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- *EVOLUTION VS. DESIGN: A REVIEW ARTICLE*
- *POST-FLOOD MIGRATION OF TORTOISES*
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Haec Credimus

For in six days the Lord made heaven and earth, the sea, and all that in them is, and rested on the seventh. —Exodus 20:11

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Send papers on all subjects to the Editor:
CRSQeditor@creationresearch.org or to
Danny R. Faulkner, 1414 Bur Oak Ct,
Hebron, KY 41048.

Send book reviews to the Book Review Editor:
Don B. DeYoung, 200 Seminary Dr.,
Winona Lake, IN 46590, dbdeyoung@grace.edu.

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Editorial

In This ISSUE

This issue of the *Creation Research Society Quarterly* features articles from a broad range of topics.

Royal Truman's article is an extensive review of Perry Marshall's book, *Evolution 2.0: Breaking the Deadlock Between Darwin and Design*. Normally, book reviews are limited in length, so publishing such a long review deviates from our normal procedure. It is left to the discretion of the editor (me) to make allowances for such things, and Truman convinced me that we ought to publish this review. Still, it didn't seem appropriate to put this in the book review section, thus the need for it to be an article. This also required more extensive peer review than a typical book review undergoes. Why is this article so important? Marshall's book has gained some attention. Furthermore, Marshall's perspective is that of a former young-earth creationist, which means his book contains criticisms of the purpose of the *Creation Research Society*. Hence, the arguments Marshall makes require a response. Truman has done a masterful job in this.

Timothy Lee McCollister identifies a problem for the recent creation/Flood model—the presence of tortoises in the Americas. Most recent creationists today believe there was an intensive, but brief, ice age shortly after the Flood. The ice age lowered sea levels sufficiently to produce a land bridge between Asia and North America, thus allowing migration of land animals from Ararat to the Americas shortly after the Flood. How-

ever, given that they are ectotherms and have a legendary slow pace, was there sufficient time for tortoises to migrate across this land bridge? McCollister argues that the answer is yes, but the exact resolution of this problem requires proper identification of the Flood/post-Flood boundary. There is much food for thought here, and his paper makes an excellent foundation for further work.

This issue also features an article by Lee Anderson. His criticism of the tablet model is sure to be controversial, because many creationists are firmly committed to that model. But is the tablet model the only theory as to the origin of the book of Genesis? No, it is not. I ask our members who disagree with this article to consider carefully the case Anderson makes. Furthermore, I remind our members that we are happy to publish letters in response to this and any other articles published in the *Quarterly*. However, keep in mind that we always give the authors of the original articles the opportunity to respond.

Jonathan Bartlett discusses intelligent design (ID) and its relationship to the Creation model. Those promoting ID seem to attract criticism from both sides—evolutionists generally equate ID with recent creation, while recent creationists often dismiss ID for not identifying the Creator or using Scripture. Bartlett attempts to clarify the situation by pointing out that rather than being an alternative to either evolution or creation, ID is a methodology used to study intelligent causation. As such, it can be

used in arguing for the plausibility of the Creation model.

Baraminology is an important part of the Creation model of biology, and in recent years, much progress has been made in developing this field. A recently developed method measures gene content similarity between species to assign individual baramins. In this issue, Jean O'Micks applies this method to fungi. Not being a biologist, this was the most difficult paper in this issue for me to read, so I guess O'Micks gets the award for the most technical paper in this issue. You may wonder how I, or anyone, can act as editor, given the rather broad range of topics the *Quarterly* must necessarily address. The answer is that we use several area editors who are proficient in their fields. It's a pleasure to work with them.

Finally, we have a Panorama note this issue. The Panorama notes used to be a regular feature in the *Quarterly*. They allow the mention of items that are too short for a regular article but not appropriate for a letter either. Perhaps we ought to resurrect this column. I encourage readers to send possible contributions.

Danny R. Faulkner
Editor
Creation Research Society Quarterly

A Critical Evaluation of the Tablet Model: Considerations on the Origin of the Book of Genesis

Lee Anderson, Jr.*

Abstract

Subsequent to its adoption by many creationists as a feasible understanding of the compositional origin of the book of Genesis, the tablet model has been repeatedly advanced as the most likely explanation for how Moses could have written about historical events that occurred long before his time. This model maintains that Moses relied upon preexistent sources, clay tablets documenting the lives of Adam, Noah, and the Patriarchs. The boundaries between these sources are purportedly reflected in the book of Genesis by the presence of the Hebrew word תולדות. This paper investigates whether the tablet model is a viable understanding of the composition of Genesis and whether it warrants continued promotion. It concludes that the tablet model is sufficiently problematic that its continued promotion may actually prove detrimental to the creationist cause. If advocated at all, it should be as one of many possible biblical theories of the composition of Genesis, with a tentativeness that befits it.

I. Introduction to the Tablet Model

The tablet model (or, as it is sometimes referred to, the “Wiseman Hypothesis”) is a theory regarding the authorship of the book of Genesis. The model maintains that in writing Genesis, Moses relied upon preexistent source material, namely a collection of clay tablets authored by the individuals whose respective lives they recount. This model is built on

the assumption that the Hebrew word תולדות (*tōlēdōt* “generations”), which serves as the primary macrostructural device in the book of Genesis, is a colophon or subscript, signaling the close of each of the sources used by Moses in writing Genesis. The word *tōlēdōt* appears eleven times in the book of Genesis (2:4; 5:1; 6:9; 10:1; 11:10, 27; 25:12, 19; 36:1, 9; 37:2), each followed by the name of an individual prominently featured in

the book (with the exception of Genesis 2:4). Despite a measure of uncertainty among the proponents of the model as to who authored certain sections of Genesis (such as the *tōlēdōt* of the reject Esau, ostensibly beginning in Genesis 36:1), the consensus is that most sections were authored by the individuals whose names are immediately connected with the *tōlēdōt* markers. Textual evidence of dependence on written source material is, according to advocates of the view, found in Genesis 5:1, which is taken as representative of the other proposed units’ subscripts: “This is the book (סֵפֶר; *sēp̄er* “scroll, written document”) of the

* Lee Anderson, Jr., andersonla@masters.edu
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generations (תולדות) of Adam.”¹ Consequently, according to the tablet model, Moses is not the author of Genesis, *per se*, but rather the final editor or redactor responsible for compiling the constituent parts that make up the book of Genesis as a whole. Proponents argue, however, that this view on the composition of Genesis does not violate the biblical claim of Mosaic authorship, since other biblical authors also used source material (cf. e.g., Luke 1:1–3).

Moreover, it should be noted that proponents of the tablet model in no way deny that the book of Genesis is inspired. It is asserted that the Holy Spirit superintended the selection and use of sources in such a way as to ensure that the final product contained the precise words and sentences that God intended. It is somewhat ambiguous in certain creationists’ writings, however, whether they regard the *individual source documents* as being inspired along with the book of Genesis, or whether only Genesis in its *final form* is considered to be inspired.

Originally developed in 1936 by the amateur archeologist P. J. Wiseman,² the tablet model quickly established itself as a viable alternative to the problematic documentary hypothesis, a compositional theory that dispenses with the Mosaic authorship of the Pentateuch altogether and attributes the book to four individual source documents composed in the first millennium BC and pieced together by anonymous redactors sometime in the postexilic period. Wiseman’s model was subsequently adopted by the Old Testament scholar R. K. Harrison, whose 1969 work presented a detailed defense of the position, arguably more robust than that of Wiseman. About the same time

as Harrison’s publication, the modern creationist movement was taking root. Henry Morris, who was later to be known as the “father of modern creationism,” embraced the position that had been set forth by Wiseman and Harrison, giving it significant attention in his commentary, *The Genesis Record*, published in 1976. Following Morris’s lead, the tablet model came to be accepted by various other young-earth creationists, including a number of researchers presently affiliated with creationist ministries.

The tablet model is a clever compositional theory, as it explains how apart from direct dictation or visions from God, Moses would have been able to write about events that occurred long before his time. However, cleverness does not automatically equal historical plausibility or biblical credibility. Any theory of the composition of the book of Genesis must take into account the sum total of historical and textual evidence. Unfortunately, the tablet model has proven selective in its handling of this information, with its proponents often ignoring some very real problems related to the historical plausibility and biblical viability of the model (see section IV). Though further research has shown as incorrect some of the original conclusions of Wiseman and Harrison, creationists have grown increasingly self-confirmed in the supposed accuracy of the tablet model, with some essentially elevating it to a point of dogma. For instance, Hodge (2013, p. 228), working off the assumption of the tablet model, asserts, “Adam, the first man, could write, and we have a portion of what he wrote being edited by Moses into the Pentateuch, specifically the book of Genesis.” Hodge further claims that Genesis 5:1 leaves “no excuse” for denying that Adam was directly responsible for writing a portion of the first book of the Bible. However, is this kind of overt dogmatism warranted? Is the tablet model really so firmly established as to leave dissenters “no excuse” for rejecting

it? Is it just a minor point of doctrinal preference? What are the consequences, if any, of holding this theory? This paper will seek to investigate these questions. Notably, it recognizes the various intended benefits of the tablet model: (1) It advocates a compositional theory of Genesis that seeks to account for the characteristic structure of the book, the separation of the major sections by a formulaic expression. (2) In its latest instantiation, it is advanced to protect the origin of writing from an evolutionary anthropology. And (3) it is advanced to provide a source of primeval events that antedates the ancient Near Eastern accounts, thereby obviating defending textual independence. (In this, it is in line with the church fathers, who took great pains to demonstrate that all the knowledge of the pagan civilization was learned from the patriarchs.) However, as this paper argues, these benefits are inconsequential if the tablet model does not line up with the biblical data.

II. History of the Tablet Model

As noted in the preceding section, the tablet model was originally developed by P. J. Wiseman, who, while participating in archeological excavations in Babylonia, observed that ancient documents (commonly written on clay tablets) often concluded with a standardized form of colophon or subscript evidencing the name of the tablet’s writer or owner. Wiseman likened this pattern to the formula repeated throughout the book of Genesis: אֵלֶּה תּוֹלְדוֹת — “These are the generations....” He asserted that this catchphrase “was the ancient conclusion which Moses inserted indicating the source from which he obtained the narratives and genealogies” (Wiseman, 1977, p. 102).³ He concluded, therefore,

¹ In keeping with the recognized conventions of journals on biblical literature, translations of Scripture, except where noted otherwise, are those of the author.

² Wiseman was an RAF officer with a deep fascination with archeology.

³ The word “catchphrase” generally refers to a phrase at the top of a tablet, which is the same as the final phrase

that Genesis was the compiled collection of ancient records pieced together by Moses, with the *tôlêdôt* markers serving to identify the original authors. Wiseman argued that the antiquity of the original source documents was supported by the presence in the text of antiquated words that would have fallen out of regular usage by the time of Moses (Wiseman, 1977, pp. 46–47).

In accordance with the evidence of the *tôlêdôt* markers, Wiseman alleged that Genesis 1:1–2:4 (Tablet I) was written by Adam on the basis of direct revelation from God. Genesis 2:5–5:2 (Tablet II) was apparently also the work of Adam, in this case writing from his own experience. Genesis 5:3–6:9a (Tablet III), relating the events preceding the Flood, was written or owned by Noah. Genesis 6:9b–10:1 (Tablet IV), which centers on the Flood event, was written or owned by Noah's sons. Genesis 10:2–11:10 (Tablet V) was written or owned by Noah's son Shem. Genesis 11:10–27 (Tablet VI), which is limited to a genealogical record, was written or owned by Terah, the father of Abraham. Genesis 11:27–25:19 (which includes Tablets VII and VIII) documents the life of the great patriarch Abraham and is attributable to his two sons, Ishmael and Isaac. Genesis 25:20–37:2 (which includes Tablets IX, X, and XI) is similarly attributable to two brothers, Esau and Jacob. The final section of Genesis, the lengthy Joseph narrative, has no colophon, and thus is ambiguous as to its authorship (Wiseman, 1977, pp. 42–45, 58–64).

In proposing this model, Wiseman gave thought, not only to the original authorship of the tablets, but also to their transmission. He maintained that Moses did not happen upon eleven different historical documents and stitch them together haphazardly; rather, each

individual tablet was likely passed from its original writer/owner onto a suitable heir, who later added to it his own record. Thus Adam would have entrusted his tablet to one of his descendants, who in turn passed it along until it came into the hands of Noah. Noah, upon adding his account, would have entrusted both his record and that of Adam (or at least a copy of Adam's record) to his sons. His sons (namely Shem), upon adding their respective portions, would have entrusted the growing collection of tablets to a suitable descendant, until it came to Terah. The line of transmission from Terah (via Abraham) to Ishmael and Isaac, and then to Esau and Jacob appears obvious (Wiseman, 1977, pp. 68–70). Consequently, as Wiseman concluded, "In Jacob's time these tablets comprising Genesis 1–36 were connected together as one record" (Wiseman, 1977, p. 70). Thus, the collecting of sources would have been essentially *done* before Moses came on the scene.

Wiseman did not deny Moses' role altogether in compiling the material; he asserted that although Moses left the text largely intact, he would likely have needed to update the language of some of the tablets and provide some explanatory notes (Wiseman, 1977, pp. 72–73).⁴ In any case, however, Moses was much less a writer than he was an editor. The

⁴ Wiseman's original model, in contrast to more recent versions, considers the source tablets themselves to be divinely inspired (Wiseman, 1977, 73). This, he believes, influenced the manner in which Moses handled his task: "The first thing that impresses us as we read them now, is that he regards the old wording as so sacred that he avoids making unnecessary alterations to the text even to modernise words. He leaves the original ancient expressions and place names just as he finds them, though they are no longer in current use" (Wiseman, 1977, 73).

substance of the text of Genesis was for Moses, according to Wiseman's theory, essentially equivalent to how it appears today.

Wiseman was the primary advocate of the tablet model until R. K. Harrison took up the view in the 1960s. He argued that though scholars were agreed as to the importance of the formulaic expression "these are the generations," many had "misunderstood entirely both its usage and its significance for the literary origins of Genesis" (Harrison, 1969, p. 545). He claimed that the expressions must necessarily serve as colophons rather than headings because, generally speaking, the biographical information concerning the person mentioned in each of the expressions appears *before* rather than *after* the *tôlêdôt* formula (Harrison, 1969, p. 545). For example, subsequent to the mention of the "*tôlêdôt* of Adam" (Genesis 5:1), no additional information about Adam is given apart from Adam's age at his death (Genesis 5:4–5).

On this assumption that "the term תולדות can be held to indicate the presence of a colophon in the text," Harrison agreed with Wiseman that "it is eminently possible to regard its incidence as indicating the presence of a genuine Biblical source in the text" (Harrison, 1969, p. 547). He thus maintained that the first 36 chapters of Genesis (but not the Joseph narrative) were taken from "a series of tablets whose contents were linked together to form a roughly chronological account of primeval and patriarchal life written from the standpoint of a Mesopotamian cultural milieu" (Harrison, 1969, p. 548). In attributing the source documents to their supposed original authors, Harrison followed the same divisions set forth by Wiseman. He suggested, as had Wiseman, that many of the textual units betray attempts at dating their origins. For instance, the phrases "when they were created" (Tablet I; Genesis 2:4), "in the day when God created man" (Tablet II, Genesis 5:1),

on another tablet so as to facilitate the ordering of the tablets.

“after the Flood” (Tablet IV; Genesis 10:1), etc., all provide something akin to a “timestamp” on their respective textual units (Harrison, 1969, p. 549). Additionally, Harrison maintained that attempts by the ancients at linking the source texts together, in keeping with Mesopotamian tradition, are evidenced in Genesis 6:9; 11:10; 11:27; 25:19; and 36:1. In all these instances, allowing for what he considered to be an “obvious gloss” in Genesis 36:1, he noted that, “the last word of a suggested tablet is the same as the first word of its successor,” thus providing continuity in the record (Harrison, 1982, p. 437; cf. 1969, pp. 549–550).

Harrison was disinclined to suggest that the Joseph narrative (Genesis 37:2–50:26) had circulated as an independent written source prior to the compilation of Genesis. Moses may have been responsible for providing the account contained in that portion of the book. However, as far as it concerned the first 36 chapters of Genesis, Moses’ role was one of an editor and compiler, a task for which his background would have prepared him well. As Harrison noted, “A person such as Moses would have been eminently suited to the task of assembling ancient records and transcribing them in edited form as a continuous record” (Harrison, 1969, p. 552).

In the face of the form- and source-critical theories that dominated the field of Old Testament study, the tablet model as articulated by Wiseman and Harrison occupied a minority position. However, it was popular among conservatives, who, on biblical grounds, rightly defended the Mosaic authorship of the Pentateuch (cf. e.g., Joshua 8:31; Mark 12:26). One such individual intrigued by the tablet model was the creationist revolutionary Henry Morris.

Notably, in the groundbreaking work *The Genesis Flood* (1961), Morris’s coauthor John Whitcomb (who wrote the first four chapters) allowed for a variety of different methods, either in-

dividually or jointly, in the composition of the book of Genesis. He wrote, “It is conceivable, of course, that God may have supernaturally sustained a *pure oral tradition* of the details of Genesis 1–11 within the line of the post-Babel Patriarchs; or that He may have revealed all these details to Moses directly, apart from any oral or written sources,” and, “It is important to remember that whatever may have been the sources employed by Moses in the composition of Genesis—whether written records, oral traditions, or direct revelation—verbal inspiration guarantees its absolute authority and infallibility” (Whitcomb and Morris, 1961, p. 41).⁵ These statements represent the classical conservative position quite well, which *permits* for the possibility of pre-Mosaic sources but does not *de-*

⁵ The remarks of Whitcomb on this point reflect the observations of Old Testament scholar Merrill Unger, to whose work he appeals. Speaking of similarities between the biblical record and Babylonian texts, that Unger claims “go back to an original source of fact, which originated in an actual occurrence,” he argues, “These common traditions among the Hebrews are reflected in the true and authentic facts given them by divine inspiration in their sacred writings. Moses very likely was conversant with these traditions. If he was, inspiration enabled him to record them accurately, purged of all their crude polytheistic incrustations and to adapt them to the elevated framework of truth and pure monotheism. If he was not, the Spirit of God was able to give him the revelation of these events apart from the need of any oral or written sources. In either case supernatural inspiration was equally necessary, whether to purge the perverted polytheistic tradition and refine it to fit the mold of monotheism or to give an original revelation of the authentic facts apart from oral or written sources” (Unger, 1954, 70–71).

mand them. In any case, whatever mix of written sources, oral traditions, and direct revelation was involved in the composition of Genesis, it was such that the final product could indeed fit within the Pentateuch, collectively referred to as being “of Moses.” Presumably, Morris endorsed this position initially, but his perspective on Genesis’ composition appears to have changed in the years following the initial publication of *The Genesis Flood*.

In his 1976 commentary *The Genesis Record*, Morris agreed with the viability of each of the three means (direct revelation, oral traditions, and written records) by which Moses could have produced the book of Genesis, noting that none violates the doctrine of plenary verbal inspiration or the notion of Mosaic authorship. However, he contended that Moses *most likely* employed written sources in composing Genesis, arguing that dependence on direct revelation or oral traditions has no parallels anywhere in the canon of Scripture when it comes to setting forth “narrative records of historical events” (Morris, 1976, pp. 25–26).⁶

⁶ In contrast to Morris’s claim, the Old Testament contains several conspicuous examples of historical narrative material that *must* have been received by direct revelation. For example, in Job 1–2, the narrator records the exchange taking place between Satan and the Lord God. Since the writer clearly had no access to the heavenly realm in which this exchange took place, the reader is left to conclude that at least some of the material in these two chapters had to come by way of direct revelation. Similarly, Genesis 1, whether revealed to Adam or to Moses, had to come via direct revelation, as there was no human witness to the events described. As for the use of oral tradition in the writing down of God’s word, who is to say that Luke, for instance, had at his disposal *only* written sources and did not incorporate the oral

Morris's separation of Genesis into textual units differs somewhat from that of Wiseman and Harrison in that he identified only nine major subdivisions. However, this stems from the fact that Morris opted to place the "tôlēdôt of Ishmael" (cf. Genesis 25:12) within the much longer "tôlēdôt of Isaac" (Genesis 11:27b–25:19a). Similarly, the "tôlēdôt of Esau" (cf. Genesis 36:1, 9) is regarded as a component of the lengthy "tôlēdôt of Jacob" (Genesis 25:19b–37:2). Supposedly, Isaac and Jacob were both responsible for obtaining the brief genealogical records from their respective brothers and incorporating them into their own accounts (Morris, 1976, p. 28). Morris further suggested that the Joseph narrative, running from Genesis 37:2b to Exodus 1:1, is distinguished as a self-contained unit by the wording of Exodus 1:1, which vaguely parallels the tôlēdôt formula: "These are the names of the children of Israel..." (Morris, 1976, p. 30).

Aside from the aforementioned contention related to biblical parallels, the chief argument Morris employed in his defense of the tablet model stems from his interpretation of Genesis 5:1, which specifically mentions "the book of the tôlēdôt of Adam." Although this is the lone usage of the Hebrew סֵפֶר ("scroll, written document") in conjunction with the tôlēdôt formula, Morris took it as a representative example of the other textual units. Thus, on the basis of Genesis 5:1, Morris maintained in his *Defender's Study Bible* notes (much more dogmatically than before) that these primeval and patriarchal records "must have originally come from eyewitnesses, and there is no reason (other than evolutionary presuppositions), why their transmission could not have been by written records instead of orally-repeated tales" (Morris, 1995, p. 17;

cf. p. 2). Despite not really developing a full case for his perspective, Morris's stature in the creationist movement led to the widespread adoption and advocacy of the tablet model by other creationists.

Naturally, the creationist ministry most directly affected by Morris's position was the one he founded in 1972, the *Institute for Creation Research* (ICR). Although the ministry focuses chiefly on the promotion of the biblical and scientific case for a recent Creation and the global Flood, it does endorse the tablet model on the composition of Genesis, having reprinted several articles by Morris backing the theory. Also, a recent article by Brian Thomas published by ICR assumes the tablet model in arguing for early man's ability to read and write. In particular, on the basis of Genesis 5:1, Thomas claims, "Scripture indicates that the very first humans were able to read and write," and, citing Morris, "Since only Adam could have personal knowledge of all the events in Genesis 2, 3 and 4, it is reasonable to conclude that this section was originally written by him. Genesis 5:1a is thus Adam's signature at its conclusion" (Thomas, 2012).

The Australian-based group, *Creation Ministries International* (CMI) has also published a number of articles staunchly supporting the tablet model. Summary arguments for Moses' use of primeval and patriarchal sources appear prominently in articles by Clifford Wilson (1992, p. 45), Russell Grigg (1993, pp. 38–40; 1998, p. 45), Charles Taylor (1994), and Don Batten (1996, pp. 44–45). Among these sources, however, only Taylor's defense went beyond the arguments submitted by Wiseman, Harrison, and Morris. He argued that viewing the tôlēdôt formula as a colophon finds support in the fact that Hebrew demonstrative pronouns הַזֶּה ("this") and הֵלֵךְ ("these") are, in the book of Genesis, more often used anaphorically (that is, to refer to something that precedes) than cataphorically (that is, to refer to some-

thing that follows).⁷ Accordingly, since all the tôlēdôt statements appearing in Genesis are introduced by either הַזֶּה or הֵלֵךְ, it is more reasonable to take the tôlēdôt statements as colophons rather than headings (Taylor, 1994, p. 210).

The creationist group that is arguably most vocal in the promotion of the tablet model is *Answers in Genesis* (AiG). It is the view adopted by Ken Ham in his seminal work *The Lie: Evolution*, where he states categorically that the tôlēdôt statements are "a kind of 'signature' to most of the sections" (Ham, 1987, p. 161), and, "Presumably Adam wrote down all the details that God had given him concerning the original creation. He would have recorded the other events under God's direction, and Moses later obtained this material and compiled it into the Book of Genesis" (Ham, 1987, p. 162). Apart from his use of the Genesis 5:1 proof-text,⁸ Ham

⁷ According to Taylor's own count (1994, p. 210), apart from the verses containing the tôlēdôt formula, in Genesis 1–36 the Hebrew הַזֶּה is used anaphorically 68 times, cataphorically 5 times, and exophorically (that is, to refer to something outside of the text) 12 times. In Genesis 37–50, הַזֶּה is used anaphorically 32 times, cataphorically 7 times, and exophorically 5 times. Similarly, in Genesis 1–36, הֵלֵךְ is used anaphorically 49 times, cataphorically 18 times, and exophorically 4 times. In Genesis 37–50, הֵלֵךְ is used anaphorically 17 times, cataphorically 2 times, and exophorically 3 times.

⁸ Here the term "proof-text" is meant in its technical sense of a biblical text to which appeal is made in support of a particular argument or position. It does not, as is sometimes erroneously assumed, necessarily carry the negative sense of "proof-texting," which is the practice of using isolated, out-of-context quotations from the biblical text to try to establish a doctrine.

testimony from people he interviewed (cf. Luke 1:1–3)?

assumes the tablet model rather than seeking to defend it scripturally (Ham, 1987, p. 162).⁹ This approach is likewise evidenced in Ham's more recent material (Ham, 2011; 2012).

Other material from AiG has taken a similar perspective, often assuming the validity of the tablet model without defending it (e.g., Mortenson, 2012). One of AiG's articles provides a fairly comprehensive comparison between the tablet model and the documentary hypothesis (Mortenson and Hodge, 2011, pp. 96–98); but the only *new* argument submitted for the model is that the Flood account supposedly reads “like a ship's log,” which suggests that some of the proposed sections of Genesis may read well as self-contained units (Mortenson and Hodge, 2011, p. 97). However, no evidence is supplied to back up this assertion. Other articles by Bodie Hodge (2010; cf. 2006) and Elizabeth Mitchell (2012) likewise present the tablet model as the view best explaining the composition of Genesis; but apart from the Genesis 5:1 proof-text, they offer no defense of the position. It is therefore disconcerting that Hodge maintains on the basis of such scant evidence that readers have “no excuse” for denying that Adam was directly responsible for writing a portion of Genesis (Hodge, 2013, p. 228). In contrast to this overly forthright assertion, the tablet model is put forth more tentatively in a recent article by Tim Chaffey, who offers it *only* as a possibility (Chaffey, 2014). Nevertheless, Hodge's assertions are representative of many

of AiG's publications addressing the composition of Genesis, which tend to imply very strongly that the tablet model is required by the biblical evidence.¹⁰

¹⁰ Despite heavy dependence upon a couple of select passages (namely Genesis 5:1), it appears that the factors driving the promotion of the tablet model at AiG are not primarily the supposed biblical evidences. Rather, it seems that AiG's stance concerning the tablet model stems from a noble desire to refute the notions (1) that early man was not highly intelligent, which purportedly accommodates an evolutionary perspective on man's origins, and (2) that the Creation and Flood accounts are original and are not derived from or associated with pagan myths. In relation to point 1, Mortenson and Hodge (2011, p. 97) in their defense of the tablet model write, “Only evolutionary thinking would lead us to conclude that Adam and his descendants could not write. Early man was very intelligent.” A similar argument is again advanced by Hodge (2013, p. 229) who asserts (again, on the basis of Genesis 5:1) that “what is known is that mankind was able to communicate with a language and, furthermore, that they were able to write it down as a record just as Adam did.” With respect to point 2, Mitchell (2012) argues on the basis of the alleged validity of the tablet model, “We have good reason to believe that the content of Genesis 1–11 predates the pagan flood myths that were written after the dispersion from the Tower of Babel,” which would, by implication, effectively militate against the notion that Genesis “borrows” from mythological pagan documents (cf. Chaffey, 2014). These statements thus suggest that AiG's adoption and promotion of the tablet model derives primarily not from any direct biblical evidence, but rather from a (legitimate) desire to guard against certain unacceptable ideas that have nothing to do with the authorship of

In addition to the writings of ICR, CMI, and AiG, the tablet model has been supported by other individuals who have contributed directly or indirectly to the modern creationist movement, including Dale DeWitt (1977), Curt Sewell (1994; cf. 2010), David Livingston (2003a; 2003b), Marvin Lubenow (2004, pp. 316–325), Paul Taylor (2007), and Barry and Helen Setterfield (2012). These sources largely parrot the arguments set forth by Wiseman and Harrison, though some new arguments surface as well. For example, Sewell maintains that adopting the tablet model aids in explaining perceived discrepancies in the sequence of the events described in Genesis 1 versus that of Genesis 2 (Sewell, 1994, pp. 25–26).¹¹ Livingston adds to this another

Genesis. While the intelligence of early man and the uniqueness of the Genesis record are indeed important issues, it is not necessary for the tablet model to be true in order to maintain robust defenses of these points; they can be adequately supported by other lines of biblical, literary, and historical data (see section 3).

¹¹ Sewell elaborates, “As an example of how the Tablet Theory can assist our understanding, consider the common accusation that a conflict exists between Genesis 1 and Genesis 2, in terms of the sequence of creative actions. This criticism is not valid, since chapter 2 does not attempt to say ‘This happened and then that happened.’ This apparent conflict is partly because of peculiarities in words; it only shows up in some languages. The English language has definite past, present, and future tenses for its verbs, but Hebrew (the language of Genesis) does not. In Hebrew, the relative timing must be taken from the context, not the actual words themselves. In chapter 1, the timing is definitely stated—these events took place on the sixth day, and in the order stated (animals, then man and woman). This

⁹ It may be granted that *The Lie: Evolution* is directed at a layman's audience and, as such, does not provide a detailed defense of the tablet model (which is, in fact, a rather minor point in the book). However, assumption of a theory without discussion unfortunately lends itself to categorical endorsement of the theory—even if this was not the author's intent.

line of biblical argumentation, claiming, based on the presence of the Hebrew **תקנות** (“statutes”) in Genesis 26:5, that Abraham possessed some form of God’s *written* law (Livingston, 2003a).¹²

chapter is written from the Creator’s viewpoint (on His tablet) and outlines the exact things He did. But in chapter 2, there are no timing statements. This chapter is written from a different viewpoint (probably by Adam himself), and describes events as he saw them” (Sewell, 1994, 25–26). It is not clear from Sewell’s argument, however, why separate sources are required to account for the fact that there is an obvious shift in theme between Genesis chapters 1 and 2 as signaled by the context. It is possible for monumental shifts in theme to occur within a textual unit written by a single author. Consider, for example, the thematic transition between Genesis 7:24 and 8:1.

¹² Livingston (2003a) writes, “Abraham had written laws of Jehovah which he kept: Genesis 26:5 says he kept, among other things, Jehovah’s statutes (*‘chuyim’*) and laws (*‘torah’*). A *‘chuyim’* is a written commandment, usually inscribed in stone.... These... we maintain, would be separate documents, themselves the Word of God.” Regrettable are Livingston’s mistakes in Hebrew (incorrect plural for **תקנות**; an apparent ignorance that there are two different, albeit related, words, **חוק** and **תקנה**, which have different plurals; mistranslating *torah* **תורה** as “laws,” rather than “law” [“laws” is from **תורות**]; and treating “*chuyim*,” the plural of **חוק** as though it were a singular). That aside, the Hebrew word **תקנה** does derive from the verbal root **תקק**, which has the sense of “engraving” or “inscribing.” But this verse does not demand that Abraham had a written copy of God’s word. The NET Bible notes, “The language of this verse is clearly interpretive, for Abraham did not have all these laws. The terms

Lubenow’s work also offers a unique defense of the tablet model, taking an entirely different tack in attacking the reliability of oral transmission. He maintains, “But it is absurd to think that God would entrust his eternal word to the fragile memories of humans.... In Deuteronomy 31:19–21, Moses was given a song to teach to the people. He was specifically commanded to write it down so it would not be forgotten. God said that forgetting was what the people were disposed to do. Obviously, God had little faith in oral transmission” (Lubenow, 2004, p. 318). Consequently, Moses *must* have relied upon *written* sources in writing Genesis. Lubenow, like Wiseman, limits Moses’ role principally to that of a compiler; however, he admits that Moses may have done some editorial updating. In fact, he indicates fifteen locations in Genesis where Moses ostensibly interjected brief editorial comments (Lubenow, 2004, pp. 324–25).¹³

are legal designations for sections of the Mosaic law and presuppose the existence of the law.... [T]he simplest explanation is that the narrator... elaborated on the simple report of Abraham’s obedience by using terms with which the Israelites were familiar. In this way he depicts Abraham as the model of obedience to God’s commands.”

¹³ Like much of the material produced by AiG, it seems that the driving force behind Lubenow’s argument is his laudable desire to avoid the pitfalls of liberal scholarship related to early man. He writes, “The implications of this evidence for the origin of Genesis are staggering. Rather than Genesis having a late date, as is universally taught in nonevangelical circles, the evidence implies that Genesis 1–11 is a transcript of the oldest series of written records in human history. This is in keeping both with the character of God and with the vital contents of these chapters. It is rea-

What this brief overview has shown is that many creationists have embraced the tablet model as originally developed, generally taking Wiseman’s arguments as he presented them with little refinement. Having now traced the development of the tablet model and having shown its broad adoption by creationists, it is necessary to move on to an evaluation of the arguments used to support the tablet model and determine (1) if they stand up to careful scrutiny and (2) if they are so airtight as to warrant the dogmatism evidenced by some of the model’s advocates.

III. Evaluation of the Tablet Model

The following section details the primary arguments undergirding the tablet model as *a theory of the composition of Genesis in which Moses is the compiler of preexistent sources*. Between the early works of Wiseman and Harrison, as well as the later writings of recent creationists, eight major arguments in support of the

reasonable to expect that the first humans created by God would have had great intelligence and language capabilities and that God would fully inform them as to their origin. This research also confirms the idea that the Genesis creation and flood accounts were not derived from the very different and polytheistic Babylonian accounts. It also supports the fact that monotheism was the original religious belief and not a later evolutionary refinement from an earlier polytheism” (Lubenow, 2004, p. 324). Again, as will be argued later in this paper, while the intelligence of early man and the uniqueness of the Genesis record should be defended, it does not follow that the tablet model must be accepted in order to construct robust arguments for these points; they can be adequately supported by many other lines of biblical, literary, and historical data.

tablet model have been identified. In the interest of space, each argument will be stated, followed immediately by relevant counterarguments.

1 (1) The tablet model allegedly reflects the historical context in which the book of Genesis was written, with Genesis following in the pattern of contemporaneous Mesopotamian documents in their use of a colophon to indicate the author of a body of text (Wiseman, 1977, p. 102). However, this argument is valid only if, in fact, the *tôlēdôt* statements of Genesis match with the style of the colophon titles found in the Mesopotamian literature. However, they do not. Colophons contained in ancient Near Eastern literature typically contain the following elements: the title of the work, the date it was authored or copied, the serial number, a concluding statement that this is the last tablet of the series, and the name of the owner. This is quite different from the *tôlēdôt* statements of Genesis (cf. Ross, 1988, p. 71). Perhaps the most striking difference, however, is, as Allen Ross observes, that “the Akkadian equivalent of *tôlēdôt* is not used in the formulas” (Ross, 1988, pp. 71–72). Correspondence is therefore lacking on the most fundamental lexical level and is reinforced by incongruence on a stylistic level. Consequently, on the basis of these critical distinctions, efforts to draw comparisons between the *tôlēdôt* statements of Genesis and the colophons found in Mesopotamian literature are unwarranted.

2 (2) The tablet model is said by its proponents to remain faithful to the structure of the text itself, taking the *tôlēdôt* statements as indicating macrostructural divisions (Mortenson and Hodge, 2011, p. 96). However, neither Genesis nor any other biblical book suggests that these *tôlēdôt* statements function as compositional markers. Where the word *tôlēdôt* appears elsewhere in the canon of the Old Testament (Exodus 6:16, 19; 28:10;

Numbers 1:20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42; 3:1; Ruth 4:18; 1 Chronicles 5:7; 7:2, 4, 9; 8:28; 9:9, 34; 26:31), never is there any evidence that it is being used to demarcate a section of text as belonging to a particular writer. Indeed, in some cases, such a notion does not even fall within the realm of possibility. For example, Ruth 4:18 mentions the “*tôlēdôt* of Perez,” an individual dead long before the events recorded in the book of Ruth transpired. Perez could not have written any portion of Ruth, which means the “*tôlēdôt* of Perez,” despite having an identical structure to the *tôlēdôt* statements found in Genesis, is not the mark of the author. Consequently, the tablet model understands *tôlēdôt* in Genesis in a manner different from how it is used in the rest of the Old Testament.

3 (3) The tablet model purportedly accounts for why the proposed sections of Genesis seem to read as self-contained units; for example, the “*tôlēdôt* of Noah’s sons,” is said to read like a ship’s log (Mortenson and Hodge, 2011, p. 97; cf. Mitchell, 2012). However, it does not follow that just because a section of text reads well as a self-contained unit that it is attributable to a different author than the surrounding text. For example, the shameful account of Judah and Tamar in Genesis 38 reads quite well as a self-contained unit, in many senses insulated from the larger Joseph narrative that precedes and follows it (Genesis 37, 39–50). However, proponents of the tablet model who regard Genesis 37:2–Exodus 1:1 (or 1:6) as representing the contents of a single tablet written by Joseph and his brothers (e.g., Morris, 1976, p. 30; cf. Sewell, 2010), do not posit that Genesis 38 existed as a separate account before being added to the contents of chapters 37 and 39–50. Given this inconsistency, it is incorrect to say that the ability for a section of text to be read as a self-contained unit automatically makes it an independent text.

Furthermore, it is necessary to point out that not all of the suspected “self-contained” textual units are in fact as self-contained as they appear. Some of them are tied together by lexical and thematic threads which, though easy to overlook, are integral to the text. For example, *according to the textual divisions established by Wiseman*, Noah’s son Shem (Hebrew שֵׁם), whose name literally means “name,” appears quite conspicuously for the first time in the “*tôlēdôt* of Noah” (Genesis 6:10; 9:18; cf. 9:26–27). The “*tôlēdôt* of Shem” notes the families descending from Shem (Genesis 10:21–31); and then the seemingly isolated Babel account, showcases the Hebrew שָׁם, where those responsible for constructing the tower say to themselves, “Now let us make for ourselves a name (שָׁם)...” (Genesis 11:4). The prominence of Shem then continues into the “*tôlēdôt* of Terah,” where he is featured at the head of the genealogical record (Genesis 11:10–11). And finally, in a unique theological twist, in the next *tôlēdôt* unit, God promises Abram, “And I will make your name great (וַאֲנִי אֶגְדָּלְךָ שְׁמִי).” This unambiguous allusion points back to the account of Babel: Whereas man’s attempt to make for himself a name (שָׁם) was doomed to failure, God is capable of making for the one He had chosen, not only a *name*, but even a *great name*. This allusion reinforces theologically the lexical link between the individual narratives and genealogies afforded by the word שָׁם, thereby showing that even if Moses relied on written sources, the textual units of Genesis are not simply individual accounts strung end to end. Rather, the book of Genesis is a grand, unified literary masterpiece, with its constituent narratives and genealogies meaningfully tied together. It is, as John Sailhamer (1990, p. 5) rightly describes it, “a carefully wrought account of Israel’s early history,” and, as Kenneth Mathews (1996, p. 25) fittingly states,

an “unmistakably coherent, unified story line.”¹⁴

(4) The tablet model allegedly represents the best understanding of the reference to “the book (סֵפֶר) of the generations of Adam” (Morris, 1995, p. 17; Ham, 1987, p. 162; Hodge, 2013, p. 228; etc.). The word *sēp̄er* refers to an “inscription,” “something written” (Koehler and Baumgartner, 2001, p. 766). It is, as Umberto Cassuto notes, a loan-word from Akkadian that “denoted a missive that was *sent* from one place to another” and subsequently came to be used to refer to anything in writing (Cassuto, 1961, p. 273). It could be used of any document, regardless of length, provided it was complete in itself (Leupold, 1942, p. 230). For example, in Deuteronomy 24:1 it is used of a certificate of divorce; in Jeremiah 32:12 it is used of a title deed. It is thus readily acknowledged that *sēp̄er* in Genesis 5:1 may possibly refer to a source text of some kind.¹⁵

For the sake of argument, it will be assumed that Genesis 5:1 has in view such an external reference. However, this concession that it notes a source text does not automatically support the tablet

model as it relates to the composition of Genesis as a whole. If Moses as the compiler of Genesis deliberately referred to the *sēp̄er* of the *tōlēdōt* of Adam in order to indicate special dependence upon a written source in transcribing that particular section of text (according to Wiseman, Genesis 2:5–5:2), then one must wonder why, if in copying the other sections of Genesis from their respective source texts, Moses did not also use *sēp̄er* in conjunction with their respective *tōlēdōt* markers. That the *tōlēdōt* marker in Genesis 5:1 goes out of its way to indicate the presence of an underlying written source by use of the word *sēp̄er* conversely suggests that it is uncertain whether markers without *sēp̄er* have dependence upon underlying written sources. Thus Genesis 5:1 is poor support for the tablet model because it singles out one section of Genesis as distinct from all the others, signaling by its unique alteration of the normal formula that the section is likewise unique in its dependence upon written source material.¹⁶ But whether or not Genesis 5:1 does truly refer to a source outside the text will be explored in point number 6 below.

