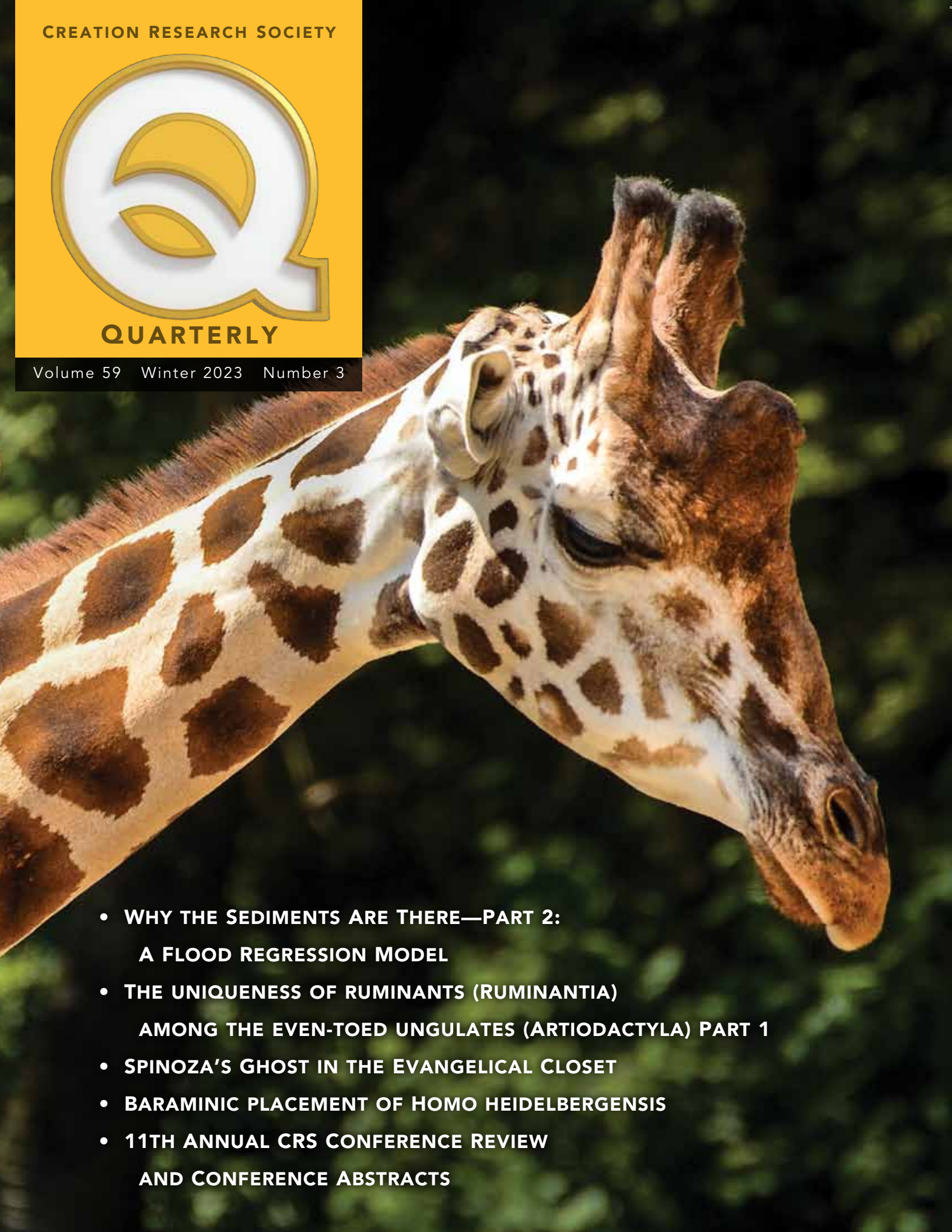
CREATION RESEARCH SOCIETY

QUARTERLY

Volume 59 Winter 2023 Number 3



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Number 3
Winter 2023

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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

Creation Research Society Quarterly

Volume 59
Number 3
Winter 2023

Cover by Michael E. Erkel, Afton, Virginia

Design services by Cindy Blandon, cblandon@aol.com

The *Creation Research Society Quarterly* is published by the Creation Research Society, 1 W. Firestorm Way #145, Glendale, AZ 85306, and it is indexed in the *Christian Periodical Index* and the *Zoological Record*.

Send papers on all subjects to the Editor: CRSQeditor@creationresearch.org or to Tim Clarey, 1806 Royal Lane, Dallas, TX 75229.

Send book reviews to the Book Review Editor: Mary Beth De Repentigny, Book Review Editor, marybethd4@gmail.com.

ISSN 0092-9166

Printed in the United States of America

Creation Research Society Quarterly 2023 59:128–141

Spinoza's Ghost in the Evangelical Closet

John Doane*

Abstract

Scientists, the media, and the courts routinely reject critiques of evolutionary ideas by arguing that such critiques are religious. Conversely, critiques of the straightforward reading of Genesis texts assert that such texts are not scientific. We show that this situation developed from the ideas of Baruch Spinoza, a 17th-century philosopher who argued that philosophy (including science) must be separated from theology. For him, the goal of philosophy is to determine truth, while the goal of theology is piety. Spinoza correspondingly denied the supernatural inspiration of Scripture and developed his own philosophy, which can be identified as a form of pantheism. Spinoza's ideas strongly influenced the Enlightenment and maintain a grip on intellectuals to the present. A pantheism similar to Spinoza's is now effectively an established religion in our culture. This pantheism masquerades as science, while denying any supernatural deity. Spinoza's legacy in today's society is consequently a conflict between two religions: pantheism versus Biblical Christianity. Christians should recognize this influence and eschew compromises with pantheistic religion.

Key Words: Spinoza, pantheism, Enlightenment, naturalism, secularism, humanism, presupposition, Big Bang

Introduction

On December 20, 2005, federal judge John E. Jones III ruled that intelligent design (ID), like creation, is religious in nature—unlike science, which is not religious. His decision[1] marked the end of the case of *Kitzmiller vs. Dover Area School District*. The school board in that Pennsylvania district had mandated that intelligent design be cited as an alternative to evolution. Judge Jones stated that ID violates "the ground rules of science" by making allowance for the existence of the supernatural, adding that "since the scientific revolution of the 16th and 17th centuries, science has been limited to the search for natural causes to explain natural phenomena." Such is the dominant view in our culture today. Those who reject evolution are commonly labeled as "science deniers."[2]

In an interview with Diane Sawyer of ABC News in 2010,[3] famous cosmologist

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Accepted for publication September 6, 2022

Stephen Hawking stated, "There is a fundamental difference between religion, which is based on authority, [and] science, which is based on observation and reason. Science will win, because it works."

Secularists try to win the cultural and spiritual battle by claiming to be non-religious. For example, Harvard University humanist chaplain Greg Epstein wrote a book called *Good Without God: What a Billion Nonreligious People Do Believe* (Epstein, 2009). By claiming to be non-religious they imply that they are objective, scientific, and relying on reason rather than superstition or arbitrary religious authority.

This paper first shows how the truth about origins is not determined by reason outside of Scripture. Then we demonstrate that people such as Judge Jones, Stephen Hawking, and Greg Epstein actually do have their own religion. Next, in their attempts to separate scientific truth from Scripture, we show that they are following Baruch Spinoza, and that their religion is similar to his. Finally, we indicate how strong Spinoza's influence has been on intellectuals, even intellectuals in the Church.

Observational Science and Origins Science

Stephen Hawking is correct in the sense that common science is based on observation. That is, scientists make conclusions from observations of repeatable events in the physical world. However, events in the past cannot be observed or repeated. In origins science, any evidence left over from the past must be interpreted.[4] This situation is similar to court cases such as murder trials that involve forensic science. In such cases, there may be eyewitnesses and testimonies of "experts." The prosecution and the defense have different ideas on how any evidence should be interpreted. The judge may wrongly exclude evidence due to personal bias.

Both Judge Jones and Stephen Hawking confuse observational (experimental) science with the use of scientific techniques in interpreting data from the past. Christians are often similarly confused. For example, some try to separate "philosophical naturalism" from "methodological naturalism." The former refers to the attitude of those epitomized by Psalm 10:4, "God is in none of his thoughts." The latter refers to doing observational science without any explicit reference to God, as Christians may also do. However, if one studies origins without reference to God, one is already a "philosophical naturalist."

The study of origins always involves presuppositions that determine how data is interpreted. Those presuppositions assert how God interacts with His creation, or deny God altogether. In particular, mainstream conclusions about the past rest on unproven assumptions (presuppositions). Indeed, as well-known Christian philosopher of science J.P. Moreland has observed, *"The conclusions of science cannot be stronger than their presuppositions.* There are many things that science presupposes. But science itself cannot justify those presuppositions" (Moreland, 2018, p. 69; emphasis in original).

Mainstream presuppositions are actually not based on reason but on a bias against any explanations involving a creator God outside of nature (Mortenson, 2004a). For example, similarity in the features of living beings is supposed in Darwinism to be due to common descent. Common design is arbitrarily ruled out, because it implies a Designer.

Similarly, the fossils and rock strata are supposed to be the result of slow processes over long ages ("uniformitarianism"). Explanations consistent with a global flood are arbitrarily ruled out because they imply judgment on sin by a Creator. Mainstream geology for almost 200 years has been based on Charles Lyell's expressed distaste for the eyewitness account of the Flood in Genesis. Lyell himself was probably a deist (Mortenson, 2004b, pp. 224–227). Geologist Derek Ager (most certainly not a Christian)[5] observed that the presupposition of uniformitarianism had been "brainwashing" geologists for all this time (Ager, 1993, p. xi).

Concerning presuppositions in cosmology, Stephen Hawking admitted that "we are not able to make cosmological models without some admixture of ideology" (Hawking and Ellis, 1973, p. 134). Modern cosmology, such as the Big Bang theory, arbitrarily assumes that we live in a universe that is unbounded and has no center.[6] This presupposition was first termed the cosmological principle by Einstein, and later was called the Copernican principle. Like Hawking, Edwin Hubble before him arbitrarily ruled out a universe with a center.[7] A center could mean there is a special place of God's attention (i.e., the Earth).[8] By assuming on the contrary that the universe is indeed bounded and has a center, Christians have derived cosmologies from Einstein's gravitational equations of relativity that are consistent with a straightforward reading of Genesis 1.[9]

In any scientific effort, a theory cannot be considered as valid unless all alternative explanations for the experimental data are proven inadequate. In the case of a court trial, alternate explanations for the evidence must be ruled out without a reasonable doubt before a defendant can be convicted. By refusing to consider eyewitness accounts from the Bible, and by arbitrarily excluding explanations of the evidence consistent with Scripture, mainstream scientists have not arrived at the truth about origins. Their reasoning outside of Scripture has not determined truth.

When people like Hawking proceed to speak as if they were the authority, we should also wonder if they are not expressing a religion of their own. After all, Hawking said that religion is based on authority. What could be his religion? We consider next the possible

options and identify what is the religion of Hawking as well as that promoted by Greg Epstein and upheld by Judge Jones.

The Religion Behind Mainstream Views of Origins

Religion is the set of beliefs in ultimate matters—especially regarding the existence and nature of God—that lie at the core of one's being that account for the world, our relationship to it, and the meaning to life. Humans are religious because we believe in a meaning to life and a goal, even if it is only progress or pleasure (Brow, 1966, pp. 77–78). Worship, awe, or wonder are not a necessary component of religion. Consequently, there is also religion in science. Unprovable philosophical presuppositions consciously or subconsciously underlie every interpretation scientists make—especially in the area of origins, in which truth claims are religious statements.

Romans 1, 2, and 3 describe the basic religions of the world.[10] Romans 1 describes those who knew God, but did not like to retain the one true God in their knowledge. Consequently, they exchanged the truth of God for a lie, worshiping and serving the creation rather than their Creator. Whether or not they have obvious physical idols, such people are non-theists, denying the supernatural Creator of the universe. What they believe causes them to sin against the real God. Some will fall into sexual immorality of all sorts, malice, or greed. Others will simply be proud, boasters, or unforgiving.

Theologian Robert Brow has succinctly outlined the basic non-theistic, or monistic, religions (Brow, 1966, pp. 79–88). Brow graduated from Princeton Theological Seminary and benefited from living in India for 20 years as an army officer, student, and teacher. He wrote that there are four logically possible types of monism, and these have been discussed by Hindu philosophers for centuries. In modern terminology, the four types are Absolute Pantheism, Modified Pantheism, Absolute Monism, and Modified Monism.[11] Absolute Pantheism holds that everything is God, while in Modified Pantheism God is the principle behind nature. "In this case, the way of salvation is…to discover the principle behind nature, and to ally oneself with that" (Brow, 1966, p. 81). For Hegel, the principle behind nature was the development of a superior culture (through the evolution of consciousness). For Karl Marx it was social progress through the class struggle,[12] and for Nietzsche it was the rise of the superman. For Darwin and his followers, the principle behind nature is evolutionary progress. Those in our society today who deny the supernatural God of Scripture, particularly those in mainstream science, often find meaning in that principle.

Naturalism is the idea that nature is all there is. Since this idea typically includes a belief in the principle of evolutionary progress, naturalism commonly corresponds to Brow's Modified Pantheism.[13] As some Christians have noticed,[14] naturalism is more than just a philosophy. Its adherents promote it with a religious fervor in current efforts to remove Biblical Christianity from the public square.

Some have labeled atheism as the religion opposing Christianity in this way. Absolute atheism (Brow, 1966, p. 76) is not religious; it is a denial that cannot provide any meaning to life. But atheists cannot live without meaning. Some may just believe in doing what makes them happy. To the extent that they believe in evolutionary progress, however, their atheism is just pantheism in disguise. While atheism seems non-religious to many people, pantheism is clearly a religion. By identifying the opposition as pantheism, we clearly indicate its religious nature.

In the following, we investigate Spinoza's similar pantheistic ideas to show how they contributed to modern views on how truth about origins is determined.

The Influence of Baruch Spinoza

Historical Setting

The family of Baruch Spinoza (1632–1677), Sephardic Jews, emigrated from Iberia and settled in Holland. The name Spinoza derives from the town in Portugal, Espinosa, from which the family came.[15] Like others fleeing to Holland, his family had been secretly practicing Jewish rituals while posing as Catholics to avoid persecution. As a child he was taught Hebrew and the Talmudic writings, and he subsequently received tutoring in the usual subjects of mathematics, science, philosophy, etc. His first name, given at his birth in Amsterdam in 1632, was Baruch, but after he was excommunicated from the synagogue (for reasons not entirely clear) at the age of 23, he changed it to Benedict (both names mean "blessed"). Unlike many famous intellectuals, Spinoza was a kind person who lived humbly and simply (Johnson, 1988).

