literally had physical eyes, we should not press every Biblical description of nature as woodenly literal either, such as insisting that the ancient Israelites understood the “pillars of the earth” to be literal, physical columns.

My hypothesis is that God corrects the ‘scientific’ understanding of Biblical characters, and informs the Biblical authors, when an incorrect understanding of nature would obscure His actions or mislead His people. This modest proposal fits with the accuracy of medically-related texts, the ban on divination, the de-personification and fixed behavior of the physical world, and it permits us to consider the possibility of a mild concordism with other scientific topics.

Rabbi David Shatz has recently written an extensive article on the issue of exegesis and scientific concordism, and concludes that there is no valid in-principle argument against the practice. Any rationale which isolates the Bible from science also prevents scholars from using history, archaeology, philology, and linguistics to interpret the Bible. Shatz concludes that any particular concordist proposal must stand or fail on its fairness to the text and the quality of its fit.²⁰ Thus scientific concordism merits careful reflection rather than breezy dismissal.

Unfortunately, there is no simple or automatic way to tease apart phenomenological descriptions of nature from physically accurate ones – in any language or culture. For example, the phrase “the four corners of the earth” could simply be the best idiom available to the original Biblical writer and his audience, thus we err if we conclude from this that the Bible is teaching that the world is square. Couldn’t someone today read about “north, south, east and west” in any modern geography text and conclude that we moderns also think the earth is square? Or what about the contemporary use of “sunrise” and “sunset,” even though most people know that this effect is the result of the Earth’s, not the sun’s, motion? Exegesis is also complicated by the fact that the meaning of words, idioms and figures of speech in any language can change over time (e.g., the English word “manufacture” literally means “made by hand”). Thus taking terms too literally may convey more than, or even the opposite of, what the author intended.

Some argue against a moderate concordism by insisting that we can only use the meaning as understood by the author’s original audience, but this approach is fraught with problems. For one, how well can we reconstruct the background knowledge and beliefs of the original audience? It seems like many ANE and biblical scholars assume that the ancient Israelites were as familiar with the creation myths of surrounding cultures as the modern scholars themselves are. While one Late Bronze (Middle

²⁰ David Shatz, “Is There Science in the Bible?” (2008) *Tradition* 41:2, p. 198-244. I would commend a concordist model like Newman, Eckelmann, and Philip’s *Genesis One and the Origin of the Earth*, available at <www.ibri.org> instead of the evolutionary one which Shatz himself finds inadequate.

Babylonian) fragment of the popular Gilgamesh Epic was found at Megiddo,²¹ this is hardly proof that the average Israelite had ever heard of it, let alone of Enuma Elish and other foreign creation myths. After all, there is a language difference between Akkadian and Canaanite or Hebrew, and from the quality of the Amarna Letters we know that even the professional scribes in Canaanite royal courts were not terribly literate in Akkadian.²² To argue that the creation myths from other cultures provide us with the background knowledge of the original Israelite audience, one must assume that there was a wide translation and dissemination of literary works between cultures. But since public education did not exist in the ancient near east, the chief vehicle for such dissemination is lacking. To make a contemporary comparison: How well does the average American know the works of Shakespeare, Goethe, or Dante? Certainly there are a few English and Literature teachers who do, but we cannot assume that these few specialists are representative of the original audience for these works, nor of today's general population. The contemporary use of famous Shakespearian phrases like, "To be or not to be, that is the question" does not mean that the average person today is at all familiar with Shakespeare and buys into his views of the afterlife. Similarly, linguistic and idiomatic parallels between Ugaritic or Mesopotamian literature and the Bible need to be examined cautiously, keeping an eye on their differences. Given the fragmentary evidence which survives, trying to reconstruct what the original Hebrew audience would have understood might be a nothing more than projecting a contemporary scholar's dreams into the distant past.