(5) The tablet model supposedly best accounts for why Genesis 26:5 speaks of Abraham keeping the “charge” (מִשְׁמֶרֶת), “commandments” (מִצְוֹת), “statutes” (חֻקֹּת), and “laws” (תּוֹרֹת) of the Lord. In particular, since חֻקֹּת typically refers to a written commandment, it would seem that its use implies that Abraham had access to a written document containing God’s laws (Livingston, 2003a). However, this

interpretation isolates Genesis 26:5 from its literary context. The list of terms appearing in Genesis 26:5 is very similar to that which appears in Deuteronomy 11:1, where the whole Mosaic Law is in view. Moreover, the individual terms appear regularly throughout the legal literature of the Old Testament (cf. Ross, 1985, p. 71). Consequently, while it is hypothetically possible that the text has in view some written ethical standard that God had revealed to the great patriarch, it more probably is a reference to the Mosaic Law. Indeed, Morris conceded this point rather than attempting to press this verse into service in an effort to construct his argument for the tablet model (Morris, 1976, p. 419). Commenting on this passage, Sailhamer notes, “Abraham’s faith was reckoned to him as obedience to God’s statutes, commandments, and laws. Abraham could not have ‘kept the Sinai law’ in a literal sense, as it had not been given until the time of Moses (cf. Ex 15:25b). Abraham lived a life of faith, and God counted that to him as his ‘keeping the law’ (cf. Gen 15:6)” (Sailhamer, 2009, p. 244). Taking Genesis within the context of the Pentateuch, it is most reasonable to conclude with the NET Bible that the author here “elaborated on the simple report of Abraham’s obedience by using terms with which the Israelites were familiar” (cf. Waltke with Fredricks, 2001, p. 368). The purpose of Genesis 26:5 is thus far more profound than a passing reference to an earlier source text. As Mathews rightly observes, “By employing covenant terminology, the author depicts the complete obedience of Abraham as the ideal for Israel in the land who must observe the provisions of the Sinaitic covenant (e.g., Lev 26:3; Deut 4:40; 30:16)” (Mathews, 2005, p. 405; cf. Ross, 1985, p. 71).

(6) The tablet model purportedly best explains the origin of Genesis in light of biblical parallels, which show that historical narrative texts commonly

¹⁴ As for the notion that the account of the Genesis Flood reads like a ship’s log, the fact is that Genesis 6:9–9:29 reads nothing like a captain’s account of a sea voyage, which would have been concerned exclusively with onboard affairs. By contrast, the Flood account includes virtually no details of life on board the ark but repeatedly addresses geological and meteorological activity outside the ark (e.g., Genesis 7:17–24) that would have been entirely unknown to Noah.

¹⁵ See especially Alter (1996, p. 23), Cassuto (1961, p. 273), Kidner (1967, p. 80), Leupold (1942, p. 230), Von Rad (1961, p. 68), Waltke with Fredricks (2001, p. 24), and Wenham (1987, pp. 126–27). For different perspectives on Genesis 5:1, see Ramban (1971, p. 96) and Fretheim (1994, p. 380).

¹⁶ It is common for departures from normal formulas to be indicative of something especially significant in the text. For example, the miraculous taking of Enoch (Genesis 5:24) is highlighted by a conspicuous departure from the expected refrain that appears throughout Genesis 5: “And he died.”

depended upon written source material (Morris, 1976, pp. 25–26). It is true that historical narrative passages often relied upon written source material. For example, Numbers 21:14 speaks of “the book of the wars of YHWH”; in Joshua 10:13 is mentioned “the book of Jashar”; the writer of 1 and 2 Kings repeatedly alludes to “the book of the chronicles of the kings of Israel” and “the book of the chronicles of the kings of Judah.” The point here is not to determine what these books were (for they are not extant) but rather simply to acknowledge that dependence upon written sources was common in the writing of the Bible’s historical records. However, in all the passages mentioned above, various source citation formulae are employed: an introductory phrase or particle such as *עַל־כֵּן* “on account of this [preposition + anaphoric particle]/hence,” or *הֲלֹא*, “is it not [interrogative particle + negative expecting positive answer]/indeed [asseverative particle],” or *הִנֵּה*, “indeed [presentative particle to be understood asseveratively]”; a statement that it is a citation, either *אמר*, “to say,” or *כתב*, “to write,” or *עַל־דְּבָרַי*, “on the words”; the actual name of the source; and finally, sometimes a short quote from the source, after which the passage resumes as before. Moses, in Numbers 21:14, uses these conventions: “Hence it is said in the Book/Record of the Wars of YHWH: ‘Waheb in Suphah and the wadis: Arnon.’” This, in some difficult to understand way, is meant by Moses to support his previous statement about the placement of the border of Moab. It is clearly a reference to an external source (whether oral or written), because after the statement, the passage continues as it did before, chronicling the travels of Israel. Shortly after this time, Joshua also employs these stylistic formulae: “Indeed, is it not written in the Book/Record of Jashar (Yashar)?” Here *כְּתוּבָה*, a Qal passive participle feminine singular of the root *כתב* (“to write”) and *סֵפֶר* (“record”) oc-

cur together. The Record of Yashar is expressly described as a written external record. Obviously, therefore, Joshua is there citing something that was written down at the time about the battle on the miraculously long day.¹⁷

Persons of note kept records of various types, as well. Annals for King David (1 Chronicles 27:24), perhaps his personal records; Annals of Samuel the Seer; Annals of Nathan the Prophet; Annals of Gad the Seer (1 Chronicles 29:29), which together could be 1 and 2 Samuel; Annals of the Kings of Israel (1 Kings 14:19), which is not extant; Annals of Shemaiah the Prophet (2 Chronicles 12:15); and an unnamed record that contains “the words of the seers who spoke to him [Manasseh]” (2 Chronicles 33:18) are all examples.¹⁸

What is seen in Genesis is nothing at all like these. Why would Moses not use the citation conventions before quoting or paraphrasing 36 chapters from other sources, namely the tablets handed down since Adam and the patriarchs? Although biblical authors sometimes did not cite their sources,¹⁹ clearly Genesis

5:1 is not a source citation. This fact on its own does not definitely establish that the tablet model is invalid, but it does put it in serious doubt. If Moses wished to clearly indicate that he was using a written source, then why did he not cite his source here? Instead he used language that could just as easily (indeed more so) refer to the subsequent material in the passage. That is, *sēp̄er* in Genesis 5:1 refers to the genealogical record that is found in that chapter. Here, an idea needs to be introduced, concerning exophoric versus endophoric usage. The latter term speaks of circumstances in which the text refers to itself, either to a place earlier in the text (anaphoric) or a place after (cataphoric). The proponents of the tablet model make the unwarranted assumption that “this is the book/record” is necessarily exophoric (a reference to an external source). But more likely, *sēp̄er* refers to the genealogical record that is found in Genesis 5. Therefore, although an unnamed and uncited external source is not impossible, it is much more likely that this statement is endophoric with the rest of Genesis 5 in view, or that it includes all ten generations to Genesis 9:28.

(7) The tablet model demonstrates the high intelligence of early man, who was able to express his thoughts in coherent literature (Morris, 1995, p. 17; Ham, 1987, p. 162; Lubenow, 2004, p. 324; Mortenson and Hodge, 2011, p. 97; etc.). This is a point insisted on by some, with the implication sometimes being that rejection of the tablet model—or, specifically, of Adam’s authorship of the material preceding Genesis 5—is tantamount to embracing an “evolutionary” perspective on early man (Hodge, 2013, p. 228). However, a multiplicity of

¹⁷ It is evident from its reference in 2 Samuel 1:18 that this record was still being kept when David’s lament, “The Bow,” was added to it on the occasion of the death of Saul and Jonathan: “And he said to teach the Sons of Judah ‘Bow.’ Indeed, it is written on the Book/Record of Yashar.”

¹⁸ In addition, several times the author of 1 and 2 Chronicles cites the biblical book of 1 and 2 Kings as his source (2 Chron. 16:11; 25:26; 27:7; 28:26; 32:32 [which also mentions the biblical book of Isaiah]; 35:27; 36:8). For no easily explainable reason, sometimes the source is called the Record of the Kings of Judah and Israel and sometimes the Record of the Kings of Israel and Judah.

¹⁹ For example, the author of 1 and 2 Chronicles mentions in 2 Chronicles

20:34 that a portion of the Annals of Hanani the Son of Jehu was incorporated into the Record of the Kings of Israel, which may be the biblical book of 1 and 2 Kings.

passages demonstrate the intelligence of early man. Genesis 4 indicates that early man was an inventor of musical instruments (v. 21), as well as a user of bronze and iron implements (v. 22). Genesis 6 indicates that Noah was able to build an enormous seaworthy vessel. Genesis 11, though describing it in the context of man's rebelliousness, mentions that early man was capable of achieving notable architectural feats. In view of these passages, it is clear that the defense of the intelligence of early man does not hinge on the tablet model. The tablet model, therefore, deserves to be evaluated *on its own merit* (whether biblical, historical, or literary), rather than on its perceived ability to serve as a "safeguard" against the adoption of a secular, evolutionary perspective.²⁰

²⁰ Creationist Kurt Wise conjectures whether, given the intelligence of early man, dependence upon written records in writing Genesis would have even been necessary. He submits that the tremendously long lifespans and sharp minds of the antediluvian ancestors facilitated the reliable oral transmission of the content that was incorporated into the book of Genesis. Assuming that the genealogies in Genesis 5 and 11 are closed, there would need to be only about eight or nine transmissions from Adam to Moses (Wise, 2002, pp. 16–17). Oral transmission would also avoid the problem of Moses having to depend on pre-Babel texts in writing the early chapters of Genesis. Objections might be raised against the reliability of oral transmission due to supposed shortcomings in the ability of the human mind to memorize large quantities of material. However, while the memorization of vast quantities of Scripture is largely foreign to most evangelical Christians living in the West, it is commonplace in the Jewish community, in which many know large sections—if not all—of the Torah.

(8) Finally, the tablet model supposedly places the original recording of the content of Genesis 1–11 long prior to the development of polytheistic pagan myths, such as the Babylonian creation story (*Enūma Elish*) and the flood legend (the *Epic of Gilgamesh*). Accordingly, the tablet model militates against any suspicion of Genesis being influenced by or borrowing from these pagan myths (Lubenow, 2004, p. 324; Mitchell, 2012; cf. Chaffey, 2014). However, the fact remains that the record of Genesis is quite obviously distinct from contemporaneous pagan mythology in terms of its content. Consequently, the tablet model need not be invoked in order to "rescue" Genesis from the charge of dependence upon the polytheistic ancient Near Eastern (ANE) myths. Furthermore, placing the composition of the content of Genesis roughly in the same time as its characters—rather than in the time of Moses—ignores the conspicuousness of the polemical features of Genesis, which would have been targeted at the well-known pagan myths *circulating in the day of Moses*. Speaking specifically of the Genesis creation account and the ANE creation myths, Steven Boyd notes that in comparing the two, scholars often "emphasize the similarities, and draw conclusions based on them." He says, however, that "this is a flawed approach, because it ignores the fact that it would be the atypical nature of the Genesis account that would attract the attention of the original readers." It is these "atypical" features, Boyd argues, "which makes the Genesis account into a polemic against the ANE texts" (Boyd, 2008, p. 188).²¹

²¹ Boyd specifies three main distinctions between the Genesis creation account and the ANE texts: (1) the distinction between the Lord and the ANE deities; (2) the distinction with respect to the nature of creation; and (3) the distinction between the mythical quality of

John Currid makes a similar point with respect to the distinctions between the Genesis Flood account and the ANE

the ANE texts and the patently anti-mythological nature of the Genesis account. On point 1, Boyd lists five main differences: "First, the Lord is self-existent and eternal; the ANE gods are born from eternal matter. Second, the Lord is uncreated; the ANE gods are created in some way. Third, the existence of the Lord is neither proved nor asserted but rather assumed; in the ANE texts the focus is on theogony (the origin of the gods). Fourth, the Lord is separate from His creation; the ANE gods are deified natural forces. And fifth, the Lord is an unopposed sovereign Creator; the ANE texts feature battles among the gods after which the victor creates" (Boyd, 2008, p. 188). Similarly, on point 2, Boyd offers six specific areas of distinction: First, "The Lord created by fiat and unopposed action; the ANE gods, by birth, battle, magic, and opposed action." Second, "The Lord created from no preexistent matter; the gods, from eternal matter and vanquished foes." Third, "The Lord created in a sequence of days; the gods—there is no analogy." Fourth, "The Lord purposefully progressed in His creation toward the creation of man; the gods created man as an afterthought." Fifth, "The Lord created man deliberately and personally; the gods created man from the entrails of a vanquished foe... (as in *Enūma Elish*) or ... from one of the lower hierarchy of gods... (as in *Atra-ḫasīs*)." Finally, sixth, "The Lord blessed man and placed him as vice-regent over the natural realm; the ANE texts have man subservient to the nature gods and terrified of them" (Boyd, 2008, p. 189). On point 3, Boyd notes that the anti-mythological character of Genesis is evidenced especially in mentioning no struggle between competing deities, and in the preexistence of the Creator rather than matter (Boyd, 2008, p. 189).

flood legends. Speaking of the author of Genesis, he states, “His presentation of the flood account not only relays the event in a historical manner; it also contains harsh and radical rebukes of the pagan myths. These taunts are often subtle, but they are purposeful” (Currid, 2013, p. 61). One of the key emphases of this polemic embedded in the Genesis Flood narrative is to show that the Lord is in full control of the event; by contrast, the ANE deities were frightened by the deluge, which they had let get out of hand. As Currid states, “These pagan deities are at the mercy of nature, whereas Yahweh presides over nature with full command” (Currid, 2013, p. 62; cf. Psalm 29:10). So too, the Genesis account functions to display the sovereignty of the Lord; by contrast, the ANE myths show the gods as dependent upon man, needing the food of man’s sacrifices to satisfy their very human-like hunger (Currid, 2013, pp. 62–63).

Additional features in the text of Genesis that function as polemics against the ANE accounts can be pointed out; however, the one mentioned here makes the point well. To assume the tablet model and to assert that most or all of Genesis was written in the time of its characters rather than in the time of Moses (i.e., prior to the ANE myths) is to miss entirely the thrust of Genesis’s polemical features. Thus, not only is the tablet model not needed to “rescue” the book of Genesis from the charge of reliance upon the ANE accounts, but it undermines the textual clues that actually show how Genesis asserts its true theology over against the ANE myths.

IV. Problems with the Tablet Model

Having set forth the arguments used in support of the tablet model and, having shown them to be unconvincing, unfounded, or even detrimental, this paper will now turn to the discussion

of additional problems incurred by the tablet model. Eight problems are noted here.

(1) The tablet model makes Moses out to be merely the compiler rather than the author of the book of Genesis. However, this notion lacks biblical support. Given the biblical evidence, it is appropriate for the reader to assume that Genesis shares the same author as the rest of the Pentateuch. The other books of the Pentateuch forcefully testify to their Mosaic authorship (Exodus 17:14; 24:4, 7; 34:27; Numbers 33:1–2; Deuteronomy 31:9, 11). Similarly, other Old and New Testament books assume the Mosaic authorship of the Pentateuch (cf. Joshua 1:7–8; 8:31–32; 1 Kings 2:3; 2 Kings 14:6; 21:8; Ezra 6:18; Nehemiah 13:1; Daniel 9:11–13; Malachi 4:4; Matthew 19:8; Mark 10:4; 12:26; John 5:46–47; 7:19; Acts 3:22; Romans 10:5; Hebrews 10:28). The Bible does not speak specifically of *Genesis* as having been authored by Moses; however, as Kidner rightly observes, the Bible “seems to imply for Genesis a similar relation between substance and final shape as it implies for the rest of the books: that is, that the material is from Moses” (Kidner, 1967, p. 15). Also, as Kidner states, “It seems artificial, for instance, to exclude Genesis from our Lord’s dictum, ‘Moses... wrote of me’ (Jn. 5:46) and from His Emmaus exposition ‘beginning from Moses’ (Lk. 24:27; cf. 44). Such a distinction would have occurred to none of the original readers of the Gospels” (Kidner, 1967, p. 15).²²

Regardless then of whatever arguments are made, the fact remains that

Scripture provides no direct evidence for any “original” (pre-Mosaic) author(s) of Genesis. Nor does Scripture suggest that Moses was anything other than an author, in the normal sense of the word, rather than a compiler. It is one thing to say that Moses used sources in writing Genesis, much as this paper was written using sources. Other books of Scripture used sources in the same way. However, it is quite another thing to say, as the tablet model does, that Moses was merely a *collector* of earlier texts, stringing them together end to end and repeating their words “verbatim” (Wiseman, 1977, p. 73). Given this definition of reliance upon sources, it would be very hard to call Moses the “author” of Genesis.²³ Consequently, the tablet model suffers from going beyond the plain statements of Scripture (contra 1 Corinthians 4:6) in explaining the provenance of Genesis. This fact alone ought to exclude all dogmatism when it comes to considering the tablet model as an explanation for the composition of Genesis. Even *if* the view is judged to be a viable option, it can never, as Hodge (2013, p. 228) insinuates, be established with the kind of dogmatic certainty afforded by the authoritative statement, “Thus saith the Lord.”

(2) The tablet model overlooks the internal evidence of the book of Genesis, which attests to its writing in the time of Moses. If Genesis was written by the individuals whose lives it details (namely the patriarchs), then it would be expected that the text would evidence details consistent with that. Geographical and cultural details in the Genesis account would fit with the lives and times of the patriarchs, rather than Moses. This means that the details should

²² Moreover, such a distinction would have omitted from the Lord’s great overview of what was written of Him both the protoevangelium and the promises to Abraham. The expression “Beginning from Moses” implies beginning from the beginning of the Scriptures, not beginning from Exodus or Genesis 37:2b.

²³ Scripture does note the presence of collectors and distinguishes them from the author(s). For example, Proverbs 25:1 refers to those who copied some of the proverbs of Solomon.

evidence familiarity with the land of Canaan and (until the Joseph narrative, at least) less so with the land of Egypt. However, particular geographical details in the text betray the fact that the author of Genesis was probably not a resident of Canaan. Speaking of the Pentateuch as a whole, Gleason Archer maintains that whereas the geography of Egypt and Sinai is “very familiar” to the author of the Pentateuch, “the geography of Palestine is comparatively unknown except by patriarchal tradition (in the Genesis narratives)” (Archer, 2007, p. 96). More specifically, he notes, “Even in Gen. 13, when the author wishes to convey to his audience some notion of the lush verdure of the Jordan plain, he compares it to ‘the land of Egypt as thou goest unto Zoar’ (v. 10), referring to a locality near Mendes, midway between Busiris and Tanis in the Delta” (Archer, 2007, p. 96). A similar case can be made for Genesis 33:18, which, speaking of the city of Shechem, notes that it “is in the land of Canaan.” Clearly, if this text had been written by one of the patriarchs (presumably Jacob, if Wiseman’s attributions are correct), there would have been no need for this explanatory note; they were, after all, familiar with Canaan. These references make more sense if the text was written by someone who was an outsider to the land of Canaan—namely Moses.²⁴

Similarly, cultural details intertwined with the vocabulary of the text

itself suggest that the author of Genesis was a native of Egypt (Moses) rather than Canaan (the patriarchs). The author shows considerable familiarity with Egyptian protocol, and this is not limited to the Joseph narrative. Notably, it is an Egyptian loanword that says the most about whether the text is Mosaic versus pre-Mosaic. In Genesis 12:10–20, the text describes how, as the result of a famine in Canaan, Abram sojourned in Egypt, where he had less-than-favorable interactions with Pharaoh (vv. 15, 17, 18, 20). As Gordon Wenham observes, “Pharaoh is the Hebrew equivalent of Egyptian *pr-o* ‘great house.’ In the Old and Middle Kingdom periods, it retains this basic meaning, ‘royal palace,’ but from the eighteenth dynasty onward (from *ca.* 1500 B.C.) it denotes the Egyptian king himself. This verse’s terminology, ‘house of Pharaoh,’ then reflects the usage of the term in the writer’s period rather than the patriarchal age” (Wenham, 1987, p. 289). Even the various attempts made by creationists at revising the Egyptian chronology cannot be called upon to evade this argument, because, if anything, these attempts move Egypt’s eighteenth dynasty *later* rather than earlier (see, e.g., Ashton and Down, 2006). And while it might be proposed that Genesis 12 has seen thorough editing by Moses, this hardly seems to fit with Wiseman’s assertion that Moses “regards the old wording as so sacred that he avoids making unnecessary alterations to the text even to modernize words,” and “leaves the original ancient expressions and place names just as he finds them, though they are no longer in use” (Wiseman, 1977, p. 73).

(3) The tablet model essentially ignores the inimitable doctrinal consistency and uniform theological message of Genesis, which points to a single author who carefully engineered the whole work, rather than many contributors who wrote independently of one another. Unfortunately, in em-

phasizing the component parts rather than the whole, the tablet model follows all too closely in the footsteps of the documentary hypothesis, being more concerned with the sources of the text than the message of the final form, and overlooking the theological strands that connect and bind together the different narrative units.²⁵

The compositional unity of the book of Genesis is evidenced by the key words and repeated theological themes that are woven throughout the book. Had the book been the product of many authors, the presence of these key words and repeated themes would be truly remarkable. However, as it is,

²⁵ T. Desmond Alexander warns against the influences of this kind of approach: “As regards the book of Genesis, modern critical methods have increased, rather than lessened, this tendency to fragment the text. Scholarly endeavors to discover the sources underlying Genesis have resulted in apparently unified narratives being viewed as composite. Interest in the final form of the text has given way to a detailed scrutiny of the component parts which are believed to underlie it. Many commentators excel at being able to reduce Genesis to various documents and/or editorial strands, without adequately appreciating that in the process they do not shed much, if any, light on the received form of the text” (Alexander, 1993, p. 256). Although surely not as destructive as the varieties of source and form criticism employed by liberal scholarship that denies altogether the involvement of Moses in the composition of the Pentateuch, the promotion of the tablet model can have a similar effect as these views, creating, as Alexander states it, “the impression that individual episodes may be understood adequately without considering their relationship to the many other episodes which comprise the rest of the book” (Alexander, 1993, p. 256).

²⁴ It might be assumed that these statements represent editorial remarks added to the existing text by Moses. This is within the realm of possibility—at least in these two cases (although Lubenow, ironically, omits them from his list of texts that he claims display evidence of editorial updating). However, the simpler explanation is that Moses authored the respective passages surrounding these verses, which accounts for why the text reads so smoothly and consistently.

they suggest one mind responsible for composing the book of Genesis as a unified work. Alexander argues that one of the principle themes of Genesis is that which is conveyed by the Hebrew word זרע (*zera* ‘seed’).²⁶ He notes, “When Genesis is viewed as a whole it is very apparent that the genealogical structure [of the book, often signaled by *tōlēdôt*] and the concept of ‘seed’ are closely linked in order to highlight a single, distinctive, family lineage” (Alexander, 1993, p. 260; cf. 2002, p. 105). Ross identifies another major theological theme, “blessing,” signaled by the Hebrew root ברכ (*brk*).²⁷ On the concept of blessing in Genesis, Ross notes, “The entire book turns on this motif and its antithetical motif, cursing” (Ross, 1988, p. 65). Interestingly, these two themes—“seed” and “blessing”—are themselves intertwined in Genesis, a fact that is showcased in God’s promise to Abraham in Genesis 17: It is God’s blessing that gives the seed

to the patriarch and then provides land and dominion to the promised seed (cf. Ross, 1988, pp. 65–66). In both cases, the way these themes are used to link together different portions of the book of Genesis evidences a truly masterful compositional strategy.

While it is certainly incorrect to think that the mere presence of these themes somehow indicates that Genesis does not employ sources, it is equally incorrect to think that the presence of these themes, when it is considered how they function in the book of Genesis, allows for the text to have been nothing more than a compilation of source material. On the contrary, the grand theological motifs appearing throughout the book that tie together the Creation, Fall, Flood, and patriarchal narratives suggest an elaborate compositional scheme. The narrative units of Genesis are not merely strung together but have been carefully interwoven according to the strategy of the text’s author, who deliberately sought to highlight and progressively develop particular theological subjects of monumental significance (cf. Davis, 1975, p. 26).²⁸

Other, more subtle, thematic and theological connections exist that further show that the book of Genesis was not composed in a piecemeal fashion. (On this point, see especially the obser-

vations by Sailhamer, 1990, noted in the appendix.) Additionally, the *tōlēdôt* structure of the book itself demonstrates that the author of Genesis was very calculating in how he presented the contents of the book, carefully crafting each individual narrative and judiciously tying them all together in order to advance his intended purpose and theme (see point 4 below).

(4) The tablet model necessitates reading the *tōlēdôt* markers of Genesis as colophons rather than transitional headings, but this is unsustainable. Jason DeRouchie (2013) has outlined four lines of evidence showing that the *tōlēdôt* markers must be read as transitional headings, which will be surveyed here. First, some of the *tōlēdôt* markers cannot logically be understood to pertain to the information that precedes them. While it might be appropriate to take the “*tōlēdôt* of Adam” (Genesis 5:1) or the “*tōlēdôt* of Jacob” (Genesis 37:2) as describing the material that immediately precedes the marker, the “*tōlēdôt* of Ishmael” (Genesis 25:12) surely cannot be thought to include all of the Abrahamic narrative (Genesis 11:28–25:11). So too, the “*tōlēdôt* of Isaac” is not a fitting description for the genealogical information of Ishmael’s descendants (Genesis 25:12–18). Likewise the “*tōlēdôt* of Esau” hardly describes the textual unit that precedes Genesis 36:1 (which is all about Jacob); rather, it serves well as a heading for the genealogical material for the descendants of Esau, which follows in Genesis 36:2–43.²⁹

²⁶ The Hebrew *zera*’ appears 59 times in the book of Genesis, compared with 170 in the rest of the Old Testament. See Genesis 1:11 (2x), 12 (2x), 29 (2x); 3:15 (2x); 4:25; 7:3; 8:22; 9:9; 12:7; 13:15, 16 (2x); 15:3, 5, 13, 18; 16:10; 17:7 (2x), 8, 9, 10, 12, 19; 19:32, 34; 21:2, 13; 22:17 (2x), 18; 24:7, 60; 26:3, 4 (3x); 28:4, 13, 14 (2x); 32:12; 35:12; 38:8, 9 (2x); 46:6, 7; 47:19, 23, 24; 48:4, 11, 19. As is evident from this list, *zera*’ has a fairly even distribution across the various narratives that comprise the book of Genesis.

²⁷ See Genesis 1:22, 28; 3:3; 5:2; 9:1, 26; 12:2, 3 (3x); 14:19 (2x), 20; 17:16 (2x), 20; 18:18; 22:17 (2x), 18; 24:1, 11, 27, 31, 35, 48, 60; 25:11; 26:3, 4, 12, 24, 29; 27:4, 7, 10, 19, 23, 25, 27 (2x), 29 (2x), 30, 31, 33 (2x), 34, 38, 41; 28:1, 3, 6 (2x), 14; 30:3, 27, 30; 32:1, 27, 30; 35:9; 39:5; 47:7, 10; 48:3, 9, 12, 15, 16, 20 (2x); 49:25, 28 (2x); 50:23. As with *zera*’, *brk* has an even distribution across the various narratives that comprise the book of Genesis.

²⁸ On this point, the author would like to thank a reviewer who added, “The selection of those few episodes from the long lives of the patriarchs which clearly show that YHWH is fulfilling His promises to Abraham and demonstrating the measure of compliance of Abraham and his descendants to the covenant expectations proves that the book was written by one hand. It is beyond ludicrous to suppose that the material putatively individually recorded on tablets when assembled would contain exactly what was needed to advance the theological purposes of the book as it does.”

²⁹ According to Morris (1976, p. 26), Isaac and Jacob were both responsible for obtaining the brief genealogical records from Ishmael and Esau, respectively, and incorporating them into their own accounts. But this is an *ad hoc* explanation that still fails to explain the anomalous appearance of the *tōlēdôt* markers at the *beginning* rather than the *end* of those particular records.

Second, the appearances of *tôlēdôt* outside of the book of Genesis show its consistency in use as a heading rather a colophon. Nowhere in the Bible does *tôlēdôt* clearly refer to what precedes, and often it *must* refer to what follows (cf. Ross, 1988, p. 72). Two examples make this clear. First, in Numbers 3:1, the “*tôlēdôt* of Aaron and Moses” cannot conclude the census of Numbers 1–2 but must function as an introduction to the high priest’s lineage (vv. 2–4). Second, in Ruth 4:18, the “*tôlēdôt* of Perez” necessarily introduces the genealogy that follows rather than concluding the preceding account. These two examples suggest that the *tôlēdôt* markers in Genesis ought to be read in the same fashion; that is, as transitional headings rather than as colophons.

Third, the very meaning of *tôlēdôt* requires that the markers be taken as headings rather than colophons. The Hebrew תולדות derives from the Hiphil stem of the root ילד (*yld*), which means “to bear,” “to beget,” or “to bring forth.” Consequently, it is fitting that *tôlēdôt* markers relate to the *descendants* of the person mentioned rather than to the person himself. The *tôlēdôt* of Adam (Genesis 5:1) describes the descendants of Adam; the *tôlēdôt* of Shem, Ham, and Japheth (Genesis 10:1) describes their descendants, and so forth (cf. DeRouchie, 2013, p. 224).

Admittedly, some of the *tôlēdôt* headings seem to serve as signals that the account to follow concerns the life of the individual mentioned (e.g., the “*tôlēdôt* of Noah” in Genesis 6:9), rather than that individual’s descendants. However, this is the exception rather than the rule. And even in the case of the “*tôlēdôt* of Noah,” Noah’s sons are in the immediate context (Genesis 6:10), so the textual unit *does* concern them. Additionally, even the unusual “*tôlēdôt* of the heavens and the earth” (Genesis 2:4) functions better to describe the account that follows rather than that which precedes. DeRouchie observes,

“It must point ahead to that which is immediately derived from the heavens and the earth—that is, humanity, shaped out of the ground and by the breath of God (Gen 2:7); a crafty serpent as a personification of all that is evil and created by God (3:1); toil, growing out of a world cursed by its Creator due to sin (3:17–19; cf. Rom 8:20–21); and a human offspring of hope, considered a gift of God and a sure sign that the promised deliverer would come (Gen 4:25; cf. 3:15; 4:1)” (DeRouchie, 2013, p. 224; cf. Ross, 1988, p. 72).

Fourth, linguistic analysis suggests that the *tôlēdôt* markers function better as headings than colophons. When Hebrew verbless clauses containing a definite subject and predicate occur with demonstrative pronouns (in this case הַזֶּה or הַלְּזֶה), they usually serve as headings, pointing forward to something not yet mentioned (DeRouchie, 2013, p. 224; cf. Deuteronomy 1:1; 4:44–45). The argument by Taylor (1994, p. 210) that the demonstrative pronouns הַזֶּה and הַלְּזֶה are, in the book of Genesis, more often used anaphorically than cataphorically is rendered irrelevant because he did not take into account the grammatical constructions in which the pronouns appear.

In view of the fact that the *tôlēdôt* markers do not function as colophons, even if they indicate the existence of prior sources that Moses relied upon in writing Genesis, those sources *are not the sources required by the tablet model*. For example, if “the book of the *tôlēdôt* of Adam” (Genesis 5:1) functions not as a colophon but as a heading *and* indicates the existence of a prior source, that unit of text *could not have been written by Adam*. This conclusion is inevitable because of the simple fact that “the book of the *tôlēdôt* of Adam” contains all the biographical material running from Genesis 5:1 to Genesis 6:8 and, accordingly, must have been compiled after the death of Adam by someone living—at the earliest—in the time of Noah. This same type of problem is also incurred by

a number of the other textual units. For example, the “*tôlēdôt* of Terah” extends all the way to Genesis 25:11, but Terah dies back in Genesis 11:32!

How, then, are the *tôlēdôt* markers to be understood? They are transitional devices that are absolutely integral to the fabric of Genesis as a whole. Each marker functions, as Mathews explains it, as a “linking device that ties together the former and the following units by echoing from the preceding material a person’s name or literary motif and at the same time anticipating the focal subject of the next” (Mathews, 1996, pp. 33–34). The *tôlēdôt* markers in Genesis thus *act to bind the book together*. Mathews provides another analogy, saying that each marker functions “like a hinge that swings back, recalling the information in the prior section, and also swings forward by suggesting the topic in the section it introduces” (Mathews, 1996, p. 34).

DeRouchie describes the *tôlēdôt* headings similarly, defining them as “transitional headings that progressively direct the reader’s focus from progenitor to progeny and narrow the reader’s focus from all the world to Israel through whom all the families of the earth will be blessed” (DeRouchie, 2013, p. 225). The Creation account contained in Genesis 1:1–2:3 (which has no *tôlēdôt* heading) serves as the preface to Genesis and supplies the thematic or theological “keys” necessary to unlocking the meaning of the whole book of Genesis. Therefore, the opening narrative unit “provides the prefatory lens into the *toledot* units, with the blessing-commission of 1:28 playing a central role in the development and narrowing in the book” (DeRouchie, 2013, p. 226).

This purpose for the *tôlēdôt* markers naturally links back to the “seed” and “blessing” motifs previously discussed, again showing that the book of Genesis did not arise by stringing together nonrelated sources. The highlighting and progressive development of key

theological themes facilitated, in part, by the narrowing and focusing function of the transitional headings evidences a grand compositional strategy in place right from the beginning of the book. Mathews's conclusion quite fittingly describes this fact: "The formula as the framework of the Genesis collection is the book's strategy for declaring *its organic unity*—from the creation of the universe to the election of Israel's historical precursors. By this overarching pattern the composition's framework is historical genealogy, tying creation and human history in continuum. *The superscription then has a unifying effect*" (Mathews, 1996, p. 34, emphasis added).³⁰

(5) The tablet model suggests that the accuracy of the record of Genesis is ensured because it comes directly from eyewitness accounts of the events described that were written down shortly after the events themselves occurred. By implication, therefore, the tablet model endorses (perhaps unwittingly) the notions (a) that an eyewitness account is necessary to ensure the reliable recording of a historical event, and (b) that

³⁰ All the *tôlēdôt* markers function to organize the contents of Genesis, focusing the contents of the book and also narrowing the reader's focus, but not all of the *tôlēdôt* markers work in precisely the same way; some have a closer connection to the material in the preceding section than do others, which is signaled by the Hebrew conjunction ׀ (*waw*), where it fronts the formula אֵלֶּה הַתּוֹלְדוֹת. DeRouchie (2013, pp. 232–33) notes, "While the five *toledot* units beginning without an explicit connector stand grammatically independent from the preceding material, the five *toledot* units fronted with the coordinate conjunction are intentionally linked to the *toledot* units that precede." He therefore sees five major sections in Genesis after the preface. See Table I.

Table I.

Preface		<i>The Creation Account</i> (1:1–2:3)
Section 1	—	These are the <i>tôlēdôt</i> of the heaven and the earth (2:4–4:26)
Section 2	—	This is the <i>sēpēr</i> of the <i>tôlēdôt</i> of Adam (5:1–6:8)
Section 3	— <i>waw</i>	These are the <i>tôlēdôt</i> of Noah (6:9–9:29) And these are the <i>tôlēdôt</i> of the sons of Noah (10:1–11:9)
Section 4	— <i>waw</i> <i>waw</i> <i>waw</i> <i>waw</i>	These are the <i>tôlēdôt</i> of Shem (11:10–11:26) And these are the <i>tôlēdôt</i> of Terah (11:27–25:11) And these are the <i>tôlēdôt</i> of Ishmael (25:12–18) And these are the <i>tôlēdôt</i> of Isaac (25:19–35:29) And these are the <i>tôlēdôt</i> of Esau (36:1–8; 36:9–37:1)
Section 5	—	These are <i>tôlēdôt</i> of Jacob (37:2–50:26)

only written documents are adequate to ensure the faithful transmission of a historical record. These points are generally true; however, in the case of Genesis, the doctrine of divine inspiration (2 Timothy 3:16; 2 Peter 1:21) affords for a text which is accurate irrespective of whether or not the human author was an eyewitness of the events described. As stated previously, certain biblical narratives (e.g., Job 1–2) contain content that must have been written on the basis of direct revelation from God, as there was no human eyewitness of the events described.³¹ Additionally, with respect to the faithful transmission of historical events, it is impossible to dismiss out of hand the possibility that oral transmission could have provided Moses with the material that he needed in order to compose the bulk of the book of Genesis (cf. Wise, 2002, p. 17). In any case, regardless of whatever compositional

model is assumed, *at minimum* the text of Genesis 1:1–2:3 must have come about by means of divine inspiration apart from the involvement of any human eyewitness. Consequently, on the whole, the tablet model does not guarantee an inerrant text any better than do other compositional models and, given the doctrine of divine inspiration, it is really unnecessary.

(6) The tablet model assumes that Moses was capable of understanding and translating records predating the dispersion at Babel (i.e., the source tablets purportedly written by Adam, Noah, and Noah's sons; cf. Genesis 5:1; 6:9; 10:1). However, this undermines the significance of the linguistic confusion the Lord brought upon the human race in Genesis 11. Responding to this charge, Hodge (2013, pp. 231–39; cf. 2006) offers four possible explanations.³²

³¹ In response to the erroneous notion promoted centuries ago by John Gill that the בְּנֵי־הָאֱלֹהִים mentioned in Job 1–2 were human "professors of religion," it is worth noting that no Hebraist adopts such a strained view of the text. See on the meaning of בְּנֵי־הָאֱלֹהִים the article, "Is the 'Sons of God' Passage in Genesis 6 Adapted Pagan Mythology?" (Anderson, 2015).

³² The four possibilities that Hodge offers are as follows: (1) The pre-Babel language survived the confusion introduced in Genesis 11 and became one of the post-Babel languages. In this case, either the Patriarchs or Moses would have been able to translate the pre-Babel records that came to be included in Genesis. (2) Knowledge of the pre-Babel language was retained by Noah and his immediate family. In this case, Noah or

However, Hodge does not, in setting forth these four explanations and the respective supporting arguments for each of them, interact with any relevant linguistic and theological scholarship. His “fallback” argument is that even if the pre-Babel tablets were humanly indecipherable, Moses could have enlisted divine assistance in translating them. Hodge asserts, “If there were any discrepancies, he would have had the all-knowing God, who invented the different languages, in his tent with him” (Hodge, 2013, p. 238).

If it is assumed that Moses translated by the aid of the Holy Spirit, there is no need for having the pre-Babel tablets in the first place. What is the purpose, after all, in distinguishing whether Moses wrote a new document by the aid of the Holy Spirit (cf. 2 Peter 1:21), or that he, in reliance on the Holy Spirit, “translated” old documents written in a long-lost language that he could not humanly comprehend? The difference is only a technical one, not a practical one, for in either case, the Spirit would be informing Moses of the things of old, and the pre-Babel records would serve no real purpose as far as Moses, the “translator,” was concerned; Moses would not have actually *used* them.³³ In

one of his sons translated the pre-Babel records, and Moses later incorporated the translated accounts into Genesis. (3) The pre-Babel language was completely lost at the confusion. And (4) the pre-Babel language was “subdivided” at Babel, with elements retained in all extant languages. Both 3 and 4 assume *either* the ability of post-Babel individuals to decipher the pre-Babel language in order to translate the records *or* that Moses was able to “translate” the pre-Babel records by the aid of the Holy Spirit.