Spinoza had several reasons for his radical ideas. First of all, Spinoza reacted against ecclesiastical authority and political repression. In Portugal, the ecclesiastical authorities required citizens to identify as Catholic or suffer persecution, and Galileo's troubles with the Catholic church were partly due to entrenched Aristotelian ideas in Catholic universities. Even in more liberal Holland an ecclesiastical decree in Utrecht in 1642 forbade teaching of any philosophy besides Aristotle's.

Secondly, he reacted against the continual strife within Christendom exemplified by the Thirty Years' War (1618–1648) and the malice associated with differences of dogma. For example, in the Preface to his most famous work, *Theological-Political Treatise* (1670), he wrote:

> I have often wondered that men who make a boast of professing the Christian religion, which is a religion of love, joy, peace, temperance and honest dealing with all men, should quarrel so fiercely and display the bitterest hatred towards one another day by day…. (Spinoza, 1670, p. 390)

In beginning Chapter 7 of the *Treatise*, which has the heading *On the Interpretation of Scripture*, Spinoza wrote about theologians:

> On every side we hear men saying that the Bible is the Word of God, teaching mankind true blessedness, or the path to salvation. But the facts are quite at variance with their words, for people in general seem to make no attempt whatsoever to live according to the Bible's teachings. We see that nearly all men parade their own ideas as God's Word, their chief aim being to compel others to think as they do, while using religion as a pretext. We see, I say, that the chief concern of theologians on the whole has been to extort from Holy Scripture their own arbitrarily invented ideas, for which they claim divine authority. (Spinoza, 1670, p. 456)

Thirdly, Spinoza believed that ordinary folk were subject to religious superstitions as a result of fear of punishment or hope of reward from an Almighty God.

The two main works Spinoza left, his *Ethics* and his *Theological-Political Treatise*, have profoundly shaped modern thought. The *Treatise* was published anonymously in 1670. Spinoza's *Ethics* was published posthumously in 1677. The *Treatise* and the *Ethics* worked together to "offer a profound critique of religion: the former from a theological, political, and historical perspective, the latter from a metaphysical and moral one" (Nadler, 2011, p. 33). By rejecting ecclesiastical authority and separating the study of truth from Scripture, Spinoza became the father of what is called secularism or modernism. The subtitles of two books on Spinoza by philosophers make this case: "The Renegade Jew Who Gave Us Modernity" (Goldstein, 2006) and "Spinoza's Scandalous Treatise and the Birth of the Secular Age" (Nadler, 2011). Enlightenment scholar Jonathan Israel also argued that Spinoza "forged a line of thought which furnished the philosophical matrix, including the idea of evolution, of the entire radical wing of the European Enlightenment" (Israel, 2001, p. 159). The Enlightenment characteristically rejected ecclesiastical authority and elevated human reason to the place of supreme authority (above Scripture) for determining truth.

Some of Spinoza's ideas probably developed from reading the works of the famous Jewish scholar Moses Maimonides (1138–1204), medieval Jewish philosophers, and Cabbalists.[16] He was also influenced by the mathematically deductive reasoning of René Descartes (1596–1650) and to some extent by the Italian philosopher Giordano Bruno. Bruno (1548–1600) "represented the first Western monistic reaction to medieval priestcraft, and his Pantheism influenced the Jew Spinoza" (Brow, 1966, p. 34).

Spinoza evidently read Thomas Hobbes' *Leviathan*, in which Hobbes (1588–1679) asserted that religion should be subservient to monarchy. Hobbes' view of religion was that it had grown out of superstition, that religious laws had simply been invented by those seeking power, and that reason superseded revelation (Nadler, 2011, pp. 30–31). Instead of monarchy, Spinoza put his confidence in democracy. Spinoza himself was surely too optimistic about democracy when he opined in Chapter 16 of his *Treatise*, "in a democracy there is less danger of a government behaving unreasonably, for it is practically impossible for the majority of a single assembly, if it is of some size, to agree on the same piece of folly" (Spinoza, 1670, p. 530). Spinoza also went further than Hobbes by developing an elaborate philosophical system in his *Ethics*.

Separating Science and Truth from Scripture

A central object of Spinoza's *Treatise* was to "attack the notion that the limits to science and philosophy are to be determined by religious criteria, and especially by Scripture and its sectarian interpreters" (Nadler, 2011, p. 180). In particular, Spinoza wrote in Chapter 14 of the *Treatise*, "Between faith and theology on the one side and philosophy on the other there is no relation and no affinity." There he declared that

> The aim of philosophy is, quite simply, truth, while the aim of faith, as we have abundantly shown, is nothing other than obedience and piety. Again, philosophy rests on the basis of universally valid axioms, and must be constructed by studying Nature alone, whereas faith is based on history and language, and must be derived only from Scripture and revelation. (Spinoza, 1670, p. 519)

By demanding a separation of theology from science (also called at that time natural philosophy) and the study of truth, Spinoza laid the foundation for the modern ideas expressed by Judge Jones and Stephen Hawking. In his *Ethics*, Spinoza developed his own philosophy. As discussed below, that philosophy amounts to a kind of pantheism.

For Spinoza, the separation between philosophy and theology was not simply the exaltation of reason over Scripture. In particular, Spinoza denied Maimonides' teaching that theology, or the interpretation of Scripture, had to be subservient to reason. If that teaching of Maimonides were correct, Spinoza argued, then

> it would follow that the common people, for the most part knowing nothing of logical reasoning or without leisure for it, would have to rely solely on the authority and testimony of philosophers for their understanding of Scripture, and would therefore have to assume that philosophers are infallible in their interpretations of Scripture. (Spinoza, 1670, p. 469)

Spinoza rather argued "…that the meaning of Scripture is established from Scripture alone" (Spinoza, 1670, p. 469). So far, Spinoza sounded rather orthodox. However, Spinoza was only arguing that some kind of "faith" was necessary to understand Scripture. He denied that Scripture was a source of truth.

Spinoza also refuted the teaching of Maimonides' opponents.[17] Those opponents argued

> …that reason should be ancillary to Scripture, and completely subservient to it… that nothing in Scripture requires a metaphorical explanation merely on the grounds that its literal meaning is contrary to reason, but only if it is contrary to Scripture itself, that is, to the clear pronouncements of Scripture. (Spinoza, 1670, p. 520)

This teaching that Spinoza refuted also sounded orthodox, because it implied that Scripture was a source of scientific truth.

So Spinoza tried to get around the apparent contradiction (in refuting both Maimonides and his opponents) by claiming that both theology and reason, or faith and philosophy, are valid in their own realms. He did this by removing truth from theology, claiming that Scripture was useful only for promoting piety, as "…scientific truth is not established from Scripture itself…" (1670, p. 469). "Each man's faith, then, is to be regarded as pious or impious not in respect of its truth or falsity, but as it is conducive to obedience or obstinacy" (Spinoza 1670, 517). "…faith requires not so much true dogmas as pious dogmas, that is, such as move the heart to obedience; and this is so even if many of those beliefs contain not a shadow of truth, provided that he who adheres to them knows not that they are false" (1670, p. 516). So, Spinoza has clearly indicated that faith need not be based on truth. For him, reason was sufficient to determine truth but not the meaning of Scripture, since Scripture could contain falsehood as long as it promoted piety.

Spinoza's Redefinition of Biblical Terms

In reading Spinoza, one must understand first how he redefined terms like God, salvation, and the Holy Spirit (see Appendix A for an extensive list). His fundamental redefinition was to equate God with nature. Spinoza also co-opted many Biblical themes in the *Treatise* (see Appendix B). Spinoza and others like Hawking capitalized "God" probably partly because they believed that nature is the one true God, as opposed to the Greeks, for example, who had many "gods." Spinoza was also eager to obtain tolerance for his views and to avoid being labeled as an atheist.

For example, after the quotes cited just above, Spinoza proceeded to list seven tenets of a universal faith that could be accepted by all men without controversy.[18] The last of these is:

> God forgives repentant sinners. There is no one who does not sin, so that without this belief all would despair of salvation, and there would be no reason to believe that God is merciful. He who firmly believes that God forgives men's sins from the mercy and grace whereby he directs all things, and whose heart is thereby the more inspired by love of God, that man verily knows Christ according to the spirit, and Christ is in him. (1670, p. 518)

Nowhere else does Spinoza address such forgiveness. He does not attempt to explain how a God identified with nature could provide any meaningful forgiveness. But for Spinoza, the main thing was promoting piety even if the belief was based on falsehood. Piety itself was living in accordance with a principle behind nature, namely a vague love for one's neighbor.

Spinoza pleaded for tolerance in the *Treatise*. He tried to avoid charges of atheism and avoided some offense by referring to God in emphasizing the need for piety. However, by arguing that the Scriptures were not inspired by a supernatural God, and since he "ruled out the possibility of miracles, identified God's providence with the laws of nature, [and] deflated the revelations of the prophets" he angered the Reformed church consistories of Utrecht, Leiden, Haarlem, and Amsterdam (Nadler, 2011, pp. 222–223). These church bodies then pressured the civic authorities to ban the *Treatise*, initially with only limited local success. Even though the *Treatise* had been published anonymously in 1670, it was suspected that Spinoza was the actual author. After the *Treatise* was re-published not only anonymously but under false authorship, the Dutch Republic formally banned it in 1674. The Jewish religious leadership had excommunicated Spinoza much earlier, in 1656, but had no legal authority to ban his books.

Spinoza's Pantheism

In *Ethics*, Spinoza developed his own system of religious thought, starting with Part I, "Concerning God." He began with eight definitions and seven unproven axioms, from which he proceeded to prove various theorems ("Propositions") in the same way that one proves theorems in geometry.[19] The Appendix to Part I contains this summary:

> I have now explained the nature and properties of God: that he necessarily exists, that he is one alone, that he is and acts solely from the necessity of his own nature, that he is the free cause of all things and how so, that all things are in God and are so dependent on him that they can neither be nor be conceived without him, and lastly, that all things have been predetermined by God, not from his free will or absolute pleasure, but from the absolute nature of God, his infinite power (Spinoza, 1677, p. 238).

In Part IV, Proposition 4, he explicitly equated God with nature (Spinoza, 1677, p. 324). He insisted that his

Propositions described the only logically possible universe: "…I do not presume that I have found the best philosophy, but I know that what I understand is the true one. If you ask me how I know this, I reply that I know it in the same way that you know that the three angles of a triangle are equal to two right angles" (letter from Spinoza to Albert Burgh, December 1675; Spinoza, 2002, p. 949).

It is generally agreed now that Spinoza espoused a kind of pantheism, although he never used the word pantheism, since that word was coined after his death.[20] There remains some debate about how Spinoza's identification of God with nature relates to pantheism. Philosopher Steven Nadler divides pantheism into two types: reductive (God is identical with everything that exists) and immanentist (God is contained within the world). These types correspond loosely to Robert Brow's Absolute Pantheism (everything is God) and Modified Pantheism (God is the principle behind nature), respectively. Nadler claims that Spinoza's pantheism could not be immanentist, since that would be a theistic concept open to superstition (Nadler, 2006, pp. 119–121). While for convenience Spinoza refers to God as "he," Spinoza's God was not a personal Being who must be worshiped; Spinoza rejected that as an anthropomorphic concept. Nevertheless, Spinoza's God could be identified with the principle behind nature. For Spinoza (and for many of today's humanists), this principle included (in addition to evolutionary progress) a kind of moral piety associated with the best interests of society and a love for one's neighbor. Hence Spinoza really did espouse Modified Pantheism as described by Brow.

Spinoza's pantheism was attractive precisely because it fully satisfied fallen humanity's yearning for autonomy from a personal God. It was a repudiation of God's authority, of His claim on us as Creator. Absolutizing nature meant that theology was no longer the "queen" of the sciences; physical (or natural) science was. It nullified the testimony of God that nature declares His glory (Psalm 19:1). It meant that an understanding of nature—not religion—held the key to truth, and that those whose work was with nature (that is, scientists) had more authority than clergy.[21] While pantheism did not originate with Spinoza, his pantheism was very influential in subsequent Western intellectual thought, as we will see.

From Aristotle to Spinoza to Darwin

Ironically, some of Spinoza's ideas were developed in a way similar to those of Aristotle whose philosophy was promoted by ecclesiastical authorities of Spinoza's time. Like Spinoza, Aristotle and other Greek philosophers believed they "could deduce how nature ought to behave from first principles" (Meyer, 2021, p. 22). Further, both claimed that nature developed necessarily from those principles (Goldstein, 2006, pp. 50–53; Nadler, 2011, p. 81; Meyer, 2021, pp. 22–23).

Some may object that Spinoza's rationalism (belief that fundamental truths can be deduced by reason) could not be a main source behind modern secular scientists' empiricism (belief that truth only comes by sense-experience observation). However, "almost no author fits neatly into one camp or another" (Markie and Folescu, 2021).[22] While Aristotle and other Greeks downplayed the need for observations (Meyer, 2021, pp. 22–23), Spinoza recognized the importance of scientific observations made by Galileo, for example, in understanding the physical side of nature. Conversely, modern mainstream scientists set reason as well as observation against Biblical authority (recall the quote from Hawking in the Introduction). In particular, they develop their presuppositions about origins not from observation, but completely from their reasoning that, in turn, is based on their religious and philosophical ideas.

Modern science developed from a belief that there is a rational God separate from nature. Since He created us in His image, we are capable of discovering His laws and designs in nature. Nonetheless, since we all also inherit the fallen nature of Adam, our hypotheses must be checked by experiments and observations.[23] These views consequently overcame Aristotle's ideas, which had been a stronghold in Christian universities. Early Christian scientists Galileo Galilei (1564–1642) and Francis Bacon (1561–1626) also argued against interpretations of Scripture about the present natural world that were not checked by experiments and observations. Unlike Charles Lyell (1797–1875), however, they did not argue that Scripture could be ignored in scientific discussions of origins.

Many intellectuals soon began to promote, like Spinoza, the specific separation of Scripture from the study of truth. Not only did they reject any insight from the Bible in observational science, they cemented Spinoza's legacy in the presuppositions of mainstream scientists about origins. Hence, as discussed earlier, they were not only methodological materialists but also philosophical materialists. For example, Spinoza directly influenced the Deists and liberal Biblical critics (particularly in Germany), who both in turn influenced the development of modern science in the 18th and 19th centuries (Mortenson, 1997, pp. 226–228). People all over the world today accept the Big Bang and evolution as truth without questioning the epistemological basis for these other than that some scientists like Hawking say so.

In particular, ideas like Spinoza's influenced Charles Darwin (1809–1882). For example, Darwin had a copy of Charles Lyell's *Principles of Geology* with him on his voyages on the *Beagle*. Lyell's old-Earth dogmas were essential

for Darwin's speculations on evolution. Similar to the way Spinoza wished to separate philosophy and science from Scripture, Lyell argued that "the physical part of geological inquiry ought to be conducted as if the Scriptures were not in existence" (Mortenson, 2004b, p. 225).