Along similar lines, others protest the idea of concordism by appealing to the author's background and original intent. For the liberal theologian who believes that the Israelites were recording merely their own experiences and thoughts about God, concordism is impossible because these primitive people were locked in their own time and they received no actual information from God. Indeed, Walton almost appears to have this view himself, as he notes, "It [Genesis 1] represents what the Israelites truly believed about how the world got to be how it is and how it works, though it is not presented as their own ideas, but as revelation from God."²³ However, for an evangelical who believes that God actually spoke through his prophets (there is no reason to require dictation theory or inerrancy here, simply that a higher power was able to communicate objectively with people), God is seen as the ultimate author, and we have no reason to expect that He cannot communicate in such a way so as to convey truths that are understandable both to the original audience and to future readers across other cultures. For a modern example, a pastor's "children's sermon" contains truths that are readily understandable to both five-year-olds and adults.

²¹ Wayne Horowitz and Takayoshi Oshima, *Cuneiform in Canaan: Cuneiform Sources from the Land of Israel in Ancient Times* (Jerusalem: Israel Exploration Society, 2006), p. 18, 102.

²² Geoffrey W. Bromiley, *The International Standard Bible Encyclopedia* (Grand Rapids, MI: William B. Eerdmans Publishing Company, 1979), s.v. "Amarna Tablets," section III, by R. F. Youngblood.

²³ Walton, *Lost World*, p. 15.

My sense is that in the Bible, God is providing us with a universal narrative of his actions in history that transcends any specific culture, time, and 'science.' The descriptions of nature are often so general that they can fit a variety of 'scientific' views, ancient or modern. For example, the description that 'the sky is blue' is true whether one thinks that the sky is blue because it is composed of lapis lazuli, because there is a layer of water above the atmosphere, because of Rayleigh scattering of sunlight by air molecules, or whether one even knows or cares about *how or why* the sky is blue. I largely concur with Holding's remark that "The cosmology [in Genesis] has been kept so basic and equivocal that one must force certain meanings into the text and analyze what the [human] writer 'must have been thinking' (as well as pay no attention to the fact that God, not man, is the ultimate author of the text) in order to find error."²⁴ Physical phenomena are described without asserting their exact nature. "Genesis 1 was perfectly designed to allow that interpretation which accorded with actual fact, for it 'says nothing more than that God created the sky or its constituent elements' while remaining 'completely silent' about what those elements were."²⁵ To insist that the words of Genesis demand an ancient cosmology is forcing a wooden literalism into the text, like insisting that the God of Israel must have eyes, hands, and be composed of granite. That God could speak in such a way as to be intelligible to his ancient audience, and convey recognizable details to moderns who have a greater understanding of Earth's history and origin, is certainly plausible, and seems to be reasonable in light of the descriptive terms used and the sequence of events given in the Genesis narrative.

For example, the first descriptions of the Earth in Genesis One imply that it was completely covered with water. Liberal Old Testament scholars site this description as proof that Israel borrowed from Mesopotamian and Egyptian creation myths, since some of these contain similar motifs. However, these cognate myths first describe the 'earth' as entirely or only water, from which dry land is created, where Genesis One describes the earth (land) as being covered with water, which is gathered into one place so that the dry land appears. Interestingly, if one studies the current scientific literature regarding the origin of the Earth, the textbook view is that the early Earth was covered with water.²⁶ Thus Genesis' concordance with the scientific literature is better than with ancient literature, although the water motif was recognizable to the ancients.

So how do we apply moderate scientific concordism in Biblical exegesis to the early chapters of Genesis? That is the topic for another paper... that we can do it is the conclusion of this one.

²⁴ James Patrick Holding, "Is the *raqiya'* ('firmament') a solid dome? Equivocal language in the cosmology of Genesis 1 and the Old Testament: a response to Paul H. Seely." *Technical Journal* (now *Journal of Creation*) 13(2):44–51, 1999. The 'sky is blue' analogy given in the earlier sentence is partially drawn from this article.

²⁵ Holding, "Is the *raqiya'* a solid dome?" Quotations within the citation are from Aalders, G.Ch., *Genesis* Vol. 1, (Grand Rapids, MI: Zondervan, 1981), p. 61.

²⁶ Jon P. Davidson, Walter E. Reed, and Paul M. Davis, *Exploring Earth: An Introduction to Physical Geology*, (Upper Saddle River, NJ: Prentice Hall, 2002), p. 320. See also Newman, *Genesis One*, p. 67.