³³ Arguments for “guilt by association” are rarely valid; however, in light of the preponderance of evidence already standing against the tablet model, it

any case, the fact remains that the polished—and sometimes elaborate—style of the book of Genesis does not suggest that it is a translated work.³⁴

cannot hurt to mention this oddity: The idea of Moses “translating” pre-Babel texts he could not read except by the aid of the Holy Spirit sounds all too much like Joseph Smith “translating” the so-called “golden plates” by means of a seer stone. In neither case would the human “translator” have had any knowledge of the language of the source text, which makes the presence of the source text unnecessary to begin with.

³⁴ The elaborate intricacy displayed in Genesis 1 (which is, according to the tablet model, a translated piece) is commented on at length by Boyd: “The palistrophic structure (corresponding clauses form an ABCDD’C’B’A’ or similar pattern) in Genesis 1:14–19 comprises eleven purpose clauses *a–k*. Six (*a*, *f* and *i–k*) are construed by λ + infinitive construct of three different verbal roots: 1) להבדיל ‘to divide,’ 2) להאיר ‘to shine light,’ and 3) למשל ‘to rule.’ Three (*b*, *c*, and *d*) are in verse 14b, ‘for signs, for appointed times, for days and years.’ Two (*g* and *h*) are imbedded in verse 16, ‘the big light source for the *ruling* of the day and the small light source for the *ruling* of the night.’ ‘For ruling’ in this verse is למשל, which is λ plus a noun from the verbal root of clause *j* (root 3). Finally, clause *e*, ‘for light sources,’ is connected to clause *f*, ‘to shine light on the earth,’ and thus, corresponds semantically to the latter” (Boyd, 2008, p. 190). He continues, “The clauses are arranged as follows: the last clause (*k*) clearly corresponds to the first (*a*), because both have root 1 and they are semantically equivalent objects. We will call them therefore *a* and *a*’. Furthermore, the third (*f*) is identical to the third from last (*i*). So they are *f* and *f*’. In addition, *g* and *h* are the same, enabling us to assign *g* to both. This leaves us *b*, *c*

(7) The tablet model asserts that Moses relied, not just on sources, but specifically on clay tablets. However, despite the bulk of Genesis having allegedly come from tablets, the Hebrew for “tablet” (לוח) never once appears in Genesis in order to indicate the existence of previous source material. Notably, the one text commonly appealed to by proponents of the tablet model in order to support the idea of Moses’ reliance upon prior sources (Genesis 5:1) uses ספר, the generic term for any sort of written document, rather than לוח, which is specifically a tablet. However, if Moses had wanted to indicate his dependence on tablets, why did he not use לוח? While it may be asserted that Isaiah 30:8 supplies evidence that לוח and ספר have overlapping semantic ranges, this is not sufficient evidence to explain why, had the use of source *tablets* been so important in the writing of Genesis, Moses was not more specific so as to use לוח. Moses’ familiarity with the word for *tablet* is evidenced by its frequent appearance in his other writings (both

and *d*, and *j*. The schema, then, is as follows: *a* [*b*, *c* and *d*] *f* *g-g* *f* [*j*] *a*’. That is, among the clauses corresponding to one another because they have identical roots, the *b*, *c* and *d* grouping is between the first and second and *j* is between the last and second to last. The result is that the precision of the author’s meticulously crafted structure directs the reader to semantically equate *b*, *c* and *d* with *j*. And since *g* and *j* have the same root, we can thus understand the meaning of ‘the big light source for the *ruling* of the day and the small light source for the *ruling* of the night’” (Boyd, 2008, pp. 190–91). The intricacy of this short passage (to say nothing of the rest of chapter 1) does not lead the reader to suspect that the text is a translation of another work. Its elaborate structure would likely not have survived intact through the translation process.

Exodus and Deuteronomy³⁵), so there is no real reason for suggesting that he could not have used it to indicate his dependence upon source tablets in compiling Genesis.

(8) Finally, the tablet model leaves too many uncertainties unaddressed and too many questions unanswered. Regardless of how confident its proponents may be that the tablet model presents a satisfactory answer for how Moses could have written about historical events that occurred long before his time, the fact remains that there is a conspicuous vagueness to the model. For instance, how were the sources compiled prior to coming into the hands of Moses? Notably, there is an extra level of difficulty in explaining how the genealogical material from Ishmael and Esau in particular (cf. Genesis 25:12; 36:1) worked its way into the collection of tablets. How were the tablets kept during Israel's long sojourn in Egypt, and how did Moses come into possession of them? These are merely logistical issues; other, far more serious questions exist as well. For example, how would the original authors of the tablets that allegedly make up Genesis have known what to write in order to ensure such a high level of consistency in the tablets' message? Were the source tablets all individually inspired by God (cf. Wiseman, 1977, p. 73), or was Moses an "inspired" editor (cf. Hodge, 2013, p. 239)?³⁶ Answers

submitted to these questions tend to be speculative, not concrete. However, the traditional view of the Mosaic authorship of Genesis is unhindered by the problems evidenced in these questions. Thus, if the tablet model is going to be proven correct, its proponents need to do a better job addressing these issues.³⁷

V. Conclusions about the Tablet Model

This paper has traced the development of the tablet model and has shown how, beginning with Henry Morris, creationists have repeatedly advanced it as the most likely explanation for how Moses could have written about historical

guided by the Holy Spirit, but were not themselves "inspired" in the technical sense of the word. Thus, the question that presents itself is whether the original authors were Spirit-guided, or whether only the author of the final form of the text (Moses) was Spirit-guided.

³⁷ There are two other objections to the tablet model that deserve to be mentioned, but which cannot here be explored at length. First, the tablet model reduces the Joseph narrative in significance, leaving it as a "tacked-on" epilogue of sorts. However, the Joseph narrative is of great significance to the book of Genesis. Aside from the narrative itself, which continues and advances many theological themes of the book, there are the extremely important blessings of Jacob in chapter 49 (in particular v. 10). Second, the tablet model wholly discounts the reliability of the convention in the Jewish community to transmit the Scriptures orally. It is possible that the idea that the Lord would not depend on oral tradition to preserve the accounts of Genesis stems from a self-awareness on the part of its proponents that they could not do this. But the Jewish people do. And this is true of more than just the scholars.

events that occurred before his time (section II). In doing so, it has examined the major arguments for the tablet model (section III) and found them to be wholly unconvincing, unfounded, and even detrimental. It has also outlined a plethora of additional problems incurred by the tablet model (section IV), demonstrating, among other things, that the model simply cannot account for the biblical data.

The weakness of the case submitted for the tablet model first by Wiseman and later by Harrison suggests that the adoption of the model into Morris's defense of biblical creationism was at best premature, if not ultimately detrimental.³⁸ Unfortunately, Morris's promotion of the model as the best explanation for the composition of Genesis set off a trend in the creationist community, such that *some* proponents of the model now tenaciously defend it as being necessitated by the biblical evidence. And this in spite of the fact that the tablet model is on such incredibly shaky ground when it is actually weighed against the scriptural data.

What, then, may be affirmed about the composition of Genesis? It may be stated, in accordance with the preponderance of biblical evidence, that it was authored by a single person—Moses. Certainly, Moses may have relied on sources (perhaps written, perhaps oral, perhaps both), but these sources are

³⁵ See Exodus 24:12; 27:8; 31:18 (2x); 32:15 (2x), 16 (2x), 19; 34:1 (3x), 4 (2x), 28, 29; 38:7; Deuteronomy 4:13; 5:22; 9:9 (2x), 10, 11 (2x), 15, 17; 10:1, 2 (2x), 3 (2x), 4, 5.

³⁶ This terminology is used by Hodge (2013, p. 239), who specifically states that "Moses was inspired as he wrote." However, this misrepresents the doctrine of inspiration. According to 2 Timothy 3:16, it is the text of Scripture, not the authors, that is inspired or "God-breathed"; the authors of Scripture were indeed

³⁸ The repeated use of the word "detrimental" is here very intentional. Simply put, holding onto an obviously erroneous compositional theory allows for there to be aspersions cast on creationists' methodology and conclusions. An outsider could well reason if some creationists hold on to *this* exploded theory, what other antiquated and refuted ideas do they grasp with equal tenacity? In the end, this does great damage to creationists' theological, scientific, and intellectual credibility.

not identifiable in Genesis. Whatever sources Moses may have used have been thoroughly incorporated into the grand flow and overarching message of the book, much in the same way that a skilled modern author might interact with source material, weaving quotes and allusions into his own work without disrupting the flow and message of the piece he is writing (cf. Garrett, 2000, p. 99). As C. John Collins states, “We cannot say that there were no sources ... but we are in a good position to say that whatever the process of stitching together, it shows high literary skill, producing a coherent whole” (Collins, 2006, p. 235).

As it has been demonstrated in this paper, the book of Genesis is a highly complex, polished literary work that does not read like an assembled or compiled text but rather as a unified, flowing, coherent account. It is a true literary masterpiece (cf. Boyd, 2008, p. 165). The *tôlêdôt* markers are devices used primarily for structural purposes (cf. DeRouchie, 2013, pp. 245–47); they do not evidence the boundaries of original source material.³⁹ Mathews is correct in saying, “What follows the catchphrase in the extant Genesis is not necessarily the material of the original source. *Thus we cannot possibly reconstruct the pre-Genesis sources with confidence as to their origins and contents*” (Mathews, 1996, p. 32, emphasis added).

Clearly, the *tôlêdôt* markers are integral to the compositional strategy of Genesis, functioning to focus the reader’s attention on God’s progressively unfolding plan and work—especially

as it concerns a “seed” and a “blessing” (cf. Alexander, 1993, p. 260; Ross, 1988, pp. 65–66). Given this fact, it is best to conclude with Woudstra, “The author of Genesis... has himself given us a clue as to the composition of the book, a composition which suggests a well-thought-out plan. The *toledot* formulas have not been subsequently added to an already existing text, but are the very fabric around which the whole of Genesis has been constructed” (Woudstra, 1970, pp. 188–89).

What, then, can be said about the sources behind the content of Genesis? Garrett responds to this question quite effectively, stating, “Any attempt to isolate documents behind Genesis must remain hypothetical. Dogmatism is impossible here!” (Garrett, 2000, p. 81). This would be an excellent point for the creationist community to consider. Garrett continues, “The text, as it now stands, is in its present form because of the work of Moses.... One cannot assume that any passage in its present form is a word-for-word representation of the original source” (Garrett, 2000, p. 81). Indeed, in contrast to much of the creationist literature surveyed previously in this paper, it is this more reserved perspective—not the tablet model—that will permit for the continued construction of a robust and respectable defense of biblical creationism.

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³⁹ Duane Garrett (2000, p. 81) makes this distinction in very bold (but helpful) terms: “Finding the sources of Genesis is not the same as identifying the structure of Genesis....The question of sources and the question of structure must not be confused.”

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Appendix

Striking parallels and other obvious connections demonstrate that the book of Genesis is not comprised of disjointed narrative units strung together by a redactor, as the tablet model suggests. For example, the Creation/Fall and Flood narratives manifest many close parallels, with emphasis placed on the important themes of creation/re-creation (note, e.g., the formation of the land; Genesis 1:9–10; 8:3–5), divine blessing (Genesis 1:22, 28; 9:1), cursing (Genesis 3:14, 17; 9:25), and others (cf. Ross, 1988, p. 190). John Sailhamer proposes an intriguing extended parallel between the Abrahamic narrative and the Joseph/Exodus narratives. Although scholars

Table II.

Abraham	Joseph/Exodus
12:10 – Now there was a famine in the land	41:54 – Then there was famine in all the lands...
12:11 – When he came near to Egypt...	46:28 – And they came into the land of Goshen
12:11 – “I know that you...”	46:31 – Joseph said to his brothers...
12:11 – He said to Sarai his wife...	46:31 – “I will go up and tell Pharaoh...”
12:12 – “And when the Egyptians see you, they will say...”	46:33 – “When Pharaoh calls you and says...”
12:13 – “Say that...”	46:34 – “You shall say...”
12:13 – “That it may go well with me because of you...”	46:34 – “That you may live in the land of Goshen...”
12:15 – Pharaoh’s officers saw her and praised her to Pharaoh	47:1 – Then Joseph went in and told Pharaoh...
12:15 – And the woman was taken into Pharaoh’s house	47:6 – [Then Pharaoh said...] “Settle your father and brothers in the best of the land...”
12:16 – [Pharaoh] gave him sheep and oxen and donkeys and male and female servants and female donkeys and camels	47:6 – “Put them in charge of my livestock” 47:27 – And they acquired property in [Goshen] and were fruitful and became very numerous
12:17 – But the LORD struck Pharaoh... with great plagues...	Exod. 11:1 – “One more plague I will bring on Pharaoh...”
12:18 – Then Pharaoh called Abram and said...	12:31 – Then [Pharaoh] called for Moses and Aaron...
12:19 – “Take her and go”	12:32 – “Take... and go...”
12:20 – And they escorted him away...	12:33 – To send them out...
13:1 – So Abram went up from Egypt to the Negev	12:37 – Now the sons of Israel journeyed from Rameses to Succoth...
13:1 – And Lot with him	12:38 – And a mixed multitude also went up with them...
13:2 – Now Abram was very rich in livestock, in silver and in gold	12:38 – Along with flocks and herds, a very large number of livestock 12:35 – Articles of silver and gold...
13:4 – [Abram returned] to the place of the altar... and there Abram called on the name of the LORD	12:11 – “The LORD’s Passover”

debate the legitimacy of some points of the proposed parallel, the fact remains that it is unlikely that Sailhamer would have even been able to argue for such a parallel (or others like it) *were it not for Mosaic authorial unity*. Sailhamer writes, “The account of Abraham’s ‘sojourn’ in Egypt bears the stamp of having been intentionally shaped to parallel the later account of God’s deliverance of Israel from Egypt (Gen 41–Exod 12). Both passages have a similar message as well. Thus here, at the beginning of the narra-

tives dealing with Abraham and his seed, we find an anticipation of the events that will occur at the end” (Sailhamer, 1990, p. 116).

Sailhamer concludes, “By shaping the account of Abraham’s sojourn in Egypt to parallel the events of the Exodus, the author permits the reader to see the implications of God’s past deeds with his chosen people. The past is not allowed to stay in the past. Its lessons are drawn for the future. Behind the

pattern stands a faithful, loving God. What he has done with Abraham, he will do for his people today and tomorrow” (Sailhamer, 1990, p. 117). Notably, parallels such as this serve to showcase the compositional unity of Genesis. It is implausible to suggest that they are coincidental. Rather, these parallels evidence the work of a single author who deliberately drew connections between different narrative units in order to make a theological point.

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eKINDS Project Paper

Baraminology Classification Based on Gene Content Similarity Measurement

Jean O'Micks*

Abstract

A recent genomics-based baraminology method has been developed that measures the gene content similarity (the Jaccard Coefficient Value, or JCV) between species and assigns them to individual baramins. The method is based on the creationist assumption that genes are conserved across genomes within a baramin and represent orthological functional units. Species from the same baramin should contain many common genes and thus have a high JCV, whereas species from different baramins should have a low JCV.

This method has been further developed and estimates baramins based also on k-means clustering. The method also calculates two parameters, the pan-genome quotient (PGQ) and the completeness index (CI), both of which describe how much genome erosion via gene loss has occurred in the pan-genome of the archebaramin since the Fall. The PGQ measures the intersect/union of all genes in all species in a given baramin, while the CI measures the number of genes in all species in the baramin divided by the number of species in the baramin times the size of the union of orthologous genes.

This method has been heretofore used in the analysis of Nucleocytoplasmic large DNA viruses (NCLDVs, which bear remarkable similarities to bacteria), Archaea, and insects. The method is applied to a data set of 26 fungal species in the present paper. The algorithm predicted three putative baramins, with seven species from Pezizomycotina, three from Agar/Ustilagomycotina, and 15 from Saccharomycotina.

Based on previous experience, there is no single JCV cutoff by which species can be assigned into the same or different baramins. For example, bacterial baramins may have a rather low mean JCV due to horizontal gene transfer (HGT). In general, gene content baraminology studies depend on the biology of the organisms under study. With more and more protein data becoming available, the JCV method appears to be a promising tool for many future baraminology studies.

* Jean O'Micks, jeanomicks@gmail.com

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Introduction

In recent years, the evolutionary community has moved away from inferring species relationships by using phylogenetic trees, which are based on single-gene families, because many times they produce conflicting results (Teichmann and Michison, 1999). Instead, so-called phylogenomic approaches are being taken into consideration to construct species relationships based on whole genome data, which average out the differences between individual genes. These include superalignment, superdistance, and supertree, as well as gene-content methods. Of these, this paper will focus more on the gene-content approach.

Until recently, not many genetic baraminology methods have been developed. Wood (2003) and Shan (2009) have proposed speculative models involving transposable elements and genomic rearrangements. Wood (2013) also performed a study that showed that genetic diversity in ancient DNA falls within modern sequence diversity in the horse, dog, and cat kinds, illustrating the continuity between older and newer species of a given holobaramin. More recently, a whole-genome content comparison method has been developed, which calculates the Jaccard Coefficient Value (JCV) for gene content between all possible species pairs within a set of species (O'Micks and Lightner, 2017).

From a creation perspective, genes code for proteins, which represent functional units in an organism, such as enzymes, transcription factors, structural proteins, or ion channels. These functional units are conserved in species across all life and resist evolutionary turnover (Cserhati, 2007). Whereas gene-content comparisons may capture the species relationships between single-celled organisms well, the relationship between multicellular organisms might not be so clear-cut. This is because, first, multiple splice variants multiply the number of gene variants and hence orthologs that a given species may have.

Second, since the majority of eukaryotic species are multicellular, genetic interactions between different tissues and cell types further complicate the picture.

Species that belong to the same holobaramin arguably have similar morphological, biochemical, and genetic features. Therefore, similar species should have many genes in common on a genomic level. These genes of similar function belong to the same gene cluster, or orthology group. Therefore, the first main step in determining the genetic relationship between species is to classify individual genes according to their corresponding orthology groups. For this, many gene/protein clustering tools and databases are available. The second major step is to calculate the distances between species in the group under study based on their orthology content. The third and last step involves clustering species together based on mutual similarity between species within the same holobaramin and dissimilarity between all other species in the data set.

This paper will describe the process of determining gene orthology and calculating similarity and distance values between species based on gene content, as well as clustering species into baramins based on gene-content similarity. Then the JCV algorithm will be presented and shown how it applies to several test cases.

Gene-content Comparison Methodology

Defining gene clusters/groups

Genes with similar function are called homologs, which includes several categories. Orthologs are genes that functionally correspond to each other between two species, whereas paralogs are genes that functionally correspond to each other within a species. Paralogs could have formed via gene duplication from existing genes, otherwise multiple gene copies may have been created as

redundant functional elements, such as the hemoglobin cluster genes (Liu and Doran, 2006). Resolving the proper relationship between orthologs is made difficult by the presence of paralogs, since we then have to figure out which of multiple paralogs a given ortholog matches to. Between species, xenologs are orthologous genes that are a result of horizontal gene transfer (HGT). Other issues that affect correct categorization of genes to gene clusters include gene loss/absence (Daubin et al., 2003), gene order (Vishnoi et al., 2010), and e-value cutoffs, which designate whether two genes are orthologous or not (Rosenfeld et al., 2016).

In some cases, orthology clusters have already been determined by previous researchers. In such cases, orthology group definition is not necessary.

A common step in defining clusters of orthologous genes is by running an all-versus-all blast of all the genes/proteins in the genome among all subject species. The BLAST algorithm sequentially compares a query sequence either with a single target sequence or a whole database full of target sequences and measures how good the alignment is between the query and the target(s). Some widely used gene cluster databases are the COG (Cluster of Orthologous Genes) database (Tatusov et al., 2003) and the eggNOG database (Powel et al., 2014). Algorithms that define gene clusters include OrthoMCL, InParanoid (Sonnhammer and Östlund, 2015), and OMA (Roth et al., 2008). Tables 1 and 2 list some of the best-known orthology algorithms and databases.

An algorithm that does all-versus-all blasts is the COGNITOR program (NCBI, 2016). It was devised based on the methodology used to build the COG database (Tatusov et al., 2001). Here reciprocal best BLAST hits between two different genomes are identified as a pair of orthologs. Clusters of orthologous genes (COGs) are formed by adding ortholog pairs from at least three species (ortholog

Table 1. Several well-known gene orthology databases.

Database name	Data	Reference
COG & KOG	Clusters of orthologous groups of proteins for prokaryotes and eukaryotes	Tatusov et al., 2003
eggNOG (version 4)	Non-supervised orthologous group data for 3686 organisms	Powell et al., 2014
HomoloGene	An automated system for constructing putative homology groups from the complete gene sets of a wide range of eukaryotic species	NCBI, 2016
Inparanoid (version 8)	Ortholog groups for 273 proteomes, inferred by Inparanoid algorithm	Sonnhammer and Östlund, 2015
MBGD	Comprehensive platform for creating orthologous groups across multiple genomes	Uchiyama, 2007
OrthoDB	Hierarchical catalogs of orthologous gene groups in animals, fungi, and bacteria	Waterhouse et al., 2013
Ortholog Ontology	Ortholog database that integrates numerous types of genome and biological data	Chiba et al., 2015
OrthoMCL-DB	Stores information on orthologous groups derived by OrthoMCL algorithm	Fischer et al., 2011

triangles). The Inparanoid algorithm (Remm et al., 2001) makes provisions for removing proteins from a pairwise species comparison, which are paralogs, which are determined by giving reciprocal best within-species BLAST hits to their corresponding orthologs. The EGO algorithm extends this to multiple species comparisons (Lee et al., 2002). The OrthoMCL algorithm (Li et al., 2003), used in the method presented in this paper, also determines orthologs between species and paralogs within species and then assigns each protein sequence pair a weight, according to the $-\log_{10}(\text{p-value})$ of the BLAST hit. These weights are then represented in a symmetrical weight matrix and converted into a graph. The weights also correspond to the probability of transitioning from one protein to the next one in the MCL (Markov cluster) algorithm (Enright et al., 2002). During the application of this algorithm, the matrix is multiplied until there is little or no change in it, whereby the final matrix represents the desired protein clusters.

Different numbers of clusters of different sizes can form based on the

e-value cutoff that is applied during the blast. If the cutoff is too high, then few clusters are formed, each with many members. On the other hand, if the cutoff is too low, then too many clusters form with too few members. Rosenfeld et al. (2016) found that the optimal e-value for blasts is between 1^{-50} and 1^{-100} . Otherwise, reciprocal best hits between the proteomes of different species helps determine clusters.

Another useful tool in determining orthology of a given species is compar-

ing each protein sequence to already existing orthology databases, such as the COG database. A well-known algorithm that does this is the Inparanoid algorithm (Ostlund et al., 2010). The eggNOG database contains HMM profiles for protein families from 106 different taxonomical categories, from bacteria to insects to birds. Therefore, instead of running a BLAST search, an HMM search could be run to identify which cluster (orthology group) a given protein belongs to.

Table 2. Several well-known orthology algorithms and programs.

Algorithm	Description	Reference
COGnitor	Program that assigns protein sequence to a COG using BLASTP	Natale et al., 2000
InParanoid	Graph-based clustering of all-versus-all BLAST comparisons	Ostlund et al., 2010
OrthoMCL	Groups genes together based on sequence similarity	Li et al., 2013
OMA	Derives orthology groups based on bidirectional best hits	Roth et al., 2008

Defining baraminic distances based on gene content

When the orthology classification has been determined for each gene within a species' genome for a number of species, this data can be represented by a presence/absence matrix \mathbf{M} , where $M_{i,j}$ represents the presence (1) or absence (0) of orthology group j in species i . The matrix is therefore made up of rows of zeroes and ones. Weights can be assigned to different orthology groups according to their importance within the genome. Several comparison measures have been devised that measure the difference/similarity between any given pair of species. For example, Snipen and Ussery (2010) devised the Manhattan distance, where the distance between species i and k is:

$$D_{i,k} = (1/W) \sum_{j=1}^n w_j |M_{i,j} - M_{k,j}|$$

where n is the number of orthology groups identified between both species, and w_j is the weight of orthology group j for all groups 1 to n . Distance values ($D_{i,k}$) range from 0 to 1.

Another comparison measure is the Jaccard coefficient method, which, in contrast with the Manhattan distance, calculates the gene-content similarity between two species. The Jaccard coefficient value, or JCV is calculated by the ratio of common orthology groups divided by the total number of orthology groups present in species A and B:

$$JCV = \frac{|A \cap B|}{|A| + |B| - |A \cap B|}$$

Three issues arise when using both of these methods. The first is whether to take mutual gene absence into account (where $M_{i,j} = M_{k,j} = 0$ for species i and k) because this might skew the result. Is it really meaningful to assign value to something that doesn't exist? In a sense, by taking mutual gene absence into

account, we are presupposing what the membership of the holobaramin is going to be. This is because the presence/absence matrix defines the working set of genes for a given holobaramin, for which we wish to calculate species distance or similarity. In turn, we can define the holobaramin only by calculating these distance/similarity values between species. This problem is a tautology.

The second issue in determining species distance via the Manhattan distance measure is assigning weights to the individual orthology groups. This is perfectly valid but requires *a priori* knowledge of which groups are more or less important, which could be difficult due to the fact that the genome is made up of thousands of genes, many of which might not have been annotated yet.

A third issue is two or more genes corresponding to the same orthology group in one species as compared to only one copy in another species. This might occur if multiple paralogs in one species maps to a single gene in another species. When defining the presence/absence matrix, this means we would have to decide whether to add extra columns for the surplus orthology groups.

Other algorithms take gene order into consideration. This way, hypothetically, two species or strains with identical gene content may have a less than 100% similarity value, in that during speciation some of their genes may have been rearranged in their genome (i.e., chromosome segment inversion).

It would also be useful to measure the degree of gene loss within the holobaramin. The pan-genome (PG) describes the complete set of genes across all the members of a holobaramin. The pan-genome would theoretically represent the genome of the archebaramin before any gene loss subsequent to the Fall. Within the pan-genome, core genes are those genes that occur in the genome of every single species. Shell genes are genes that occur in the genomes of the majority of the species, whereas cloud

genes are genes that are specific to only the genomes of a small number of species and take part in physiological processes that are specific to certain species—for example ones that produce special secondary metabolites.

Two related parameters can be calculated that measure how intact a genome is after gene loss. In other words, it also measures the degree of erosion the pan-genome has gone through after the Fall. One is the pan-genome quotient (PGQ), which is equal to the ratio of the number of core genes in the pan-genome to the total number of genes in the pan-genome:

$$PGQ = \frac{\cap_{i=1}^n G_i}{\cup_{i=1}^n G_i}$$

where n is the number of species in a given holobaramin, and G_i represents the set of genes in species i . The PGQ value can range from 0 to 1. A value of 0 means the pan-genome has completely eroded and no core genes exist in the holobaramin. A PGQ of 1 means all genes are intact and no genes have eroded from the pan-genome.

The completeness index (CI) also measures pan-genome erosion:

$$CI = \frac{\sum_{i=1}^n G_i}{n \cdot \cup_{i=1}^n G_i} = \frac{1}{n} \cdot \sum_{i=1}^n \frac{G_i}{\cup_{i=1}^n G_i}$$

where n is the number of species in the holobaramin, and G_i represents the set of genes in species i . The numerator of the CI sums the total number genes in all species that are members of the holobaramin. The denominator is the number of species times the size of the pan-genome. Since we assume all genomes of a given holobaramin are derived from the archebaramin and the genome of the archebaramin represents the intact pan-genome before the Fall, before any gene loss had occurred, the CI measures the average genome intact-

ness within a given holobaramin. Similar to the PGQ, the CI can take a value between 0 and 1, where 0 corresponds to a pan-genome that has completely eroded with no core genes left, and 1 corresponds to a completely intact genome with no genes having been eroded from the pan-genome.

We should expect that if we already have assigned several species to a given holobaramin, the PGQ and the CI should not decrease too drastically with the addition of any new species. If it does, then it may be a sign that that species is not a member of the holobaramin.

As a result of this step, we should get a square matrix of distance/similarity values for all species pairs, from which we calculate the membership of different baramins.

Clustering species into baramins based on gene similarity

The JCV method described in this paper uses the default clustering algorithm (the “complete” method) used by the heat map function in R for defining and displaying the members of different baramins in a given data set as well as k-means clustering. Other clustering methods in R include partitioning methods, such as k-means clustering, and hierarchical agglomerative methods, such as Ward’s method.

Molecular Genetic Baraminology Studies Using the JCV Method

Methodology

The JCV method (O’Micks, 2016; Yaugh, 2016; O’Micks and Lightner, 2017) implements molecular genetics-based baraminology classification in the following steps. First, the researcher downloads the complete proteome for each species under study. Each individual species has all of its protein sequences in a multifasta file. Protein sequences may be downloaded from

the NCBI database; however, these proteomes may not be complete. The UniProt database (<http://www.uniprot.org/proteomes/>) contains proteomes with high-quality sequences for species with completely sequenced genomes but does not have information on as many species as the NCBI database.

Attention must also be paid to whether it is possible to include non-coding (that is, now inactive) protein sequences in the proteome of a given species in the analysis. Leaving out such noncoding proteins from the analysis may skew the results.

Next, the OrthoMCL algorithm (Li et al., 2003; Fischer et al., 2011) is used to assign the individual protein sequences of a proteome to existing orthology clusters. The online version of orthoMCL (<http://orthomcl.org/orthomcl/proteomeUpload.do>) can also be used to upload these proteome files in order to complete this step. Afterward, the result of the OrthoMCL algorithm is retrieved. All orthology group IDs for all species is then combined into a large list, which is used for the JaccardClusters script.

The R script is available at <https://github.com/jeanomicks/JCV>. Version 2 (JaccardClusters2.R) of the script uses k-means clustering to estimate the baramins from the data (estimates may vary per run). The new version also outputs baramin membership as well as statistics for each baramin. The output of this algorithm is the similarity matrix, a .noa and .sif file, which can be used in Cytoscape for downstream analysis, as well as a heat map that displays the JCVs for all species pairs (visualizing the similarity matrix values). Lighter colored pixels correspond to higher JCVs close to 1 (similarity between two species), whereas darker colored pixels correspond to JCVs closer to 0 (dissimilarity between two species) on the heat map. Since the heat map function uses a clustering algorithm, it visualizes different clusters of species

that are similar to each other based on their JCVs.

A boxplot can be drawn comparing the mean JCV and the JCV range for all species pairs within a baramin, as well as between each member of the baramin and every other species. This illustrates the defining principle of baraminology—showing continuity within a baramin and discontinuity with all other species outside of the baramin. Ideally, these two ranges of JCVs should separate well from one another. The best-case scenario is when the intrabaraminic JCVs have a narrow range with high values and the extrabaraminic JCVs also have a narrow range with low values. The discordance between intrabaraminic JCVs and extrabaraminic JCVs can be measured by a p-value, which is the result of the Student’s t-test.

Test case on 26 fungal species

So far, the JCV method has been implemented in three baraminology studies in Archaea, Bacteria, and Insects, representing the three main domains of life. We also applied the algorithm to a set of 26 fungal species studied by Dutilh et al. (2007). These included 22 Ascomycota, 3 Basidiomycota and the Microsporidium *Encephalitozoon cuniculi* as an outlier. These species include single-celled yeast species as well as filamentous fungi. A list of these species can be seen in Table 3, along with the number of proteins they each have, the number of OrthoMCL orthology groups that these proteins were assigned to, and the putative baramin ID that they belong to.

Fungi are not specifically mentioned during the days of Creation; however, since we know that many fungal species form symbiosis with certain plant species, such as in mycorrhiza, we can speculate that fungi were created on Day 3 of Creation, along with plants (Loucks, 2009). One can also reason that if plants and animals were created according to their kind, then so were fungi. Since

fungi, along with plants do not have living souls, they do not classify as proper living beings. Fungi may have played a saprophytic role in the original created world in recycling nutrients.

These researchers used a COG-based method (Tatusov et al., 1997), which resulted in 6,488 unambiguous triangle-based triOGs. Each triOG

lists all the proteins of all species that it belongs to. After transforming the data, we were able to supply the list of species and ortholog pairs to the JaccardClusters script. The heat map that displays the species relationships between the 26 fungal species can be seen in Figure 1. The intrabaraminic JCV range for all three baramins is visibly higher than that

of the extrabaraminic JCV range (JCV between species from the given baramin and all other species; Figure 2).

It is interesting to observe how the size of the intersect and the union of orthologs change as more and more species are added together from a given baramin. After selecting an initial “seed” species for a given baramin, the inter-

Table 3. List of 26 fungal species from Dutilh et al., 2007, the number of proteins, orthology groups, and baraminic classification

Species	Proteins	Orthology groups	Classification 1 (heat map)	Classification 2 (k-means)
<i>Ashbya gossypii</i>	4720	2867	3	3b
<i>Aspergillus fumigatus</i>	9926	4038	1	1
<i>Aspergillus nidulans</i>	9541	3769	1	1
<i>Candida albicans</i>	11904	2399	unassigned	3b
<i>Candida glabrata</i>	5272	2856	3	3b
<i>Cryptococcus neoformans</i>	5882	1745	2	2
<i>Debaryomyces hansenii</i>	6896	2570	unassigned	3b
<i>Encephalitozoon cuniculi</i>	1918	412	outlier	outlier
<i>Fusarium graminearum</i>	11640	4461	1	1
<i>Kluyveromyces lactis</i>	5331	2976	3	3b
<i>Kluyveromyces waltii</i>	5230	2920	3	3b
<i>Magnaporthe grisea</i>	11109	3904	1	1
<i>Neurospora crassa</i>	10620	3858	1	1
<i>Phanerochaete chrysosporium</i>	11777	1942	2	2
<i>Saccharomyces bayanus</i>	4966	2737	3	3b
<i>Saccharomyces castellii</i>	4690	2656	3	3b
<i>Saccharomyces cerevisiae</i>	6702	3028	3	3b
<i>Saccharomyces kluyveri</i>	2992	1876	unassigned	3b
<i>Saccharomyces kudriavzevii</i>	3813	2026	unassigned	3b
<i>Saccharomyces mikatae</i>	3100	1640	unassigned	3b
<i>Saccharomyces paradoxus</i>	8955	2962	3	3b
<i>Schizosaccharomyces pombe</i>	4990	2098	unassigned	3b
<i>Stagonospora nodorum</i>	16597	4216	1	1
<i>Trichoderma reesei</i>	9997	4212	1	1
<i>Ustilago maydis</i>	6522	1701	2	2
<i>Yarrowia lipolytica</i>	6666	2392	unassigned	3b

sect of orthology groups common to all species slowly decreases asymptotically, until it reaches a plateau, as can be seen in Figure 3 (here the number on the x-axis shows the number of species already added to the seed species). This plateau shows the number of orthology groups that make up the core genome of a given baramin. A sharp decrease in the intersect can be observed after adding a species from baramin #2 to the seven species in baramin #1. Also, there is a sharp drop in the orthology group intersect, the PGQ, and the CI once a species from another baramin (as can be seen in Figure 4) is added to the working baramin (at eight species on the x-axis, since *Pezizomycotina* has seven species in its membership). This is because the set of core genes differs between two individual holobaramins, and their overlap is smaller than the set of core genes from either holobaramin.

There are at least three putative baramins represented on the heat map, as listed in Table 3. The statistics for these three groups are shown in Table 4. The first, stricter classification of the third baramin includes only *Ashbya gossypii*, *Candida glabrata*, *Kluyveromyces lactis*, *Kluyveromyces waltii*, *Saccharomyces bayanus*, *Saccharomyces castellii*, *Saccharomyces cerevisiae*, and *Saccharomyces paradoxus*. Seven other species are unassigned, namely *Candida albicans*, *Debaryomyces hansenii*, *Saccharomyces kluyveri*, *Saccharomyces kudriavzevii*, *Saccharomyces mikatae*, *Schizosaccharomyces pombe*, and *Yarrowia lipolytica*. K-means clustering includes these seven species along with the previous eight species to form a baramin with 15 species. However, this way the mean JCV of the third baramin drops from 0.86 to 0.65 and the p-value is much higher at 7.5×10^{-42} as opposed to 3.1×10^{-66} , although statistically still rather significant. Thus there is no significant reason in not expanding the third group to include all 15 species. The third baramin, including only eight species, also has a higher PGQ

and CI value than the same baramin including 15 species. However, since the p-value for 15 species within the third baramin is also statistically significant, we can state that the third baramin is made up of 15-member species.

This third, large-sized baramin corresponds to the subphylum *Saccharomycotina*, which includes the genera *Ashbya*, *Candida*, *Kluyveromyces*, and *Saccharomyces* and is considered to be monophyletic on evolutionary trees (James et al., 2006). The seven species in the first baramin belong to the subphylum *Pezizomycotina*. The three

species in the second baramin belong to separate subphyla (*Agaricomycotina* and *Ustilagomycotina*). This number of species is too small to say whether they form a single holobaramin.

The reason that three *Saccharomyces* species, *S. kluyveri*, *S. kudriavzevii*, and *S. mikatae* show somewhat lower JCVs to the other *Saccharomyces* species is because their genomes are incomplete (Cliften et al., 2003; Scannell et al., 2006). Table 3 shows that besides the outlier species, *Encephalitozoon cuniculi*, these three species have the lowest number of proteins in their genome.



Figure 1. Heat map of JCVs for 26 species of fungi based on the Jaccard Coefficient Method. Lighter colors denote higher JCVs, closer to 1, whereas darker colors denote lower JCVs, closer to 0.

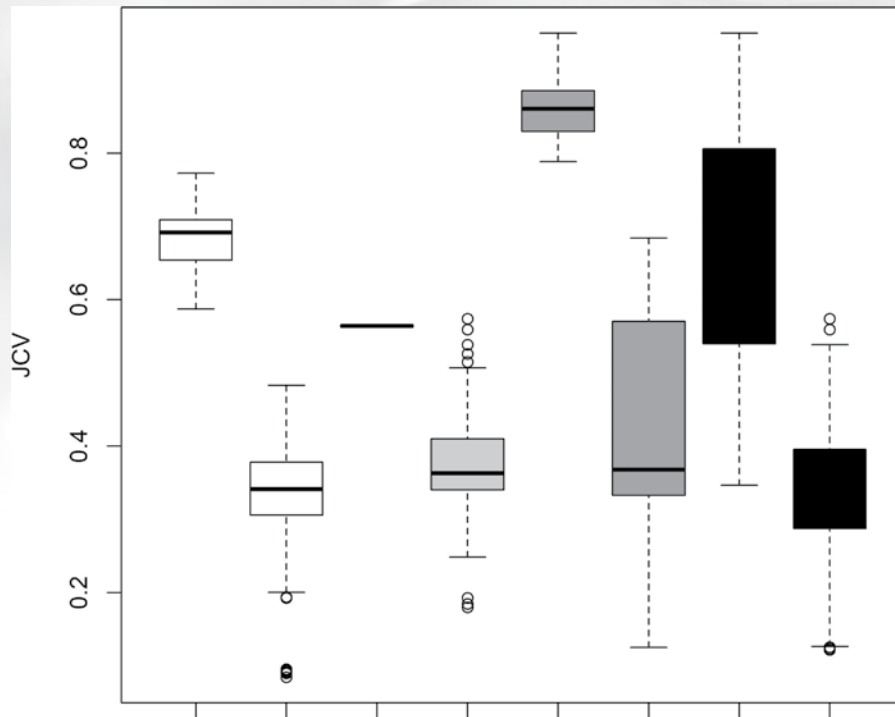


Figure 2. Box plot for four different baraminic classifications of 26 fungal species. 1: White—intrabaraminic and extrabaraminic JCVs of Pezizomycotina, 2: Light gray—intrabaraminic and extrabaraminic JCVs of Agar/Ustilagomycotina, 3a: Dark gray—intrabaraminic and extrabaraminic JCVs of Saccharomycotina (with only 8 species), 3b: Black—intrabaraminic and extrabaraminic JCVs of Saccharomycotina (with 15 species).