Spinoza also influenced Darwin through Hegel. Hegel (1770–1831) wrote, "to be a follower of Spinoza is the essential commencement of all Philosophy."[24] Then Nietzsche (1844–1900) observed, "without Hegel there would have been no Darwin."[25,26] Enlightenment ideas also influenced Charles Darwin's grandfather Erasmus Darwin, who formulated the first formal theory of natural evolution in his book *Zoonomia; or the Laws of Organic Life* (1794–1796).

In arguing Spinoza's foundational influence on the Enlightenment and the concept of evolution in particular, Jonathan Israel wrote:

> …the probing towards the concept of evolution from inert matter, and of higher from lower forms of life, was derived, as its foremost champion, Diderot [1713–1784], stressed, directly from the doctrine that motion is inherent in matter, a concept generally regarded with horror and universally acknowledged in Enlightenment Europe as quintessentially Spinozist. The claim that Nature is self-moving, and creates itself, became indeed the very trademark of the *Spinosistes*. (Israel, 2001, p. 160)

Spinoza's Legacy in Modern Thought

Spinoza uniquely influenced modern thought because he both elevated reason in determining truth and specifically denied the supernatural origin of the Scriptures. Greek philosophers had elevated reason and promoted some kind of naturalism, but they had not addressed the Scriptures. Those like Maimonides, Aquinas, and Descartes also elevated reason, but they had not denied the supernatural. In particular, evidence from Descartes' writings and correspondence show that he believed "the truths of revelation are beyond the scope of rational criticism" (Clarke, 1982, p. 101). Thus it was Spinoza's ideas that fueled the anti-clerical sentiments of the Enlightenment and the anti-Church and anti-Scriptural attitudes of today.

Spinoza viewed the Bible as a piece of literature of human origin, variously corrupted and inconsistent. (See, for example, quotes from Spinoza about the Bible in Appendix A.) Higher criticism of the Bible developed from these ideas.[27] He rejected the incarnation of Christ as "absurd," a contradiction of terms just like saying that "a circle has taken on the nature of a square" (letter from Spinoza to Henry Oldenburg in 1675; Spinoza, 2002, p. 943). Yet he valued Christ's ethical insights and teachings, mainly as directed towards loving fellow human beings. He referred to Jesus as a great moral example for us to follow (Nadler, 2011, p. 175). Spinoza's patronizing words continue to be mouthed today, particularly among humanists.

More than 200 years after Spinoza's death, some of the main ideas of his *Treatise* became the foundation for the humanist Ethical Culture movement. In founding that movement in 1876, Felix Adler sounded just like Spinoza when he said, "freedom of thought is a sacred right of every individual man…. Diversity in creed, unanimity in the deed. This is that practical religion from which none dissents" (Radest, 1969, p. 28; cited in Epstein, 2009, p. 213). Humanist Epstein also wrote that "He [Spinoza] was arguably the first public Humanist in modern Western history" (Epstein, 2009, p. 49).

Epstein approvingly noted that mainline Protestants, most organized Jewish groups, and even a goodly number of evangelicals also have no problem with the humanist position on evolution. He wrote that "science is a much better method than revelation for determining the nature of reality" (Epstein, 2009, pp. 160–161). If we identify "nature of reality" with "truth," we find that his position is similar to Spinoza's. In contradiction to the tolerance of "diversity of creed" commonly expressed by humanists, such diversity is not an option for humanists when it comes to belief in evolution. As an expression of pantheism, humanism also holds that evolutionary progress is a fundamental principle behind nature.

By excluding Christian ideas of origins from the science classroom, Judge Jones was expressing a preference for another religion, namely pantheism. Indeed, public schools generally exhibit the existence of pantheism rather than Christianity as the established religion in America. Even in private schools, evolution is commonly taught. For example, Catholic schools in the United States teach evolution[28] as part of their science curriculum. They teach evolution as a fact. In such ways, Christianity becomes a cultural background rather than a living hope.

Even Albert Einstein often described himself as a "disciple of Spinoza" (Goldstein, 2006, pp. 61–62). In 1929 Einstein wrote, "I believe in Spinoza's God, who reveals himself in the lawful harmony of all that exists, but not in a God who concerns himself with the fate and the doings of mankind" (response to Rabbi Goldstein as quoted in Isaacson, 2007, pp. 388–389). He further wrote in 1939 in response to another rabbi:

> The religious feeling engendered by experiencing the logical comprehensibility of profound interrelations…does not lead us to take the step of fashioning a god-like being in our own image—a personage who makes demands of us and who takes an interest in us as individuals. There is in this neither a will nor a goal, nor a must, but only sheer

> being." (Dukas and Hoffman, 1979, pp. 69–70)

In this way, Einstein summarized Spinoza's insistence that all things follow necessarily from the divine nature by means of nature's laws. This view also inspires some modern scientists, such as Hawking, to try to come up with a "theory of everything" such as string theory. So Hawking concluded:

> If we discover a complete theory… we shall all, philosophers, scientists, and just ordinary people, be able to take part in the discussion of the question of why it is that we and the universe exist. If we find the answer to that, it would be the ultimate triumph of human reason—for then we would know the mind of God." (Hawking, 1988, p. 191)

For Hawking, "I use the word 'God' in an impersonal sense, like Einstein did, so knowing the mind of God is knowing the laws of nature" (Hawking, 2018, p. 28). His God was like Spinoza's. Hawking explicitly denied the existence of a supernatural Creator: "…it's my view that the simplest explanation is that there is no God. No one created the universe and no one directs our fate" (Hawking, 2018, p. 38).

Human reason is not sufficient to find truth, since the Fall also affected our reason. What passes for reason or wisdom is often simply speculation based on non-theistic religious presuppositions. As Paul wrote, "For since, in the wisdom of God, the world through wisdom did not know God, it pleased God through the foolishness of the message preached to save those who believe" (1 Corinthians 1:21). The message of the Cross will always appear as foolishness to the unbeliever, but it is wiser than men. Through his speculations, Spinoza could never come to the knowledge of the true God and eternal life (1 John 5:20). Jesus Himself is the truth (John 14:6), and He will win.

Because Spinoza elevated reason in determining truth, the project of modernity would be the domain of the intelligentsia. The intellectuals of the Enlightenment reinforced this with a vengeance, even turning the idea around: Anyone who identifies as—or who aspires to be—an intellectual, must adopt Spinoza's legacy. (See, for example, Hegel's quote cited above.) If a believer in Christ identifies as an intellectual, then Spinoza's legacy will prey upon that person's soul. To be an intellectual in today's world one must, almost by definition, hold to an evolutionary explanation of origins and/or to billions of years.

Spinoza's Legacy in the Church

Pressure from Spinoza's legacy has unwittingly motivated many evangelical intellectuals to compromise Biblical beliefs. First of all, they have bought into Spinoza's idea that theology must be separated from all science, including origins science. For example, consider the following in *The Expositor's Bible*, used by countless pastors in past decades:

> If anyone is in search of accurate information regarding the age of the earth, or its relation to the sun, moon and stars, or regarding the order in which plants and animals have appeared upon it, he is referred to recent textbooks in astronomy, geology, and paleontology. No one for a moment dreams of referring a serious student of these subjects to the Bible as a source of information. It is not the object of writers of Scripture to impart physical instruction or to enlarge the bounds of scientific knowledge. (Dods, 1947, p. 5)

Secondly, many evangelicals have accepted the idea that whatever "science" says, even about origins, has more authority than a plain reading of Scripture. Such a notion follows naturally from Spinoza's denial that the Scriptures are the source of truth. For example, Gleason Archer was a highly respected Christian who was a translator for the NASB and NIV versions of the Bible. He was known for his stand on Biblical inerrancy, while convincing himself that the inerrant Bible indicates the days in Genesis were not literal.[29] In his book *A Survey of Old Testament Introduction*, he wrote (Archer, 1985, p. 187):

> From a superficial reading of Genesis 1, the impression would seem to be that the entire creative process took place in six twenty-four-hour days. If this was the true intent of the Hebrew author…this seems to run counter to modern scientific research, which indicates that the planet Earth was created several billion years ago…

Archer's thoughts were influential in convincing other evangelicals such as J.P. Moreland to change from a young-Earth perspective to an old-Earth one.[30]

Significantly, Christian theologians who dream up various alternatives to a plain reading of Genesis 1 all begin with the assumption that billions of years for the age of the universe is a proven scientific fact. These include Meredith Kline, who espoused the framework hypothesis (Kline, 1966), John Walton, who promotes the idea of a cosmic temple (2009, pp. 91, 107), C. John Collins, who suggested the "analogical days view" (2003, p. 95), and John Lennox, who claims there could be long gaps between the days in Genesis 1 (2011, pp. 54, 154). The continual generation of new mutually contradictory alternatives indicates that none has been found to be satisfactory. Like the Gap Theory and the Day-Age Theory before them, they are the end results of exalting human speculation above revelation. As we have shown, ideas about long ages for the Earth are not scientific fact but rather rest on pantheistic presuppositions.

A torrent of books by evangelical authors and concerted efforts by ostensibly Christian organizations are attempting to harmonize evolution and/or billions of years with belief in the Bible.[31] As

a typical example, a recent book by William Lane Craig argues that one should look for the religious meaning of Genesis 1–11 rather than literal truth. Accounts such as a talking serpent in Genesis 3 "…if taken literally, would be so extraordinary as to be clearly false" (Travis, 2021). Craig's other justification for rejecting literal readings of Genesis 1–11 is mainly in one paragraph beginning with "young earth creationism's scientific claim is wildly implausible" (Craig, 2021). Such a view is consistent with Spinoza's argument that the Scriptures are mainly meant for promoting piety, and may contain falsehoods.

For many similar evangelical intellectuals, it is simply anti-intellectual to consider that the early parts of Genesis could be taken at face value. Consider the following reasoning by Oxford professor John Lennox. Noting "the current scientific evidence for an ancient earth," he advises that "we would be very unwise to ignore science through obscurantism or fear, and present to the world an image of Christianity that is anti-intellectual" (Lennox, 2011, p. 86). Sadly, such Christians also ignore the very strong evidence for a young Earth presented by many Ph.D. creation scientists who are far from being anti-intellectual. That evidence not only deals with cosmology, but also with such things as geology and genetics.

The resulting capitulation or compromise by Christian leaders has a disastrous effect on the perceived trustworthiness of the Bible. For example, most unbelievers see that the Bible clearly teaches a young universe. They then ridicule the Bible, often using the perceived settled "science" of the Big Bang. They either are not aware of, or are not impressed by, attempts to fit long ages into Genesis 1. Christians who use the Big Bang Theory to try to prove the existence of God or to justify their interpretation of Genesis fail to understand the pantheistic ideology behind the Big Bang's fundamental presupposition.[32] That presupposition is the cosmological or so-called Copernican principle promoted by Stephen Hawking, which states, as mentioned earlier, that the universe is unbounded and has no center. In using the Big Bang Theory, Christians allow the character of God to be stained. A God who presides over billions of years of creation and hundreds of millions of years of death shown in the fossils is weak, identifies Himself with the evil of death, and cannot even judge evil by a worldwide Flood. If our view of the early chapters of Genesis depends on pantheistic presuppositions, we weaken our testimony and displease our Creator.

Hawking was right that religion is based on authority. Since all things were made through Christ (John 1:3 and Colossians 1:16) and all things in heaven and on Earth were reconciled to God through Christ's blood (Colossians 1:20), all authority in heaven and on Earth was given to Jesus Christ (Matthew 28:18). Let us therefore submit to the authority of Jesus, the Word of God, and not to the words of sinful men.

Conclusion

In his *Theological-Political Treatise*, Spinoza deeply influenced modern intellectuals by demanding a separation between science and theology (and the Bible). Spinoza's *Ethics*, with its denial of the supernatural, also led to widespread acceptance of pantheism by intellectuals. As long as we allow non-Christians to frame the conflict in society as "science versus religion," we will always be on the defensive. We need to perceive and expose this conflict in our culture as basically a pantheistic religion versus Biblical Christianity.

Not only did Spinoza try to separate science from Scripture, he tried to separate the study of truth from Scripture. Scripture for him was useful only for promoting "piety," even though it could be full of falsehoods. Modern evangelical intellectuals have unwittingly succumbed to Spinoza's influence (his "ghost" lurking undetected in the closet of our minds) by putting more confidence in speculations of mainstream scientists than in the plain reading of Scripture. In so doing, they seriously weaken the authority of the Bible.

Acknowledgment

The inspiration for this paper originated with Dr. Merrill Cohen of Dover, PA.

Appendix A

See Table I

Appendix B

Spinoza's co-opting of Biblical themes: selected quotes

"1 John 4:13—Through this means we recognize that we remain in God, and God remains in us—that He gave to us from His own Spirit." Title page of the *Treatise* (1670, p. 387).

"…the moral value of a man's creed should be judged only from his works." Preface to the *Treatise* (1670, p. 393). Compare James 1:27.

"To the early Jews religion was transmitted in the form of written law because at that time they were just like children; but later on Moses (Deut. Ch. 30, v. 6) and Jeremiah (Ch. 31, v. 33) told them of a time to come when God would inscribe his law in their hearts." *Treatise*, Ch. 12 (1670, p. 504).

Table I. "Spinoza Speak"—Spinoza's redefinition of Biblical terms.

When Spinoza Says	What Spinoza Means	Representative Quotes	Reference	Page in Spinoza 2002
God	Nature	"…God, or Nature…"	*Ethics*, Part IV, Proposition 4	324
Divine	Referring to a principle behind nature (piety)	"A thing is called sacred and divine when its purpose is to foster piety and religion..." "…natural knowledge is divine…"	*Treatise*, Ch 12 *Treatise*, Ch 1	505 395
Salvation	Blessedness	"…it is not reason but revelation that can teach us that it is enough for blessedness or salvation for us to accept the divine decrees as laws or commandments..."	*Treatise*, Supplementary Note 31	580
Word of God	Right theology; the universal true religion	"…the phrase 'Word of God,' when used in connection with anything other than God himself, properly means the Divine Law…; that is, religion universal to the entire human race…"	*Treatise*, Ch 12	506
Bible	A variously corrupted set of books transmitted by human authors	"…faulty, mutilated, adulterated and inconsistent, that we possess it only in fragmentary form…" "…the letter, a mere shadow of God's word. " "…letters that are dead, and may have been corrupted by human malice…"	*Treatise*, Ch 12 *Treatise*, Ch 15 *Treatise*, Ch 15	503 521 521
Scripture	The part of the Bible containing the "Word of God"	"…Scripture, insofar as it contains the Word of God, has come down to us uncorrupted" "…Scripture has come down to us uncorrupted in respect of its doctrine and its chief historical narratives."	*Treatise*, Ch 12 *Treatise*, Ch 15	503 525
Theology	Studies whose aim is piety, not truth	"…faith demands piety rather than truth…"	*Treatise*, Ch 14	518
Philosophy	The study of truth	"The aim of philosophy is, quite simply, truth, while the aim of faith, as we have abundantly shown, is nothing other than obedience and piety."	*Treatise*, Ch 14	519
Piety	Doing justice and charity; loving one's neighbor	"Worship of God and obedience to him consists solely in justice and charity, or love towards one's neighbour."	*Treatise*, Ch 14	518
Obedience	Leading to piety	"…faith requires not so much true dogmas as pious dogmas, that is, such as move the heart to obedience; and this is so even if many of those beliefs contain not a shadow of truth, provided that he who adheres to them knows not that they are false."	*Treatise*, Ch 14	516
Revelation	Prophecy; superior imagination	"Prophecy, or revelation, is the sure knowledge of some matter revealed by God to man." "…the prophets perceived God's revelations with the aid of the imaginative faculty alone…" "…prophecy varied not only with the imagination and the temperament of each prophet but also with the beliefs in which they had been brought up…"	*Treatise*, Ch 1 *Treatise*, Ch 1 *Treatise*, Ch 2	394 403 405
Miracle	Unusual work of nature	"…unusual works of Nature are termed miracles, or works of God, by the common people; and partly from piety, partly for the sake of opposing those who cultivate the natural sciences…"	*Treatise*, Ch 6	444
Religion (ordinary)	Relics of man's bondage; superstition	"…religion—that is, the relics of man's ancient bondage…"	*Treatise*, Preface	390
Holy Spirit	Peace of mind	"…the Holy Spirit itself is nothing other than the peace of mind that results from good actions."	*Treatise*, Ch 15	525

In the above, *Treatise* refers to Spinoza's *Theological-Political Treatise*.

"Romans 1:20—'For the invisible things of God from the creation of the world are clearly seen through the intellect in the things that are made, even his power and his Godhead which is unto eternity, so that they are without excuse.' Here he quite clearly indicates that, by the natural light of reason, all can clearly understand the power and eternal divinity of God…" *Treatise*, Ch. 15 (1670, p. 434).

"Blessedness is not the reward of virtue, but virtue itself. We do not enjoy blessedness because we keep our lusts in check. On the contrary, it is because we enjoy blessedness that we are able to keep our lusts in check." *Ethics*, Part V, Proposition 42 (1677, p. 382). Compare Romans 8:2.

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Endnotes

1 Available, for example, at https://law.justia.com/cases/federal/district-courts/FSupp2/400/707/2414073/.

2 See, for example, Livio 2020. Popular astrophysicist Livio claims that there is not even the slightest scientific doubt about evolution (p. 223).

3 https://abcnews.go.com/WN/Technology/stephen-hawking-religion-science-win/story?id=10830164.

4 For an expanded discussion of the difference between observational science (also called operation science or experimental science) and origins science, see Mortenson (2020b).

5 In his book, Ager clearly expressed his disdain for Bible-believing Christians. In the preface he wrote (in bold font) that "…nothing in this book should be taken out of context and thought in any way to support the views of the 'creationists'" (p. xi), and on p. 129 he wrote: "Since the ideas of Darwin and Wallace first burst upon the scientific world, we need no longer concern ourselves with the opposition of the 'fundamentalists' and 'creationists'…)." His pantheistic views were evident in the following: "I am very much included towards the views of Lovelock…and his concept of the Earth as *Gaia*, like a huge working organism, with everything related to everything else, without the intrusion of outside bodies" (Ager, 1993, p. 196).

6 Mainstream cosmologists imagine that the universe is like a three-dimensional surface of an expanding four-dimensional balloon.

7 In several places in his classic book (Hubble, 1937, pp. 50, 51, 59), Hubble exhibits a distaste for any idea that the universe could have a favored position or center. For example, "Such a condition would imply that we occupy a unique position in the universe, analogous, in a sense, to the ancient conception of a central earth. The hypothesis cannot be disproved but is unwelcome and would be accepted only as a last resort in order to save the phenomena." He makes the "sheer assumption" that "There must be no favoured location in the universe, no centre, no boundary; all must see the universe alike."

8 In his famous book *Pale Blue Dot*, Carl Sagan claimed that "the delusion that we have some privileged position in the universe" is challenged by the fact that "Our planet is a lonely speck in the great enveloping cosmic dark. In our obscurity, in all this vastness, there is no hint that help will come from elsewhere to save us from ourselves" (1994, p. 9).

9 Such cosmologies include possible explanations for distant starlight (Humphreys, 2008b) and the cosmic background radiation (Humphreys, 2014). In particular, due to the relativistic effects of gravity on time, time on Earth could pause (stop) during Day 4 of Genesis 1 while light traveled billions of light-years from newly created stars. Furthermore, red shifts of light from stars actually do indicate that the universe has a center (Humphreys, 2002). Other creationist

cosmologies exist. Humphrey's theories are heavily informed by Scripture and explain additional data such as planetary magnetic fields (Humphreys, 2008a) and signals from distant spacecraft (Humphreys, 2007).

10 Romans 2 and 3 can be viewed as follows. Chapter 2 describes theists, those who proclaim belief in a Creator outside of nature, but are self-righteous. They end up breaking their own laws and doing the same sorts of things as the non-theists. Their religion can be Islam, Judaism, or nominal Christianity. In Romans 3 we finally find those who realize that righteousness before a holy God only comes through faith in Jesus Christ. Temptations can come to such Christians to fall back into the ways of those described in Romans 1 and 2. For example, 1 John 5:21 exhorts us to keep ourselves from idols. Galatians warns us not to fall back into trying to gain righteousness through the law and efforts of the flesh.

11 Modified Monism has a personal World Soul, and Absolute Monism holds that everything is illusion (Brow, 1966).

12 Gertrude Himmelfarb writes, "What they [Marx and Darwin] both celebrated was the internal rhythm and course of life, the one the life of nature, the other of society, that proceeded by fixed laws, undistracted by the will of God or men" (Himmelfarb, 1959, p. 348). In Marx's system, there is natural progression of history from primitive societies to more advanced ones, just as in Darwinism there is natural progression of living forms from the primitive to more advanced ones; progress is inherent in the nature of the cosmos. Marx himself actually lived in active rebellion against God; his pantheistic system obscured an underlying Satanist religion (Wurmbrand, 1986).

13 Stephen Meyer argues for a distinction between naturalism and pantheism, because naturalism does not have an impersonal god (Meyer, 2021, pp. 219–220). In Modified Pantheism, however, the reality or the principle behind nature is considered as god, whether or not explicitly labeled as such.

14 For example, Hedin, 2019, p. 213.

15 Rebecca Goldstein suggests Spinoza was motivated to reject the Biblical God's existence because of the terrible suffering his people experienced in the Spanish Inquisition (2006). He had a problem, in other words, with theodicy. But his system fails to resolve the problem. Doing away with the God of the Bible does not do away with the existence of evil, nor does it explain the presence in the world of good. Deeper knowledge of and reflection on the Scriptures might have rewarded Spinoza with true *baruch* (blessedness). Had the Jews of the medieval era not deliberately suppressed Isaiah, Chapter 53, Spinoza might have seen that Scripture is self-authenticating and of supernatural origin, given by a loving God who desires all His creatures to be blessed by His presence.

16 Spinoza certainly would have been familiar with the esoteric writings of Jewish mystics called Cabbalists. Cabbalism is difficult to understand, but it is pantheistic: it holds that a god-force permeates the universe, and that a direct connection exists between that god-force and everything that exists (thus the doctrine, "as above, so below"). It holds also to an evolutionary process that leads inexorably to a state of perfection—apart from God. And it believes in the unity of all things (Downing, 2011, pp. 108–109).

17 Rather counterintuitively to modern thinking, Maimonides' opponents were called "skeptics," while followers of Maimonides' idea were called "dogmatists."

18 The other six are:

God, that is, a Supreme Being, exists, supremely just and merciful, the exemplar of true life. He who knows not, or does not believe, that God exists, cannot obey Him or know Him as judge.

God is one alone. No one can doubt that this belief is essential for complete devotion, reverence, that is, love towards God; for devotion, reverence and love spring only from the pre-eminence of one above all others.

God is omnipresent, and all things are open to Him. If it were believed that things could be concealed from God, or if it were not realised that He sees everything, one might doubt, or be unaware of the uniformity of the justice wherewith He directs everything.

God has supreme right and dominion over all things. He is under no jurisdiction, but acts by His absolute decree and singular grace. All are required to obey Him absolutely, while He obeys none.

Worship of God and obedience to Him consists solely in justice and charity, or love towards one's neighbour.

All who obey God by following this way of life, and only those, are saved; others, who live at pleasure's behest, are lost. If men did not firmly believe this, there is no reason why they should obey God rather than their desires.

19 The eight definitions defined self-caused, finite, substance, attribute, mode, God, free, and eternity. For example, Definition 6 states, "By God I mean an absolutely infinite being, that is, substance consisting of infinite attributes, each of which expresses eternal and infinite essence" (Spinoza, 1677, p. 217). Axiom 1, for example, states, "All things that are, are either in themselves or in something else" (p. 217). From the definitions and axioms he proceeded to prove propositions such as Propositions 14 ("There can be, or be conceived, no other substance but God") and 15 ("Whatever is, is in God, and nothing can be or be conceived without God") (Spinoza, 1677, p. 224).

20 The origin of term pantheism is attributed to Joseph Raphson in 1697. See Thomson, A. (2008). *Bodies of Thought: Science, Religion, and the Soul in the Early Enlightenment*, Oxford University Press, NY, p. 54, cited at https://en.wikipedia.org/wiki/Joseph_Raphson.

21 See also Moreland, 2018, for a discussion of how this developed.

22 "Descartes, for instance, who is commonly regarded as a representative rationalist

(at least with regard to metaphysics), had clear empiricist leanings (primarily with regard to natural philosophy, where sense experience plays a crucial role)…Conversely, Locke, who is thought to be a paradigmatic empiricist, argued that reason is on an equal footing with experience, when it comes to the knowledge of certain things, most famously of moral truths" (Markie and Folescu, 2021).

23 See, for example, the discussion "The Judeo-Christian Origins of Modern Science" in Meyer, 2021, Chapter 1.

24 Haldane, E.S., and F.H. Simson (translators) 1963. *Hegel's Lectures on the History of Philosophy*, Volume 3. Routledge and Kegan Paul, London, England. Cited in Westphal, Merold. 2003. "Hegel Between Spinoza and Derrida." *Hegel's History of Philosophy: New Interpretations*. Duquette, D.A. (editor). 2003. State University of New York Press, Albany, NY, p. 144.

25 Nietzsche, Friedrich. 1882. *The Gay Science*. Cited in Pearcey, Nancy. 2018. *Love Thy Body: Answering Hard Questions about Life and Sexuality*. Baker Books, Grand Rapids, MI.

26 As a particular aspect of the spontaneous, progressive processes of nature, the Hegelian dialectic is an aspect of pantheism. Probably few evolutionists or science popularizers are aware of it, but Darwinian evolution is classic Hegelianism. It is so obscured by scientific jargon and supposed evolutionary mechanisms that we easily fail to recognize it. But the dialectic is certainly there. Consider: Organisms are in conflict with nature. "Thesis" is the need for organisms to adapt to a new or changed environment. "Antithesis" is mutation acted on by natural selection. "Synthesis" is a new species. An incipient dialectic can be located in Spinoza's thought. In *Ethics*, Spinoza's musings on the modes of Deity include the notion of conflict and struggle for existence, and that out of this conflict would arise things and persons. Hegel surely had read Spinoza's thinking, and one cannot help but wonder if that is where he derived his idea of the dialectic. Hegel was a pantheist; he believed that everything is part of an evolutionary process that eventually leads to perfection (Downing, 2011, p. 192).

27 Mortenson (1997) in a section on the Enlightenment documents the direct connection between Spinoza and higher criticism.

28 https://en.wikipedia.org/wiki/Evolution_and_the_Catholic_Church.

29 Mortenson (2020a) examines this common justification of old-Earth compromise. Besides Gleason Archer, Mortenson mentions other well-known figures in the Biblical inerrancy movement who held old-Earth views: Bill Bright, James Montgomery Boice, W.A. Criswell, Wayne Grudem, Walter Kaiser, J.P. Moreland, J.I. Packer, and R.C. Sproul.

30 For example, Moreland, 2018, p. 189.

31 The list of books espousing some form of theistic evolution is long. Examples include Collins, 2003; Sperry and Noble, 2009; Davidson, 2010; Collins, 2011; Giberson and Collins, 2011; Lennox, 2011; Asher, 2012; Enns, 2012; Miller and Soden, 2012; Applegate and Stump, 2016; Hill et al. 2016; Lamoureux, 2016; Longman, 2016; and Venema and McKnight, 2017. Organizations and websites devoted to promoting some form of evolution and/or billions of years in the Church include BioLogos, the American Scientific Affiliation, Solid Rock Lectures, Reasons to Believe, and the Templeton Foundation.

32 See, for example, Meyer, 2021. Meyer presents a detailed summary of most of the historical steps involved in acceptance of the Big Bang Theory by mainstream scientists and discusses its fundamental presupposition, but does not notice the ideology behind that presupposition.

Creation Research Society Quarterly 2023 59:142–150

eKINDS Project Paper

The uniqueness of ruminants (Ruminantia) among the even-toed ungulates (Artiodactyla)

Part I: Molecular baraminology studies

Jean K. Lightner and Matyias Cserhati

Abstract

Though evolutionists routinely assume universal common descent of life, observational evidence militates against this unsubstantiated belief. In contrast, creationists recognize limited common descent where originally created kinds of organisms have reproduced to fill the earth. As they have done so, there has been considerable diversification and adaptation, though not enough to transmute them into a fundamentally different type of organism (e.g., from a rodent to a bat). Organisms that are not related by common descent can be recognized by significant holistic discontinuity between them. In this paper we begin an investigation of ruminants (Ruminantia), members of the order Artiodactyla, to determine if there is significant discontinuity between them and other species within this order. In this first paper, two molecular baraminology techniques were applied to available data to determine the relationship of ruminants to other artiodactyls. The results support the hypothesis that ruminants do not share common ancestry with other artiodactyls.

Key Words: Baraminology, ruminant, artiodactyl, gene content method, GCM, whole genome k-mer sequence, WGKS, statistical baraminology

Introduction

All honest supporters of the theory of evolution, who pay due attention to the facts, acknowledge further that the grounds for assuming the existence of a real relationship between the forms in question become more scanty when the higher divisions are considered. For the species of one genus these grounds often amount to great and even irrefutable probability, and the same may be said in not a few cases of the genera of one family, and occasionally for the families of one order, but it can seldom be maintained of the orders in one class. The evidence afforded by natural science for the theory of common descent becomes steadily weaker the higher we ascend the system. —Erich Wasmann (1910)

Accepted for publication July 14, 2022

Over a century ago, the renowned entomologist, Erich Wasmann, clearly pointed out that universal common ancestry is unsupported by observations in the biological world. While he supported the idea that species can change (which fits one definition of the word *evolution*), he clearly rejected the idea that all life-forms are related, or that humans descended from apes (i.e., universal common descent, which fits another definition of *evolution*. As a Jesuit priest, he accepted the "Doctrine of Creation," recognizing that even the ability to change must have been endowed by a Creator. Wasmann's view of limited common ancestry (or limited common descent) is essentially the same as the view held by young-Earth creationists today (Wise, 1990; Friar, 2000; Wood et al., 2003; Jeanson, 2010; Hennigan, 2014; Ahlquist and Lightner, 2018, and a myriad of others).