As an outlier, *Encephalitozoon cuniculi* belongs to a different phylum than *Ascomycota* and *Basidiomycota*. The classification of fungi is in constant flux. Apparently, in fungi, the holobaramin may even reach the level of subphylum, as opposed to animals and plants, but further study is needed.

Discussion

This work has reviewed a recent statistical phylogenomics-based baraminology method that has been used on three data sets covering bacterial, Archaea, and eukaryotic species, and newly on a fungal data set. This method could potentially be used in more baraminology studies in a variety of different species. The method apparently works both in

unicellular and multicellular organisms. However, comparisons of results from genetic and morphology-based baraminology studies must be made to validate our results and increase our confidence that our classification is correct.

One of the main arguments against using genetic data in baraminology is that it does not accurately translate to morphological characterizations (Wood and Murray, 2003). However, since the genotype determines the phenotype, it precisely changes in the genome of the archebaramin that leads to speciation within a baramin. In other words, mutations in the genome of the archebaramin lead to speciation during the life history of the holobaramin. Furthermore, with quickly accumulating genomics and proteomics data, species sets with available

proteomics data of any kind may be put together, provided that a complete data set is provided.

One challenge with the method is providing enough, high quality data. Based on a baraminology study of 107 insects (O'Micks and Lightner, 2017), if the number of proteins within a group of species varies too much, some species might not fall within their proper baramin. Another problem is if there are many short protein sequences for a given species, the ortholog algorithm might reject them (as is the case in the OrthoMCL algorithm), thus fewer orthologs are identified for a given species and its JCVs with other members of its baramin will be low. Therefore the species will not cluster well enough. In addition, different orthology algorithms might give different ortholog classifications. Furthermore, the present algorithm counts multiple members of the same orthology group only once.

An important issue is the selection of a cutoff JCV that could serve as an indicator as to whether two species belong to the same baramin. One would think, intuitively, that species within a baramin would have a high number of common genes. A commonsense speculation could be that at least half of all genes should be common between any two species within a baramin ($JCV \geq 0.5$). However, as in the case of bacteria and Archaea (O'Micks, 2016; Yaugh, 2017), the average JCV within a baramin can be quite low, even as low as 0.19 as in certain *Ascoviridae*, and 0.45 in some methanogenic Archaea. This is due to the high rate of HGT in these single-cell organisms. Therefore, as of yet, no certain JCV cutoff can be set in stone to differentiate between species; rather, the cutoff depends on the biology of the given group of species under study. A good way to determine baramin membership is by monitoring the gene intersect and the PGQ and CI values, which gives us a picture of the size of the core set of genes (the

Table 4. Characteristics of the three fungal holobaramins from Dutilh et al., 2007.

Baramin	Species	Mean JCV±stdev	JCV range	PGQ	CI	p-value
Pezizomycotina	7	0.69±0.05	0.59–0.79	0.38 (2001/5295)	0.77 (28458/37065)	5.1x10 ⁻²⁷
Agaro/Ustilagomycotina	3	0.57±0.02	0.56–0.6	0.42 (1070/2525)	0.71 (5388/7575)	5.2x10 ⁻⁶
Saccharomycotina	8	0.86±0.04	0.79–0.96	0.62 (2022/3243)	0.89 (23002/25944)	3.1x10 ⁻⁶⁶
Saccharomycotina	15	0.65±0.15	0.35–0.96	0.11 (399/3694)	0.64 (35611/55410)	7.5x10 ⁻⁴²

pan-genome) of a given baramin. For example, in the case of the *Pezizomycotina*, we see that the gene intersect, PGQ, and CI decreases asymptotically, which implies the presence of a core set of genes within the pan-genome of the holobaramin. This is because since

these genes are present in all species in the baramin, this set of core genes cannot decrease any farther. When core gene sets from two different baramins are compared with each other, the overlap between these two gene sets is smaller than either core gene set. This

is because these sets of core genes are responsible for the bauplan for two different kinds of organisms. However, after adding a seventh species from the *Agaro/Ustilagomycotina* baramin, this trend breaks. The intersect drops from 2001 genes to 1050, almost half (Figure 3). The drop in PGQ is from 0.38 to 0.2, also almost half. The drop in CI is less pronounced; from 0.77 to 0.71 (Figure 4). PGQ and CI values were also calculated for the five holobaramins that were predicted in the study on insects (O’Micks and Lightner, 2017). As we can see, similar PGQ and CI values occur for both fungi and insects.

As with other baraminology methods, selecting the proper set of species is also important. If the number of species being examined is either too small, or the number of sampled holobaramins is too large, holobaramins might go undetected or might not be able to be clearly defined with too small a membership. This was the case in cluster #2 in the fungal baraminology analysis in this paper, which had only three members, or several small groups of NCLDV’s with three members or less (O’Micks, 2016). In such cases, if a holobaramin is represented by only a small number of species (two or less), then it is impossible to know whether these two species belong to the same baramin or different ones. The addition of extra species is needed to determine this, whether the additional species all form one group, or whether they group with one or the other (initial, seed) species.

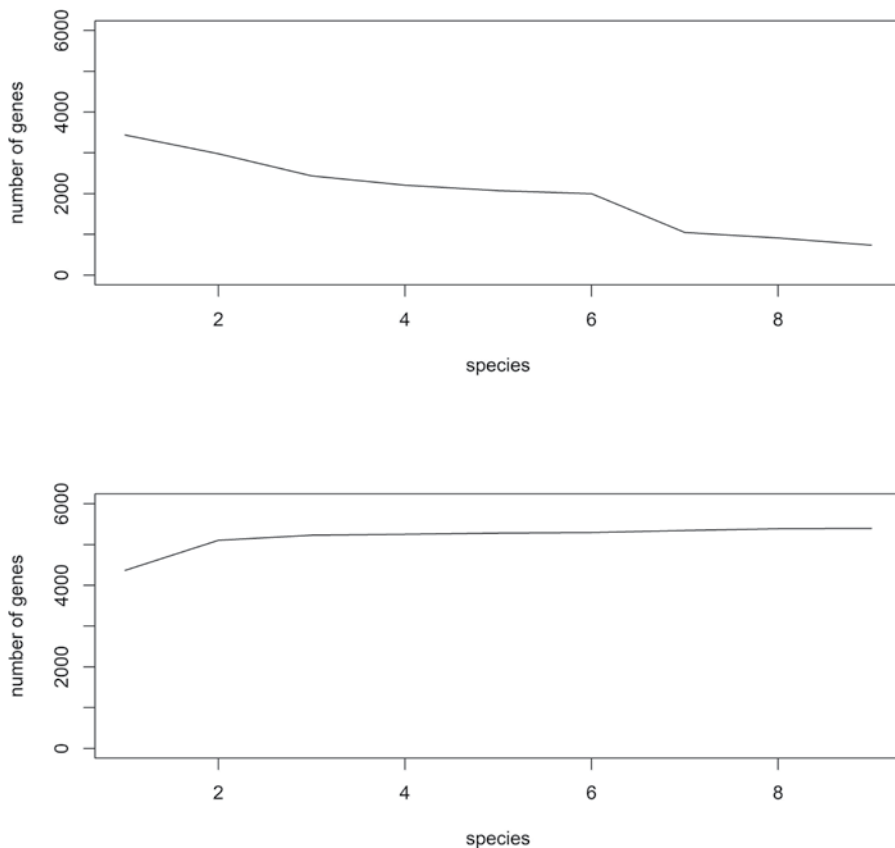


Figure 3. Changes in the number of genes in the intersect (above) and union (below) of increasing numbers of added species from the *Pezizomycotina* baramin, after which species from the *Agaro/Ustilagomycotina* baramin were added at n=6 species.

Table 5. Characteristics of the five insect holobaramins from O'Micks and Lightner, 2017.

Baramin	Species	Mean JCV ± stdev	JCV range	PGQ	CI	p-value
Diptera I (mosquitos)	6	0.74±0.05	0.66-0.84	0.48 (6030/12597)	0.76 (57388/75582)	1.5x10 ⁻⁸
Diptera II (flies)	33	0.89±0.06	0.69-0.98	0.22 (2725/12564)	0.7 289797/414612)	0.0
Auchenorrhyncha	7	0.76±0.04	0.71-0.84	0.5 (5627/11366)	0.72 (57127/79562)	9.8x10 ⁻¹²
Hymenoptera	42	0.86±0.03	0.75-0.94	0.37 (4751/12849)	0.62 (335369/539658)	0.0
Lepidopterans	10	0.71±0.16	0.45-0.9	0.48 (6030/12597)	0.76 (57388/75582)	5.2x10 ⁻⁵

Materials and Methods

The JaccardClusters2.R script was further developed in R version 3.2.2. The script is available at github.com/jeanomicks/JCV. Figures 2–4 were made in R version 3.2.2. The orthology data set for 26 fungal species was

downloaded from the supplementary data from Dutilh et al. (2007).

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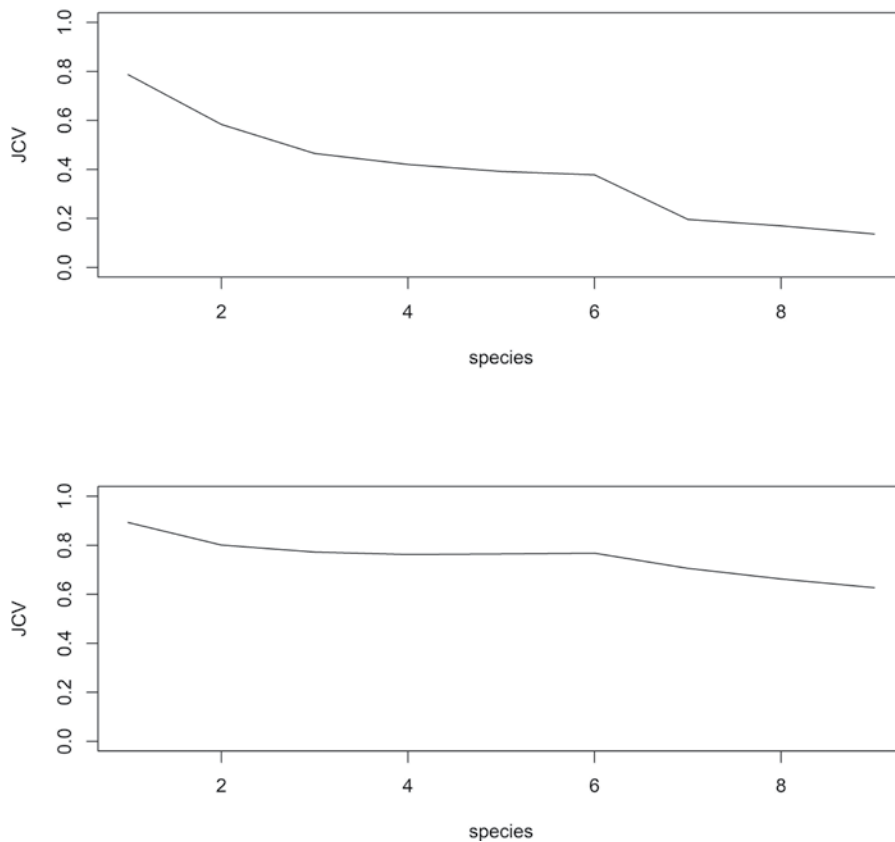


Figure 4. Changes in the PGQ (above) and CI (below) parameters of increasing numbers of added species from the Pezizomycotina baramin, after which species from the Agar/Ustilagomycotina baramin were added at n=6 species.

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Post-Flood Migration of Ectothermic Tortoises to the Americas: A Terrestrial Route

Timothy Lee McCollister*

Abstract

Michael Oard presents a global flood Ice-Age model that not only highlights how the Ice Age initiated and was sustained but also inadvertently provides a migratory route for ectothermic species within its coastal isotherms. By incorporating Oard's calculations and what is known about the thermal requirements of extant ectothermic tortoises, a window of opportunity of approximately 87.5 years presents itself to allow intercontinental migration to the Americas. This assumes that the present elevation of the Bering Strait land bridge is not consistent with what existed in the immediate post-Flood environment but has undergone erosion. The fossil record does appear to display a terrestrial expansion if the Flood/post-Flood boundary exists at, or near, the Cretaceous/Tertiary boundary. But there are a few fossils that seem problematic to this placement, which may open the door to other interpretations in regard to the boundary's location. The placement of the boundary, however, doesn't negate the possibility of a terrestrial intercontinental migration of tortoises to the Americas.

Introduction

When approaching the biogeography of North American tortoises, an old-earth creationist (OEC) can simply go to the library and pull out virtually any publication on tortoises to learn more about the biogeographical histories. Though studies have been done on the migration of animals in general in the post-Flood environment, the discussion of biogeogra-

phy of ectotherms from the young-earth creationist's (YEC) perspective is nearly nonexistent (Statham, 2013; Taylor, 2014). If the Flood was global, as the Bible clearly states, then the YEC position should be able to account for how the various ectothermic tortoises migrated to the Americas following the Flood's recession. What makes the migration of ectothermic tortoises so difficult is

their dependency on external heating sources. This is problematic because for terrestrial species like tortoises to migrate to North America, they likely required a terrestrial route through Beringia. The latitude of Beringia sits so far north that one would think their migration through this region was impossible, especially if the land bridge was only exposed during maximal glaciation. Greg Moore, an OEC, acknowledges this difficulty in an article from 2004:

According to their model, the Flood was followed by a major Ice Age that lowered sea levels and exposed

* Timothy Lee McCollister PhD, Cassatt, SC, Tim.McCollister@yahoo.com
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land bridges between the continents. However ... some species would have difficulty using the known land bridges. The distance would be too great for slow, delicate species. Other species couldn't tolerate the temperatures, such as the chilling cold of the land bridge between Siberia.

Unfortunately, this problem has not been directly addressed yet. Therefore, this research attempts to provide a case for the post-Flood migration of ectothermic tortoises through Beringia to North America from a YEC perspective in order to demonstrate the reliability of a literal interpretation of Scripture in yet another area that has caused some concern.

Post-Flood Environment

The global flood described in Genesis was a catastrophic event, with a magnitude beyond our human experience. Only the One who is omnipresent, omnipotent, and omniscient can describe every single cause-and-effect relationship that occurred during this massive event. Only He can provide the details we earnestly seek. Within His Word, He provided just the right amount of information for paleoclimatologists to get a basic idea of what the lasting effects of the Flood would have been like on the Earth and its climate. Numerous evidences portray an incredibly harsh climate that existed immediately after the Flood, and this period is known as the Ice Age. Michael Oard proposes a model that not only describes how the Flood caused the Ice Age but also created a contrasting environment that would have aided in the intercontinental migration of tortoises while the earth was still in the process of reaching its equilibrium (Oard, 1990).

Warmed Oceans

Oard lists several contributors that would have aided in the warming of the oceans. One of the mechanisms was the vapor

canopy that is suggested in Genesis 1:7. It is believed that the vapor canopy created a uniformly warm climate from pole to pole in the pre-Flood world. Oard does acknowledge that "most creation scientists do not believe it anymore" but thinks "a very thin canopy still has merit" (M. Oard, 2017, personal communication). A second mechanism included "all the springs of the great deep," which ruptured during the initial phases of the Flood (Genesis 7:11 NIV). This likely refers to the eruption of all the volcanoes and water springs that were once used to water the plant life in the pre-Flood world. Another contributor consisted of all of the tectonic activity that would have occurred during and after this global catastrophic event. These mechanisms together would have contributed to the warming of the vast oceans. Due to the massive size of the world's oceans, it would have taken several hundred years for it to cool. That is because once the surface water cooled, the increasing density of that water would cause it to sink, being replaced with lighter, warmer water until the present values had been achieved after several hundred years. Oard estimates that the average oceanic temperatures were about 30°C when the Floodwaters receded and that the current temperatures had not been reached until about 700 years after the Flood (Oard, 1990).

Cooled Climates

The continents experienced a climatic situation that was far different from that of the warmed oceans. They were cooled from a number of factors, such as volcanic dust and aerosols, cloudiness, albedo, and barren land (Morris, 2004; Oard, 1987). The volcanic dust and aerosols came from the volcanic eruptions that took place during and after the Flood until an equilibrium was reached (Oard, 1987). As a result of these eruptions, the various forms of debris that were spewed into the atmosphere created an inverse greenhouse effect that

prevented solar radiation from reaching and warming the earth. The next two mechanisms, cloudiness and albedo, would have also contributed to increasing solar reflection. Cloudiness would have been a factor as these contrasting environments would have resulted in a precipitation factory over the oceans, where it would then cool, condense, and fall onto the continents as rain or snow. This increased rate of cloudiness would have increased solar reflection. Another mechanism that would have increased solar reflection is albedo, which refers to the reflective capacity of snow. Once fresh snow had been dumped onto the continents, 70–90% of the solar radiation that was able to penetrate through the volcanic dust, aerosols, and clouds would have been reflected back up into space due to the snow's highly reflective surface qualities. To make matters worse, the areas that existed far from the warmed waters were wiped free and left barren (Oard, 1990).

Barren land aided in keeping the continents cooled by reducing the amount of surface area available to gather the radiant heat that was able to reach the earth's surface. This is an important contributor, as the raging Floodwaters would have dislodged all the trees and most likely deposited them on the surface of the water, similar to what happened when Mt. Saint Helens erupted in 1980, acting as a radiant absorber and insulator for oceanic waters. Due to this factor, the oceanic waters may have remained warmer for a bit longer than what Oard calculated.

Coastal Isotherms

This collision course of warm, moist air and cooler continental temperatures created coastal isotherms that would have been consistently warm, even in the upper latitudes. In regard to ectothermic migration, these coastal isotherms are key to understanding how terrestrial-bound reptiles may have been capable of crossing the Bering Strait land bridge

during the Ice Age. That is because the thermal gradient that existed within the immediate post-Flood environment's coastal isotherm was unlike anything that is experienced in the present-day climate. It would have been uniformly warm regardless of one's latitudinal location, but it would have been gradually cooling in temperature as the oceans cooled. Based on Oard's calculations (Figure 1), by approximately 21.87 years after the Flood the ocean temperatures would have been around 28°C. They would have been about 26°C in 43.75 years and 24°C in 87.5 years (Oard, 1990). These estimates will prove to be invaluable to the post-Flood migration of ectothermic tortoises.

Due to the cooled continental temperatures from the various factors, it would have been too difficult for the tortoises to migrate through the interior of the continents. Instead of relying on radiant heat as their primary source of external heat in the post-Flood world, tortoises would have relied on the convection from the ocean winds as their primary heat source. These different sources of heat will be covered briefly in

the next section. This uniform thermal gradient along all the oceanic coastlines, however, would have provided a suitable habitat for ectothermic tortoises to remain active year-round, but for just a brief period of history.

Thus, the consequences of the global Flood did not end with its immediate recession. Instead, it left behind an imbalanced earth that took several hundred years for an equilibrium to be reached. As a result, the immediate post-Flood environment consisted of warmed oceans and cooled continents, creating coastal isotherms that were consistent in temperature regardless of latitudinal positioning. These isotherms likely aided in the intercontinental migration of tortoises into the Americas.

Tortoise Thermal Requirements

In order to determine the available window of opportunity the coastal isotherms would have presented the tortoises, an understanding of the tortoises' minimum thermal requirements is absolutely necessary.

Ectothermic

Tortoises are ectotherms, meaning they rely on the environment as their source of heat, whereas endotherms produce their own heat at the cellular level (Hickman et al., 1998). There are three methods reptiles utilize in order to raise their body temperatures: conduction, radiation, and convection. Conduction refers to the transfer of body heat to and from the environment through direct contact. Radiant heat refers to the heat that is emitted from all objects that have a temperature above absolute zero. Convection, on the other hand, refers to the transfer of heat through air movement (Campbell et al., 1999). In order for tortoises to remain active, they must rely on at least one of these three sources of heat at all times in order to maintain their desired ranges of internal temperature.

Many reptile species can effectively maintain their body temperatures within rather narrow limits. They accomplish this by adjusting their posture, or by relocating in order to thermoregulate (Heatwole and Taylor, 1987). Thermoregulation, the ability to monitor and adjust internal temperatures, is regulated by the brain's hypothalamus region (Vitt and Caldwell, 2014). Every species of ectotherm has a voluntary thermal minimum (VTmin) and voluntary thermal maximum (VTmax), as well as critical thermal minimum (CTmin) and critical thermal maximum (CTmax) that they can be exposed to. The former two focuses on the temperatures the animal voluntarily exposes itself to, whereas the latter two refer to limits; exposure to temperatures beyond this will lead to the death of the organism.

The VTmin of *Gopherus* tortoises in their natural habitats have been reported down to 18°C (Rostal et al., 2014). However, it is unclear if this is the result of the tortoises' thermal inertia. The CTmin, however, is different, and they can tolerate temperatures down to negative 5.25°C (Rostal et al., 2014).

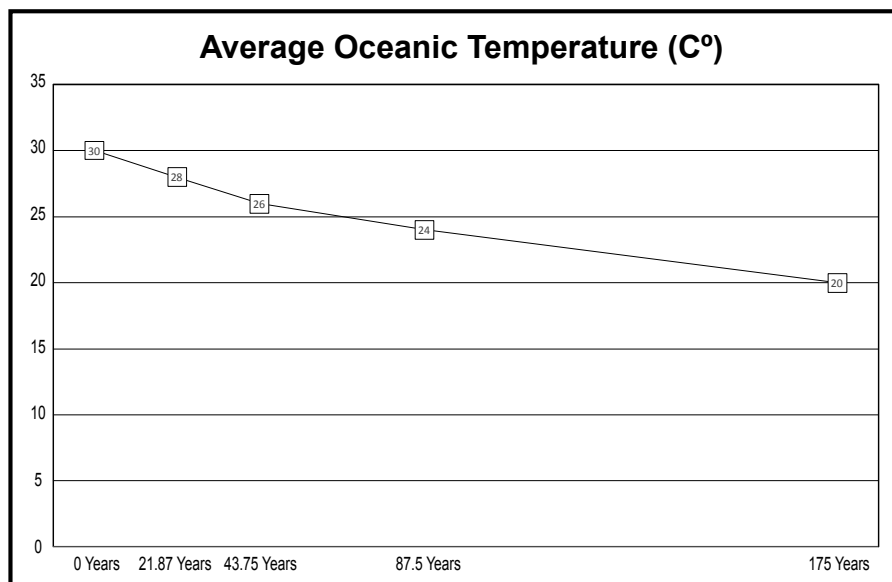


Figure 1. Post-Flood Average Ocean Temperatures—This figure illustrates average ocean temperature after the Floodwaters receded. Based on Michael Oard's calculations, it focuses only on the first 175 years after the Flood.

CT_{min} commonly occurs when the body's fluids freeze beyond their tolerable range, or from spontaneous freezing, which results in death (Heatwole and Taylor, 1987). Though it appears these two minimum thermal tolerances would have been extremely relevant to the post-Flood migration of ectothermic, terrestrial-bound tortoises, especially since the immediate post-Flood world experienced an Ice Age after the Flood's recession, there is one more minimum temperature that must be considered.

Embryonic Development

In regard to embryonic development, most embryos successfully develop between 24° to 32° C (Wyneken et al., 2008), with death resulting if temperatures go above this range, and embryos ceasing to grow when temperatures are below this minimum threshold (Wyneken et al., 2008; Ferri, 2002). This minimum temperature of 24°C demonstrates that all biological functions are operational, and it will serve as the primary minimum temperature for the window of opportunity's far right limit. To make matters more complicated, the sex of reptiles is determined by either genetic sex determination (GSD) or temperature-dependent sex determination (TSD) (Valenzuela, 2004). Those that employ GSD only have to reach temperatures that permit embryological growth in order to produce a mixed ratio of males and females. That is because their sex is determined by sex chromosomes. Those that utilize TSD, however, will typically have to reach higher incubation temperatures in order to produce females, which would be difficult to do in higher latitudes of the post-Flood environment, or once the coastal isotherm temperatures decreased. But there is an exception (noted presently). The problem this poses is that each of the four North American *Gopherus* tortoises that exist today—the desert tortoise (*G. agassizii*), Texas tortoise (*G. berlandieri*), Bolson tortoise (*G. flavomarginatus*),

and gopher tortoise (*G. polyphemus*)—employ the standard variation of TSD, where females are produced only at higher incubation temperatures (Valenzuela 2004, 2005). But that doesn't mean the stem tortoises that exited the ark also incorporated the TSD variation that extant species display today.

If the taxonomical classification of "family," is equivalent to the "kinds" that were on the ark, and if all these tortoises, turtles, and other animals have been properly classified, that would mean the original "kinds" had the genetic potential to create offspring that may also utilize GSD or TSD (Froman, 2016; Sanford, 2014). One simply may be recessive to the other. This is apparent in the aquatic turtle family *Emydidae*. Here members of the same family utilize different sex determining strategies; the North American wood turtle (*Glyptemys insculpta*) uses GSD, whereas the box turtle (*Terrapene Carolina*) uses TSD (Valenzuela, 2004). That means the stem *Emydidae* turtles, the original pair that exited the ark, had the genetic potential to create offspring that used one of the two sex-determining strategies, while another one from the same family utilized another. This situation may have applied to other groups of turtles outside this one family, such as the tortoises in the *Testudinidae* family.

Another exception exists, but this time it applies to the incubation temperatures that are necessary for the development of females for those that utilize TSD. The alligator snapping turtle (*Macrolemmys temminckii*) follows a different set of rules. With this species, females can be produced at both the ends of the spectrum, whereas the production of males is reserved for the intermediate temperatures that exist between the two extremes. If either of these two situations can be applied to the stem tortoises that exited the ark, the production of females would not cease when temperatures within the isotherm dropped. Instead, female production

would have been possible during the entire duration of the coastal isotherms, as long as the minimum temperature for embryological development was met. Sadly, the massive number of tortoise extinctions may have obscured this information indefinitely (Rhodin et al., 2015).

Cold Weather Survival Strategies

Gopher tortoises have the ability to survive subzero temperatures by incorporating a freeze-avoidance strategy known as supercooling (Rostal et al., 2014). Another North American terrestrial species of turtle, the box turtle (*Terrepenne Carolina*), hasn't been grouped together with the tortoises by biologists, but it can utilize two different cold-weather survival strategies, freeze avoidance and freeze tolerance (Costanzo and Lee, 2013). Freeze tolerance refers to the box turtle's ability to survive several days with 50% of its bodily fluids frozen, with their lowest lethal temperature determined by the critical minimum cell volume (Storey and Storey, 1996). To prevent ice crystals from forming inside the cells, cryoprotectants are delivered to help protect them and their tissues from ice formation by limiting cell shrinkage when the water is drawn out of the cells into extracellular regions, where ice formation is permitted. The second strategy, freeze avoidance, refers to an overwintering strategy that allow the organisms to go beyond their freezing point without freezing. They can also enhance their supercooling capabilities by employing cryoprotectants as well (Costanzo and Lee, 2013).

Tortoises that do experience cold weather can apparently supercool to temperatures as low as -5.25°C (Rostal et al., 2014). Aquatic species can go well beyond this point, down to -12°C (Storey, 2006). Spontaneous freezing can occur at any time the organism is below freezing temperatures, either by going below the minimum threshold or by coming into contact with any ice-nucleating agents (INAs). INAs serve as a catalyst to

ice formation. They can exist internally, as in organic matter that has not been flushed from the system prior to hibernation, or externally. For instance, if an ice crystal comes into contact with the animal's skin within their hibernacula, it will spontaneously freeze and result in the organism's death (Costanzo and Lee, 2013). These strategies may have aided in the migration of North American tortoises if severe weather had been encountered for brief periods of time.

Thus, by understanding and applying these thermal minimums to the immediate post-Flood environment, a window of opportunity for ectothermic tortoises presents itself within the global Flood Ice-Age model's coastal isotherms.

Post-Flood Coastal Isotherm Migration Model

The temporary window of opportunity of the coastal isotherms would have been sufficient for terrestrial-bound ectotherms to migrate through the Bering Strait land bridge before temperatures dropped below a point that would not support embryological growth. Comparing the average oceanic temperatures with the minimum temperature for such embryological development allows approximately 87.5 years of migration to occur. Depending on the sex-determining strategy employed, GSD or TSD and its variations, the left and right limits of the window may vary somewhat. The progression of fossils also appears to coincide with a Flood/post-Flood boundary at, or near, the Cretaceous/Tertiary boundary. But there are fossils that seem problematic with this placement. Therefore, other interpretations are encouraged and welcomed. Regardless of where the Flood/post-Flood boundary exists in the geological column, the global Flood Ice-Age model would still provide the necessary terrestrial route for ectothermic species to expand their territory into the Americas at an accelerated rate.

Biblical Overview

God and the Animals

There is biblical support for a unique relationship between God and the animals. This peculiar relationship certainly may have aided in the post-Flood migration of terrestrial-bound reptiles to the Americas. There are numerous examples in the Bible of God using animals to perform some special activity, such as when ravens fed Elijah (1 Kings 17:2–6), the great fish transported Jonah (Jonah 1:17; 2:10), the lions refrained from attacking Daniel (Daniel 6:21–22), bears attacked Elisha's tormentors (2 Kings 2:23–25), and serpents bit the complaining Israelites (Numbers 21:4–9). It is clear that animals are readily employed according to the will of God. Whether this was necessary in a special way for the post-Flood migration of tortoises remains to be seen. In other words, we cannot fully rule out other modes of migration, as the animals may have willfully obeyed their Creator by mounting a log mat, something that is contrary to what is observed today. Such a possibility simply cannot be ruled out by those who accept the Scriptures as their infallible source of truth, a source that reveals many situations where the natural world is obedient to the commands of God in ways that may seem to be unnatural from our limited perspective.

Dispersal

Once mankind and the animals came out of the ark, the immediate dispersal of the animals, along with the delayed dispersal of mankind, gave the various animals a 106-year head start, according to Archbishop Ussher's chronology (Ussher, 2003). By the end of that period, the coastal isotherms would have been closed for the various ectothermic reptiles to traverse the Bering Strait land bridge if the minimum temperature that permits embryological development, 24°C, is used as the barrier for when these reptiles had to have traversed the

areas in the higher latitudes. As stated earlier, though the Gopher Tortoise has been reported outside of its burrow when temperatures were above 18°C, it is unknown whether this was due to its thermal inertia. Therefore, the minimum temperature that permits embryological development has been set as the minimum temperatures, since it allows for all biological functions to effectively operate.

Determining the Window of Opportunity

It is important to reiterate the fact that the coastal isotherms didn't exist forever and that the window of opportunity to utilize them was greatly limited. That is because the gradual cooling of the oceans brought to a close the opportunity for ectothermic tortoises to migrate to North America (see Figure 1). The isotherms also would have been decreasing the size of a livable habitat, forcing the tortoises into intercontinental migration or territorial expansion. Based on the average ocean temperatures (Figure 1) and the minimum temperature of 24°C for embryological development, the opportunity would have ended about 87.5 years after the Flood. This means the tortoises would have had to have entered North America before maximal glaciation was achieved according to the global Flood Ice-Age model and before God multiplied the languages at the Tower of Babel to force their dispersion. Therefore, this model assumes that the present values of the Bering Strait land bridge are not consistent with those in the immediate post-Flood world. Instead, the increased precipitation and oceanic storm intensity contributed to the land bridge's rapid erosion.

To get a general idea of how long it would take the tortoises to walk from the ark to Southern California, the tortoises' walking speeds must be taken into account. This will demonstrate that the limited window of opportunity of 87.5 years is adequate to allow them

to migrate from the ark to the southern United States. For instance, according to the National Park Services, the desert tortoise (*G. Agassizii*), a medium-sized tortoise, has a walking speed of 0.2 mph (Davidson, 2016). The mean velocity of five separate Galapagos tortoises (*Chelonoidis nigra*) was much faster at .34 mph (Zani et al., 2005). This leads to the mean speed of 0.27 mph for these two vastly different species. If we apply the mean speed of a walking tortoise to the estimated 24,000-mile trip from the ark to southern North America, as demonstrated in Figure 3, and apply the thermal requirements for reproduction, a few limits become evident.

First Limit: Applying Extant TSD Variant

This option requires the tortoises to utilize the variation of TSD that North

American tortoises utilize today to determine when the production of females would cease within the coastal isotherms, which is around 21.87 years. If the distance, 24,000 miles, is divided by the amount of years, 21.87, that the coastal isotherms would permit the production of females, an annual average of 1,097 miles would have to be covered. This number can then be divided by the amount of days there are within a year, and this equals 3 miles per day. If the average speed of a tortoise walking is .27 mph, then it would have to spend about 11 hours of walking a day in order to walk 3 miles a day.

Though this seems problematic, it is possible that the original pair of tortoises that exited the ark were natural foragers that were constantly on the move, or God could have instilled the desire to

fulfill a task that is otherwise unnatural, such as the examples from Scripture mentioned above. Though that is not an exhaustive list, it demonstrates that various creatures exhibited uncommon behaviors that were necessary in order to fulfill the will of God. Though this explanation will not be accepted by those who do not adhere to the teachings of Scripture, it cannot be dismissed by a Christian. Thus, this first limit is possible from a biblical perspective.

Second Limit: GSD and/or Other TSD Variation

If GSD or a different variation of TSD was incorporated by the ancient tortoises that utilized the coastal isotherms, then 24,000 miles could have been divided up by 87.5 years to determine the number of miles of progress necessary per year;

Post-Flood Migration of Ectothermic Tortoises to the Americas

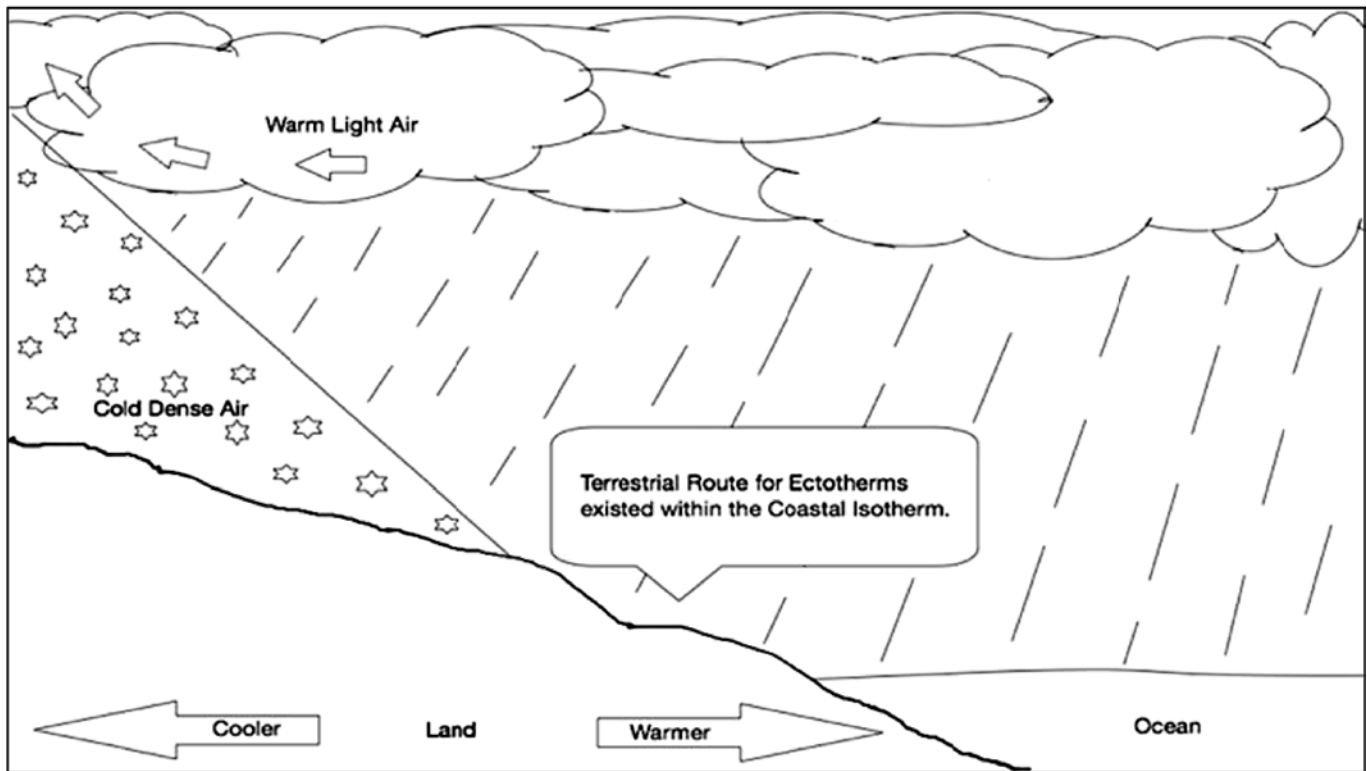


Figure 2. Coastal Isotherm Illustration—This figure provides a general idea of what a coastal isotherm consisted of. It is not drawn to scale but instead provides a visualization of how warmer temperatures existed near oceanic coastlines, while cooler temperatures were experienced farther inland.

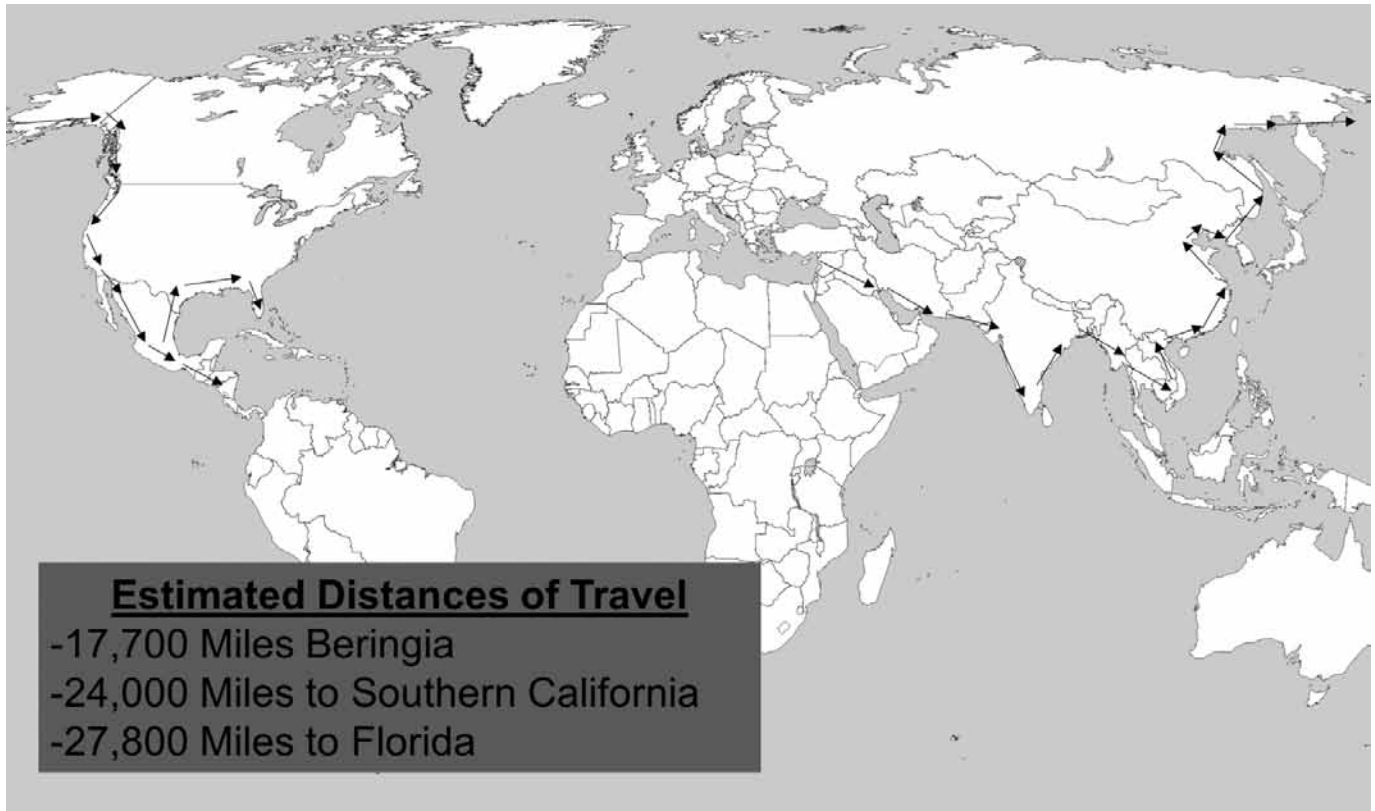


Figure 3. Map of Migratory Route—This figure provides a generalized route that likely would have been utilized by the tortoises in their territorial expansion, or migration, toward the Americas as they lived within the coastal isotherms of the global Flood Ice-Age model. (Adaptation of a map by Petr Dlouhy. C.C. Attribution-Share Alike 2.5 Generic.)

this equals 274.28 miles a year. Dividing that number by 365 requires the tortoises to cover only $\frac{3}{4}$ of a mile per day, or 2.7 hours of walking per day. If either of these exceptions can be applied, it wouldn't really require a migration. That is because the potential world population of tortoises 87 years after the Flood's recession would have grown rapidly without human interference. It also wouldn't require any divine assistance, as it could have naturally occurred in the environment that resulted from the Flood and its contributors. The limited window of opportunity was created by a shrinking isotherm that forced its occupants to forage farther down the coast in order to take advantage of the shrinking resources, encouraging an accelerated

rate of expansion. But can this model be validated?