There are some distinct groups of mammals (e.g., bats) that the average person can recognize as being obviously separate from all others in the class (Mammalia). This gap is evident in the morphology of extant species, as well as in the fossil record. In a creationist taxonomy, when a group is surrounded by such clear, systematic discontinuity, it is called an apobaramin (Wise, 1990; Wood et al., 2003). This implies that the members of the apobaramin do not share common ancestry with any creatures outside the group. It is still possible that not all members in the group share common ancestry, as they may represent more than one created kind (holobaramin, or sometimes just baramin).

We suggest that another apobaramin would be the order Artiodactyla, or even-toed ungulates. This order of herbivores has the axis of the feet between the third and fourth digits (a paraxonic limb structure), with the first digit absent in all extant species. Thus, they have an even number of toes, except in Tayassuididae (peccaries) which only has three digits on the hind limbs (Huffman, 2016). Although molecular studies that assume universal common descent have placed whales (order Cetacea) in this group, and some fossils have been suggested to fill in the gaps, we believe that such placement is implausible based on significant morphological and physiological differences.

Extant terrestrial Artiodactyla includes several suborders including Tylopoda (camelids), Suiformes (pigs and peccaries), and Ruminantia (ruminants) (Huffman, 2016). Initially, hippos had been placed in Suiformes, but the fact that molecular studies place them in with aquatic mammals suggests they may not be related to the pigs and peccaries. This is further supported by statistical baraminology analyses suggesting Camelidae, Suidae, and Hippopotamidae are each separate holobarmins (Thompson and Wood, 2018). In this series of studies, we will focus on the ruminants, highlighting through multiple lines of evidence that they form a very distinctive apobaramin. This strongly suggests they do not share common ancestry with other members of this order.

Ruminants are divided into six extant families: Antilocapridae (pronghorns), Bovidae (cattle, sheep, and antelopes), Cervidae (deer), Giraffidae (giraffes and okapis), Moschidae (musk deer), and Tragulidae (chevrotains). Previous creation studies have identified several monobaramins, or groups of organisms that share significant, holistic continuity and, thus, are likely related in that they are from the same baramin, as detailed below.

Sheep and goats comprise the subfamily Caprinae in the family Bovidae. Based on hybrids that have formed between the different species, and other evidence, it has been suggested that all Caprinae are related, forming a monobaramin (Lightner, 2006a). A similar conclusion was reached regarding the subfamily Bovinae, as hybrid data unites most of the group, and the remaining species appear very similar to those united by these data (Lightner, 2007). In Cervidae, two of the four traditionally recognized subfamilies (Cervinae and Odocoileinae, the latter of which is now recognized as Capreolinae) are united by hybrid data, forming a third ruminant monobarmin (Lightner, 2006b). While there have been occasional reports of hybrids between these three monobaramins, none were documented well enough to warrant uniting them based on currently available information. Thompson and Wood (2018) identified Moschidae as a monobaramin in a statistical baraminological study given its strong evidence for continuity between its members in baraminic distance correlation and multidimensional scaling. The same authors also analyzed Cervidae, but the results were inconclusive.

Here, in part I of this series, we use two different molecular techniques to detect clusters within the order Artiodactyla (cetaceans excepted). First, we applied the gene content method (GCM) to available proteome data. This technique was developed as part of the Creation Research Society (CRS) eKINDS (examination of kinds in natural diversification and speciation) project (O'Micks, 2017). Due to the small number of artiodactyls with sufficient protein data to be included, we also performed the Whole Genome K-mer Signature (WGKS) on available genomic data so more species could be compared. In Part 2 of this series, these molecular findings will be augmented with descriptive study of morphologic and physiologic characteristics of ruminants to further delineate the profound gap between them and other even-toed ungulates.

Materials and Methods

Usage of the Gene Content Method

The Gene Content Method (GCM) is a statistical method used in molecular baraminology to delineate baramins based on their common orthologous protein

content (O'Micks, 2017). The whole proteomes for 15 Artiodactyl species (Table I) were downloaded from NCBI and were run against the OrthoMCL database at the EuPathDB Galaxy website (veupathdb.globusgenomics.org) to match them against orthologous protein groups (Chen et al., 2006). In an all-versus-all manner, the common orthologous protein content between all possible species pairs was computed and the Jaccard Coefficient Value (JCV) was calculated (common orthologous protein groups divided by the union of the orthologous protein groups) for each species pair. These values were put into a matrix, which was then visualized in a heatmap using the heatmap command using the 'ward.D2' clustering algorithm in R, version 4.0.1 (Figure 1). Ward clustering is a type of hierarchical clustering which minimizes within-cluster variance (Aldernderfer and Blashfield, 1984, p. 43). Higher JCVs are colored with lighter colors, denoting species belonging to the same cluster (and ideally, the same baramin), whereas lower values are colored in red, suggesting the pair of species belong to two separate groups (different baramins). The JCV matrix and statistical values for the main groups are available online in Supplementary File 1. An elbow and a silhouette plot were generated from this data to help with the interpretation; figures for these are located in Supplementary File 3 at https://github.com/csmatyi/artiodactyls.

Table I. The artiodactyl species included in the gene content method (GCM) analysis are listed according to their taxonomic placement. The superscripts 1–3 indicate which group they fell into in the study. The * indicates a species that did not cluster well with other species.

NON-RUMINANTS

Camelidae
- *Camelus_bactrianus* (Bactrian camel)[1]
- *Camelus_dromedarius* (Arabian camel)[1]
- *Camelus_ferus* (Wild Bactrian camel)[1]
- *Vicugna_pacos* (alpaca)[1]

RUMINANTS (Ruminantia)

Bovidae

Bovinae
- *Bos taurus* (domestic cattle)[2]
- *Bos indicus* (zebu cattle)[2]
- *Bos indicus* x *Bos taurus* (Brahmin)[2]
- *Bos mutus* (wild yak)[2]
- *Bison bison* (American bison)[2]
- *Bubalus bubalis* (domestic water buffalo)[2]

Caprinae
- *Ovis aries* (sheep)*
- *Capra hircus* (goat)*

Cervidae

Capreolinae
- *Odocoileus virginianus* (white-tailed deer)[2]

Cervinae
- *Muntiacus reevesi* (Reeves's muntjac)[3]
- *Muntiacus muntjak* (Indian muntjac)[3]

Usage of the WGKS method

The whole genome sequence (WGS) for 80 Artiodactyl species (Table II) were downloaded from NCBI and analyzed using a Python script to generate the whole genome k-mer signature (WGKS) for each one, according to the protocol in Cserhati et al. (2019). The resulting Pearson Correlation Coefficient (PCC) matrix is available in online Supplementary File 2. The 'ward.D2' clustering algorithm was used here as well. On the heat map (Figure 2) higher correlation values are colored with brighter colors, denoting species belonging to the same cluster, whereas lower correlation values are colored in dark yellow to red, denoting a pair of species belonging to two separate groups, similar to the GCM.

Statistics are reported for each of the putative clusters, including the number of species, minimum, mean and maximum PCC values, standard deviation, and p-values. The p-values were calculated with the Student's t-test comparing PCC values within a given cluster versus PCC values between the species of the cluster and all other species in the study. These are listed in Supplementary File 2. An elbow and a silhouette plot were also generated from this data to help with the interpretation and is located in Supplementary File 3. All supplementary files and figures are located at https://github.com/csmatyi/artiodactyls.

Results

The GCM heat map (Figure 1) shows three obvious clusters, and two species that are off by themselves. The silhouette plot indicates four as the ideal number of clusters (k); the elbow plot has a bend (elbow) at k = 4. When k = 4, the two species in the upper right form the fourth, less significant, cluster. The Hopkins clustering measure for the JCV

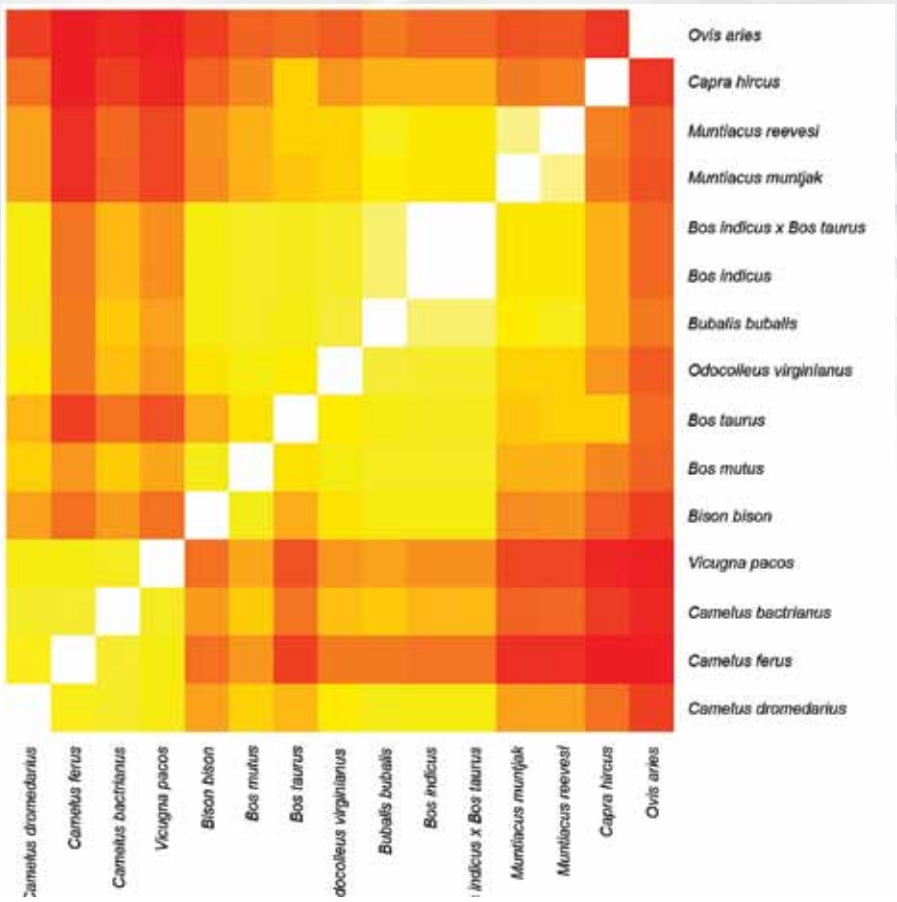

Figure 1. A heat map visually representing the relative similarity/dissimilarity within and between clusters as identified using the GCM. Note that every species listed on the right is also listed along the bottom. This way the gene content similarity between any two species can be visually represented according to a color scale. The nearly white squares that "stair-step" from the lower left to upper right are where each species is compared to itself, 100% similarity (identical). Yellow indicates high similarity/continuity; red indicates low similarity/discontinuity.

matrix is 0.614, which is sufficient for meaningful clustering. The first cluster includes all four Camelidae species used in this study. The second group includes six species of Bovidae from the subfamily Bovinae and one species of Cervidae from the subfamily Capreolinae (formerly Odocoileinae). The third group includes the two members of the traditional Cervidae subfamily Muntiacinae, which has recently been lumped into Cervinae as a distinct tribe. Additionally, there are two species (*Ovis aries* and *Capra hircus*) that did not cluster with anything; they are from the Bovidae subfamily Caprinae.

The WGKS heat map (Figure 2) reveals two obvious clusters. Here the Hopkins clustering value is 0.89, which means that the PCC matrix is of very good quality for clustering. A very large cluster includes the majority of ruminants (45 of the 50 species from Bovidae, 14/15 Cervidae, 3/3 Giraffidae, 1/3 Moschidae, 0/1 Antilocapridae, 0/2 Tragulidae). A second cluster is comprised of all four camelids included in the study. An odd pattern is seen with some of the 9 species in the Bovidae subfamily Caprinae. Two (*Ovis canadensis* and *Capra hircus*) are beside the large ruminant cluster, though they show obvious similarity to two other Caprinae species within the cluster (*Hemitragus hylocrius* and *Capra sibirica*). Yet there are five other species from this subfamily, including another from each of the genera *Ovis* and *Capra*, that are well-integrated within the ruminant cluster.

Two of the Moschidae (*Moschus moschiferus* and *M. chrysogaster*) and two of the Bovidae (*Saiga tatarica* and *Beatragus hunteri*) are intermingled to the side of the two aberrant Caprinae species. The two Tragulidae species did not cluster with the ruminants, but they do show some similarity with each other despite being on opposite ends of the heat map. The cervid *Rangifer tarandus* (reindeer) and the bovid *Alcelaphus buselaphus* (hartebeest) are at the extremes of the heat map. *R. tarandus* is in the subfamily Capreolinae, which has five other species in the main ruminant cluster. *Alcelaphus buselaphus* is the family Alcelaphinae; of the four species included in this study, two are in the main ruminant cluster. The species from the monotypic Antilocapridae does not cluster with any other species and shows only weak similarity with some of the other ruminants.

Interestingly, both the elbow and silhouette plots suggest two as the optimal number of clusters, with three as a less probable alternative. When statistics were run for k = 2, eleven of the aberrant ruminants discussed above ended up in with the non-ruminants. The large ruminant cluster with 63 species had a p-value approaching zero, meaning it was a very highly significant cluster including species from three ruminant families. When statistics were run for k = 3, two non-ruminants (the hippo and pig), *Alcelaphus buselaphus* and two species of *Tragulus* remained in with the camelids, and eight of the eleven aberrant ruminant species separated into the third

Table II. The artiodactyl species included in the whole genome k-mer signature (WGKS) analysis are listed according to their taxonomic placement. The superscript c indicates species that visually grouped in the camelid cluster, an * indicates ruminants that did not fall in the large ruminant cluster.

NON-RUMINANTS		
Suiformes	**Suidae**	*Sus scrofa* (pig)
Tylopoda	**Camelidae**	*Camelus bactrianus* (Bactrian camel)[c]
		Camelus dromedarius (Arabian camel)[c]
		Camelus ferus (Wild Bactrian camel)[c]
		Vicugna pacos (alpaca)[c]
Cetancodonta	**Hippopotamidae**	*Hippopotamus amphibius*
RUMINANTS (Ruminantia)		
	Antilocapridae	*Antilocapra americana* (pronghorn)*
	Bovidae	
	Aepycerotinae	*Aepyceros melampus* (impala)
	Alcelaphinae	*Alcelaphus buselaphus* (hartebeest)*
		Beatragus hunter (Hunter's hartebeest)*
		Connochaetes taurinus (brindled gnu)
		Damaliscus lunatus (topi)
	Antilopinae	*Antidorcas marsupialis* (springbok)
		Eudorcas thomsonii (Thomson's gazelle)
		Litocranius walleri (gerenuk)
		Madoqua kirkii (Kirk's dik-dik)
		Nanger granti (Grant's gazelle)
		Neotragus moschatus (suni)
		Neotragus pygmaeus (royal antelope)
		Oreotragus oreotragus (klipspringer)
		Ourebia ourebi (oribi)
		Procapra przewalskii (Przewalski's gazelle)
		Raphicerus campestris (steenbok)
		Saiga tatarica (saiga)*
	Bovinae	*Bison bison* (American bison)
		Bos frontalis (gayal)
		Bos grunniens (domestic yak)
		Bos grunniens x *Bos taurus* (dzo)
		Bos indicus (zebu cattle)
		Bos indicus x *Bos taurus* (Brahmin)
		Bos mutus (wild yak)
		Bos taurus (taurine cattle)
		Bubalus bubalis (water buffalo)
		Syncerus caffer (African buffalo)
		Tragelaphus buxtoni (mountain nyala)
		Tragelaphus eurycerus (bongo)
		Tragelaphus imberbis (lesser kudu)
		Tragelaphus oryx (common eland)

Table II (cont.)

		Tragelaphus scriptus (Cape bushbuck)
		Tragelaphus spekii (Sitatunga)
		Tragelaphus strepsiceros (greater kudu)
	Caprinae	*Ammotragus lervia* (aoudad)
		Capra aegagrus (wild goat)
		Capra hircus (domestic goat)*
		Capra sibirica (Siberian ibex)
		Hemitragus hylocrius (Nilgiri tahr)
		Oreamnos americanus (mountain goat)
		Ovis aries (sheep)
		Ovis canadensis (bighorn sheep)*
		Pseudois nayaur (bharal)
	Cephalophinae	*Cephalophus harveyi* (Harvey's duiker)
		Philantomba maxwellii (Maxwell's duiker)
		Sylvicapra grimmia (bush duiker)
	Hippotraginae	*Hippotragus niger* (sable antelope)
		Oryx gazella (gemsbok)
	Reduncinae	*Kobus ellipsiprymnus* (waterbuck)
		Redunca redunca (Bohar reedbuck)
Cervidae		
	Cervinae	*Axis porcinus* (hog deer)
		Cervus elaphus (red deer)
		Cervus hanglu (Central Asian red deer)
		Elaphurus davidianus (Pere David's deer)
		Muntiacus crinifrons (black muntjac)
		Muntiacus muntjac (Indian muntjac)
		Muntiacus reevesi (Reeves' muntjac)
		Przewalskium albirostris (white-lipped deer)
	Hydropotinae	*Hydropotes inermis* (Chinese water deer)
	Capreolinae	*Alces alces* (Eurasian elk)
		Capreolus capreolus (Western roe deer)
		Capreolus pygargus (Eastern roe deer)
		Odocoileus hemionus (mule deer)
		Odocoileus virginianus (white-tailed deer)
		Rangifer tarandus (reindeer)*
Giraffidae		*Giraffa camelopardalis* (giraffe)
		Giraffa tippelskirchi (Masai giraffe)
		Okapia johnstoni (okapi)
Moschidae		*Moschus berezovskii* (Chinese forest musk deer)
		Moschus chrysogaster (alpine musk deer)*
		Moschus moschiferus (Siberian musk deer)*
Tragulidae		*Tragulus javanicus* (Java mouse-deer)*
		Tragulus kanchil (lesser mouse deer)*

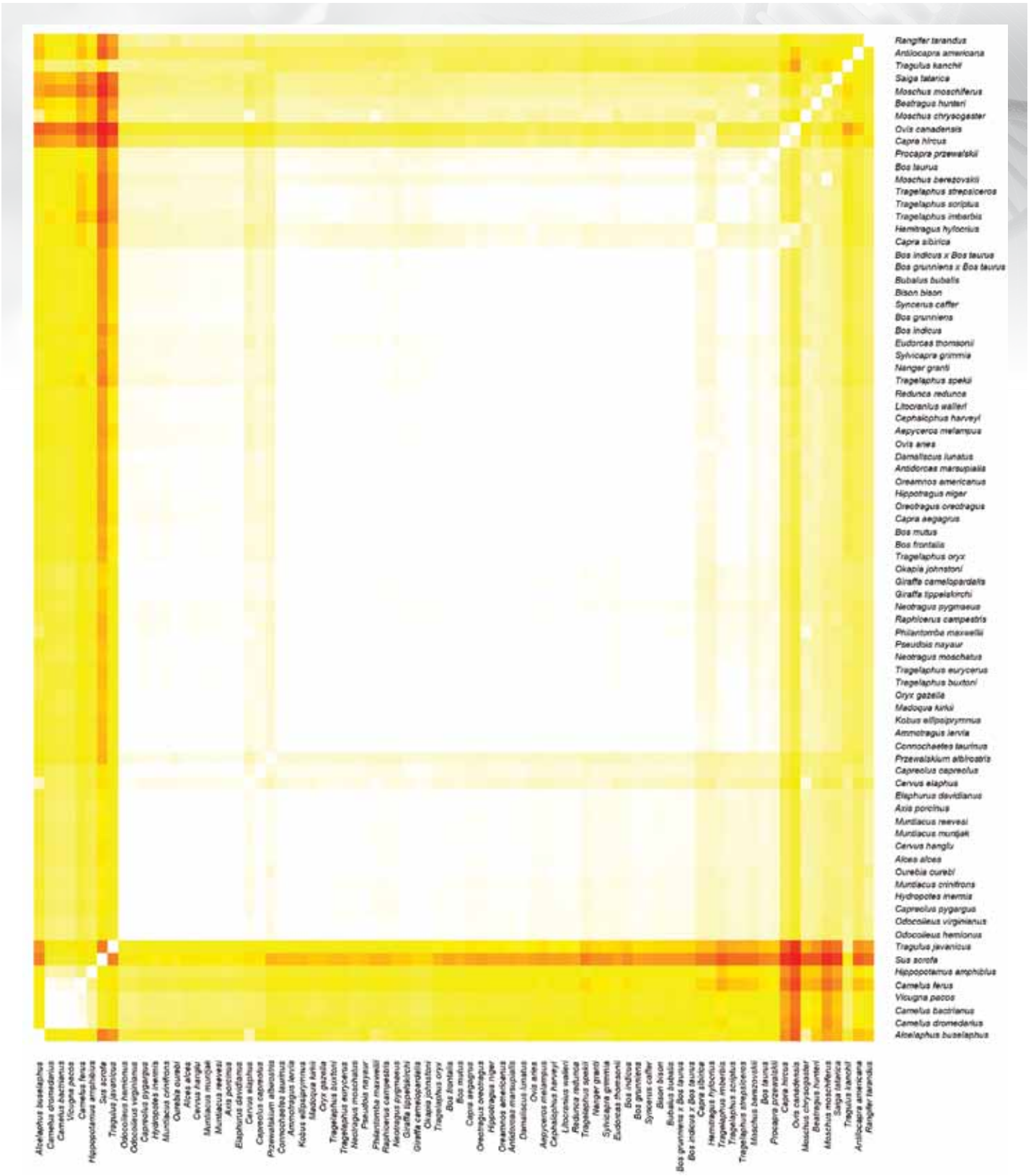

Figure 2. A heat map visually representing the relative similarity/dissimilarity within and between clusters as identified using the WGKS method. Here the value of the Pearson Correlation Coefficient is visualized according to a color scale. Each point in the heat map represents the correlation value between a given pair of species. More similar species pairs with higher correlation values are represented by lighter, whitish colors. Species pairs which are dissimilar with one another (lower correlation values) are represented by darker, yellow to red colors.

cluster. The p-values of these two groups were fairly high (less likely to be significant), while the large ruminant cluster remained the same, highly significant.

Regarding the heat maps, Figures 1 and 2 are not directly comparable to each other. The colors in the Figure 1 heatmap are darker yellow/orange than the points in the heatmap in Figure 2, which are much brighter yellow/white. The points in Figure 1 represent Jaccard Coefficient values calculated by the GC method, whereas the points in Figure 2 represent PCC values calculated by the WGKS algorithm. Supplementary File 3 shows a histogram of the JC and the PCC values, one above the other. As we can see in the top half of Supplementary Figure 1 in Supplementary File 3, the top of the JCV histogram is shifted to the left, towards lower values, with a mode of 0.937. The PCC values in the histogram in the bottom half of Supplementary Figure 1 are shifted to the right, towards higher values. The PCC values have a mode of 0.989. This is what causes the difference in the color of the points towards brighter colors in a large part of the heatmap in Figure 2. Supplementary File 3 can be found online at https://github.com/csmatyi/artiodactyls.

Discussion and Conclusions

The results support the hypothesis that ruminants are distinct from other artiodactyls. In the GCM study, proteins from Camelidae and Ruminantia were used. The four camelids formed a separate group from the ruminants. All ruminants in this study were from the families Bovidae and Cervidae, two of the six extant families of ruminants.

The WGKS study had data from more species and families available and gave similar results. Again, all four camelids in the study formed a clear group, and the majority of ruminants (63/74) fell in one huge cluster. The pig (*Sus scrofa*; Suiformes) shows the most discontinuity with all the other artiodactyls, with the lowest mean PCC value with all other species (0.922). The hippopotamus (*Hippopotamus amphibius*; Cetancodonta) showed less discontinuity. However, neither grouped with the large ruminant cluster.

What is more challenging to interpret are some of the ruminant species that do not cluster as would be predicted. For example, in the GCM results, the bovids from the subfamily Bovinae (cattle, bison, buffalo) cluster together with one species from Cervidae (*Odocoileus virginianus*), yet two other bovids from a separate subfamily (Caprinae) are off to one side showing discontinuity with the first group and each other, despite known hybrids between sheep (*Ovis aries*) and goats (*Capra hircus*). There is another small cluster of two cervids from the subfamily Cervinae. Errors in the database are one possibility; parameter settings may also have some influence. Another possibility is that these organisms have changed in ways that affect the results, though this seems less likely given the quantity of data used in these comparisons. This should be investigated in more detail in future studies.

A similar pattern is seen in the WGKS study. Here, all six extant families of ruminants had at least one representative in the study. One family, Giraffidae, has all members, of the three extant species included in this study, nested beside each other within the large ruminant cluster. Two families, Bovidae and Cervidae, had most species fall within the main cluster, though bovids are a bit spread out with most on either side of the giraffids and one (*Ourebia ourebi*) in the middle of the cervids. A fourth family, Moschidae, had only one of three species land in the main ruminant cluster. The final two ruminant families, Antilocapridae and Tragulidae, had only one and two species represented in the study, respectively. None fell within the large ruminant cluster.

Thus, while ruminants are distinct from other artiodactyls, there is some evidence the group may be divided by discontinuity as two families which are represented by three species did not fall in the main ruminant cluster. Two of these species are in Tragulidae, a family that lacks some of the traits typical of other ruminant families (horns, well-developed omasum with full rumination, etc.) (Janis and Theodor, 2014). The monotypic Antilocapridae (pronghorn) also did not group with the large ruminant cluster. This is a bit surprising as this ruminant species possesses traits (e.g., horn morphology) which seem intermediate between Bovidae and Cervidae, both of which are well represented within the large ruminant cluster. Other work has placed the Antilocapridae as a sister taxon to Giraffidae (Fernández and Vrba, 2005; Price et al., 2005).

The fact that Tragulidae and Antilocapridae did not fall in the ruminant cluster may hint at a polybaraminic status for Ruminantia. However, it is best to consider this tentative, especially for the monotypic Antilocapridae, due to the small number of species included in this study. Further, based on fossil evidence, if antilocaprids are related to other ruminants, they appear to have been separated from the other lineages for more time (Beatty and Martin, 2009). One or more factors appear to be adversely affecting the analysis, as members of the same genus should group together, especially if there is strong clustering above the genus level. The same can be said of species in one family when there is strong clustering above a family. Potential explanations for these apparently aberrant results include errors in the NCBI database, a defect in the algorithm or parameters settings, or, seemingly less probable, massive genetic shifts that affect a single species in a genus.

It should be noted that baraminological techniques use various clustering techniques (JCV and/or PCC). These methods will naturally cluster species into groups, just like evolutionary meth-

ods will naturally make phylogenetic trees. Whether or not the clusters are always biologically meaningful is an important concern. Therefore, looking at statistical significance and using various methods to visualize the results are important as we draw conclusions. For example, in the WGKS-method heat maps there were two visually obvious groups, and the rest of the species did not appear to group very well at all. If we had used statistics alone, this may not have been as obvious. As we continue to develop these methods, improving visualization and understanding when differences truly qualify as significant, holistic discontinuity is important considerations.

Finally, the NCBI databases are extremely valuable, yet not error-free (Rhie et al., 2020). As technologies improve, the quality of the database should as well. Complete proteomes for more species will become available. This highlights the fact that molecular studies should always be supplemented with other studies. We want to see consilience through multiple lines of evidence to support our conclusions about relationships. This will be done for ruminants using anatomic and physiologic data in Part 2 of this series, to show further evidence that the taxon Ruminantia constitutes an apobaramin, implying they do not share ancestry with any other extant suborders within Artiodactyla.

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Baraminic Placement of *Homo heidelbergensis* Based on Molecular Data

Matthew Cserhati

Abstract

The consensus of creationist opinion places *Homo heidelbergensis* within the human holobaramin. This is based on morphological data, but what do the molecular data say? Can we build a stronger holistic case for this fossil by adding molecular data? Further evidence for the humanity of *Homo heidelbergensis* comes from the sequence analysis of the mitochondrial genome of several dozen primate species. Nuclear data has also been isolated from *Homo heidelbergensis* fossils from Sima de los Huesos. These sequencing reads and sequencing data from an archaic ("Paleolithic") human were mapped to the genomes of modern human, Neanderthal, and chimpanzee. Based on the proportion of mapping reads and the sequence similarity of these reads when mapped to the human genome, *Homo heidelbergensis* can confidently be placed in the human holobaramin. Both morphological and genetic evidence additively support this conclusion.