Progression of Fossils?

This section will highlight the two different interpretations of what appears to be a progression of fossils. The first position is based on the presupposition that the Flood/post-Flood boundary exists at, or near, the Cretaceous/Tertiary boundary. The second view places the Flood/post-Flood boundary higher up in the geological column within the late Cenozoic period. It is important to note, however, that the location of the Flood/post-Flood boundary has been a topic of debate for years, and there is not one universally accepted view at this time. Regardless of where the boundary

is located in the geological column, the migratory model presented here remains probable and necessary.

Cretaceous/Tertiary = Flood/post-Flood Boundary

Placing the Cretaceous/Tertiary boundary as the approximate location of the Flood/post-Flood boundary would appear to be the most natural way to explain the biogeography of tortoises in the Americas. That is because the emergence of fossils from the various epochs after the Cretaceous appear to present a global progression and diversification of the tortoises in the post-Flood world as they fulfilled the purpose of their Creator to increase and fill the earth (Genesis 8:17; Isaiah 45:18). For in-

stance, the earliest known Testudinidae, *Sinohadrianus sichuanensis*, was discovered in the Paleocene of China, while the first appearance in North America was the *Hadrianus majusculus*, discovered in Ellesmere Island, within Eocene strata (Hai-Yan et al., 2016; Rostal et al., 2014). Tortoises were then discovered throughout North America during the Oligocene, which is also when they first arrived to Central America. Following that, tortoises then emerged in South America during the Miocene (Cadena et al., 2012). This pattern shows exactly what one would expect if the global Flood Ice-Age model is applied with the Cretaceous/Tertiary boundary serving as the Flood/post-Flood boundary. A YEC simply cannot accept the amount of time that is typically associated with them by uniformitarians.

The Pleistocene epoch, however, was probably the worst time to be a tortoise. According to *Turtles and Tortoises of the World During the Rise and Global Spread of Humanity: First Checklist and Review of Extinct Pleistocene and Holocene Chelonians*, 32 North American species of turtles had gone extinct during the Pleistocene epoch. Most of this was the result of human migration and exploitation, as turtle bones have been recovered from a number of archaeological sites, such as inhabited caves and trash heaps with hack and burn markings (Rhodin et al., 2015). Of the 32 North American species that went extinct, twenty-six of them were tortoises.

There is one major hurdle that becomes exposed when analyzing the tortoise fossils by themselves if the Flood/post-Flood boundary exists at, or near, the Cretaceous/Tertiary boundary; a group of tortoises have been discovered in the interior of North America and dated to the Oligocene. *Oligopherus laticuneus* and *O. quadratus* were uncovered in Weld County, Colorado, *O. praextans* in Niobrara County, Nebraska, and *O. thomsoni* in Ziebach County, South Dakota (Rostal et al.,

2014). That would have required these tortoises to experience the frigid continental temperatures during glacial accumulation. At first glance the geothermal springs seem adequate to explain this pattern. However, upon closer examination, these fossil locations become very problematic. There simply aren't any geothermal springs in Weld County, Colorado, Niobrara County, Wyoming, or Ziebach County, South Dakota. In fact, a tortoise would have to walk for several weeks to get from the only two geothermal springs in South Dakota to Ziebach County. This certainly may serve as a devastating blow for placing the Flood/post-Flood boundary at, or near, the Cretaceous/Tertiary boundary.

Alternative Explanations?

If the Flood/post-Flood boundary existed farther up the geological column, then the appearance of the ancient tortoises' territorial expansion based off the fossils that were just presented would be incredibly misleading. It doesn't mean their migration through the coastal isotherms would be debunked, as the route remains necessary regardless of the Flood/post-Flood boundary's position. But it would mean that the previously stated fossils are nothing but coincidental depositions at best. The strongest argument for this designation is magnified by the greatest weakness of the prior placement, and that is the discovery of the Oligocene-dated tortoises in the interior of North America, when glacial accumulation would have been occurring if such a placement occurred.

Michael Oard believes "the boundary is in the late Cenozoic, which means Miocene, Pliocene, or Pleistocene and that every area has to be determined on its own merits" (Oard, 2017, personal communication). If that were the case, it would not be able to explain how various tortoise species of the *Gopherus* genus have been recovered from Oligocene strata in North America only, unless the locality of the strata the *Gopherus*

tortoises were deposited in can be proven to be post-Flood depositions and/or mistakenly attributed to the wrong epoch. Andrew Snelling highlights the same problem when he makes a case for a Flood/post-Flood boundary farther down the geological column. In *Earth's Catastrophic Past*, he stated that it is common to see

the fossil record and modern distribution limited to only one continent. For example, kangaroos are only found in Australia, and so are their fossils, in upper Tertiary strata. It hardly makes sense to suggest that the kangaroo fossils represent kangaroos buried in the Flood, and that the extant kangaroos are thus back in Australia after having traveled there from the Ark after the Flood. On the contrary, it is logical that the kangaroo fossils represent kangaroos that were buried by local catastrophes after the kangaroos traveled to Australia from the Ark after the Flood. Thus, the upper Tertiary strata containing kangaroo fossils must be post-Flood, and the Flood/post-Flood boundary is therefore farther down in the strata record. (Snelling, 2014, p. 173)

It doesn't seem logical to suggest that gopher tortoise fossils were deposited only in North American Flood strata and that they exited the ark to go back to the same exact location where they lived in the pre-Flood world. This would also seem to require more than a single pair of tortoises on the ark from the Testudinidae family. In this case, the kind would have to be dropped down to the genus level, requiring nearly two dozen pairs of tortoises. Otherwise, the turtles would have diversified into the same genera that existed before the Flood, which seems far more unlikely.

This study may act as only one small piece of a very large puzzle. To solve the riddle requires the cooperation and understanding of many godly men and women to take on the task to settle the

intense debate on where the Flood/post-Flood boundary exists. It is safe to say, however, that regardless of where the boundary is located, the global Flood Ice-Age model would provide a terrestrial route for tortoises to enter into the Americas in the immediate post-Flood environment. Due to the severe limitations of tortoises and the head start God provided for the animals, the other methods of migration would remain unnecessary and unsuitable for large, terrestrial-bound tortoises to reach the Americas.

Thus, the 106-year head start would have allowed the various kinds to establish a significant foothold in the world before mankind was encouraged to follow. By the time the Tower of Babel's dispersal occurred, the coastal isotherms would have weakened beyond the stage that would allow embryological developments to occur in ectotherms. The tortoises' opportunity to cross into the Americas would have remained open for up to approximately 87.5 years after the Flood's recession. It also appears that the progression of fossils coincides with the coastal isotherm migration model that was presented in this paper, if the Flood/post-Flood boundary is at, or near, the Cretaceous/Tertiary boundary. But one major problem prevents this cut-and-dry explanation, and that may very well mean that the appearance of progression is misleading and that the Flood/post-Flood boundary exists farther up the geological column. Regardless of where the Flood/post-Flood boundary exists, this terrestrial route would have been necessary, and it would certainly explain the past existence and present existence of tortoises in the post-Flood world.

Summary

The global Flood Ice-Age model that Michael Oard proposes not only highlights how the Ice Age was initiated and sustained, but it also inadvertently proposes a migratory route for ectothermic species

within its coastal isotherms. With Oard's calculations and the thermal requirements of ectothermic tortoises, a window of opportunity avails, which varies in length based on the sex-determining strategy employed, that allows for a mixed ratio of male and female tortoises migrating and establishing a breeding population within the Americas. By placing the Flood/post-Flood boundary at, or near, the Cretaceous/Tertiary boundary, the fossils appear to demonstrate a global expansion and diversification that remains consistent with the migratory model presented here, but the existence of inner continental fossils during glacial accumulation seems problematic. If the boundary exists farther up the geological column, then the appearance of global expansion and diversification would be grossly misleading. However, regardless of where the boundary exists, a terrestrial route seems necessary for the global expansion of tortoises.

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Intelligent Design and Its Place in the Creation Model

Jonathan Bartlett*

Abstract

Many critiques of intelligent design stem from a misunderstanding and misconception of what it is, what it is for, and its role in a young-earth creation framework. The present paper presents intelligent design as an independent subject matter (similar to chemistry, physics, biology, and mathematics), which, as such, is both orthogonal to questions of creation as well as usable in determining answers to them.

1. What Is Intelligent Design?

Intelligent design has mystified many different people as to its role in the debate over origins. There are two reasons for this bafflement. First, intelligent design theory *is not* a theory about origins. And second, intelligent design theory *impacts* theories about origins in numerous ways. Because of this second fact—that ID impacts theories about origins—it is often assumed (by both proponents and detractors, and by both creationists and evolutionists) that intelligent design *is itself* a theory about origins. Additionally, this presumption often colors the way every statement given by an ID theorist is interpreted, and this causes a lot of confusion.

A better way to understand intelligent design is not as a theory of origins

but rather *as a theory of causation*, specifically a theory about the unique ways that agency plays a role in causation. In materialist visions of the universe, there are at most two types of causes—law and chance (and, in some visions, chance is merely law working in a way we can't yet practically quantify). In such a metaphysic, there is no room for agency. By *agency*, I am speaking of things such as creativity, choice, reason, and morality as first-class causes. In a materialist view, everything that we call “creative” is merely an unexpected outworking of predetermined laws. In other words, creativity is a myth; nothing actually creative really happens. Likewise, we do not make any choices. In the materialist view, choice is also a myth; it is simply the result of predetermined laws

that are obscure enough we cannot see the cause.

This is in contradiction to the viewpoint of the Bible, which emphasizes the power and importance of choice. God tells the people of Israel through Moses, “I call heaven and earth to record this day against you, that I have set before you life and death, blessing and cursing; therefore choose life, that both thou and thy seed may live” (Deuteronomy 30:19 KJV). God Himself gives options to the people of Israel and acknowledges that it is in the power of the people of Israel to choose one or the other. Thus, as Christians, the metaphysic we choose must be one in which there is more to causation in the world we live in than merely law and chance.

Thus, intelligent design, as a theory, is an attempt to describe (at least in part) what it calls “intelligent causation.” Roughly speaking, intelligent causation occurs when an agent (i.e., a being that operates according to purpose) performs an intentional, creative, and informed

* Jonathan Bartlett, The Blyth Institute
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act. If you compose a sonnet, you are exhibiting intelligent causation. If you write a computer program, you are exhibiting intelligent causation. The goal of intelligent design is to develop theoretical models that allow us to understand the nature of intelligent causes.

Just as Newton aimed to develop a theoretical model of physical causes, intelligent design aims to develop a theoretical model of intelligent causes. So far, the development of the model has focused on detecting patterns that are the result of intelligent causes, but as shall be shown, it is not limited to this.

However, the reader should note that our descriptions so far have been primarily about *human* activity, not God's activity. That is because the place where we are most familiar with intelligent causation is within the creativity that humans exhibit every day. In fact, in his seminal work, *The Design Inference*, Dembski (2006) hardly even mentioned any questions of origins. His primary example (which we will deal with in-depth later on) actually centers around detecting election fraud (i.e., detecting *intention* within a set of data).

The goal of intelligent design is to understand and analyze intelligent causes in themselves. While application areas may extend to human intelligent causes or God's intelligent causes, at its core, the actual object of study for intelligent design is simply intelligent causation in general, however or whomever employs such causes.

2. Does Intelligent Design Need to Acknowledge God?

Many creationists have criticized intelligent design for not mentioning God (Purdum, 2006) or not utilizing the Bible (Johnson, 2011). This is a very valid criticism if we view intelligent design to be a theory about origins. However, if we view intelligent design as merely a study of intelligent causes, it starts to make a lot more sense.

Think about chemistry. As a creationist, I believe God created the elements. But chemistry, as a subject, does not refer to God. I do not mean that a book on chemistry should not refer to God—I regularly teach from Wile (2003)—but rather that nowhere in our *equations* about chemistry is there a reference to God. Additionally, no one would question anyone who uses or teaches from a secular book on chemistry for advanced courses, precisely because it is the subject matter itself which is being consulted, not how it is used in a particular application to origins.

The ideal gas law does not have a symbol for God. The entropy equations do not have a symbol for God. The equilibrium equations do not have a symbol for God. However, none of this prevents us from using our *understanding* of chemistry to show the necessity for God in nature, and none of this prevents us from using biblical history to provide a context in which we can use these equations.

There are a number of great books that use chemistry to argue for a creator, including Bradley and Thaxton (1984) and Wilder-Smith (1981). However, none of these books suggests that the *subject* of chemistry be modified to include God as a part of the subject.

If we view intelligent design not as an apologetic or a view of origins but instead as a subject all on its own (the study of intelligent causes), it becomes clear why intelligent design, by itself, does not refer to God. It isn't that the proponents are being coy but rather that, as a subject matter, intelligent design does not have the power to speak of God. As the study of intelligent causes, its only ability is to describe the actions of intelligent causes. It no more explicitly includes God in its subject than it explicitly includes my wife or me, despite the fact that my wife and I also engage in intelligent causation.

It is perfectly understandable that when intelligent design is mistaken for

a full-blown viewpoint about origins that Christians think it is shortchanging God. However, when viewed from the standpoint of simply being a subject that focuses on a particular kind of cause, its reticence makes perfect sense. This does not mean that it cannot be used as part of a larger teleological argument about origins where God is explicitly named as the designer. It just means that it requires additional philosophical moves that are outside of intelligent design proper in order to do so. As an example, I may be able to use the methods of intelligent design to prove that software I created did indeed have a designer. However, I would have to introduce additional arguments outside the theory itself to prove that *I* was the designer.

3. The Facets of Intelligent Design

Intelligent design can be roughly divided into three facets—the theory, the applications, and the movement. Intelligent design theory focuses on formal and informal models of intelligent causation. What are the things that take place when an intelligent cause happens? What are the identifying marks of intelligent causes?

These questions can be answered formally through mathematics or informally through general descriptions. Intelligent design makes use of both types of theory. The mathematical side, which will be discussed at further length in section 4 and following, includes topics such as specified complexity, active information, relative irreducible complexity, and related topics. The informal side includes topics such as irreducible complexity.

Many people mistakenly think that irreducible complexity is a strictly biological phenomenon, mostly because the book describing it (Behe, 1998) is a work of biology. Irreducible complexity simply states that intelligent causes, because their goal is planned, can execute

multiple steps to achieve a goal, even when each step on its own does not produce in any way the function desired and may even cause temporary regression.

Think about getting your car repaired. If I have a belt loose in my engine, depending on the car, a mechanic may have to take the entire engine out of the car to fix it. I started with a running car, but the mechanic, in order to make my car run better, actually made it worse first. The mechanic is able to do that because he knows the end point and can deduce a path to the end point, even if he has to make the car worse first. The fix is irreducibly complex because knowledge of the goal enables the mechanic to take a path that includes neutral or even negative steps in order to get to the goal. So, while irreducible complexity can be applied to biology, it is actually just a general description of the way many intelligent causes happen.

The applications of intelligent design are numerous. Two applications, however, tend to dominate discussion of intelligent design, both of which relate to questions of origins: biology and cosmology.

In biology, many people have applied intelligent design by pointing to pieces of biology (especially the cell and the genome) that exhibit distinctive marks of intelligent causes. First, the cell uses information in a symbolic way. This itself is a mark of intelligent causation, as symbolic representations have been known to arise only in the context of intelligent agency (Meyer, 2010). Second, the fact that this representation also represents the symbolic communication itself creates a problem of recursive necessity, which is another mark of intelligent agency (Voie, 2006). In fact, for biology to even start, one needs self-replication, which requires abundant forethought and planning even for the simplest self-replicator (Mignea, 2014a, 2014b, 2014c).

Then, when we look at what biology itself does, we can see that many

of its subsystems exhibit irreducible complexity (Behe, 1998). By this we mean that the subsystem has a multipart core functionality such that removing one part causes the whole subsystem to fail. This implies that to get the system in the first place, something had to be able to look forward far enough to see the purpose of the parts in order to put them in place. This is also the case, not just for subsystems, but even new protein folds, which require a multistep, forward-looking process to create (Axe, 2004, 2010).

Even in adaptation and microevolution there is evidence of design. The amount of foresight encoded into the genome can be measured (Bartlett, 2010a). One can even do experiments to help classify mutational events as to whether they are accidental or part of an original design (Bartlett, 2009).

In biology, the most stringent nonintelligent challenger to intelligent design is natural selection. Therefore, many working on biological applications of ID also show not only why intelligent design is a likely cause, but also that natural selection is unable to be a workable causal alternative.

However, I should point out again that, as a subject matter, intelligent design does not invoke God, simply because God cannot be modeled by simple models and equations. Many of the points of intelligent design do indeed point to God, but if we are to take seriously intelligent design *as a subject matter*, it is clear that while someone can easily use ID to point to God (who else has the power and wisdom to do these things?), the subject matter itself can only measure and identify intelligent causation in the abstract. Just as ID *as a theory* can be used to identify creativity in my computer programs but does not have the power to name me as the author, it has the ability to identify creativity in the genome but does not have the power to name God as the author.

This is not the result of ID theorists being coy about their beliefs; it is merely respecting the limits of subject matters (Behe, 2000; Meyer, 2005; Luskin, 2007). Those who use intelligent design and are Christians are usually very public about the fact that they believe that the God revealed in the Bible is the designer of life, but they acknowledge that it takes more than just ID to get there, in the same way it takes more than ID to identify me as the author of my programs.

Another common application of intelligent design is in cosmology. However, my own knowledge of cosmology is sufficiently limited to prevent me from discussing it at any length.

While intelligent design is usually considered to be limited to discovering evidence for design in biology and cosmology, it actually has quite a few uses beyond that. However, to understand them, we will need to first dive deeper into the mathematical side of intelligent design. Section 4 and following will show an outline of how the mathematics of intelligent design works. Then, section 8 describes applications of intelligent design to business and technology. Finally, section 9 will show how intelligent design can be applied in interesting ways toward building a creation model.

4. Mathematical Intelligent Design: Specified Complexity

The mathematics of intelligent design is an outgrowth of several developments in information theory that occurred in the twentieth century. The development of the computer allowed mathematicians to convert between numbers and procedures. Surprising though it may sound, a computer program is in fact simply a (usually extremely large) number that is also a procedure. For instance, I recently wrote a very short program to blink some lights on and off. While I do not have space to write the number here, this

program could be written out simply as a number, which is about 3,700 digits long. Because computers are very concrete devices, we can definitively say whether or not our procedures are effective at accomplishing their goal merely by executing them. Since computers have no subjective bias (or any subjective anything), they can tell us if our procedures are actually fully objective descriptions of the task described.

Thus, using information theory we can measure not only *data* but also *algorithms*, both using the same unit: the bit. Bits can represent probabilities as well. Equation 1 shows how to convert a probability P to a quantity of bits B .

$$B = -\log_2 P \quad (1)$$

Equation 2 is merely the inverse.

$$P = 2^{-B} \quad (2)$$

So, if we have an information string that is 32 bits long, the chance of arriving at just that string of bits by chance (i.e., by flipping a coin and getting the same result) is 2^{-32} or 1 in 4,294,967,296.

Now, let's say that we asked someone to go flip a coin 32 times and write down '1' every time it is heads and '0' every time it is tails. Then, they came back with the following result: 00000000000000000000000000000000. Would that be surprising? It should, but why? It has the exact same chance of occurring as any other particular set of coin tosses. So why does this one in particular stand out?

The answer is that it conforms to an independent pattern—a sequence of all zeros. But why is that significant? It turns out that most sequences do not conform to any pattern. Therefore, the fact that it conforms to a pattern at all is significant. But how do we quantify whether or not it conforms to an independent pattern?

The answer is that we can write a program *shorter* than the sequence to *produce* the sequence. The code for this would essentially be “repeat 1 32

times.”¹ For the vast majority of possible sequences, it is simply not possible to describe the program in a shorter way than stating the sequence itself. Therefore, when we come upon a sequence that can specify something in a shorter way, we can infer significance for the sequence. The sequence 10010111001011010001010001101111 has the same absolute probability, but it is not compressible—there is no shorter way of writing it than simply listing out the results.

Dembski (2006) uses this to show evidence of the rigging of an election. Dembski's example centers around Nicholas Caputo, whose job it was to determine the order of candidates on the ballot, which was supposed to be done at random. However, in 40 out of 41 elections, the Democrat's name was first. So, we can represent this just like the coin tosses (1 for Democrat, 0, for Republican): 11111111111111111111111101111111111111111.² Again, this sequence is not any more or less probable than any other sequence of selections. However, since it is also compressible (“repeat

1 22 times, 0, repeat 1 18 times”), this gives independent testimony that the sequence is a special sequence. The more compressible the sequence, the more special it is.

Thus, we can use this property of sequences to determine whether or not something is the result of chance. Since Caputo's results were *supposed* to be from chance, we can reasonably infer that Caputo was himself manipulating the election.

The size of the underlying sequence itself is known as the complexity of the sequence. The size of the program that can generate the sequence is known as the specification. Specified complexity is, essentially, how much compression the specification gives to the sequence. Specified complexity actually includes a number of other factors, but this gives a good intuition about it. The full details about specified complexity can be found in Dembski (2006, 2005b).

However, it is also possible that a compressible aspect could come from a law. If we have a set of data about objects falling from buildings, we can compress that data using Newton's law of gravity. This is nonrandomness by law, not intelligent agency.³ Therefore, for specified complexity to show design, the probability model that is used for the measurement must have known laws factored out.

The question that regularly arises, therefore, is whether, when determining specified complexity, you have discov-

¹ Technically speaking, this “program” is not shorter than the sequence, since the program is encoded in an ASCII character set while the sequence is binary. The sequence would have to include more than 144 coin tosses for this program to be shorter than the sequence. Nonetheless, we will consider this program to be “shorter” for didactic purposes. In real life, we would be using machine code, which would be inherently shorter but much more difficult to read. Also note that there are differences in machines that affect the length of the required program but since any given machine is interconvertible to another machine through a fixed-length program, the results are much more stable for longer sequences than for shorter ones.

² The actual position of the 0 was not recorded in the documents related to the case, so it is merely inserted arbitrarily.

³ In the broader scope, law itself can be considered an aspect of design. In the Aristotelian/Thomistic tradition, the regularities of nature are themselves evidences of design, often referred to as teleonomy (Feser, 2009; Lopez, 2017). Whether or not you remove law-like processes from your characterizations of intelligent causation depends on what types of intelligent causes you are wanting to show.

ered intelligence or merely a new law (which would give similar results). One answer is to use the logical depth (Bennett, 1988) of the compressing program. Physical systems are referred to as such because they exhibit simple, finite relationships to each other (Bartlett, 2014b). Such a relationship would preclude a law with a large logical depth (i.e., one requiring a complicated relationship).

Additionally, Ewert et al. (2014) show that functional requirements can be used for compression. A functional requirement, as a teleological mode of compression, indicates design. This has been used by others, such as Durston et al. (2007), to measure specified complexity in protein folds.

Therefore, even though specified complexity does not on its own distinguish whether agency has been discovered or merely a law, further reflection on the nature of the specification is often able to resolve it.⁴

5. Mathematical Intelligent Design: Active Information

Specified complexity is a fairly well-worked-out system of identifying the patterns resulting from intelligent causation. The problem, however, is that it is very difficult to use in practice. It is easier to use for simple systems such as computers, or for simple tasks such as the Caputo example, but using it for something more complex such as biology, where even the relevant laws are not already known, is much more difficult.

However, for systems that have a function (i.e., a goal), a new development in computer search theory paved the way for making further break-

throughs in how to apply specified complexity. In computer search, the question has always been whether there is a “best” way to search for a needle in a haystack. For instance, if I am looking for the ace of spades in a card deck, what is the best way to search for it? It turns out that this question is heavily dependent on the way the deck is organized.

Additionally, if we know nothing about how the deck is organized, then the average performance of all possible search algorithms for the deck will be the same as picking cards at random. These results are known as the “no free lunch theorems” (Wolpert, 1996; Wolpert and Macready, 1997). Essentially, if we want to create an algorithm that is better than random chance for finding a target, we have to have some sort of specialized knowledge about the search space or the target we are looking for.

These theorems allow us to measure an average expected probability of positive events for search algorithms and machine-learning algorithms. If we can measure how well random chance is able to perform a task, we can use this as an expected average value for any arbitrary algorithm. Therefore, if we find a search mechanism that reliably performs better than chance, then this is good evidence that the search mechanism benefited from prior knowledge about what the “space” of the search looked like. In other words, it indicates that the search mechanism is infused with prior information about what types of eventualities to expect.

The Evolutionary Informatics Lab, which is at the forefront of active information research, has used active information to show that every claimed instance of computer-based Darwinian evolution either (a) actually had information included in the search algorithm, (b) had results that were so simplistic that they were completely within the realm of random chance, or (c) some combination thereof (Dembski and Marks, 2009; Ewert et al., 2012). It is

true that the evolutionary examples do not have the specific results encoded within them, but they are structured in a way that makes finding the solutions more probable, which, if applied to different problems, would make finding the solutions less probable.

Most people (including those working in the field) do not realize the extent to which the *parameterization* of the problem (i.e., determining which fields to vary and how they should be varied and interpreted) contributes knowledge to an evolutionary search. While computers are the best at searching large spaces of parameters quickly, it takes an intelligent cause (i.e., humans in this case) to generate the most important parameters and how they contribute to the problem (Hubbard, 2010; Bartlett, 2016).

The way active information is measured is by comparing the relative probabilities of finding a solution both by chance and with the search algorithm. Using Equation 1, each of these probabilities can be converted to bits, and we can have a measurement of how many bits the search algorithm contributes to the search, even without knowing what the code or mechanism of the search is. For example, let’s say that we have a search problem for which random chance gives us a 1 in 1,000,000 chance of finding an answer. This is equivalent to approximately 20 bits of information. Then, using a search algorithm, we then have a 1 in 5,000 chance of finding the answer. This is equivalent to about 12 bits of information. Therefore, I can say that my search algorithm contributed $20 - 12 = 8$ bits of information to the search.

In biology, we can use this to measure how much information a cell has about its own genome adaptations. By measuring the likelihood of an advantageous change in the genome by random chance against the likelihood of an advantageous change that the organism itself provides, we can determine how many bits of information a cell has about

⁴ Technically, this doesn’t resolve it per se, but it can show us which things can *only* be agency. That is, agency can create something law-like (as in the Caputo example). However, law cannot create something that is fully teleological.

its potential fitness landscape. This has been measured for the adaptive immune system (Bartlett, 2010a) and can be further extended to measure other ways in which a cell is predisposed to adapt in advantageous ways.

In short, an algorithm that gives consistently positive active information toward its target is a strong indicator that the algorithm had a purposive design toward that end.

6. Mathematical Intelligent Design: Relative Irreducible Complexity

While irreducible complexity is founded upon an informal description of how agents pursue their designs, Bartlett (2010b) describes a way to formalize this description in terms of the theory of computation. As we have described, irreducible complexity states that some features require multiple steps in order to achieve the goal, and the intermediate steps are unhelpful or even hurtful on their own. Only when the whole system is in place do the steps make sense. In relative irreducible complexity, this concept was mapped onto the concepts of computational complexity classes developed by Stephen Wolfram (Wolfram, 1984, 2002).

Essentially, what Wolfram found was that in order for a computer to be *universal* (i.e., capable of running an arbitrary program), it also had to be *chaotic* (i.e., small changes in the input have an unpredictably nonlinear affect on changes in output). What I was able to show is that this means that in order to evolve useful complex functions, an algorithm would have to cross over paths where selection would be pointing the wrong way. A complex function in the computational sense would be one that requires an open-ended loop to produce, and in the biological sense would be a negative feedback loop. Irreducible complexity in this sense means that all single steps on a path to a particular

target are nonselectable, and therefore would occur only with a near-zero probability since all the steps would have to occur at the same time to prevent strong negative selection.

The only way around this difficulty is to import information from another source—either from an agent, from a repository of information somewhere else, or from mapping the solution space to a nonuniversal, non-chaotic one (essentially infusing the algorithm with active information by restricting the range of possible choices).

Thus, finding irreducible complexity of the computational sort is evidence that at least part of the algorithm arose through intelligent agency. This was shown by Bartlett (2010b) using the evolutionary software Avida as an example. While most of an Avida “organism” was developed via natural selection, there is one part of the Avida algorithm that is irreducibly complex in this sense (the replication loop), and it is actually designed into the software! Thus, far from demonstrating evolution, the Avida software validated that irreducibly complex systems are indeed markers of design and can even allow designed parts of evolved systems to be identified. Additionally, this should make clear why intelligent design cannot identify *who* the designer is. Using irreducible complexity, we could identify *that* a section of code had an author, but those techniques do not help us to identify *who* the author is. They merely point to the fact that a search for an author would be a warranted endeavor.

Similarly, using different techniques for identifying irreducible complexity, Ewert (2014) showed that in the evolutionary system known as Tierra, an irreducibly complex system was found—the sensory system. Just like in the Avida example, the irreducibly complex system can be traced back to the authors of the system itself, not to the evolving system. The evolved features of Tierra did not display irreducible complexity.

7. Intelligent Design and Evolution

One further thing to clarify about intelligent design is that if an object or process is found to have been the result of design, that does not mean it did not evolve or did not have a natural history. What it means is that somewhere within or at the beginning of that causal history design had to be involved.

As an example, consider the Windows operating system for personal computers. If you install Windows on an empty computer, you will install it from an installation disk. The Windows installer is not the same program as Windows. However, it contains sufficient information to transfer Windows to your computer. In fact, it may not even transfer the exact same version of Windows to every computer. There may be aspects that are turned off or changed depending on whether you installed it on a laptop, or on a computer with a large number of processors, or within a virtual machine.

As such, one could say (using certain terminology) that your installation of Windows evolved from the installer. However, it would be ridiculous to say that evolution was the *primary cause* of Windows on your computer. It overwhelmingly came from an intelligent cause. Sure it had a natural history—it started out as a repository within the installer, then was transferred to your hard drive, and then bits of it were tweaked to match your setup—but none of that takes away from the question of whether agency was the primary originator of Windows.

Likewise, while ID itself cannot say what the natural history of a designed object has been, Dembski’s “no free lunch regress” (2005a) shows that it takes more design to find a designed object in an evolutionary search than it does to design the object itself. Thus, while you may be able to make an argument that a given object was not designed directly but had an evolutionary history, that is

not the same as arguing that the object was not designed. In fact, it is likely to actually be adding to the number of bits required for a designer to create such a process.

This is why, rather than saying that mutations cannot add information to the genome, I prefer to say that in order for mutations to add information to the genome there must already be a large amount of information that channels mutations in a beneficial direction (Bartlett, 2012).

8. Business and Technology Applications of Intelligent Design

So far, our study has focused on the biological aspects of intelligent design, which are directly applicable to origins issues. However, because intelligent design is a general field of study of intelligent causes, it can be applied to a number of non-origins issues.

Bartlett (2014b) applied many of the ideas of irreducible complexity to the study of the mind, showing how the mathematics of information theory can be used to model the operation of the mind in its nonmaterialistic aspects.⁵ Bartlett (2014a) used those same ideas to quantify complexity in software development projects. Thus, irreducible complexity can be used in software development to measure, manage, and

⁵ Some people think that *model* means *predict*. However, there are many processes that can be modeled in a non-predictive way. Models simply allow us to combine knowledge in useful ways. For instance, a random probability distribution is a non-predictive model. It doesn't tell us *where* a particular event will land, but it will tell us about the general ways that large numbers of similar events will land. Bartlett (2014b, 2017) covers potential methods of non-predictive modeling for nonmaterialistic events.

value the creativity necessary to produce software products.

Intelligent design, however, is not just about detecting and measuring design; it is also about understanding what it is that intelligent causes do. Intelligent design aims to formalize the cut between the abilities of algorithms and the abilities of minds. Using that information allows entities to better divide tasks between software and humans. Holloway (2017) uses this to develop a generalized method of harvesting information from human subjects that computers are either unable or poorly able to calculate. This method, known as imagination sampling, allows machine-learning algorithms to make use of human subjects in a game-like environment to gain more information about the solution space than they are able to using computation alone. Essentially, we are asking humans to supply active information to machine-learning algorithms where automated methods are not sufficient.

In fact, the use of humans in automated computation loops is a growing field of human computation and artificial intelligence (AAI). Amazon.com has a platform known as The Mechanical Turk which makes writing AAI tasks and matching tasks with humans easier. Intelligent design provides a theoretical framework to this field, both as a justification for its existence and as a unifying concept behind the many tricks that have been developed.

The study of human creativity also has application to economics—both macro and micro. George Gilder, one of the founders of the Discovery Institute (which, among its other roles, is an intelligent design think tank), uses the same principles of intelligent agency in developing his “information theory of capitalism” (Gilder, 2013). Gilder shows that the development of economies is not a predictable outcome of equilibrium equation but the dynamic result of intelligent causes acting to solve problems.

In microeconomics, Peter Thiel (cofounder of PayPal) explicitly uses intelligent design theory to talk about the ideal ways a business can increase its value both in terms of profits and its value to society (Thiel and Masters, 2014). Peter Thiel even states:

Computers are far more different from people than any two people are different from each other; men and machines are good at fundamentally different things. People have intentionality—we form plans and make decisions in complicated situations. We're less good at making sense of enormous amounts of data. Computers are exactly the opposite: they excel at efficient data processing, but they struggle to make basic judgments that would be simple for any human.... In 2012, one of [Google's] supercomputers made headlines when, after scanning 10 million thumbnails of YouTube videos, it learned to identify a cat with 75% accuracy. That seems impressive—until you remember that an average four-year-old can do it flawlessly. When a cheap laptop beats the smartest mathematicians at some tasks but even a supercomputer with 16,000 CPUs can't beat a child at others, you can tell that humans and computers are not just more or less powerful than each other—they are categorically different. (Thiel and Masters, 2014, pp. 143–144)

So, far from being a theory only about origins, intelligent design is a general theory about intelligent causes that can be applied to any number of agency-oriented problems in a number of fields.

9. Applying Intelligent Design to a Creation Model

While showing that certain features of biology necessarily originate from intelligent causes, many creationists want to know if intelligent design can

help move forward a general creation model, especially one in which the creation of biology is presumed. That is, if we presume that life is designed, then doesn't *showing* that it is designed become redundant?

That would be the case if all intelligent design had to say was whether or not life was designed. However, as we have seen, intelligent design, as a tool, is useful for generating much more specific results. It can tell us if specific subsystems are designed or not and even *measure* the amount of aptness certain systems have to their environment. This alone makes intelligent design a powerful tool, as one can use it to answer detailed questions about what life is geared to do and to what extent it is geared to do it and, using active information and similar metrics, retrieve an answer in bits.

Additionally, all young-earth creationists agree that a significant amount of change has occurred in life history. This has made searching for which species belong to which created kinds one of the hallmarks of creation biology. Many creationists have attempted to solve this problem by making statistical comparisons of biological characters one of the foundational methods of determining created kinds (Wood, 2008). However, one common issue is knowing *which* characters should be included in comparisons of created kinds (Robinson and Cavanaugh, 1998). Ideally, since certain characteristics of organisms are evolvable and some are non-evolvable, the characters used in comparisons of created kinds should be characteristics that are non-evolvable. Because intelligent design can point to *which* subsystems require design for implementation, it can potentially be used to prioritize the preferred characters to be used when doing statistical baraminology.

10. Conclusion

Many of the criticisms about intelligent design occur because it is misunderstood

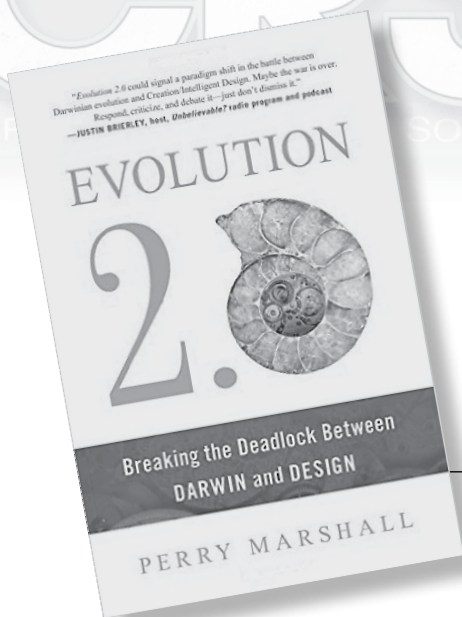
as being an alternative to creationism or evolution. Instead, it is a subject matter to itself about the general nature of intelligent causation. As such, intelligent design does not explicitly reference God or the Bible any more than physics or chemistry typically do. However, just like physics and chemistry, intelligent design can be used to demonstrate the plausibility of a creation model (for ID, this is by identifying and measuring design within an organism), or used within a creation model (for ID, this is by helping to determine the relevance of different features for statistical comparison for assigning to created kinds).

Intelligent design, as a subject matter, has a number of uses both inside and outside the question of origins, and creationists would do well to learn the details and apply them to their own studies. The field of intelligent design is still growing, and new aspects are still being discovered, and new uses for it are still being discovered. I anticipate that, in the future, intelligent design will become a common aspect of theory in a number of fields, both inside and outside origins questions.

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Evolution 2.0: Breaking the Deadlock Between Darwin and Design

by Perry Marshall

BenBella Books, Inc., Dallas,
Texas, 2015, 374 pages, \$24.95

Review Article— Evolution vs. Design: Wrong Assumptions Cannot Produce a Correct Model¹

Royal Truman*

Much is promised by the author of this book, who assures the reader, “If you’re a person of faith, and you’ve been struggling to integrate scientific evidence with your core beliefs, this book is a great start” (p. xxv) and claims it will “resolve age-old tensions.” He identifies himself multiple times as a former young-earth creationist (YEC) and a Christian (e.g., pp. 248,

255, 265). The book is well-structured, easy to read, and includes a good index and many good references.

The author shares the intellectual journey he went through in a very honest and personable manner. Warning signals appear, however, already in the introduction. Under the heading “Who Should Not Read This Book?” we are informed, “If you’re a staunch six-day

Creationist; if you hold a firm conviction that the universe is young, and no other interpretation of ancient texts is permissible; if evolution seems an impossible hoax; then you will find this book threatening” (p. xxv). His implication appears to be that anyone holding to the idea of a young creation is either uneducated, fearful, or both. Considering the number of degrees and professions represented in

¹ Editor’s note: Book reviews generally are carried in the Media Reviews section of the *Quarterly*. However, this greatly extended review of an important book is warranted. For another review of this title, see Robert Lattimer’s review in the Summer 2016 issue of the *Creation Research Society Quarterly* (53:79–80).