Key Words: *Homo heidelbergensis*, Neanderthal, modern humans, *Pan*, mitochondrial DNA, variant analysis

Introduction

In general, the fossil hominid *Homo heidelbergensis* is taken by creationists to be a member of the human holobaramin (Woodmorappe, 1999; Lubenow, 2004; Line, 2013; Rupe and Sanford, 2017). The holobaramin is defined as the complete species membership of a given kind. They do this based on their more *erectus*-like features (Line, 2013). *Homo erectus* has generally been accepted by most creationists as human. Even some evolutionists (e.g., Wood and Collard, 1999) note the human-like body size, locomotion, jaws, and teeth of *H. heidelbergensis*. For example, the cranial capacity of *H. heidelbergensis* specimen Kabwe 1, is 1325 cc, which fits within the lower range of modern humans.

The sequencing of the mitochondrial DNA (mtDNA) (Meyer et al., 2014) and the availability of Next-Generation sequencing reads have made the molecular analysis of *H. heidelbergensis* possible. This is great news for creationists, since molecular evidence may possibly re-affirm the baraminic status of *H. heidelbergensis*.

The mtDNA sequence similarity between *H. heidelbergensis* and other primates has already been analyzed (Cserhati, 2022). *H. heidelbergensis* was shown to fall within the human holobaramin.

Furthermore, read sequences derive from ancient DNA (aDNA) from *H.*

Accepted for publication May 16, 2022

heidelbergensis can also be aligned to the whole genome sequence (WGS) of modern human and *Pan troglodytes* to examine how well these reads match to the two genomes. The proportion of aligned reads, the number of single nucleotide polymorphisms (SNPs), and the mean read sequence similarity could be used to get a broad picture of how *H. heidelbergensis* is related or not to modern humans and chimpanzee.

Materials and Methods

Data sets

A list of NCBI accession numbers for the mtDNA sequences of 36 primates and the South American gray short-tailed possum (*Monodelphis domestica*) is available in Supplementary File 1. The 28 *Homo* and 3 *Pan* NCBI accessions can be found in Supplementary File 2. From the second data set, *Homo sapiens* isolate NA24143 and NA24149 and EgyprRef1 were recoded into their reverse complement sequence so they could be used in further analysis.

In a second study comparing the sequence similarity of *H. heidelbergensis* with human, 21 mtDNA sequences from modern humans were downloaded from NCBI together with one from Neanderthal, Denisovan, and *H. heidelbergenesis*, respectively, and two mtDNA sequences

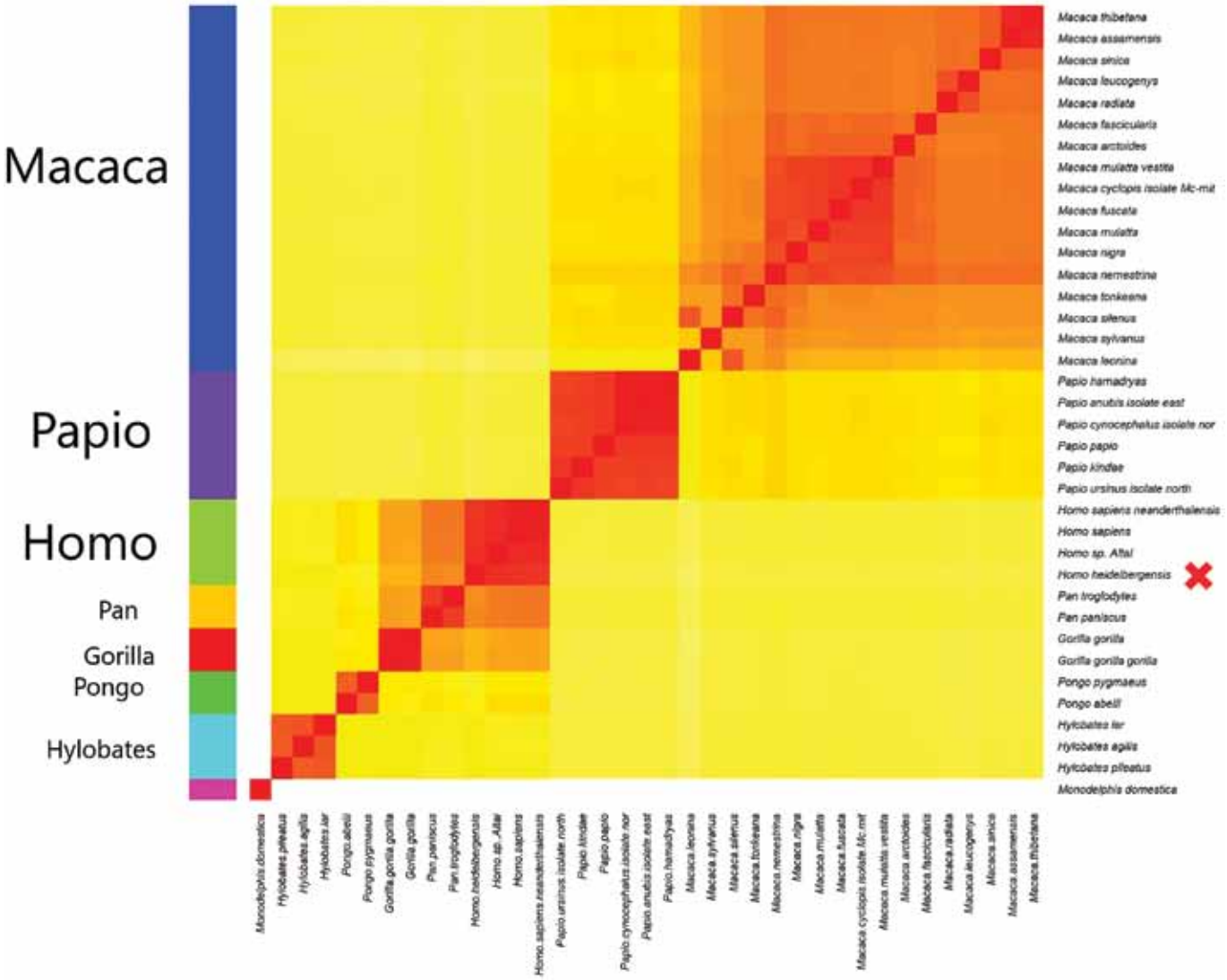

Figure 1. Heatmap showing hierarchical species relationships between 36 primate species as well as the outlier *Monodelphis domestica*. The heatmap depicts sequence mtDNA similarity values between all pairs of species in the analysis. Lighter colors denote higher similarity values between species which are closer relatives, whereas darker colors denote lower similarity values. *H. heidelbergenesis* is denoted with a red "X."

from *Pan paniscus* and one from *P. troglodytes*.

Nine *H. heidelbergensis* Sequence Read Archive (SRA) data sets from BioProject PRJEB10597 and ten SRA data sets from archaic (so-called "Paleolithic") humans from BioProject PRJEB22592 were aligned to the hg38 WGS of modern human and the panTrog6 (or pt6) WGS of *P. troglodytes* (Sikora et al., 2017). These genomes were downloaded from the UCSC browser, whereas the Neanderthal WGS was downloaded from the website of the Bioinformatics Core of UNMC (University of Nebraska Medical Center). A bowtie2 index was created for all three WGS using the bowtie2-index command. The vcf file containing 1,112,554,591 SNPs from the dbSNP database was downloaded from ftp.ncbi.nih.gov/snp/latest_release/VCF/GCF_000001405.39.gz.

The SRA data sets for PRJEB10597 are listed in Supplementary File 3, along with the number of reads in each data set and several statistics calculated during the analysis. The SRA data sets and the results for PRJEB22592 are listed in Supplementary File 4. All Supplementary files are available on Zenodo at https://zenodo.org/record/6551642#.YoF8q1TMLrc.

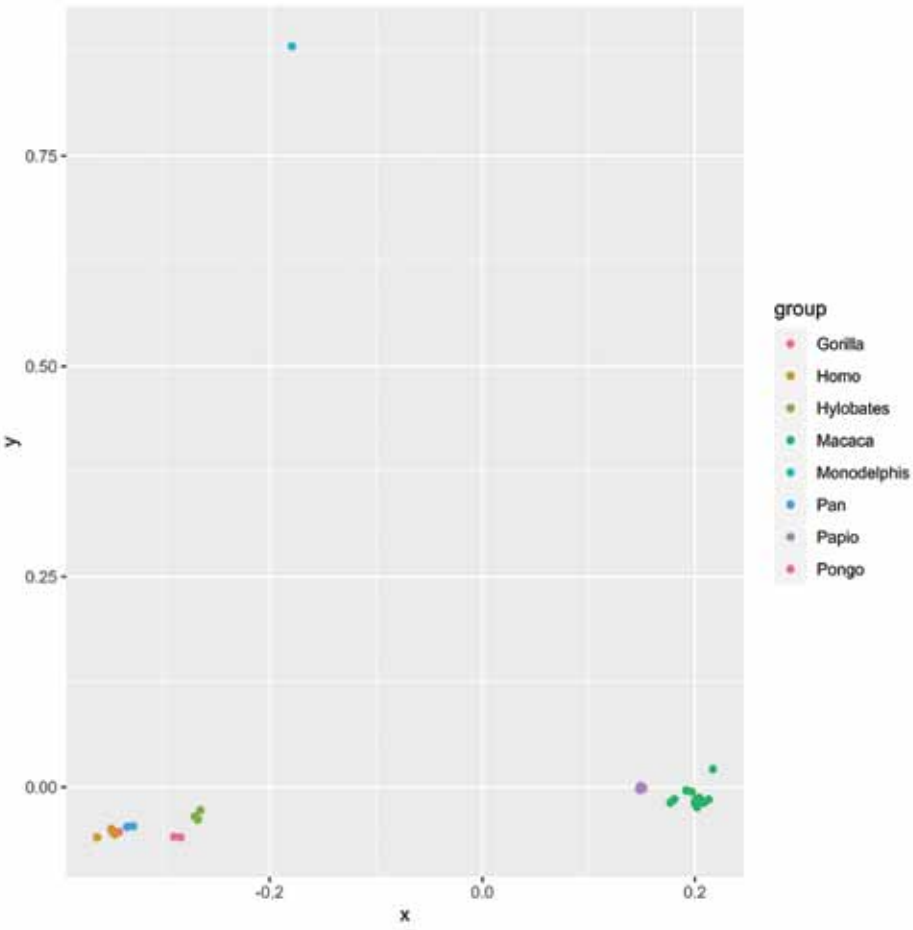

Figure 2. Two-dimensional MDS plot of 36 primate species plus *M. domestica* as an outlier. Eight disjunct groups can be observed, each represented by a separate color, as seen in the color legend.

Generation of plots

For the generation of the heatmap (Figure 1) showing the baraminic relationships between the 36 primate species and the outlier, the heatmap.2 function using the 'single' clustering method was used. The MDS plot in Figure 2 was created using the cmdscale function to create MDS plot coordinates. Figure 3 was created using the hist function in R, and Figure 5 was created using the plot function. The MEGA-X software (Kumar et al., 2018) was used to create alignments for the mtDNA for the 28 human mtDNA sequences and the baraminic tree in Figure 4 using the Neighbor Joining method (Saitou and Nei, 1987; Tamura et al., 2004). Default parameters were used to generate the tree. Supplementary Figures 1a and 1b were generated using the treemap tool in R.

Data processing pipeline

When aligning the archaic reads from *H. heidelbergensis*, the bowtie2 aligner was used against bwa-mem, since bowtie2 is faster and increases genome coverage when aligning aDNA reads (Poullet and Orlando, 2020). The bowtie2 aligner was run with the —local and —end-to-end flags. The bwa aligner was not used due to the fact that it presumes that there are few differences between the query and the target sequence within the first 32 bp, which frequently is the case with aDNA (Schubert et al., 2014). The resulting sam files were transformed into bam files and sorted for the mpileup function of samtools. Finally, for each sample, variants were called using bcftools with the following command: bcftools call -P 1e-3 -mv -Ob. The -P flag means that variants were called at a p-value of 0.001.

For each sample, the number of reads and the proportion of reads aligning to hg38 and pt6 were noted in separate columns in Supplementary Files 3 and 4. Then, the variant density

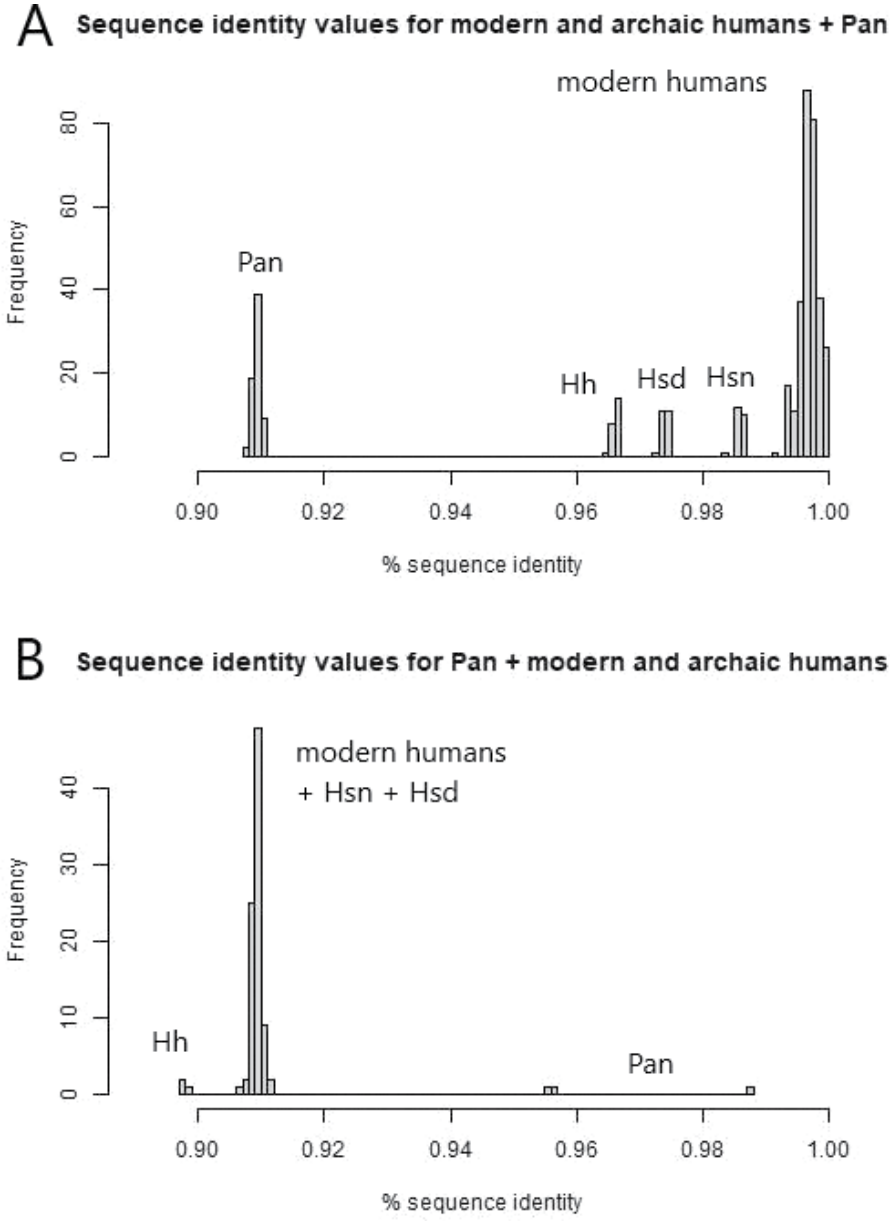

Figure 3. (A.) Histogram showing frequencies of mtDNA sequence similarity values, shown on the x-axis. The sequence similarity values between *Pan*, *H. heidelbergensis* (Hh), Denisova (Hsd), Neanderthal (Hsn), and modern humans are depicted compared to modern humans. (B.) Histogram showing frequencies of mtDNA sequence similarity values, shown on the x-axis. The sequence similarity values between *H. heidelbergensis* (Hh), Denisova (Hsd), Neanderthal (Hsn), modern humans, and *Pan* are depicted compared to *Pan*.

was calculated for hg38 and pt6 WGS by dividing the number of reads by the number of variants found for that sample. Next, the hg38/pt6 density proportion was calculated by dividing the variant density of pt6 with the variant density of hg38 to see whether there are more variants in the *P. troglodytes* genome compared to human.