* Royal Truman, Mannheim, Germany
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the young-creation “side,” that is a little hard to swallow.

Our expectations are whetted by the promise that this book will “reveal a century of unrecognized research and discoveries” (p. 374). And as an incorrigible glutton for origins-related scientific data that needs to be reinterpreted, I hungrily searched for new tidbits with a collection of highlighters handy.

The book can be summarized in a paragraph: We are offered an excellent analysis of the dependency of life on genetic codes, which require a divine designer at some point, but common ancestry from a single-cell organism is assumed. It is shown that rapid and massive biological changes can occur through nonrandom mutations, but inexplicably the author throws in vast periods of time between these putative evolutionary jumps. These notions are standard doctrine of advocates of the punctuated equilibrium theory and Evo-Devo scientists.

As far as the actual science is concerned, it became clear that the author thinks he is banging his head against an open door with most of his intended audience. The ID (intelligent design) community has discussed extensively the notion of front-loaded and information-driven biological processes. And for decades the YEC community has researched biological factors that are able to produce a wide variety of species derived from a small number of roughly family-level animals that debarked from Noah’s ark about 2500 BC.

For a scientific newcomer to the topics, interesting biological facts are discussed. I suspect the author would be astonished, however, to discover that if he would attend one of the annual creation-science biology conferences I attend, the YEC PhDs and professors in attendance could explain to him in vast detail all the biology and information science presented in this book. In fact, this book could have been written by referring exclusively to the YEC and

ID literature, supplemented by insights of knowledge common to these experts.

I asked myself why, after roughly ten years of research, this intelligent, motivated, and honest author (who identifies himself as a former young-earth creationist) fell so far short of what he set out to accomplish.

Old-Earth Assumptions Determine the Model

The author has a university degree in electrical engineering and is a gifted business consultant and software entrepreneur. His marketing skills were instrumental in developing such a formally well-crafted and carefully structured book. He shares his doubts and struggles openly and leads us through the path that led to the conclusions that, he wishes to persuade us, provide a resolution between theism and science.

As a starting point, Marshall decided that if God is real, if there is design in the universe, one shouldn’t need a holy book or blind faith to know this. Design in nature ought to be detectible (p. 8), since whatever one puts his or her faith in shouldn’t contradict obvious verifiable facts (p. 9). This sounds fair enough unless we reflect carefully on Will Durant’s warning in *The Story of Philosophy* that “we find no new truth because we take some venerable but questionable proposition as an indubitable starting-point” (Durant, 1974, p. 132).

If the past could be interpreted using error-free facts and perfect logic, we could delegate the grunt work to a computer program. The evolutionary assumptions Marshall treats below as facts proving an ancient earth did not prevent him from concluding God indeed had some role in nature, but his data now needs to be reexamined to arrive at a better model.

If only ten thousand years or less is being considered, it is impossible to come up with compelling scientific data to explain the origin of existing biologi-

cal features if only naturalist forces are permitted. To demonstrate this, attempt to do so for all known, but far simpler, current technologies under those same constraints. It can’t be done. The lack of intelligent agency must be compensated for somehow, and deep time is used. Inadequate causal factors cannot produce a correct model. Therefore, those providing the data, or rather, assumptions that Marshall feels compelled to work with, have hopelessly prejudiced his search for truth.

Marshall needs to reevaluate the so-called facts that led him to reject the YEC position. He is astute enough to recognize that diehard junk-DNA advocates like Larry Moran possess an antireligious bias (p. 273). I urge him to reflect more carefully about the biases of those like Charles Lyell and the establishment, die-hard evolutionists, who have a not-too-well-hidden agenda to establish an old age for the earth and naturalism in order to deliberately discredit the Bible.

Archeologists, detectives, forensic examiners, and other experts who attempt to decipher the past have vast flexibility in adjusting parameters to come up with explanations. The community Marshall has relied on for his interpretations of ancient history admit being “forced by our a priori adherence to material causes to create an apparatus of investigation and a set of concepts that produce material explanations, no matter how counter-intuitive.... Moreover, that materialism is absolute, for we cannot allow a Divine Foot in the door” (Lewontin, 1997, p. 31).

Historical science methodologies make no attempt at, or claim, a full coverage of the facts before deducing interpretations. Instead, usually an intuition or theory is conceived, funds are obtained, and then the research is guided to confirm the thesis. Therefore, the naturalist community is not falling over itself to analyze reports of intact tissue in dinosaur bones (Anderson, 2016) or the mitochondrial evidence for a

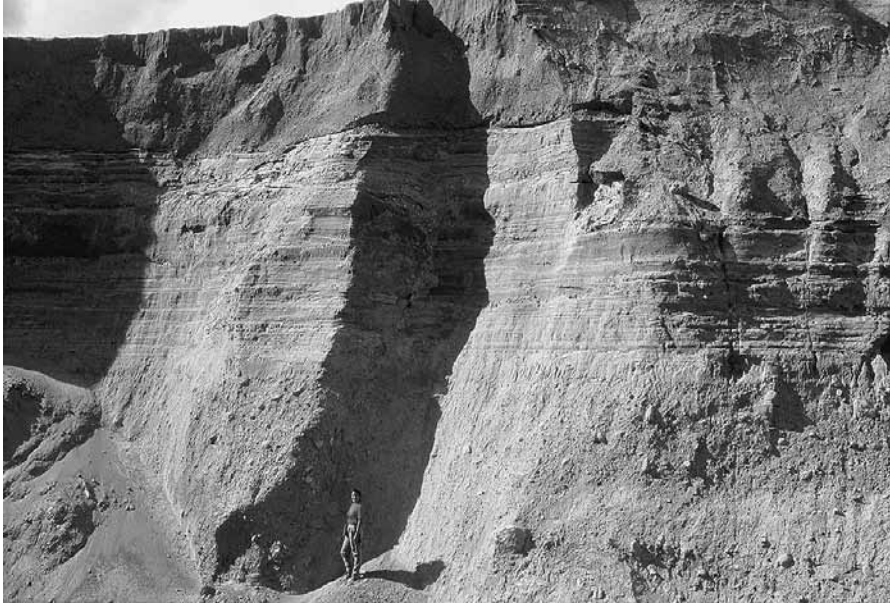


Figure 1. Fine layering was produced within hours at Mount St Helens on June 12, 1980. (Photo by Steve Austin. Used by permission of Institute for Creation Research.)

single female common ancestor split up into three female branches, as reported recently by Carter and Lightner (2016). As such, Marshall's statement that "further investigation becomes impossible if a miraculous event cannot be reproduced in the lab" (p. xxiii) overlooks that laboratory experiments are never used to replicate events from the distant past, and one should not discard the evidence of a reliable witness.

Reasons for Believing the Earth Is Very Old

Marshall shares his reasoning for assuming the earth is billions of years old. On page 3 he simply claims that "there are millions of fine layers of sediment in the Earth's crust, deposited year by year." No references for such an important statement are provided. Presumably he is referring to varves, but current research debunks the need for millions of years for them to form (Oard, 2006). Dr. Walker explains:

The assumption that each couplet always takes a year to form is wrong. Recent catastrophes show that violent events like the Flood described in Genesis can deposit banded rock formations very quickly. The Mount St Helens eruption in Washington State produced eight metres (25 feet) of finely layered sediment in a single afternoon! (Walker, 1999)

Figure 1 shows Mt. St. Helens layers that were rapidly produced.

Next, by accepting macroevolutionary claims, Marshall makes the unwarranted assumption of long time periods. He claims that the small set of bones at the back end of whales "are obviously a set of minimally formed feet and legs . . . remnants of an earlier ancestor having been some other type of mammal" (pp. 13–14). He then raises doubts about his own argument two pages later (and again later in the book) by freely admitting those bones might serve some function. It would have been better if he had reviewed the creation research

literature, where these "remnants" are shown not to be useless at all but helpful in strengthening both the male and female reproductive organs. It is not clear why atrophied legs would demonstrate vast times.

On page 16 Marshall boldly states, "If whales and blind mole rats are descended from other mammals, then it might seem to follow that humans are merely primates." Well, moles do have a useful membrane that covers their eyes, protecting them from dirt while digging, having no use for eyesight deep under the ground. Their eyesight seems adequate to sense light at the surface, and there is no compelling reason to believe their design is deficient for their lifestyle underground (Weston and Wieland, 2003).

The biblical "kind," or *baramin*, is roughly equivalent to the family level of our current zoological classification—the felines, equines, canines, bovines, etc.—and they were to multiply and fill the earth (Genesis 1:28; 9:1). A great deal of genetic variation and adaptability had to be built in *ab initio*. Loss of some features occurred in the same cases for some lineages over time, as they rapidly adapted to special environments. In addition, the survivors of the Flood would not have carried the full genetic potential originally distributed among the different members. There is no justification for believing the current traits of moles represent millions of years of devolution. Snakes and fish also have protective membranes.

Much is made of the claim that there are small bits of data (pseudogenes) shared only by humans and primates and allegedly found nowhere else in the animal kingdom (pp. 19, 190). This bold claim was based on a paper published in 1992, when very few higher organism genomes had been sequenced. In reviewing that paper, I wanted to see what data actually had been examined. The relevant segments of CYP21 genes were collected, 2 from human, 3 from

chimpanzee, 3 from a gorilla, and 4 from an orangutan. This data set was absurdly too limited to claim “nowhere else in the animal kingdom.” As I suspected, the authors of the study did not even make this statement or anything resembling it, nor does the paper provide any support for such an absurd extrapolation (Kawaguchi et al., 1992).

Ever more biological uses for “pseudogenes” are being reported, being typically used by other cellular genetic codes for regulatory purposes, such as coding for miRNAs and increasing variety through chromosome crossover when producing gametes. Furthermore, the potential for statistical coincidences at mutational hotspots among populations undergoing a genetic bottleneck has been discussed in the YEC literature (Truman and Tarborg, 2007). It is easy to selectively report examples without mentioning the counterexamples, and thereby draw incorrect conclusions. Instead of looking at similarities, differences need to be considered to decide if common ancestry is plausible. To illustrate, a recent comparison of 16 similar cyanobacterial strains reveals they shared only 660 genes, whereas on average 869 genes are unique to only one strain (Beck et al., 2012). As ever more genomes are being sequenced, investigators are finding that the number of “orphan genes” continue to increase faster than possible homologs in other taxa (Beiko, 2011). Darwin’s predicted tree of life is not being confirmed.

Many independent studies by YEC researchers have confirmed that very significant differences exist between the chimp and human genomes (Bergman and Tomkins, 2012a, 2012b).

Hebrew *Yom* Interpreted as Time Periods

Unsurprisingly, a Christian who believes in the Bible and an origin of life billions of years ago has some serious hand waving to do. The fistful of arguments

reviewed in this book are all well-known from decades of jousting with our progressive creationist brethren. Marshall brings up the matter of the apparent illusion of history if the universe is recent (p. 319) with no mention of any of the last 20 years or so of YEC scholarship on this manner. There is no consideration anywhere in this book of biblical miracles implying quick fixes, like water being converted into wine or instant healing. The experienced YEC reader knows where one will end up once one embarks on this slippery slope—as Marshall has—with a picture of an incompetent God who fails in over 99% of His evolutionary attempts to get new species to work and submitting His creatures to millions of years of agony, living in terror from predators and suffering sicknesses and death in His so-called “very-good” masterpiece. To grasp the horror of a fallen creation, one can view Youtube footages of lions not only killing but even eating each other.

Inescapably, Marshall tells us once more, “Day is a period of time, not 24 hours. The Hebrew word for day (*yom*) has a variety of meanings in Genesis” (p. 310). This has been competently answered by many experts in the YEC community. To be recommended is Dr. Sarfati’s (2004) encyclopedic *Refuting Compromise*. The point Marshall fails to grasp is that languages, including Hebrew, provide the means to remove ambiguity when isolated words can assume different meanings, including the use of “day” or “days.”

Since I am fluent in several languages and need to translate every day between them correctly, this is easy to recognize. For example, discussing health problems during the Middle Ages, a German speaker could describe that period as “bad days” (*schlimme Tage*), even though centuries are meant. On the other hand, in many languages, including German and English, saying I studied “all day long” is clearly narrowing the period to no longer than

24 hours. In Spanish, one can express “good morning” as *buenos días* (literally “good days”). Even though *días* is plural, the greeting must be repeated afresh the next day; it is only good for one day. This Spanish greeting is translated to the singular “good day” in Portuguese, Catalán, German, French, Australian English, Italian, etc. Virtually no one translating even notices because it is so obvious and automatic. There is no ambiguity, the meaning is clear.

There are many examples of words associated with time that can have different meanings when taken in isolation, but are never ambiguous to native speakers when used in normal discourse. In Spanish, *mañana* could mean “morning” or “tomorrow.” The word can even be used jokingly in some contexts to postpone indefinitely and thus mean “never,” but to fluent speakers there is never any confusion when used correctly in each context. Claiming ambiguity in the Hebrew word *yom* in Genesis reflects a poor understanding of Hebrew and the nature of languages in general.

Information in Biology Requires Divine Contribution

Having unceremoniously abandoned potentially new YEC allies (the traditional bulwark against atheism) who would have been thrilled to invite him in, Marshall then tries to see if the ID community is more pliable. In chapter 28 he points out that many of the greatest scientists were devoutly religious and makes a plea for people of faith to embrace scientific inquiry (p. 255). He reviewed the made-up war between science and religion, all topics that have been analyzed in the YEC and ID literature in great detail for decades. Out of the clear, blue sky, Marshall then informs the reader that he believes God breathed the breath of life into Adam and he became a living being (p. 258) and that He created human beings in His image (p. 265). We are not offered

any justification for these beliefs, since his investigative journey ignored the Bible *in toto*. Biblical content is thrown in as an afterthought.

I read chapters 5–9 with much interest, since they discuss information theory, in particular Shannon and Yockey’s ideas, topics I have published about and presented at conferences and workshops over the years. We read about how mutations destroy information, but the seminal work of professor John Sanford (2008) is never mentioned. (Incidentally, Sanford is a former long-age evolutionist who became a YEC.)

Mr. Marshall’s analysis of genetics needs some refining. For example, he claims that the instructions to build the whole body come from the chromosomes (p. 45). If this were the whole picture, then transferring chromosomes to a different environment, providing only the necessary nutrients and energy source, should produce a living cell.

Careful analysis by others, not only those in the YEC camp, has produced a view of the whole cell as being involved in providing informational guidance. Sometimes DNA functions as the active source of instructions (e.g., exons, to specify protein sequences), whereas other portions of DNA are passive (e.g., cis-regulatory elements), being activated and regulated by transcription factors. The physical organization of cellular and intercellular components also control outcomes, and a holistic model known as *Coded Information Systems*, developed by myself, integrates all these informational components.

Marshall mentions redundancy in codes and error corrections. Unfortunately, there is nothing in these chapters not already better understood among creation and ID scientists. I say “unfortunately” since much work lies ahead in understanding the huge number of cellular codes, and the interaction between them is still poorly understood. New insights would have been much appreciated. For more information on

the topic of multiple genetic codes and implicit genetic languages, see my detailed analysis (Truman, 2016a, 2016b).

Usual scientific protocol is to review key published contributions of others preceding one’s own work, for example Marshall would have greatly benefited from reading Truman (2012). Not even mentioned is the work of the giants in this field from the YEC and ID communities, household names like Kirk Durston, Steven Meyer, and Lee Spetner, all researchers with PhDs and many years of experience in this field. The work of YEC Dr. Werner Gitt is mentioned a couple of times superficially, and then only by mentioning a book written almost 20 years ago.

Marshall believes his challenge to produce a code naturalistically will impress the atheist community. Gitt has been challenging those people for some 20 years with a whole series of theorems he characterizes as “information laws of nature,” which already explicitly include the inability of a code arising without intelligent guidance. Unfortunately, Gitt’s complete edifice has been ignored in the secular literature by those adamantly committed to a universe without God. The reader interested in a thorough treatment of various topics in information theory is strongly urged to read the brilliant book, *Biological Information: New Perspectives*, based on a symposium held at Cornell University, with papers presented by several PhDs and professors, almost all of YEC and ID persuasion (Marks et al., 2013).

Message to the ID Community: Evolution Is Guided

Marshall’s proposal for evolutionists is to replace the neo-Darwinian random mutation theory with that of goal-seeking and adaptive mutations (pp. 9, 259). He correctly points out that geneticists have been breeding fruit flies for sixty years all round the world (flies produce a new generation in about eleven days) but

have not produced even a new enzyme (p. 31).

The fact that natural selection can slow entropy down but is powerless to reverse it (p. 292) is, of course, well known to YECs, who recognized long ago the statistical significance of Muller’s Ratchet.

Much is made throughout the book that there is no mathematical procedure for proving absolute randomness (e.g., pp. 74, 292). Marshall argues that there is some vanishingly small number of beneficial mutations that were generated by random accidental copying errors, but there is no way to be certain they were random (p. 75). Marshall concludes that this inability to determine whether mutations are random is the reason for “our deadlock between Darwin and Design” (p. 75). The significance that complete randomness in mutations cannot be demonstrated by evolutionists is overplayed, since no empirical models are expected to fully capture all aspects of nature. We cannot even prove that pi is a random number, or even prove that the second law of thermodynamics cannot be violated, no matter how unlikely we believe this to be.

Marshall offers five drivers to produce rapid evolutionary change. Once again, Marshall is apparently unaware that for many YECs with advanced degrees in science or medicine, what follows in his book is well known, has been often discussed, and is frequently published.

1. Transposition. This means that portions of chromosomes can change positions. Marshall claims this is performed by cells to adapt in a targeted manner (chapter 11). However, this means there must be a designated and defined target. What process designates this target? How does the cell know what specific transposition will achieve the necessary adaptation? What is the source of the encoded information that guides this targeted transposition? For an in-depth treatment, I recommend that the reader

digest publications by YEC experts, such as my colleague Dr. Tarborg (2009). Marshall also mentions mutations generated under starvation conditions. The notion of mutational hotspots is certainly well known to the YEC and ID communities, and conceptually is closely related to the topic of targeted mutations that mature B-cells as part of an immune system response (Truman, 2002).

2. Horizontal gene transfer (HGT). Vertical gene transfer is what happens from parent to child—heredity. Horizontal gene transfer is the exchange of genetic material between different organisms, often claimed to be due to a virus. Horizontal gene transfer is mentioned in chapter 12 as a way to speed up evolution. Carl Woese is the champion of the proposal that horizontal gene transfer was the dominant form of evolution before multicellular life existed (p. 96). The YEC position has been for many years that microorganisms provide a wide range of nutritional services, such as nitrogen fixation and digestion, necessary for higher organisms, and HGT is a designed means to adjust rapidly and to ensure the variety of genes necessary for the common ecological good.

Preexisting genes are already part of what Dr. Lee Spetner (1997) calls the biosphere and thus permit bacterial colonies to solve categories of anticipated challenges through a collaborative distribution of effort.

3. Epigenetics. This involves altering gene expression without altering the organism's DNA. Because epigenetics is unrelated to the universal genetic code, it provides a separate source of information within the cell. This topic is touched on lightly in chapter 14. For the reader interested in an in-depth overview, I recommend *The Handbook of Epigenetics*, a gold mine of new research data (Tollefsbol, 2011). I recognized the examples discussed by Marshall below from *The Epigenetics Revolution* written by Nessa Carey (2012). As an example, researchers in Canada discovered that

pups licked by their mothers had a reduction in a specific type of gene expression in the hypothalamus. Methylation is an ingenious form of data compression, because portions of DNA can be used to generate different messages (p. 116). The point is that our bodies can adjust to external circumstances, such as by developing callused fingers from playing the guitar (p. 117).

Once again, this is common knowledge, since these kinds of effects were being sought long before Mr. Marshall or I were even born, inspired by YEC fundamental principles. These biblical lampposts produced various insights, so that even a non-biologist like myself could point out:

Since after the completion of Creation Day 6 God rested, the individual organisms, and ecologies produced so far had to be adaptable to new contingencies in real time and across generations.... Visible benefits may occur within a second, such as rapid reflexive actions (re-

moving a hand from a hot object). A reaction could also take a few seconds (sneezing), up to minutes (vasoconstriction of skin and limb blood vessels when temperature drops), or hours or months (such as resulting from varying hormone levels).... Other adjustments benefit future generations. Long periods of dryness cause spruce trees to sacrifice their seven-year-old needles by cutting off moisture and most nutrition to them, transferring the resources elsewhere in the tree. (Truman, 2015)

Tarborg (2008a, 2008b) discussed the idea of front-loaded higher organism baranomes—pluripotent, undifferentiated genomes with an intrinsic ability for rapid adaptation and speciation.

4. Symbiogenesis. This theory, that eukaryotic organelles like mitochondria and chloroplasts are ingested, formerly free-living prokaryotes, is discussed in chapter 15. Professor Lynn Margulis from the University of Massachusetts Amherst strongly defended this theory,

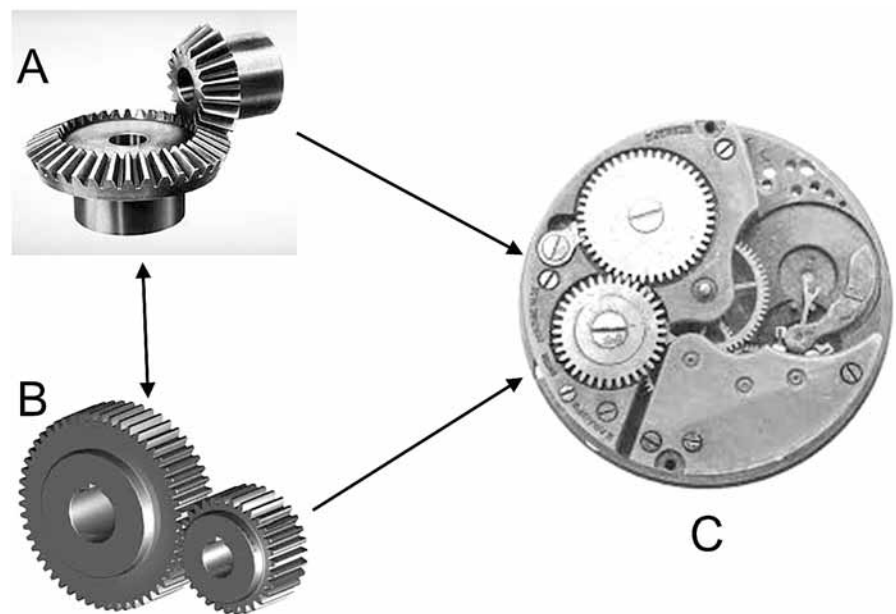


Figure 2. A similar conceptual solution need not imply an evolutionary common ancestor, such as between A and B. Furthermore, the presence of the same feature in more complex or multiple copies does not imply a step-wise evolutionary relationship, such as A or B becoming C.

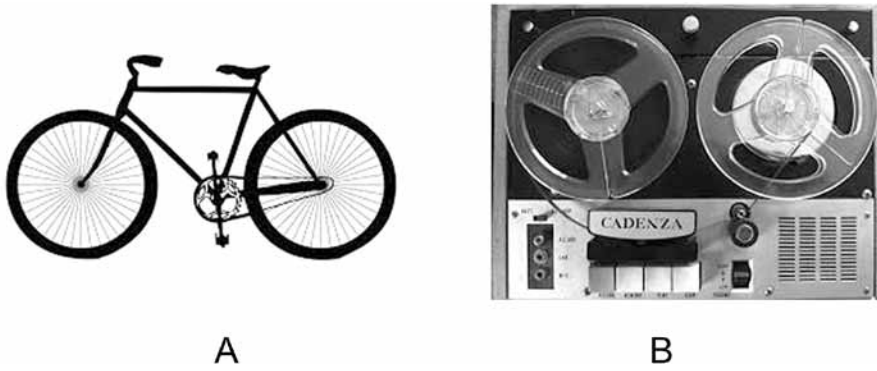


Figure 3. Object A and B share a conceptually similar solution for how to move a round object via another round object using a ribbon-like connector. An intelligent agent was responsible for the similarity of solution, one object was not physically converted into the other.

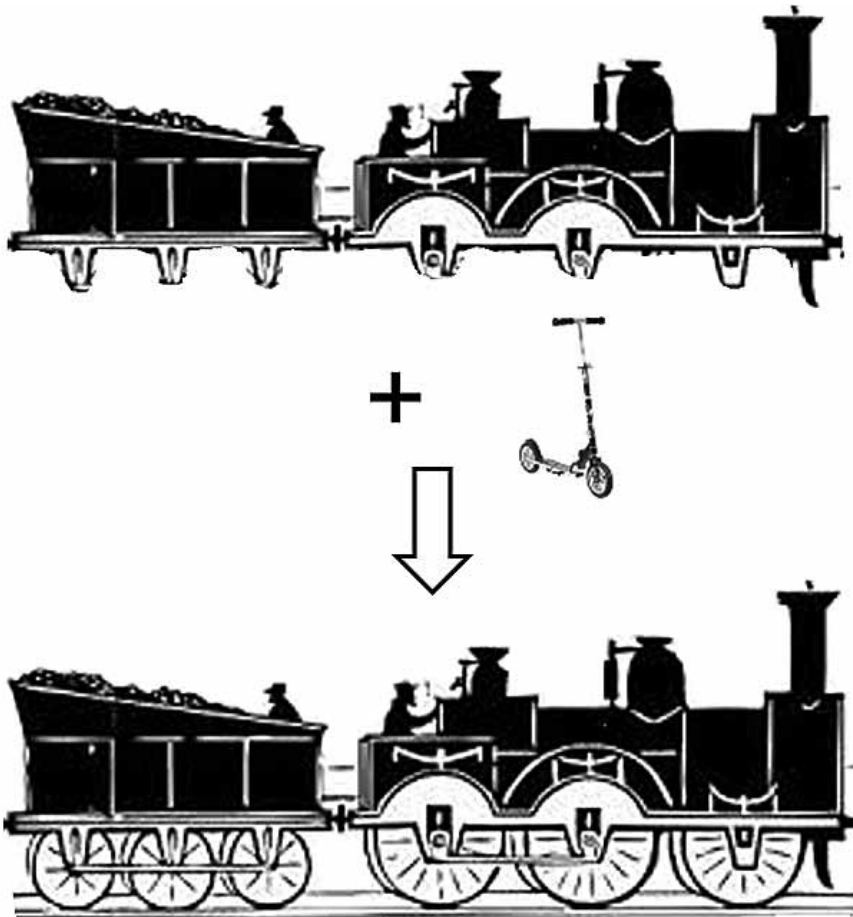


Figure 4. The symbiogenesis theory resembles having a functional train lacking wheels integrate an independent, functional scooter and replicate the wheels to produce a dramatically improved train now having a multitude of wheels.

which was accepted uncritically by Marshall.

Marshall claims that there is nearly universal agreement that organelles originated through symbiogenesis, firmly established by ribosomal RNA sequencings (p. 124). Designers, however, often reuse a conceptual inspiration for many purposes, and finding the same pattern in multiple places need not mean parts were physically brought together, as explained in Figures 2 and 3. Marshall (p. 127) unwittingly provides an example that corroborates this point:

It's like finding the same chassis in two cars, the Toyota Camry and the Lexus, with only minor differences in the mounting brackets, and striking similarities down to the most trivial details. One would naturally conclude the chassis was only developed once, then the other car borrowed the design.

Exactly right. The correct interpretation is that a principle had been conceived and then reused appropriately in different environments (cars), not that part of a Lexus had been assimilated by a Toyota model that had worked just fine before without a chassis. The symbiogenesis theory claims, however, that chloroplasts in plants originated when a protozoan ingested a cyanobacterium, and mitochondria originated when a complex cell ingested a bacterium (p. 124). The auto chassis illustrates exactly what YECs believe did not occur in nature; namely that all chloroplasts and mitochondria found in higher organisms allegedly arose from such singular events. Marshall is claiming a principle that would be similar to claiming that a fully functional train having no wheels ingested a scooter and then replicated the scooter's modified wheels to produce an improved train (Figure 4).

YEC Dr. Batten has pointed out that it is only to be expected that there would be similarities in many of the genes for photosynthesis or respiration between prokaryotes and eukaryotes—they

must achieve the same chemistry. A designer would obviously reuse a brilliant concept, suitably adjusted for the requirements of different multicellular organism. In addition, detailed studies of the DNA base sequences have shown that the pattern of similarity between eukaryote and prokaryote is not what would be expected from the endosymbiont hypothesis (Batten, 2000), but of course we can recognize that the same biological need was solved multiple times.

5. Genome Duplication. This theory, that various simpler organisms underwent genome duplications and then dramatically created new genes and regulatory networks, is discussed in chapter 16. It is certainly true that hybridization can occur in plants, and plant growers make hybrids at will (p. 142), but this produces only modified plants. Marshall once again uncritically swallows unjustified evolutionary claims, such as the origination of the hagfish via hybridization—the mating of two species of invertebrate sea squirt (p. 135). He does admit on page 143 that the transition from sea squirt to hagfish would have required massive cellular engineering, including construction of several new body parts, but he does not hesitate to assure the reader that the resulting creature was the ancestor of the world’s first jawed vertebrate, which led to bony fish, reptiles, amphibians, birds, and mammals (p. 138).

Genome duplication *per se* can only work with what is already present, and the modified organism will not deviate significantly from the original or the potential already implied. New protein families will not arise, and neither will new cell types. This resembles comparing single- and double-barreled shotguns. One could reasonably argue that being able to shoot at separate targets without reloading offers novelty, in addition to some disadvantages (like greater weight and slower movement). But we can agree that finding a double-barreled shotgun would hardly justify the claim

that we now know how a church organ, having multiple pipes, evolved from a single-barreled shotgun. This is the flaw of focusing on only the features shared in common between organisms when arguing for common ancestry, when there is absolutely no justification to favor this over other explanations.

Marshall’s Five Tools Have Limited Scope

What do we make of these five “tools” that Marshall claims accelerate evolution? He even claims that these tools interconnect the entire tree of life, so that any point on the tree is connected to any other point (p. 144). If Marshall could have demonstrated this, he would have collected several Nobel Prizes by now. The genetic tools that Mr. Marshall describes certainly play a divinely planned role to facilitate adaptation, but they resemble the development of different business processes by rearranging existing elements such as contracts, ships, assembly lines, and suppliers. The origin of the elements tools themselves has not been explained, far less how the countless interactions could have been put into place step by step to produce vastly new organisms. This is the key message of *Evolution: Still a Theory in Crisis* (Denton, 2016). Denton conclusively demonstrates that there is no known or conceptually feasible path linking the top-level Bauplans (architectures) to each other, nor is there such a link among the thousands of specific taxon-defining biological features. There are thousands of examples of separate ensembles of features that jointly, unambiguously define discrete taxa.

Mr. Marshall, trained as an electrical engineer, can be forgiven for apparently being unaware of the vast unrelated specialized genetic infrastructure different classes of organisms use. Hundreds of thousands of orphan genes, thousands of novel protein families, vast networks of complex cis-regulatory logic, and

multiple cell-type specific codes cannot arise from these five high-level drivers. A tractor can indeed be used to rapidly move large integrated functional elements around but not to produce new microcircuits.

Let us examine an example where the evolutionary novelties would be dramatically less than entire Bauplans. On page 109 Marshall discusses signal molecules used by bacteria as a communication language within and across species (Figure 5) (Bassler, n.d.). To work, various specialized protein sensors (able to identify a specific kind of molecule) and signal transfer pathways are needed by the different species. Where did these new specialized components come from? Did one species branch off and then have to evolve a new metabolic path to produce and process a different biochemical while still using the former scheme?

Marshall rightly critiques neo-Darwinism as being anecdotal, not empirical, and agrees that millions of years are too long to test. He reiterates that rapid change using rearrangement of existing factors has been demonstrated in 70-plus years of documented live lab experiments (p. 147). But none of the five novelty-generating factors mentioned—transposition, horizontal gene transfer, epigenetics, symbiogenesis, and genome duplication—would produce the new fine details necessary to process these individual signal molecules.

A Bit of Confusion

We are left with no idea what Marshall’s historical model is. Did God create integrated ecologies *ab initio*, able to collaborate together, as YECs believe? If this is Marshall’s concept of creation for prokaryotes, then why shouldn’t integrated ecologies of plants and pollinating insects have been created also? Alternatively, did God intervene continually, slowly modifying a few nucleotides at just the right locations and times on

some members only? Or did He preplan these much smaller mutations to occur “naturally” by evolutionary accident in an almost, but not entirely, random manner along continuously viable paths to ever greater complexity up the tree of life? Such processes would have left a fluid record of change in the paleontological record, which everybody knows is not the case. The differences between “similar” organisms do not involve a mere chromosome change or two, but at a minimum typically many hundreds, or thousands, of very precise, different regulatory elements, plus novel proteins and developmental paths.

I sincerely applaud Mr. Marshall’s intense efforts to make scientific and theological sense out of the world we find ourselves in. He wisely states that his current interpretation of Genesis 1 and 2 and modern science have been presented provisionally, and they are not written on stone tablets (p. 330). I

respectfully believe he still has much work ahead of him, and I fear his conclusions, theological and scientific, are seriously premature. Based on various peculiar statements, his grasp of some of the scientific areas he has been reading about appears to be weak. On page 10 he claims that “bioinformatics explores the deep parallels between genetic information and human-made systems.” Where did he get that notion? This is not at all what bioinformatics students learn or what the practitioners work on professionally. On page 181 we read, “In DNA transcription and translation, in order to convert code to proteins, you need a ribosome to transcribe the message.” Correction: DNA sequences are transcribed to RNA sequences, using polymerases (not ribosomes), and mRNA sequences are translated into amino acid sequences by ribosomes.

The discerning reader will realize quickly that there is a complete absence

of any evidence that Marshall has had any recent, serious interaction with YEC or ID advocates who have more than a high school science education. We are assured there were hundreds of online debates (usually led by genetic novices), but we read nowhere about valid points made or of any of the reasonable and expert answers that are freely available.

On page 150 we read, “A frequent Creationist and ID claim is that there is no known observable process by which new information can be added to the genetic code of an organism.” The reference is to a book written in 1997 by an engineer, but nothing is mentioned about the current literature available on this topic. During the 1990s, not much was known about information processing involving DNA beyond the ability to specify protein sequences. No competent creation scientist believes that bacteria, for example, cannot add DNA to their genome. Virtually all YEC scientists know that plasmids can be added and lost by bacteria, not to mention the multiple forms of HGT bacteria use. In a recent paper, Truman (2015) pointed out that sophisticated coded information systems are both open and adaptable.

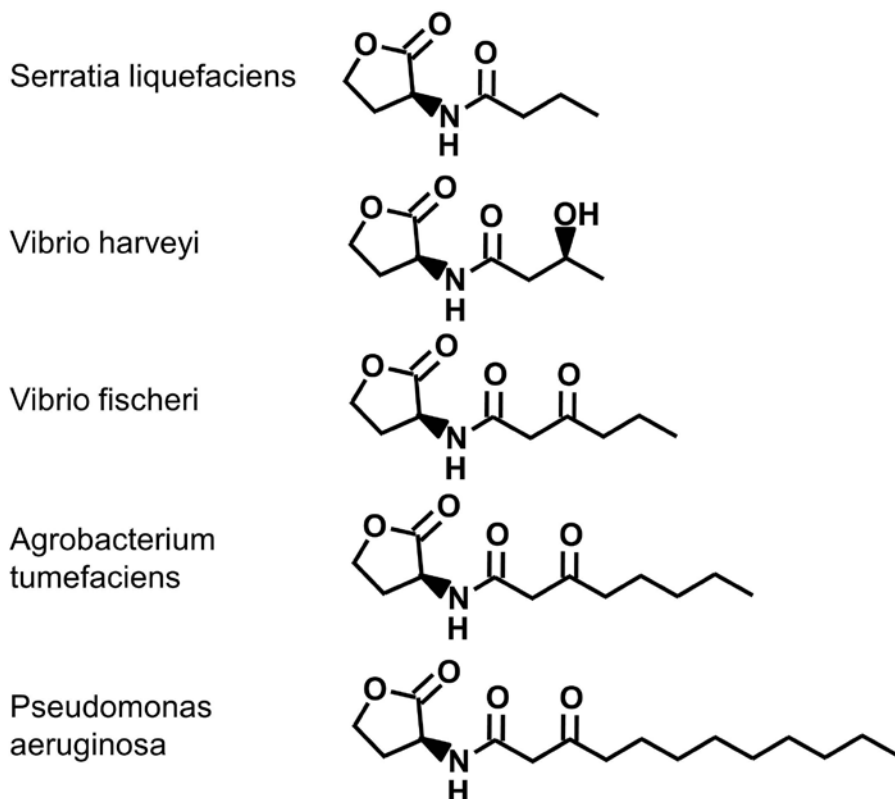


Figure 5. Signal molecules used by different species of bacteria.

Codes Cannot Arise Naturally

The main thesis of this book is presented up to the beginning of Part VI, after which different topics are introduced without the same clear structure seen previously. Nothing here is new to those following the YEC professional literature. Chapters 18–19 discuss DNA processing as a language, chapter 20 addresses irreducible complexity, and chapter 21 emphasizes that codes cannot arise naturally.

Chapter 23 presents a huge financial award to “the first person who discovers a natural process which produces a communication system without having to design the encoding and decoding rules in advance.”

I am convinced that this is indeed a fool's errand, but evolutionists have shrugged off inconvenient details related to a naturalist origin of life for years. However, Marshall is leaving little if any way to identify truly creative acts. He frankly admits, "Half the thesis of this book is that randomness does not create codes . . . the other half of this thesis is that the origin of life required the creation of codes, and that non-random, linguistic adaptations of DNA continue to create codes and thus drive biological evolution" (p. 282).

Basing one's case on only this one central theme, without revealing the massive difficulties in far more detail, will not be enough. How often have single-punch, knockout-attempt arguments like this been deflected by evolutionist claims that the conditions billions of years ago were so different that we cannot know what happened and therefore need not worry about it. The excuses can even sound highly sophisticated, like the claim that such things are the "inevitable emergent ends of nature's deep structure" (Denton, 2016, p. 117).

In Barbieri's seminal book on biological codes, we read that "organic codes are there, that they have always been there, from the very beginning" (Barbieri, 2003, p. 7). But throughout this otherwise very illuminating book, I found no suggestion that this admission led the author to belief in a creator, far less the God of the Bible. After defining codes, Barbieri was then careful to inform his readers right up front that "this does not mean that a correspondence between two independent worlds must be the result of a conscious activity" (Barbieri, 2003, p. 5), and during the remainder of the book, Barbieri seemed to blithely assume the genetic code arose with no divine contribution.

As another example, in *The Implicit Genome*, Dr. Lynn Caporale claims that "protocols become an important substrate for evolution, and their appearance under natural selection is

inevitable" and that "multiple examples in this book illustrate that natural selection can favour the evolution of whole protocol suites and their interactions, which in turn massively accelerates the acquisition and sharing of functional adaptive change" (Caporale, 2006, p. 297). Note that for her, codes are merely a subset of protocols.

The YEC approach has been to take a holistic view of the entirety of nature and God's creative activity. By foolishly abandoning the battle for a young earth and all evidence for direct divine fingerprints, those wishing to avoid scientific and theological conflict through a range of strategies from compromise to outright surrender have provided endless loopholes for atheists to avoid confronting many hard questions.

From chapter 24 to the end of the book, Marshall argues that intelligence must be involved at some point, or codes could not have arisen, but he also argues that essentially everything else in biology might be explainable through natural processes, some of which are discussed below. So, when he embraces the dualist view and asserts the human mind is nonphysical (p. 233), we are left with uncertainty as to what he is proposing. His model is not clear, since he thinks cells might be self-aware (chapter 19). How does Marshall's view differ from an apparent atheist like University of Cambridge professor emeritus Dennis Bray? In his *Wetware: A Computer in Every Living Cell*, Bray (2009) argues for a naturalist source of consciousness already present in single cells and simply attributes evolutionary refinement for its higher degree in humans.

Adaptability Is Not Evolution

YECs have argued for decades that God created the means to generate rapid variety, such as chromosome crossover when producing new gametes. How else would the rich variety we see have arisen from the animals that survived

the Flood? YEC Dr. Lightner pointed out, "Within the context of creation, the development of genetic diversity has been a means by which God has enabled his creatures to adapt to the many different environmental niches they occupy today (Genesis 1:22; 8:17; Isaiah 45:18) . . . God designed meiosis in a way that naturally tends to increase diversity" (Lightner, 2013). YEC biologist and theologian Dr. Reinhard Junker with *Wort und Wissen* in Germany is a walking library on the topic of rapid adaptability. Worldwide, YEC scientists independently concluded years ago that high variety and adaptability reflect God's anticipatory, holistic design of nature.

As Marshall comes to the end of his book, I can't help wondering if he is comfortable that he is reasonably close to a satisfactory old-age model of creation. He challenges the reader on page 265, saying, "You can tell yourself stories of junk DNA and vestigial, or you can ask why those things are there," and then on page 275 we read:

Another case in point is the matter of vestigial organs, the organ-in-your-body version of junk DNA. There is no such thing as useless organs; every organ in your body has a function, even if, like those whale legs, Evolution 2.0's Swiss Army Knife is saving it for a rainy day. Yes, even that troublesome appendix.

From the YEC point of view, the door is not only wide open, but we will roll out a red carpet toward anyone with such views.

After this long journey and soul-searching, if Marshall is now willing to believe whale legs are not useless after all, he should review his earlier premise that it proves whale evolution tens of millions ago from an earlier ancestor (p. 14)—even though we read again and again that Marshall knows that biological change can easily occur in a handful of generations. For example, on page xix he confirms that "weeds to wheat didn't

take millions of years, it might have only taken 100 generations to reach its current form,” and on page 259 he states, “Evolution . . . isn’t gradual; the majority of measurable progress occurs in short periods of time, followed by long periods of general stability.”

Having now persuaded himself that his childhood beliefs in God were correct, Marshall would make quantum leaps in his progress and understanding if he would open himself up and let the Creator of the genetic code, who revealed his thoughts in the Bible, provide the conceptual guidance needed. The Bible speaks unmistakably of miracles that occurred almost instantly, despite giving an illusion of false history. When Jesus calmed a violent, life-threatening storm, the waves did not begin to subside in a normal, unremarkable process over the next hours; rather, there was suddenly a great calm (Matthew 8:26; Mark 4:39; Luke 8:24).

Marshall need not worry that irrational, blind faith is demanded by God and that he would have to abandon normal scientific reasoning and observation (p. 8). Belief in God and miracles is not a research killer, especially since we are talking about historical and not repetitive, empirical science here. One notices a general pattern in biblical miracles where there is often a preliminary buildup and anticipation before something happens, then a miraculous activity associated with some aspect of human experience makes the miracle at least comprehensible, and finally evidence remains that indeed something miraculous had occurred.

The reader can confirm this observation with miracles of their choice. In Genesis 19 God did not simply make Sodom disappear or have it deteriorate naturalistically over millions of years. Instead, Lot was warned the city would be destroyed, brimstone and fire then rained down from heaven, and then for years afterwards everyone could see the effects. In Exodus 7 Moses told Pharaoh

in advance that God had instructed him to strike his rod upon the waters and they would be turned into blood. Afterward, everyone could see the effect of dead, stinking fish. The destruction of Jericho (Josh. 6) shows the same pattern.

In the pattern we see, some kind of action immediately precedes the miracle, as a kind of breakpoint to alert when the miraculous will be initiated. Yet the action itself has no causal effectiveness. Whether hitting water with sticks (Exod. 7:20), blowing trumpets before walls fall (Joshua 6:20), cursing bad young men (2 Kings 2:24), cursing a fig tree (Mark 11:21), or touching blind eyes (Mark 8:25), none of these actions mechanistically caused the miracle; they only provided a human reference point for the miracle.

Review John 2:1–11. If Jesus had instantly caused empty jars at the wedding to be full of wine, it would have been incomprehensible and difficult to recognize that a miracle had really occurred. But by having the empty jars first filled with water in front of everyone (John 2:6–7), the “break point” to the supernatural was prepared. Conversion of water to wine had at least the chance of being processed mentally, whereas producing wine instantly from nothing is such a stretch that most observers would suspect a trick (e.g., the jars were not really empty). Distributing bread to thousands of individuals made the miracle more comprehensible than if everyone suddenly had a full stomach (Mark 6:41). And the effects afterward of the miracles were then obvious for everyone to confirm, whether by viewing the baskets of bread left over or by being able to drink the wine.

No, God often generously leaves comprehensible footprints behind His miracles in our physical world that help confirm something very special has been done.

Evolution 2.0 does not mention Jesus, miracles, or salvation, so of course we cannot expect much in the way of

groundbreaking insights. The author is strongly urged to reexamine his deep time evolutionary assumptions.

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Notes from the Panorama of Science

Stones to Stonehenge: How Did They Do It?

Stonehenge, located in southern England, is one of the best-known ancient stone circles in the world. It is comprised of larger stones called sarsens weighing about 70,000 pounds each and smaller bluestones weighing about 6,000 pounds each. Sarsen is a type of extremely hard sandstone, and these stones were quarried about 20 miles north of Stonehenge. The smaller bluestones are a variety of rock and were quarried in the Preseli Hills of southwest Wales, about 150 miles west of Stonehenge. Approximately 75 sarsens and 80 bluestones were used to build Stonehenge. These huge stones were set in place by men with an obvious understanding of stone masonry and astronomy before 2000 BC!

How did they move these massive stones from the quarries to the construction site? A popular idea is that each sarsen was placed on a wooden sled and pulled by about 200 men using ropes to roll the sled over logs. Supposedly it would have taken about 12 days to move one sarsen from its quarry to Stonehenge. Theoretically, the bluestones were moved over water as well as land from their quarry in Wales (Richards, 2015).

Based on the impact of the Genesis Flood, ice is a possible solution for moving these massive stones to Stonehenge. How could a worldwide flood lead to an ice age? The Bible says the entire planet was covered by a flood (Genesis 6–8). The “fountains of the deep,” movement of continents, and heavy rain caused the oceans to become very warm. During and after the Genesis Flood, explosive volcanic eruptions produced enormous ash clouds that prevented solar radia-

tion from warming the earth. Rapid evaporation from warm oceans produced torrential rains, and the cooler atmosphere produced enormous snow accumulations in northern and southern latitudes, as well as in higher elevations. The

cooler air also prevented all the snow from melting each year. This resulted in an ice age that may have peaked about 500 years after the Flood. The Flood occurred in 2348 BC (Wright, 2012), and the peak of the Ice Age occurred around 1848 BC (Oard, 2004). Stonehenge was built during this time period.

It is possible that Stonehenge’s builders used their cold climate to make ice roads by pouring water over frozen ground. This made a substantial slick surface for sliding sarsens on sleds. Cold water poured under the sleds while they were moving would make the surface even slicker. The sleds could have been pulled by wild, large cattle called aurochs (Figure 1). Aurochs, which weighed up to 3,300 pounds, lived in southern England. Skulls and bones of aurochs have been found during excavations at Stonehenge (Richards, 2015). Interestingly, the last aurochs died in Poland in AD 1627 (Wikipedia, 2017a).

At the peak of the Ice Age the sea level may have been 360 feet lower than at

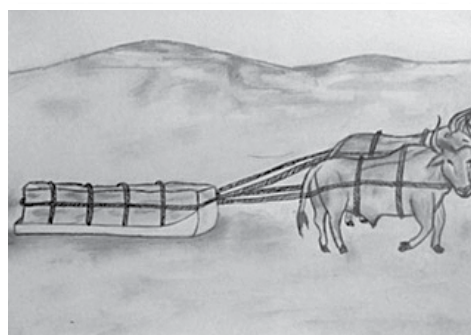


Figure 1. Aurochs pulling a sled. Drawing by Kathryn Clough.

present due to the tremendous accumulations of snow and ice on land (Prigg, 2014). The lowered sea level created land bridges that connected Ireland, England, and France during the ice age (Wikipedia, 2017b) and ex-

posed wide plains along the coasts of southern Wales and western England. This made it possible to use the ice road transportation technique for moving the bluestones from Wales to Stonehenge. After the stones arrived at Stonehenge, snow and ice ramps may have been used to place them in the desired positions using aurochs guided by the builders. Aurochs may have substantially reduced the number of men needed to build Stonehenge.

It is known that in China between AD 1406 and 1557, very large rocks were moved from their quarry on sleds over an ice road that was 43.5 miles to build the Forbidden City (Rathi, 2013). Ice roads may explain how massive stones were moved to build Tiwanacu and Puma Punku in western Bolivia, the giant walls of Sacsayhuaman near Cusco in Peru, the temples at Baalbeck in Lebanon (Blog Word Mysteries, 2012), and other arrays of standing stones found in France, the Orkney Islands, Scotland, Korea, China, and other locations (Wikipedia, 2017c).

Application of the impact of the worldwide Flood and the Ice Age caused by the Flood described in the Bible is a key element in understanding Earth's history. This unique, cataclysmic event helps explain what is seen in geology, biology, zoology, paleontology, and sociology. It also helps explain how large stone structures could have been built in ancient times.

Lawson L. Schroeder, D.D.S.

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Letters to the Editor

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Can Creationists Accept Fossil Forests as Being in Situ?

In a recent issue of this quarterly (CRSQ, Fall, 2016), Timothy Clarey and Jeffrey Tomkins carefully analyze a fossil forest that “is possibly the best-preserved example of an in situ lycopod forest in the world, and possibly the first identified in a Flood context” (Clarey and Tomkins, 2016, p. 113). The forest they have studied is the famed “Fossil Grove” in Glasgow, Scotland, which was discovered exactly 130 years ago. What sets apart their study as being more valuable than other similar creationist studies is that for the first time they have set forth a list of stringent requirements that are necessary for identifying a truly autochthonous (in situ) forest in contrast to an allochthonous one (i.e., Flood transported). The failure to utilize some of these criteria can only lead to confusion in the ranks of creationists.

Creation scientists, especially those with a knowledge of paleobotany, can now apply these criteria to perhaps several dozen purported fossil forests around the world found in geological strata from the Devonian through the Pleistocene. Not all forests claimed to be in situ will qualify as such when the Clarey and Tomkins criteria are applied. The starting point in the search for additional in situ forests should be the Junggar Petrified Forest, Xinjiang Province, China. The result of this initial search should be that creationists now have available for comparison the second most convincing in situ fossil forest, which needs to be properly inserted into a Flood model. This forest is well exposed above the surface on the edge of a major fault-bounded, very deep sedimentary basin known as the Junggar

Basin (McKnight et al., 1990). The forest is said to be preserved in Upper Jurassic strata and is accurately measured and displayed in a single horizontal layer (see Figure 1). The stumps are unusually well preserved, except for nearby piles of loose pieces of petrified wood indicating where trees once grew (denoted by “rp” in Figure 1). Immediately one notices that one of the criteria for an in situ forest is fulfilled—the nonrandom spacing of upright stumps. One would expect that in a flood setting the stumps would be piled up into heaps, especially due to the fact that roots are usually sharply truncated and thus would hook one stump against another when transported, as one can detect today in fluvial deposits, where piles of tangled trees are found. This is not the case here.

Other criteria mentioned in the Clarey and Tomkins article buttress the initial conclusion that the Junggar stumps are in situ. One is the preservation of roots spread out in all directions from the stump without apparently being broken off or truncated short, especially convincing when roots penetrate the underlying soil at an angle leading downward away from the stump. The Clarey-Tomkins criterion is that if the roots sloped downward at an angle greater than 30 degrees, this is good evidence of in situ growth. The Junggar studies do not provide creationists with root-slope angles, but the pictures in those studies clearly portray a “root flare” on several trees that reveal roots sloping at an angle into the underlying soil (McKnight et al., 1990; Hinz et al., 2010).

The lengthy spread of the roots is another point favoring the in situ model.

One stump (stump A in Figure 1) has roots spread out in all directions more than one meter from the stump and surprisingly one long root that extends outward 12.5 meters. This unusually long root would of itself argue against the transport model. All the many transported trees lying in a prone position in the immediate area have their roots sheared off. In the 1980 eruption of Mount St. Helens the transported trees leaving stumps in an upright position along the North Fork of the Toutle River have all their roots truncated to a length generally less than one meter and in most cases very close to the stumps themselves (author’s personal observation, 1981).

Flood geologists who wish to have both the Glasgow and the Junggar forests be preserved as part of Flood deposits would have to come up with modern analogs for stumps dropping out of a quiet column of water and would have to argue that they could sink with the same spacing as when they grew in a living forest. The modern analog currently is Spirit Lake at Mount St. Helens (Coffin, 1983). This analog indicates that stumps will sink faster out of a floating position than logs would. Stumps can supersaturate with water faster, and their roots often contain small-to-large boulders within the root ball, making it much more likely the stumps will sink upright and with much greater rapidity than logs. An examination of the extensive mat of logs still floating at Spirit Lake more than twenty years after the 1980 eruption fails to find any stumps floating among the logs; only straight logs were left floating (author’s

personal observation, 2001). The Junggar stumps should have been sorted out and deposited at a lower horizon than

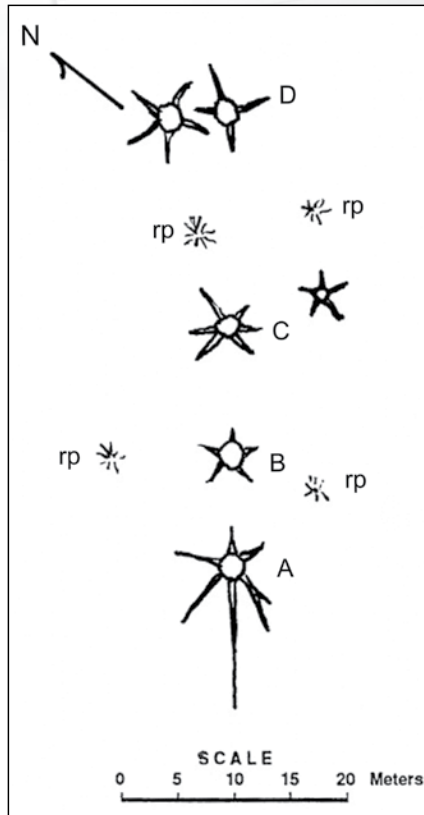


Figure 1. A schematic horizontal view of the fossil forest in the Junggar Basin, western China. The upright stumps pictured here all have non-truncated roots extending outward as in the diagram, a meter or more in length. Also included are rubble piles (denoted as “rp”) of fragments of petrified wood, assumed to be the remnants of former stumps also presumably rooted in situ. In all cases the spacing of the stumps is non-random. A clear evidence of non-randomness is the alignment of stumps A through D following the same axis as the 12.5-meter long root of stump A. Stumps A through D all have a diameter slightly over 2 meters, suggesting they began growing at approximately the same time, perhaps commencing growth over a rotted “nurse log” or a paleofault. (Redrawn from McKnight et al., 1990).

the prostrate logs were. The Junggar forest, however, is seven meters above an adjacent bed composed exclusively of logs lined up in the direction of a predominant current flow. The beds of prostrate logs below and upright stumps above should have been reversed if composed of sinking uprooted trees in a large body of water, based upon the Mount St. Helens model.

The total nonrandom arrangement of the Junggar stumps is highlighted by the direct alignment of four stumps, including the one stump with a root extending 12.5 meters out. Incredibly the alignment of this root is in the same direction as the four stumps, which are labeled Stumps A through D (Figure 1). One explanation for the straight-line alignment is that a previously fallen monarch tree, when rotted, may have offered fertile soil for the new growth of trees, much in the manner of “nursing logs” in the Pacific Northwest forests of the United States. Another explanation is that the alignment may have been caused by a paleofault that allowed extra rainwater to collect and thus provided extra nourishment for rapid tree growth. From a Flood geology standpoint, the alignment could have been caused by the movement of Floodwaters in a single direction. In this case it would have been a movement from southwest to northeast because the long root would be like the tail of a kite trailing behind its parent stump if transported (see the compass directions based on “N” or North in Figure 1). This hypothesis, however, is eliminated by the fact that paleocurrents for the stump horizon were flowing either east to west or west to east. A total of 15 horizontal logs at the same level as the stumps have been measured with compass measurements, which show in most cases a nearly exact east-west alignment (McKnight et al., 1990). This conflicts with the above hypothesis that the four stumps A through D were aligned by Floodwaters. The extra-long root especially should have

been oriented in an east-west direction if transported.

Of special interest to Flood geologists is the question of where to put the Flood in the Junggar basin, which is known to have several thousand feet of sediments below the fossil forest—sediments that have been designated as Carboniferous, Permian, Triassic, and lower to middle Jurassic (McKnight et al., 1990). The Jurassic/Cretaceous sediments alone have a composite thickness of 1400 meters where the fossil forest is located (Eberth et al., 2001). The Upper Jurassic beds containing this forest are overlain by Cretaceous beds that have an abundance of dinosaur fossils, including dinosaur eggs in scattered locations around the basin. If the Flood is said to have ended by the Upper Jurassic in the Junggar basin, then the dinosaur fossils would definitely have to be considered post-Flood. Current Flood models do not allow the Flood either to end in the upper Jurassic or to begin as late as the Cretaceous. If the above in situ interpretation of the Junggar fossil forest is equally as convincing as the Glasgow fossil forest, then today’s Flood models applied to western China will have to be drastically modified.

The Grand Canyon area has one in situ fossil forest that likewise may force a drastic revision of contemporary Flood models. It is the Blue Mesa Stump Field located in the famed Petrified Forest National Park to the southeast of Grand Canyon National Park, both in Arizona. An application of the Clarey-Tomkins criteria results in the conclusion that most likely the petrified stumps outlined in Figure 2 are all in situ. Figure 2 has been re-drawn to the same scale as Figure 1. A comparison of just the spatial arrangement of the stumps in both figures suggests nonrandomness and a spacing comparable to coniferous forests today with large conifers. Both fossil forests consist exclusively of conifers. The Blue Mesa Stump Field has a total of 40 stumps that “are generally

separated by 3 to as many as 11 m” (Ash and Creber, 1992, p. 304). This spacing puts the stumps not too close together and not too far apart to preclude being an in situ arrangement. Thus, one of the key in situ requirements is met.

Another one is clearly satisfied when it is noted that “the upright stumps occur typically in mudstone usually and have long unbroken roots which extend downward some distance below the trunks” (Ash and Creber, 1992, p. 304). This characteristic alone would argue for an in situ growth picture in keeping with what is characteristic of the lycopod stumps in the Fossil Grove of Glasgow. The long roots are like the legs of a spider that hold the body up off the ground. No transported stumps in riverbeds such as the Toutle River near Mount St. Helens or the coastal rivers

emptying into the Pacific Ocean in northern California have roots capable of suspending the stump well above the riverbed like spider legs. One example of an upright transported northern California stump is pictured in Figure 3 (author’s personal observation, 2017). One should note the sharply truncated roots in the upright stump and in the nearby prone stump as well. The base of the upright stump is elevated perhaps 4–6 inches above the mudflat, when it would have been much higher if all the roots were not truncated. The one Junggar stump with the ultra-long root portrays the stump base at a higher level than the downward-sloping roots all around it. The stump base is elevated many feet higher above the root ends, not just a few inches. All creationists are agreed that sharply truncated fossil

roots are indicative of transport. The converse ought to be true that the lack of truncation in fossil roots should be solid evidence for being in situ.

The Arizona stump field is in the Chinle Formation, which is Triassic and which north of the Grand Canyon overlies the highest formation of the Grand Canyon itself, the Kaibab Limestone at the top of the Permian. It is interpreted in situ by means of one additional Clary-Tomkins criterion, the discovery of a paleosol at the level where stumps are rooted. According to Ash and Creber (1992, p. 305), the stumps all lie on a B horizon paleosol. Among creationists, the interpretation of “paleosols” within the fossil record is extremely controversial (Klevberg and Bandy, 2003a, 2003b). The possibility of paleosols existing in all three fossil forest beds—Glasgow, Junggar, and Blue Mesa—should never be the lead argument for determining whether the stumps are in situ, but only a corroborative argument when the other criteria have already been satisfied.

From the standpoint of the Flood (which I support as universal and not local), the Chinle Formation of the Petrified Forest either marks the termination of the biblical Flood or the commencement of the Flood at least for the area of northern Arizona and southern Utah. If the latter interpretation holds true, then none of the Grand Canyon deposits can be considered Flood related. One problem for a worldwide diluvial interpretation is that there are no valid evidences of angiosperm fossils in the Chinle or below, even though the Chinle is perhaps the richest formation with petrified wood around the world, having literally tens of thousands of fossilized trees. Creationists have established the fact that by far most trees in the Chinle have been transported by means of large bodies of water, based on an examination of over 700 prostrate logs (Chadwick and Brand, 1974). An analysis of the occasional leaves, twigs, and branches besides the abundant wood uncovers a total of 50

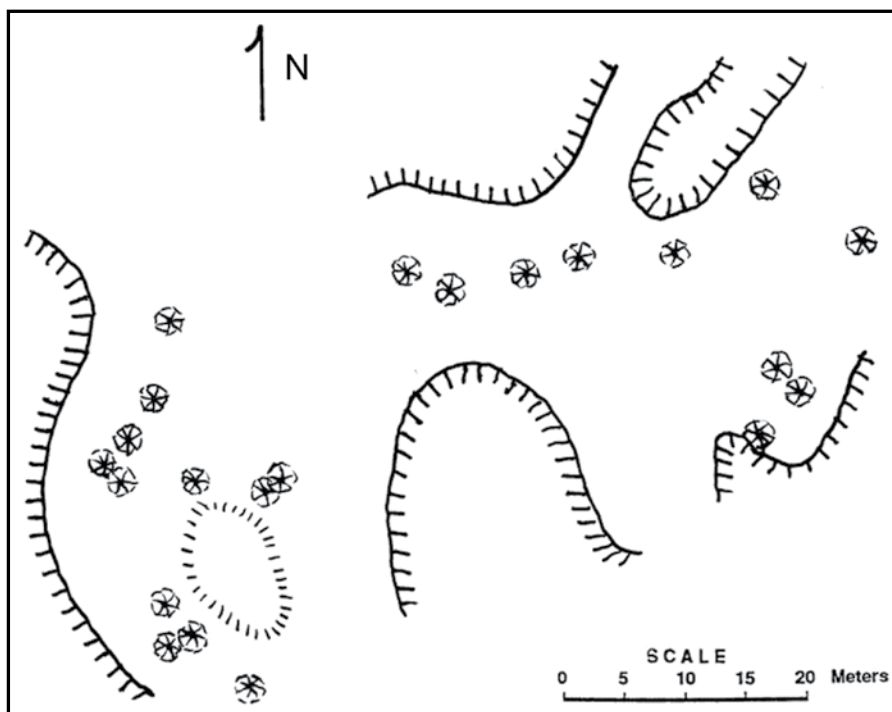


Figure 2. A schematic horizontal diagram of the Blue Mesa Stump Field, Petrified Forest National Park, Arizona. The stumps are suggested as being in situ and are located on a small flat raised plateau, surrounded with water-eroded gullies. The spacing of all the stumps indicates non-randomness. Some stumps have twin trunks, just as modern conifer forests have twin trees with no spacing between them. (Re-drawn from Ash and Creber, 1992).



Figure 3. Two transported stumps on the small bay at the Salmon Creek outlet into the Pacific Ocean just north of Bodega Bay, California. Note the sharply truncated roots that are less than 0.5 meters in length. The writer is pictured here for scale (W. Johns, 5'9" in height). The picture was taken on 6 May 2017, and the stumps were undoubtedly transported here during the heavy flooding of the winter, 2017.

genera with 40 species represented but no angiosperms present. Where are the angiosperms? A recent floristic study of the Junggar beds uncovers a rich flora of non-angiosperms but no traces of angiosperms (Hinz et al., 2010). Where are they? If the Flood ended in the upper Jurassic of western China or in the Triassic of northeastern Arizona, a total of 300,000 species of angiosperms, according to today's count, are strangely absent. Was there an angiosperm creation after the Flood? This proposal would be anathema to creationist teaching, which upholds Genesis 2:2, where it is announced that the Creator completed His work of creation at the end of the six days.

The alternate view to what is presented here and in the excellent study of

Clarey and Tomkins is that virtually all "fossil forests" are allochthonous if the Flood is responsible for most of the fossil-bearing sediments. This view is credible if one takes the position that Scripture itself mandates that all pre-Pleistocene sediments are the product of a one-year Flood. Such a position admirably starts with Scripture but unfortunately fails to set up a list of rigorous requirements to differentiate allochthony from autochthony. In that case the above biblically-based approach is more theological than scientific in its interpretation of the factual data of geological science. Clarey and Tomkins ought to be commended for establishing criteria totally rooted in science for differentiating which forests are in situ. In a sense their approach is truly scientific. Theirs is perhaps the first

creationist paleobotanical study to list very detailed criteria that are not dependent at all upon Scripture. To the credit of Flood geology previously, creationists have established some criteria useful for identifying allochthonous tree deposits, such as the presence of roots completely broken and truncated in upright stumps. But the challenge now is for creationists to add to the list of criteria for determining what may or may not be truly in situ fossil forests.

Warren H. Johns, Ph.D.
wjohns@llu.edu

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Response to Warren Johns

I appreciate your recognition of our ef-
 forts to establish scientific criteria for in
 situ pre-Flood forests. Dr. Tomkins and
 I tried our best to keep our approach
 steeped in science and, at the same
 time, committed to the historical truth
 of the global Flood. And I applaud your
 attempts to apply our criteria to other
 claimed in situ sites.

Although I have not studied the
 Junggar Forest in China or the Petrified
 Forest in Arizona in any great detail,
 I do suggest a little more caution may
 be needed. The description presented
 of the Junggar Forest claims there are
 several thousand meters of Flood-related
 sediments beneath the layer containing

the tree stumps. Therefore, this would
 not be considered an in situ forest, as it
 fails our Criteria #5 (Clarey and Tom-
 kins, 2016). A truly in situ forest cannot
 have substantial amounts of Flood-
 related sediment beneath the tree level.

In contrast, the Petrified Forest, with-
 in the Chinle Formation in Arizona has
 a better possibility of being in situ. My
 unpublished mapping of the geologic
 columns across North America shows
 most of the exposed Grand Canyon-
 equivalent sedimentary layers (Paleo-
 zoic) thinning dramatically in parts
 of eastern Arizona, including the area
 beneath the Petrified Forest. Therefore,

this site may indeed fulfill our Criteria
 #5. A more detailed study of this area
 may be warranted in order to establish
 if this site is truly in situ.

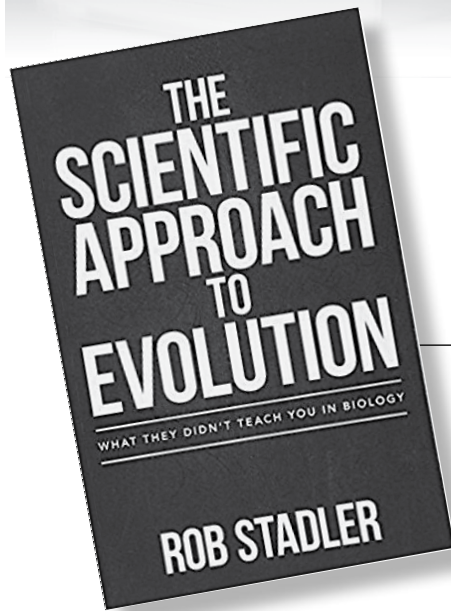
I hope others find our paper helpful
 and informative.

Timothy Clarey, Ph.D.
 Dallas, Texas

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 vestigation into an in situ lycopod forest
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Media Reviews



The Scientific Approach to Evolution: What They Didn't Teach You in Biology

by Rob Stadler

CreateSpace Publishing,
Charleston, SC, 2016,
203 pages, \$10.00

This book focuses on six criteria the author uses to determine the level of confidence of a specific scientific assertion or explanation. These criteria are:

1. Have the results been supported by repeatable experiments (a process called replication)?
2. Can the results be directly or at least indirectly measured?
3. Is the inference based on observation or controlled experiments or, conversely, on inferences from historical events?
4. Is any evidence of bias present?
5. Have the researcher's assumptions been disclosed and justified?
6. Are the judgments that produce the results overstated?

Author Stadler uses several examples to illustrate his method to divide science into two levels, low- and high-level confidence, based on an evaluation of each of the six criteria. One example compares statin drug research with both microevolution, where the six criteria

are met, and macroevolution, where the criteria are not met. In Stadler's area of biomedical research, all six criteria must be met in order to achieve FDA approval. The author is a Harvard PhD in biomedical engineering with over 100 US patents in medicine.

The high-confidence microevolution studies on evolution, which Stadler cites in some detail, can be summarized as follows:

1. Michigan State University's Lenksi *E. coli* experiment produced a combination of two new mutations. This achievement required 33,000 generations and more than 10 trillion (10^{13}) organisms. The result of the two mutations was a bacterium strain that was able to metabolize citrate in the presence of oxygen. In the wild, these mutated bacteria suffered from a major survival disadvantage called a *fitness cost*. Thus, the two mutations provide an advantage only in the artificial laboratory environment.
2. A malaria "experiment" required one hundred million times one trillion (10^{20}) total organisms in order to develop resistance to the insecticide chloroquine. This resistance was achieved by a combination of four to eight point mutations. The life

cycle of *Plasmodium falciparum* is very complex, so it is difficult to estimate a number of generations in human decades that this experiment required, but at least several thousand generations were necessary, far longer than evolutionists postulate was required for humans to evolve from their common ancestor of the chimps.

3. In Ann Gauger's mutant *E. coli* experiment on tryptophan synthase, she included 9,300 generations and at least 1 trillion (10^{12}) organisms in an effort to repair the two mutations she bred into the bacteria in her research. The desired repair of two mutations was never achieved.

Each of these studies used focused, consistent, and intense selective pressure to ensure that natural selection was at work (p. 121). Conversely, as documented in chapter 6, each of the studies of claimed examples of macroevolution that were carefully evaluated failed to achieve the high-confidence science level.

Jerry Bergman
jerrybergman30@yahoo.com



Reviews

Was Darwin Wrong?

by Richard Pittack

Waldens Computer Services,
178 pages. 2011, \$20.00

This is a book-length response to an article by David Quammen (also titled “Was Darwin Wrong?”) published in *National Geographic Magazine* (2004). Contrary to the evolutionary thrust of the article, Pittack answers *yes* to the question. As the Quammen article illustrates, *National Geographic* was once purely a journal about world geography and the various peoples of the world, and it has now become a major apologist for Darwinism.

The public acceptance of this *Geographic* article is illustrated by the fact that David Quammen was the recipient of several related awards. He advocates Darwin’s evolutionary theory of natural selection and variation of plants and animals without limit. Pittack’s book is a direct refutation of every principle argument that Quammen uses to defend the pro-Darwinian position.

Pittack did a survey of specifically why people believe in evolution. The

most common reason was the existence of ape-men and, more generally, the alleged scientific evidence for human evolution (p. 59). Other larger and more scientific surveys have produced the same result.

Much of the material Pittack covers is familiar to those involved in the creation movement. One area Pittack focuses on is that of problems in taxonomy, both creationist and evolutionist. For example, he notes that creationists believe God brought life into existence, but an examination of species lists in the Linnaeus *Systema Naturae* differs from that of modern creationists. Linnaeus divided many of the Genesis kinds into “species.” Linnaeus concluded that horses, asses, and zebras were all different Genesis kinds, in contrast to both evolutionists and special creationists who believe these animals are varieties of the same “kind.” Linnaeus made a similar mistake in the naming of plants. For example, Linnaeus put spring wheat and winter wheat in separate species, which creationists would recognize as one kind or one species.

One disadvantage Linnaeus had was a lack of detailed information about these life-forms, including the genetic

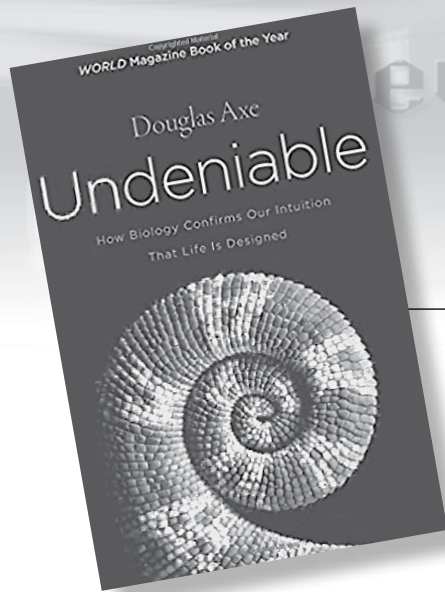
and phylogenic information available today (p. 69). Pittack discusses similarities between chimps and humans: “What must at this point be discussed ... is the similarity of human and chimp DNA. This is the traditional argument presented by evolutionists. The DNA serves as evidence to prove that there is an evolutionary relationship between humans and primates” (p. 69). In truth, the difference is actually close to about 15%, not 1% as once claimed, or close to one-half billion base pairs difference between the two groups.

This book does an excellent job of analyzing in detail a special Darwin issue of one of the largest circulating popular magazines in America. At face value, the article makes a good case for Darwinism. When looked at in more detail, as this book does, it is clear that the case for Darwinism is unsupportable.

Jerry Bergman
Jerrybergman30@yahoo.com

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Undeniable: How Biology Confirms Our Intuition That Life Is Designed

by Doug Axe

Harper One, New York. 2017,
298 pages, \$26.00

This book documents the intuition common in most every child that life, the earth, and the universe were all designed. To support this title, Axe quotes several leading Darwinists who discuss how teachers and others can help children and adults reject this common conclusion. Instead, they advocate the Darwinian worldview that life was not designed but rather evolved due to the outworking of natural law, chance, and an enormous amount of time.

The introduction relates an event Axe experienced that illustrates his theme, namely that peer pressure is a major factor influencing many conclusions, especially Darwinism. The example Axe relates was a graduate class exam question when he was a Caltech student. The question he was concerned about asked, “Which of the biological macromolecules is apt to be the first living molecule?”

Axe knew where this question was going, so he first answered it in the way the professor wanted. Then he added why he did not believe it was possible that any molecule, no matter how large, could be the first life-form. When his

paper was graded, points were deducted for giving his opinion. Axe notes that “we as students were expected not only to know current thinking in biology but also to accept it without resistance” (p. 3). Axe added, “I had learned my lesson. The stream of scientific consensus flows with an almost irresistible current” (p. 3).

As Axe documents, this is an example of pure indoctrination, not education. Professors should be challenging students to both evaluate and reason about the issues they cover, not just mindlessly repeat what they are told. And this event happened at one of the most elite colleges in the world that required very high admission standards.

Axe also recounts meeting a distinguished scientist, a former friend, Sir Alan Fersht, whom he had worked under as a research scientist at Cambridge University in England for 12 years, from 1990 to 2002. This meeting was, once again, another example that illustrates dogmatic thinking. Their conflicting views on origins fractured their formerly good relationship. During this chance meeting, after discussing the issue again, Axe noted, “We settled for something less than closure” (p. 2). Axe attempted to reaffirm their friendship, even if his former friend did not. After relating other similar events, Axe concludes that the issue of origins depends less on facts than it does on bowing to peer pressure.

The rest of the book reviews in detail these facts and Axe’s experiences with Darwinian dogmatism related to origins.

A research experience relates to the fact that only three major classes of 20 amino acids exist, those that are water-loving (hydrophilic), water-repelling (hydrophobic) and ambivalent (neutral) (p. 34). The once common view was all that was required for a functional protein to fold into its proper conformation was the existence of the approximate number of hydrophobic and hydrophilic amino acids in general areas of the amino acid chain (p. 33). Given this, it was believed the amino acid chain would fold into the shape required to serve its specific function in the cell.

Axe found that experiments showed this simplified view was clearly incorrect. To determine this, Axe performed experiments on two different enzymes. One study was on proteins that catalyzed a specific set of chemical reactions. In 1996, one study found that a particular small enzyme continued to do its chemistry even after all its interior amino acids had been randomly replaced with water-repelling alternatives. Shortly after Axe began to work on the problem of the effects of the amino acid substitution, he found that in contrast to this study, both the enzymes he was testing were completely inactivated after only a fraction of their interior amino acids were haphazardly replaced.

Axe then replaced the exterior amino acids in groups consisting of five or ten amino acids with alternatives that were very similar in polarity. Again, both enzymes were rendered nonfunctional long before their amino acid exteriors were fully replaced. Axe concluded that even a few amino-acid replacements could disrupt the function of the enzyme. From this research Axe concluded, “This is a significant result because it contradicted the prevailing view so clearly” (p. 35). These proteins were far more exacting about which exterior amino acids were required for the protein to function than most scientists had previously assumed. Axe later found that the same was true of many other proteins. In short, he had documented

that the ability of proteins to keep working after a small number of their amino acids are replaced—one of the main justifications of the simplified view—didn’t mean that these changes were harmless. It only meant the harm had not yet reached the breaking point. The breaking point is always reached as more changes are introduced, even changes of the conservative kind I was using (p. 35).

Amazingly, the results were rejected by his supervisor, Nobel Laureate Max Perutz, because they clearly created problems for Darwinism. His paper was eventually published in the leading molecular biology journal (Axe, 2000). Axe soon learned that “many other scientists had been offering similarly weighty challenges to Darwinism for well over a century” (p. 39). Knowing this earlier, Axe “might have reached the sobering realization of how long the scientific community can take to settle

on the truth ... I now see how the pursuit of prestige—so evident in my own life—goes a long way toward explaining how science gets stuck on certain wrong ideas” (p. 39).

A colleague of Axe, Myriam Altamirano, produced results very different from Axe’s. By using informed guesses, she was able to change an enzyme to cause it to perform the function of a different enzyme. Her paper was published in *Nature* and later retracted (Altamirano, 2000, 2002). When attempting to replicate her work, the researchers found her modified enzymes performed as well as natural enzymes because it was the natural enzyme due to contamination.

Although Axe was openly pressured to resign his appointment due to his Darwin intelligent design conclusions (p. 51), he was able to complete his research project, which was published in the *Journal of Molecular Biology* (Axe, 2004). None of his papers have been retracted as of this date, and subsequent research has largely supported all his basic conclusions.

Chapters 11 and 14 were among the best ones in the book. In chapter 11 Axe uses Richard Dawkins’s widely referenced Weasel example (pp. 198–201) to focus on the major problem for evolution. This problem is presented by the design perfection required for life to live at each stage of evolution, from a single cell to humans. Especially is the evolution from simple molecules to a living cell problematic, a topic that Axe documents is a transition that could never happen. He does this both by logic and mathematic probability.

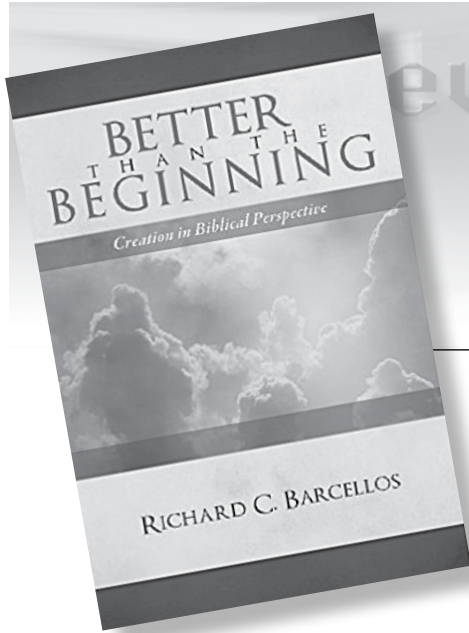
Chapter 14 covers the enormous resistance by established science to accept the clear results of solid, repeated empirical research if it contradicts their

dogma. Axe concludes from his research that the design intuition, which clearly “is intuitively obvious ... that a mere collection of atoms cannot attain consciousness. It can never become aware of its own existence,” was valid (p. 39). His goal is to continue carefully working in this area with the hope of solidifying through scientific research his design intuitions. Eventually, he believes, his work should merit the opportunity to communicate his conclusions publicly to the world. When that time comes, he is sure that science will be the best podium from which to speak and that the scientific arguments in defense of the design argument will eventually be widely accepted. He is greatly disappointed in the response to his research. His research, and that of others, is largely ignored because the Darwinian worldview is so entrenched that it becomes clear that solid research is not going to easily upset it.

Jerry Bergman
Jerrybergman30@yahoo.com

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Better than the Beginning: Creation in Biblical Perspective

by Richard C. Barcellos

Reformed Baptist Academic
Press, Palmdale, CA, 2013,
173 pages, \$16.00

Back when I first started following the creation-evolution debate and had immersed myself in an array of Henry Morris books, a particular statement he made in passing stuck with me. Morris wrote, “Somehow, [God] is bringing even greater glory to His Name, and greater blessing to His children, through the work of redemption and salvation than through His work of creation” (Morris, 1991, p. 70). The inference is that the Fall in the Garden of Eden was not a disconnected, random, or haphazard intrusion into an otherwise perfect universe but a necessary component of a broader picture of history and theology.

The inherent compartmental nature of Morris’s dispensationalism aside, the above statement spoke to the importance of an integrated theology that finds the doctrine of creation set properly within the context of a broader narrative, speaking to the *purpose* of creation as well as the *new creation* in Christ. Though the cosmos was pronounced “very good” at the completion of Creation Week, Day 7

was not the fulfillment of God’s ultimate purpose in creating the physical universe. As evidenced by the presence of the serpent, the Garden of Eden would be unlike the final consummation.

Better than the Beginning develops that sidebar from Henry Morris and fills an eschatological gap (definitely no pun intended) in creationist literature. Barcellos is careful to demonstrate the interconnectedness of the doctrine of creation with other key doctrines by surveying the broader metanarrative of Scripture. It is a reminder that the doctrine of creation is ultimately theological, not scientific, and must not be treated as an isolated, specialized field of study.

While biblical creationists have been enthusiastic to defend the historicity and authenticity of the Creation account as recorded in Genesis, such should not be divorced from a comprehensive theological framework. For this reason, Barcellos’s work will be of little interest to the apologist hoping to simply add more evidence to his arsenal for the dismemberment of evolutionary mythology. Barcellos’s approach is unashamedly presuppositional, asserting that “we should not argue about evidences. We should simply proclaim them, but within a biblical worldview. The penetrating Christian apologist will attempt to get behind the facts and arguments

to the philosophy of fact which their opponent brings to the facts” (p. 59). Barcellos explains why the truthfulness of Scripture must be our starting axiom and not a conclusion expected to be produced via the accumulation of data.

Noteworthy is the discussion of general and special revelation and the epistemological ramifications of the Fall on man’s mind. Barcellos writes, “Man’s ability to receive and acknowledge the revelation of God’s glory in creation is like trying to listen to AM radio at night. It is all distorted” (p. 48); “Man’s ability to receive and properly acknowledge the revelation of God’s glory in creation is not what it was in the beginning” (p. 50). This section reminded me of W. R. Downing’s fine treatise on the epistemological futility of the natural man (Sabato, 2016).

While the focus is primarily theological, the author also takes the time to defend a literal six-day creation, noting the ramifications of various compromise efforts. He accomplishes this by utilizing a simple and consistent hermeneutical method (the “analogy of faith” and “the analogy of Scripture”). He rightly notes, “When asking a question about any text of Scripture, the safest place to go for answers is the Scripture itself. In the case of the days of creation, God speaks. He interprets them for us through the words of Moses in Exodus 20:11 (and in other

places). *This is the divine interpretation and therefore it is infallible—it cannot be wrong*” (p. 85, emphasis mine). He concludes that “the triune God created the Son-tilted heavens and the earth for His own glory in the space of six, ordinary, twenty-four hour days” (p. 84).

There are many fine insights in this short book, and readers are likely to benefit from Barcellos’s unique approach to the study of creation. He contends that “creation and new creation are vitally related in the biblical drama of revelation. Redemption by Christ is connected to creation in the space of six days” (p. 88). Certainly, no book I have read thus far has more adequately dealt with the eschatology of creation while maintain-

ing a literal, biblical, “young-earth” perspective on the Creation Week and the age of the earth.

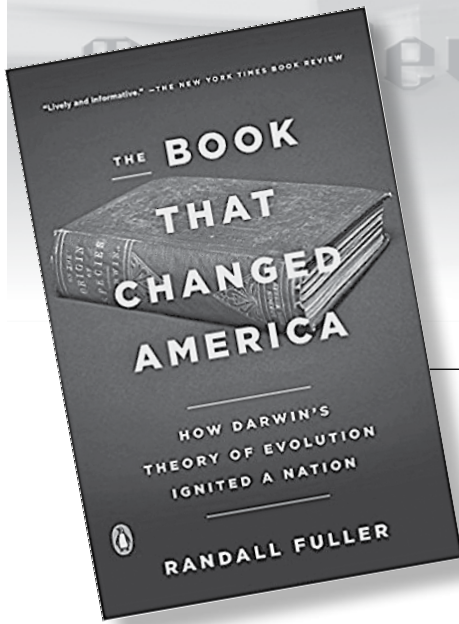
For those interested in pursuing this subject in greater depth, planned for release in the near future is Barcellos’s work tentatively titled, *Getting the Garden Wrong* (Founders Press), a preview of which can be found in, *The Covenant of Works* (2016). Also scheduled for publication this year is Lita Cosner’s *From Creation to Salvation* (Cosner, 2017). I look forward to these contributions to the study of biblical creation.

Nick Sabato

n.sabato@tutanota.com

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The Book That Changed America: How Darwin's Theory of Evolution Ignited a Nation

by Randall Fuller

Viking, New York, 2017,
294 pages, \$27.00

This is a history of how Darwin's 1859 book changed America, especially for the worse due to such topics as eugenics. This book fills an important gap in our knowledge of the history of Darwinism. In short, many leading early American writers and clergy, after they understood "Darwin's theory of natural selection ... discover[ed] that it also posed enormous threats to their other beliefs, including their faith in God and their trust that America was a country divinely chosen for the regeneration of the world" (p. x).

Much of the book reviews the effect of Darwinism on a major problem that was tearing apart America when Darwin's book was published, namely slavery. An example that Fuller covers in some detail concerns Zip, the African American who was put on display in Barnum and Bailey's circus as "Darwin's missing link" (pp. 101–102).

A common theme of the author is the enthusiastic reception of Darwin's book by many leading American literary figures, including Henry David Thoreau, Ralph Waldo Emerson, and Bronson Alcott, the father of Louisa May Alcott. All these well-known writers, and many others, were heavily influenced by Darwinism, an influence that was reflected in a short adventure novel *The Call of the Wild* by Jack London published in 1903.

The influence of Darwinism was more subtly present in other writings. For example, Thoreau wrote that empirical knowledge is finite, and after "we have exhausted its limits, we are still left with speculation, supposition, and hypotheses. And those are invariably influenced by belief in some ordering principle. For many people, that principle involves a divinity inherited from four thousand years of tradition" (pp. 193–194).

Thoreau was not the only person to raise such questions. Even Darwin thought about this concern. For example, in an early draft of his *Origin of Species*, Darwin wrote that "nature was composed of laws ordained by God to govern the universe." Soon after sending his book to Asa Gray, he wrote, "I am inclined to look at everything as result-

ing from designed laws, with the details whether good or bad, left to the working out of what we may call chance." Within a year or so, he would abandon the idea of design entirely; it was unnecessary, he realized, for his theory (pp. 193–194).

About a year later, due to the influence of Darwin, Thoreau moved "close to Darwin's position. He assumed the universe was governed by laws, but he also believed that the products of those laws occurred in a more or less random way. He hovered between design and chance, between idealism and materialism" (pp. 193–194). In the end, Thoreau placed the mystery and wonder of life within the worldview of materialism (pp. 193–194).

The work of Harvard biologist and theistic evolutionist, Asa Gray, was critical in furthering the acceptance of Darwinism and the demise of theism, even though his intent was the opposite. The other theistic evolutionist theory was the pre-Adamite theory. This view taught that "Adam and Eve were the parents of the white races, and God created another set of parents that fathered the

black races" (p. 90). The pre-Adamite form of compromise with Genesis also taught that blacks and other "inferior" races were created before Adam along with the other animals.

This theistic evolution theory soon fell out of favor, partly due to the influence of Darwin's book.

One reason it fell out of favor was because Darwinism was interpreted by many Americans who opposed slavery as teaching that all men have evolved from one common ancestor, thus all men were equal. For this reason, some anti-slavery supporters actually used Darwin to support their side.

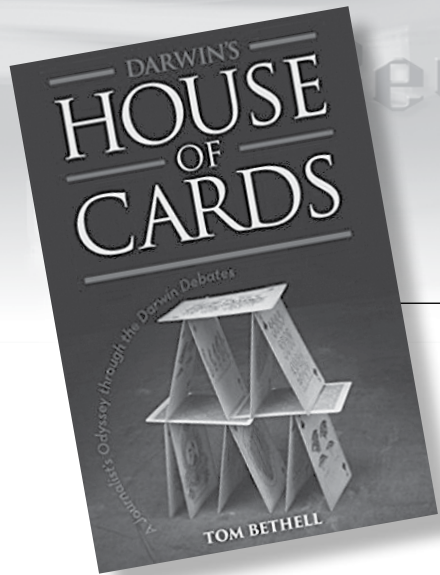
The author shows how theistic evolution was important in producing the two camps still existing today, namely those persons that advocate intelligent design and biblical creation, and others who conclude Darwinism explains the existence of all life-forms and thus there is no need for an intelligent creator to explain the existence of the creation of life.

Author Fuller adds that Darwin's theory of natural selection explains that life-forms are shaped by the particular

context of their environment, "thriving or dying as a result of their ability to adapt. This process can be wrenching; it leaves people trapped between two ways of thinking and believing, stranded between two existences" (p. x). Fuller concludes that, in the end, Darwin's theory has "remade the world" from the Christian era to the Post-Christian world (p. x).

The book reads like a novel and fills a major gap in the story of how Darwinism both took over the world of academia and also became the dominate view of the educated members of Western society in only a few years. In short, this book "is a biography of the single most important idea of the nineteenth century. It is also an account of issues and concerns that are still very much with us, including racism, one of the most intractable problems in American life, and the enduring conflict between science and religion" (p. x).

Jerry Bergman
Jerrybergman30@yahoo.com



Reviews

Darwin's House of Cards

by Tom Bethell

Discovery Institute Press,
Seattle, WA, 2017, 293 pages,
\$21.95

Author Bethell is a journalist who writes mainly on economic and scientific issues. He is a senior editor of *The American Spectator* magazine and was formerly Washington editor of both *Harper's Magazine* and the *Washington Monthly*. Bethell has also published books on a variety of topics. A major focus in this one the observation that in today's world, authority has increasingly replaced evidence.

The book details many major issues relating to the evidence for Darwinism in a concise and entertaining manner. It also covers the major criticisms of Darwinism that have been published throughout history, such as the problems with the fossil record and homology and the flawed logic behind Darwin's theory.

Darwin's House of Cards serves as an excellent resource to the relevant scientific literature. References to creationist literature are largely absent because Bethell has found more than adequate support for his arguments in the peer-reviewed scientific literature and the statements from leading Darwinists.

Bethell first reviews his disillusionment with Darwinism when he was a student of physiology at Oxford University in the UK. In short, after reading the title of Darwin's 1859 book and thinking about its implications, he realized that the only sure way of determining what animals are "fit" is to observe what animals survive in the wild. The book also focuses on the view that science as a field is deceiving the rest of the world by making major assumptions based on very little scientific evidence and then stifling those who dare to come forward with ideas different than the current established doctrine.

Chapter 2 highlights both the naivety and the failures of Darwinism. Bethell reviews a conference at the University of Chicago in 1959, which he terms the apex of the evolution theory. Leading evolutionary scientists attended with little disagreement. Most were firm atheists, claiming that evolution explained all of life and that no room existed for intelligence at any stage of evolution, including the evolution of the human mind. Bethell added that part of the unanimity was because "no one was permitted to step out of line, and in 1959 few were inclined to" (p. 37). Most attendees agreed that "Darwinism removed the whole idea of God as the creator from rational discussion" (p. 39), and evolution could be effectively used as a "weapon to combat religion" (p. 49).

The origin of life from nonlife was felt by many to be solved in 1959 by the now discredited Miller-Urey experiment. The implications of the Holocaust had

not sunk in yet; eugenics was still advocated by some leading scientists such as Huxley (pp. 42, 44). Hermann Muller speculated that x-rays could be used to speed up evolution enormously, a discovery for which he earned a Nobel Prize (p. 43). This idea of healthy x-rays has not only been abandoned but is an embarrassment to evolutionists today. The goal of speeding up evolution echoes Darwin himself, who believed that, thanks to evolution, in the future humans would have a far more perfect body and mind, continuing to move us to a higher and better plane of existence (p. 44).

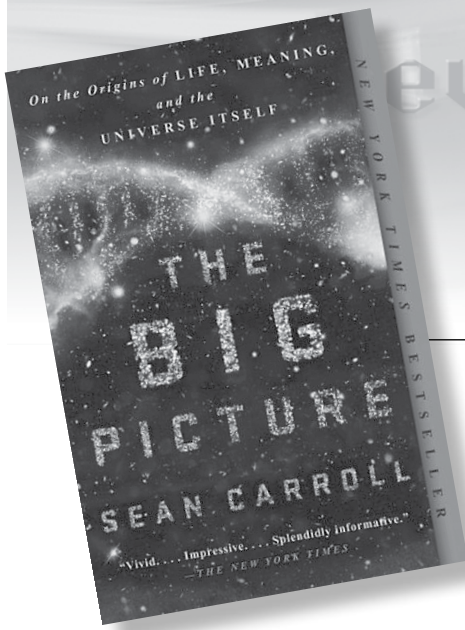
Chapter 16 gives a history and evaluation of Michigan State Professor Lenski's evolving *E coli* bacteria study, which has been touted as a major new proof of evolution. The study, which be-

gan in 1988, has now produced close to 64,000 generations and is still ongoing. The conclusions of the study include the fact that many of the mutations that appear to be beneficial in specific circumstances, as is true in the wild, involve breaking or deleting existing genes or regulatory elements. One example was a mutation that causes the loss of the bacteria's ability to make flagella, which, as might be expected, allows the organisms to grow and reproduce faster (p. 197). This does not affect their ability to move around because, as is common in labs, the nutrient-filled flasks that grew the bacteria are agitated, negating the need for the flagella. In the end, bacteria remain *E coli* bacteria and do not evolve into any other type of bacteria or organism. Professor Lenski began with *E coli*

and ended with *E coli* after 25 years and close to 64 thousand generations. He does document the claim that damage can occasionally produce a beneficial result in certain circumstances, but as Bethell writes, damage to some genes can allow the bacteria to leave more offspring, grow or reproduce faster, but cannot create any new structures or systems (p. 200).

In summary, this is a readable critique of Darwinism. It covers the material in a way that stimulates the reader's interest, covering not just the problems with Darwinism but also the implications of the theory.

Jerry Bergman
Jerrybergman30@yahoo.com



Reviews

The Big Picture

by Sean Carroll

Dutton, New York, 2016,
470 pages, \$28.00

Author
Carroll studied astrophysics at Harvard and is a physics professor at the California Institute of Technology. His research focuses on issues in cosmology, field theory, and gravitation. Carroll is well versed in topics related to the concordance model (called the core theory) for the evolution of the universe. In this book, Carroll goes far beyond modern physics to promote a humanist worldview on the deepest personal questions of mankind. The book subtitle states this big picture: *On the Origins Of Life, Meaning, and the Universe Itself*.

The book contains 50 chapters in 6 major sections. In the prologue, Carroll expresses the dual goals: “One is to explain the story of our universe and why we think it’s true, the big picture as we currently understand it”; the second is “to offer a bit of existential therapy.” He also introduces a new framework called *poetic naturalism*, which describes the

world we live in. Carroll spends a major portion of the book steering the reader to his viewpoint that the origins of the universe and life are limited to naturalism as discovered through science.

In the first major section, titled “Cosmos,” the author examines the universe and points out where he intends to apply his humanistic thinking. The poetic portion of the framework provides license to use different language at different levels that exist in nature. For example, terms in quantum mechanics are used at the atomic particle level, while terms in general relativity are used at the astronomical level. As yet there is no all-encompassing theory that joins these levels. The disparity in terms promotes the concept of *emergent* phenomena that has become prevalent in scientific circles to explain how one level is connected to others. Carroll attempts to show that due to the arrow of time, everything that is happening now can be tied to the big bang that supposedly started the whole universe at the lowest level.

The second major book section is titled “Understanding.” In it, Carroll attempts to teach how we should go about understanding the universe around us. He admits there is uncertainty involved

and that usually there are several theories about what is the truth. He proposes that we use Bayes’s theorem to determine which theory has the best credence level. Carroll neglects the fact that human reasoning is involved in determining the credence level of each theory and may cause this method to fail. The final chapter of the section attempts to apply Bayes’s theorem to whether or not God exists and plays an integral part in the day-to-day operation of the universe and living our lives. Carroll builds his credence levels so that from his viewpoint it would be better if God does not exist. The author enjoys the control of his own life and his gaining knowledge of evolution in the world around him.

In the third major section, titled “Essence,” Carroll presents his “core theory” to highlight how much knowledge mankind has accumulated about the laws of nature. The mathematical description of this theory can be found in the appendix. He claims this theory applies to phenomena in a very large domain of applicability. That domain includes the particles and forces that make up all physical reality with which our senses can interact. According to

Carroll, the spiritual world (if it exists) is outside of this domain, along with telekinesis and astrology.

The fourth major section is titled "Complexity." It attempts to explain how the universe evolved without a designer. Hence, the emergence of complex structures is not a strange phenomenon in tension with the general tendency of the universe toward greater disorder but instead is a natural consequence of the tendency. Carroll believes everything came about naturally because matter self-organizes when the right circumstances are present. It is not explained how inert matter is capable of sensing its environment and using this information to organize itself into a living cell. In his refutation of Behe's mousetrap example of irreducible complexity, Carroll neglects to mention that a designer

has the purpose he derived from his environment and an inert substance does not. Nature does not design a mousetrap nor decide if a better or less complex one is required.

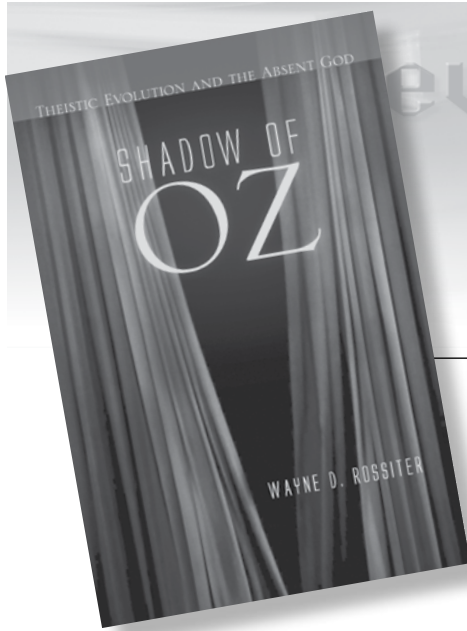
The fifth major section, titled "Thinking," steps into the domain of consciousness. The author uses poetic license to go beyond naturalism to what he calls physicalism. He attempts to apply knowledge from modern neuroscience to explain how a brain works and could have evolved.

The sixth major section is titled "Caring." It attempts to explain where mankind derives purpose, meaning, and values in life solely within the physical cosmos. It is admitted that some very knowledgeable people (even naturalists) conclude that this is impossible. However, Carroll believes that even these

qualities of life can be deduced using the scientific method. It is suggested that people can derive these qualities for themselves from their environment. It should be noted that such qualities are not passed on genetically, and therefore it is not clear how they could have evolved.

This book provides a big picture of the physical world in which we exist. But without the spiritual aspects of life, there will always be much missing. Author Carroll does not answer the main questions on where the laws of nature came from or how life began. Poetical naturalism is simply a story that remains with no the evidence that the world evolved on its own.

Del Dobberpuhl
dobberpuhl@crsvarc.com



Reviews

Shadow of Oz

by Wayne D. Rossiter

Pickwick Publications,
Eugene, OR, 2015, 178 pages,
\$24.00

This book begins with the following gripping introduction:

On a warm October day in New York, Jessie Kilgore, a twenty-two-year-old college student, walked into a forest near his home, and took his own life. Implicated as the driving force behind his unraveling was Richard Dawkins's book *The God Delusion*. Specifically, the ideas therein so devastated the boy's Christian worldview that he could not bear a life lived under this new arrangement. (p. 1)

Author Rossiter is a biologist who now self-identifies as a Christian and teaches at a Christian university (Waynesburg University, founded in 1845). He writes that he left his youthful Christianity because of the logical consequences of the Darwinian evolution that he learned as a university student. As a result, he, like so many others, became "a staunch and cantankerous atheist." He had just published an article on the evolution of rattlesnake venom in the *Journal of Mo-*

lecular Evolution when, one evening in 2008, he was forced to face his personal mortality (p. 4).

Rossiter writes that what had made logical sense—atheism—when he was a bright, healthy young man, with maturity revealed itself to him as an empty, dark, and destructive force of everything that made his life good, happy, and hopeful. Rossiter was forced to reevaluate his life and, eventually, reconverted to Christianity, which, in contrast to atheism, offered him hope in this life and in the next life as well. Rossiter then writes:

My story (both personally and occupationally) is not unique, but is consistent with Dennett's claim. I entered college at [United Methodist] Otterbein University in the fall of 1998 as a Christian. By the spring of 1999, I openly renounced my faith, and quickly spiraled towards full atheism. ... The logical consequences of Darwinian evolution left no room for a God that was actively participating in the world. In short, a blind and chance process seemed incompatible with the intentionally and purposeful creating described in Judeo-Christian traditions. I believe this observation is still valid. (p. 1)

At this point, Rossiter opines that an evangelical atheist like Richard Dawkins would claim, "Christianity is a fairy tale

for those afraid of the dark," to which Oxford professor John Lennox would retort with, "Atheism is a fairy tale for those afraid of the Light!" Other Christians from the Bio-Logos camp would probably rush to comfort him by saying, "Wayne, just keep your Christian faith and accept evolution!"

Books, including Francis Collins's *The Language of God*, Karl Giberson's *Saving Darwin*, Francisco Ayala's *Darwin's Gift to Science and Religion*, and Keith Miller's *Only a Theory* and *Finding Darwin's God*, would all argue that theistic evolution is the answer to the conflict. In this book, Rossiter effectively documents the view that theistic evolution is both bad science and bad religion. Rossiter persuasively argues that theistic evolution consists of a solid body of evolution philosophy coated with a thin veneer of theism. The role of God in theistic evolution is usually vague at best. Evolution is interpreted by theistic evolutionists as directed by God, even though the entire point of evolution from Darwin's day to today is to explain the creation without an intelligent creator. Darwin taught a totally atheistic, naturalistic view of origins. He even once said, "I would give nothing for the theory of natural selection if it requires miraculous additions at any one stage of descent" (Darwin, 1888, p. 210).

Rossiter notes that while in graduate school working on his Ph.D. at Rutgers University, out of the 65 faculty in his area, he knew of only one Christian faculty member and only four Christians among the graduate students (p. 4). He documents that theistic evolution takes one of three forms: (1) massively compromised Christian theology, so that it might fit snugly around evolution; (2) creating artificial firewalls between scientific and theological beliefs so they cannot damage each another; or (3) hiding God in the undetectable distant cosmic background and claiming that He is somehow controlling every subatomic particle in the universe and the world only looks random. Each of these positions he documents is logically flawed and internally inconsistent (p. 9).

The balance of this book covers the major evidence for Darwinism in order

to document the case against evolution. Rossiter concludes the book by contrasting the relationship between the Judeo-Christian teaching of reality and that of Darwin's. His thesis is "that the two ideas can be thought of as two ends of a continuum, along which all of us reside. Simply put, you cannot have your God and your Darwin too. ... As we award explanatory power to one, power is taken from the other (i.e., every step towards Darwin is one away from the Judeo-Christian God and vice-versa)" (p. 9).

Although an extreme example of an attempt to blend together Darwinism and theism to produce theistic evolution, Otto Dietrich, Third Reich press chief and a close associate of Hitler for over a decade, claimed Hitler's "evolutionary views on natural selection and survival of the fittest coincided with the ideas of Darwin" but Hitler also "professed

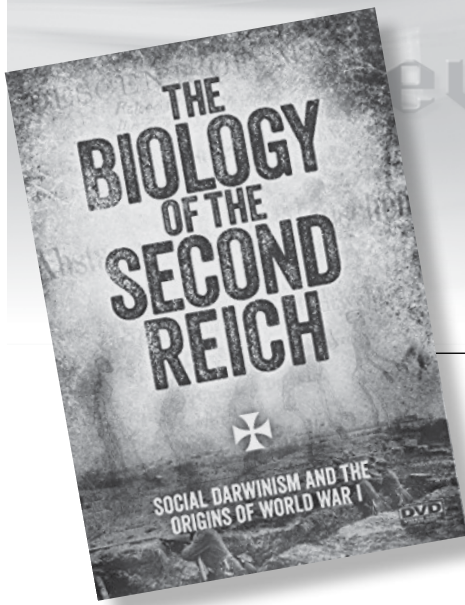
a highly general, monotheistic faith" (Dietrich, 2010, p. 126). In other words, according to Dietrich, he was a theistic evolutionist.

In summary, this is a well-written book that deals head-on with the putative theistic evolution answer to the contrast between Darwinism and theism. The author concludes that theistic evolution is both inept theism and thoroughly debunked science.

Jerry Bergman
Jerrybergman30@yahoo.com

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- Dietrich, Otto. 2010. *The Hitler I Knew: Memoirs of the Third Reich's Press Chief*. Skyhorse Publishing, New York, NY.



The Biology of the Second Reich

Directed and written
by John West

Set of three DVDs, 2014,
\$15.95

These three films consist of numerous quotes and interviews from well-known historians and professors, as well as critics of intelligent design. *The Biology of the Second Reich* is about the documented influence of Social Darwinism, primarily on the First World War but also by extension the Second World War as well. The influence of Darwinism on WWII is well known, but less well known is its important influence on both WWI and the atrocities committed in the German colony in Africa, specifically the aggressive campaign of racial extermination that Germany undertook in German South West Africa (modern-day Namibia) between 1904 and 1907 against the Herero, Nama, and San people. As many as 100,000 Herero and 10,000 Nama died in this, the first genocide of the twentieth century.

Part 2 is on C. S. Lewis's warning about scientism, a movement that has used the field of science to attack religion, or at least theism. Scientism also aggressively supports positions the

scientific establishment came to accept for various reasons as consensus science, including Darwinism and global warming. In C. S. Lewis's novel *That Hideous Strength*, the leaders of a scientific organization called the National Institute for Coordinated Experiments exhibit ruthless disregard for human rights, which Lewis feared would eventually begin to infect those who reject traditional Christian values—something we see happening today. That his fears were not far-fetched is evident in some of the developments in science that have occurred since Lewis wrote his book, such as the aggressive movement against those who oppose Darwinism and the putative consensus on the causes and effects of global warming.

Part 3, on the war against humans, gives numerous examples showing how classifying humans as animals can affect how they are treated. The film shows that the writings of Charles Darwin destroyed the perceived chasm between humans and animals, altering people's perception of humanity from beings specially made by God to just another animal that has evolved from other animals. The animal rights movement elevates animals, but in fact the film documents it is only the latest episode in a long history of attempts to degrade humans.

An example is the new abortion law in Oregon that allows abortion for any reason up to nine months to be paid by taxpayers. Another example is the policy in Iceland that uses ultrasound, amniocentesis, and chorionic villus sampling evaluations to help diagnose genetic disorders before birth, such as trisomy 21, which causes what is commonly called Down Syndrome, for the purpose of aborting the fetus. The goal is to eliminate genetic diseases. This policy resembles the policies used in Nazi Germany to reduce the level of inferior persons, which were soon extended to certain ethnic groups, including Slavic peoples, Jews, and Romani.

All three films are professionally produced and edited. The only negative I note is the poor-quality picture on the DVD cover. This highly recommended documentary clearly supports the view that if we do not learn from the past, we are condemned to repeat it. It seems the lessons of World Wars I and II are now being repeated, as per the warning of part 2 of the series. One who is familiar with this period of history will have some background knowledge of the events covered and thus appreciate the importance of this film series.

Jerry Bergman
Jerrybergman30@yahoo.com

Instructions to Authors

Submission

Electronic submissions of all manuscripts and graphics are preferred and should be sent to the editor of the *Creation Research Society Quarterly* in Word, WordPerfect, or Star-Office/Open Office (see the inside front cover for address). Printed copies also are accepted. If submitting a printed copy, an original plus two copies of each manuscript should be sent to the editor. The manuscript and copies will not be returned to authors unless a stamped, self-addressed envelope accompanies submission. If submitting a manuscript electronically, a printed copy is not necessary unless specifically requested by the *Quarterly* editor. Manuscripts containing more than 35 pages (double-spaced and including references, tables, and figure legends) are discouraged. An author who determines that the topic cannot be adequately covered within this number of pages is encouraged to submit separate papers that can be serialized.

All submitted manuscripts will be reviewed by two or more technical referees. However, each section editor of the *Quarterly* has final authority regarding the acceptance of a manuscript for publication. While some manuscripts may be accepted with little or no modification, typically editors will seek specific revisions of the manuscript before acceptance. Authors will then be asked to submit revisions based upon comments made by the referees. In these instances, authors are encouraged to submit a detailed letter explaining changes made in the revision, and, if necessary, give reasons for not incorporating specific changes suggested by the editor or reviewer. If an author believes the rejection of a manuscript was not justified, an appeal may be made to the *Quarterly* editor (details of appeal process at the Society's web site, www.creationresearch.org).

Authors who are unsure of proper English usage should have their manuscripts checked by someone proficient in the English language. Also, authors should endeavor to make certain the manuscript (particularly the references) conforms to the style and format of the *Quarterly*. Manuscripts may be rejected on the basis of poor English or lack of conformity to the proper format.

The *Quarterly* is a journal of original writings, and only under unusual circumstances will previously published material be reprinted. Questions regarding this should be submitted to the Editor (CRSQeditor@creationresearch.org) prior to submitting any previously published material. In addition, manuscripts submitted to the *Quarterly* should not be concurrently submitted to another journal. Violation of this will result in immediate rejection of the submitted manuscript. Also, if an author uses copyrighted photographs or other material, a release from the copyright holder should be submitted.

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Manuscripts shall be computer-printed or neatly typed. Lines should be double-spaced, including figure legends, table footnotes, and references. All pages should be sequentially numbered. Upon acceptance of the manuscript for publication, an electronic version is requested (Word, WordPerfect, or Star-Office/Open Office), with the graphics in separate electronic files. However, if submission of an electronic final version is not possible for the author, then a cleanly printed or typed copy is acceptable.

Submitted manuscripts should have the following organizational format:

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2. Abstract page. This is page 1 of the manuscript, and should contain the article title at the top, followed by the abstract for the article. Abstracts should be between 100 and 250 words in length and present an overview of the material discussed in the article, including all major conclusions. Use of abbreviations and references in the abstract should be avoided. This page should also contain at least five key words appropriate for identifying this article via a computer search.

3. Introduction. The introduction should provide sufficient background information to allow the reader to understand the relevance and significance of the article for creation science.

4. Body of the text. Two types of headings are typically used by the *CRSQ*. A major heading consists of a large font bold print that is centered in column, and is used for each major change of focus or topic. A minor heading consists of a regular font bold print that is flush to the left margin, and is used following a major heading and helps to organize points within each major topic. Do not split words with hyphens, or use all capital letters for any words. Also, do not use bold type, except for headings (italics can be occasionally used to draw distinction to specific words). Italics should not be used for foreign words in common usage, e.g., "et al.," "ibid.," "ca." and "ad infinitum." Previously published literature should be cited using the author's last name(s) and the year of publication (ex. Smith, 2003; Smith and Jones, 2003). If the citation has more than two authors, only the first author's name should appear (ex. Smith et al., 2003). Contributing authors should examine this issue of the *CRSQ* or consult the Society's web site for specific examples as well as a more detailed explanation of manuscript preparation. Frequently-used terms can be abbrevi-

ated by placing abbreviations in parentheses following the first usage of the term in the text, for example, polyacrylamide gel electrophoresis (PAGE) or catastrophic plate tectonics (CPT). Only the abbreviation need be used afterward. If numerous abbreviations are used, authors should consider providing a list of abbreviations. Also, because of the variable usage of the terms “microevolution” and “macroevolution,” authors should clearly define how they are specifically using these terms. Use of the term “creationism” should be avoided. All figures and tables should be cited in the body of the text, and be numbered in the sequential order that they appear in the text (figures and tables are numbered separately with Arabic and Roman numerals, respectively).

5. Summary. A summary paragraph(s) is often useful for readers. The summary should provide the reader an overview of the material just presented, and often helps the reader to summarize the salient points and conclusions the author has made throughout the text.

6. References. Authors should take extra measures to be certain that all references cited within the text are documented in the reference section. These references should be formatted in the current CRSQ style. (When the *Quarterly* appears in the references multiple times, then an abbreviation to CRSQ is acceptable.) The examples below cover the most common types of references:

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Lipman, E.A., B. Schuler, O. Bakajin, and W.A. Eaton. 2003. Single-molecule measurement of protein folding kinetics. *Science* 301:1233–1235.

Margulis, L. 1971a. The origin of plant and animal cells. *American Scientific* 59:230–235.

Margulis, L. 1971b. *Origin of Eukaryotic Cells*. Yale University Press, New Haven, CT.

Hitchcock, A.S. 1971. *Manual of Grasses of the United States*. Dover Publications, New York, NY.

Walker, T.B. 1994. A biblical geologic model. In Walsh, R.E. (editor), *Proceedings of the Third International Conference on Creationism* (technical symposium sessions), pp. 581–592. Creation Science Fellowship, Pittsburgh, PA.

7. Tables. All tables cited in the text should be individually placed in numerical order following the reference section, and not embedded in the text. Each table should have a header statement that serves as a title for that table (see a current issue of the *Quarterly* for specific examples). Use tabs, rather than multiple spaces, in aligning columns within a table. Tables should be composed with *14-point type* to insure proper appearance in the columns of the *CRSQ*.

8. Figures. All figures cited in the text should be individually placed in numerical order, and placed after the tables. Do

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Creation Research Society

History—The Creation Research Society was organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly publication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a need for an association devoted to research and publication in the field of scientific creation, with a current membership of over 600 voting members (graduate degrees in science) and about 1000 non-voting members. The *Creation Research Society Quarterly* is a peer-reviewed technical journal. It has been gradually enlarged and modified, and is currently recognized as one of the outstanding publications in the field. In 1996 the CRSQ was joined by the newsletter *Creation Matters* as a source of information of interest to creationists.

Activities—The Society is a research and publication society, and also engages in various meetings and promotional activities. There is no affiliation with any other scientific or religious organizations. Its members conduct research on problems related to its purposes, and a research fund and research center are maintained to assist in such projects. Contributions to the research

fund for these purposes are tax deductible. As part of its vigorous research and field study programs, the Society operates The Van Andel Creation Research Center in Chino Valley, Arizona.

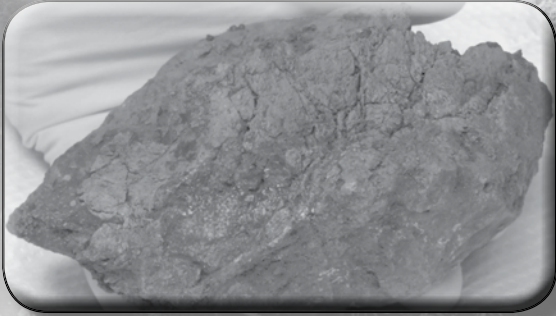
Membership—Voting membership is limited to scientists who have at least an earned graduate degree in a natural or applied science and subscribe to the Statement of Belief. Sustaining membership is available for those who do not meet the academic criterion for voting membership, but do subscribe to the Statement of Belief.

Statement of Belief—Members of the Creation Research Society, which include research scientists representing various fields of scientific inquiry, are committed to full belief in the biblical record of creation and early history, and thus to a concept of dynamic special creation (as opposed to evolution) both of the universe and the earth with its complexity of living forms. We propose to re-evaluate science from this viewpoint, and since 1964 have published a quarterly of research articles in this field. *All members of the Society subscribe to the following statement of belief:*

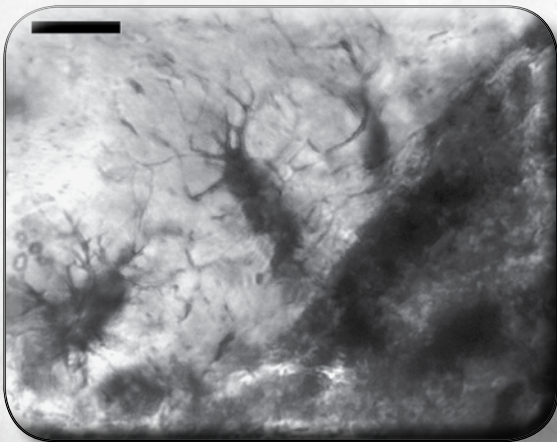
1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.
2. All basic types of living things, including humans, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.
3. The Great Flood described in Genesis, commonly referred to as the Noachian Flood, was a historical event worldwide in its extent and effect.
4. We are an organization of Christian men and women of science who accept Jesus Christ as our Lord and Savior. The act of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Savior for all people. Therefore, salvation can come only through accepting Jesus Christ as our Savior.

iDINO II

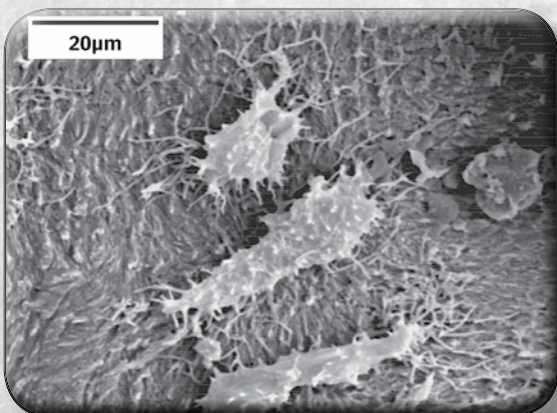
Investigation of Dinosaur Intact Natural Osteo-tissue



A fragment of the *Triceratops* brow horn. Fragments, such as this one, still contain tissue and cells.



Microscopic examination of tissue extracted from a *Triceratops* horn reveals bone cells still present.



Electron microscope picture of intact bone cells still in tissue extracted from a *Triceratops* horn.

How can pliable, stretchable tissue survive inside dinosaur fossils for over 65 million years?

How can this tissue still contain intact cells and even dinosaur proteins?

How can this fragile biological material survive for so long?

The answer to these questions directly challenges the current, evolutionary-biased, geologic timescale.

The Creation Research Society began its iDINO research initiative for the purpose of studying soft tissue in dinosaur fossils. The first phase of the project detected pliable, unfossilized tissue in a brow horn of a *Triceratops*. Within this tissue were intact osteocytes (bone cells). Some results from the iDINO project have been published in a technical microscopy journal and presented at an international microscopy conference. The Spring 2015 issue of the *Creation Research Society Quarterly* also features a special report of the iDINO project. Plus, to further spread the important information about soft tissue, the Society is developing a video (Echoes of the Jurassic).

The **second phase** of the project (iDINO II) will look more extensively at the process of tissue preservation. Evolutionists have offered various theories of how this tissue could survive for millions of years. iDINO II will methodically investigate these preservation claims, assessing their plausibility.

The iDINO results have already provided a strong challenge to the evolutionary worldview. More extensive and detailed examination may provide even stronger evidence that the age of dinosaur fossils is far less than 65 million years. To this end, the Society continues to seek those willing to fund this project with either one-time gifts or monthly donations.

For more information contact us at (928) 636-1153 or crsvarc@crsvarc.com.

Also visit <http://tinyurl.com/nphm2c4> for project updates and details.