The variant calling pipeline was run on an Ubuntu 18.04.1 operating system. Student's t-tests were run in R, version 4.1.0. using the t.test command. Two t-tests were run to calculate the p-values reported in Table 4: a normal t-test and a second one where the 'alternative' parameter was set to 'less.' This is because the values in the first data set are less than those in the second data set used in the t-test.

Read sequence similarity analysis

For each sample from PRJEB10957 and PRJEB22952, the first 10,000 reads from the fastq file were converted to fasta files using the fastq_to_fasta tool. They were then BLASTed against the hg38 and pt6 genomes using blastn. Z-scores were calculated to tell how statistically significantly similar two normal distributions were, based on the following equation:

$$Z = \frac{(\bar{X}_1 - \bar{X}_2)}{\sqrt{\sigma^2_{\bar{X}_1} + \sigma^2_{\bar{X}_2}}}$$

where $\bar{X}_1$ and $\bar{X}_2$ stand for the mean value of both distributions, and $\sigma^2_{\bar{X}_1}$, $\sigma^2_{\bar{X}_2}$ stands for the standard deviation.

Results and Discussion

Mitochondrial DNA sequence similarity

The result of the alignment of the 36 primate mtDNA sequences can be seen in the heatmap in Figure 1. The South American gray short-tailed possum (*Monodelphis domestica*) was used as an outlier). The Hopkins clustering statistic is 0.904, which indicates very good clustering. The species visibly form compact clusters. Based on k-means clustering, there are seven clusters corresponding to the seven primate genera selected for the study. *H. heidelbergensis*, *H. sapiens*, Neanderthal, and Denisovan form a cluster.

The mean sequence identity value between all four species in this cluster is 97.33±0.77% (p-value = $2.5x10^{-30}$). In contrast, the mean sequence similarity between the four *Homo* individuals with *Pan paniscus* and *P. troglodytes* is 90.7±0.58%. This is quite different from the long-held 99% genetic similarity between chimpanzees and humans and is in line with the work of Tomkins (Tomkins, 2015, 2018).

In contrast to these alignments using short reads, Tomkins reported that the mean similarity of BLASTN alignments with 18,000 long-read de novo assembled sequencing contigs of chimpanzee genomic DNA queried onto the human genome was only 84% (Tomkins, 2018). In Tomkins' analysis, the contigs on average were about 30,913 bases in length, but the achieved alignments were only on average 10,508 bases in length due to regions of dissimilarity that could not be bridged despite the liberal gap extension parameters that were used. Thus, the actual genome-wide similarity between chimps and humans may prove to be even lower. The results from the present study and previous work by Tomkins are quite different from the long-held myth of 99% genetic similarity between chimpanzees and humans.

In the MDS plot in Figure 2, the seven groups (plus *M. domestica* as an outlier) are coded with different colored dots. To the lower left, we have *Homo*, *Gorilla*, *Pan*, *Hylobates*, and *Pongo*. To the lower right, we have *Macaca* and *Papio*. The outlier, *M. domestica*, is at the center top of the plot. The MDS coordinates for all 37 species are provided in Supplementary File 1.

In Figure 3, two histograms showing the frequencies of mtDNA sequence similarities (MSS) are shown. In Figure 3A, we see the frequency of MSS between 21 modern humans and among modern humans and Neanderthal, Denisovan, *H. heidelbergensis*, and *Pan*. *H. heidelbergensis* is arguably the least similar archaic human compared to modern humans. It is the farthest away from modern humans, followed by Denisovan and then Neanderthal. This is to be expected, since *H. heidelbergensis* is the oldest individual from the *Homo* group, being a super-archaic human.

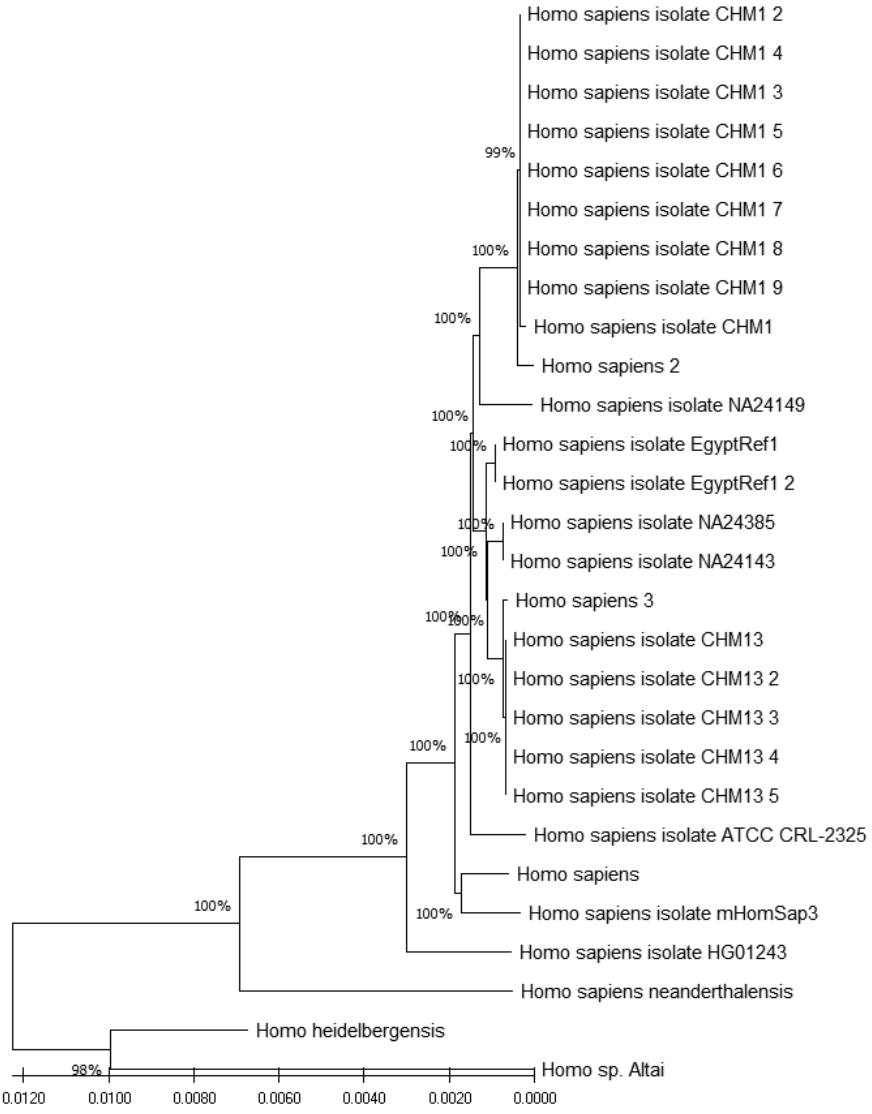

Figure 4. Baraminic tree produced by MEGA-X based on the Neighbour-Joining method. The software used the multiple alignments of 28 modern and archaic human mtDNA sequences.

However, in Figure 3B, we see a different picture. The standard deviation of MSS between *P. troglodytes* and *P. paniscus* is 96.7%, with a variance of 1.8%. Despite their reproductive and morphological differences, chimpanzees and bonobos can hybridize in captivity (Vervaecke and Van Elsacker, 1992), and there is evidence of introgression of a small portion of nuclear genetic material between the two species based on a study of 75 wild-born chimpanzees and bonobos (de Manuel et al., 2016). The standard deviation of the MSS of

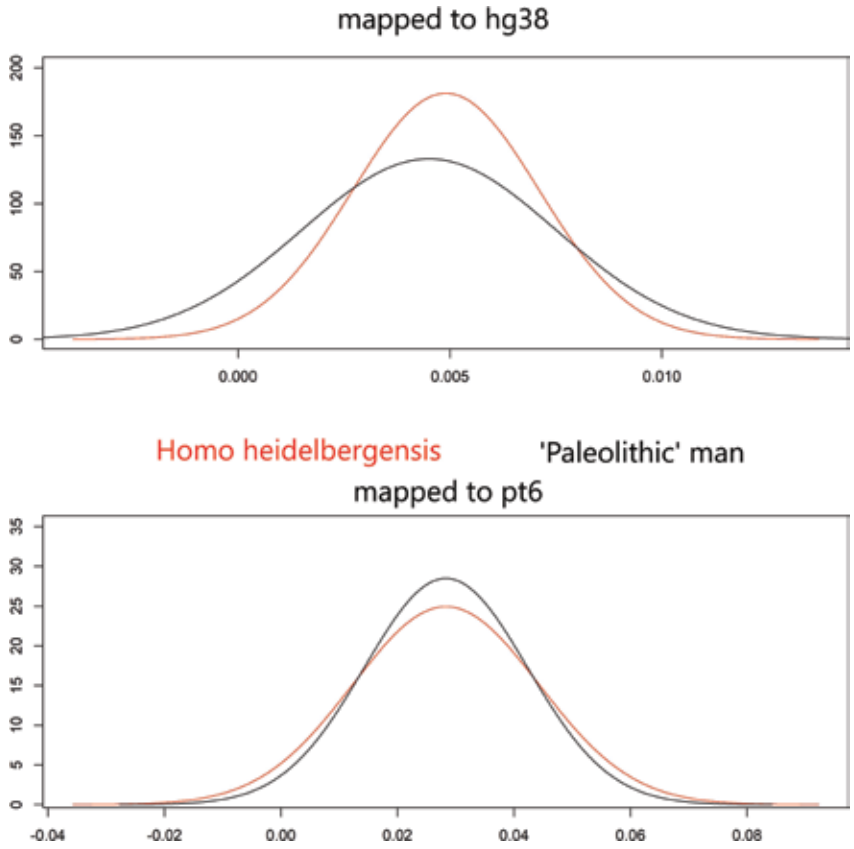

Figure 5. Normal distribution of mismatches between the first 10,000 read sequences from the nine PRJEB10957 and ten PRJEB22952 SRA samples mapped to hg38 and pt6. The red curve corresponds to *H. heidelbergensis*, whereas the black curve corresponds to 'paleolithic' archaic human.

Table I. Mean sequence similarity value between modern humans, Neanderthal, Denisovan, *H. heidelbergensis*, and *Pan*.

Group	Mean ± st.dev.	No. comparisons
All modern humans	$0.997 \pm 1.7 \times 10^{-3}$	210
Modern humans and Neanderthal	$0.986 \pm 7 \times 10^{-4}$	21
Modern humans and Denisovan	$0.975 \pm 5 \times 10^{-4}$	21
Modern humans and *H. heidelbergensis*	$0.967 \pm 6 \times 10^{-4}$	21
Modern humans and *Pan*	$0.91 \pm 9 \times 10^{-4}$	63
All *Pan*	$0.971 \pm 2.5 \times 10^{-2}$	3
Pan versus Neanderthal	$0.912 \pm 6 \times 10^{-4}$	3
Pan versus Denisovan	$0.909 \pm 6 \times 10^{-4}$	3
Pan versus *H. heidelbergensis*	$0.898 \pm 1.2 \times 10^{-3}$	3

Homo seen in Figure 3A is only around 0.9%, almost only half of that within *Pan*. Modern humans, Neanderthals, and Denisovans are thought to have interbred with one another in the past (Savanne, 2014; Pennisi, 2016; Rupe and Sanford, 2017). Furthermore, as we can see from Table I, the standard deviation of MSS between *H. heidelbergensis* and *Pan* is the least among *Homo*, at 89.8%. This indicates that *H. heidelbergensis* is the least similar to all other members of *Homo*. One might be misled to believe that *H. heidelbergenesis* is closest to *Pan* based on Figure 3A, but 3B clearly shows it is actually the least similar to *Pan* compared to other members of *Homo*. The mean MSS between *Pan* and all other Homo is 91%.

To illustrate relationships within the human holobaramin, a baraminic tree is presented in Figure 4. The 25 modern human individuals are closely grouped together, whereas Neanderthal, Denisovan, and *H. heidelbergensis* are more basal in the baraminic tree.

Variant Analysis of *H. heidelbergensis* and Modern Human

For each of the nine SRA samples from BioProject PRJEB10957 from *H. heidelbergensis*, several variant statistics were called, as reported in Table II. These same statistics are also provided for BioProject PRJEB22592 in Table III and are also available in Supplementary Data File 3.

Proportion of aligned reads to WGS

The proportion of aligned reads from a DNA sample to the WGS of another species should be high if the other genome comes from a species from the same holobaramin and lower if from another baramin. This is a qualitative measure only, for there is no absolute cutoff yet that one can use to determine if two species belong to separate kinds (Cserhati and Carter, 2020). Thus, the propor-

Table II. Variant calling statistics for PRJEB10957: reads from *H. heidelbergensis* to hg38, Neanderthal and pt6.

	% aln hg38	% aln ntal	% aln pt6	No. hg38 vars	hg38 var. density	No. ntal vars	ntal var. density	No. pt6 vars	pt6 var. density	pt6/ hg38 dens. prop.	pt6/ ntal dens. prop.	hg38/ ntal dens. prop.
Mean	0.966	0.959	0.742	16356.4	54.6	16904.556	51.1	35767.8	28.1	2.440	2.300	0.946
Std. dev.	0.034	0.035	0.161	32127.7	66.5	32951.654	62.2	59506.0	29.0	1.267	1.154	0.021

tion of reads from *H. heidelbergensis* mapping to hg38 and the proportion of reads from the archaic human to hg38 sample should not differ significantly. For PRJEB10957, the mean proportion of *H. heidelbergensis* reads mapping to hg38 (96.6±3.4%) is much higher than that mapping to pt6 (74.2±16.1%). This proportion is also very similar to the mean proportion of reads mapping to the Neanderthal genome (95.9±3.5%). This is noteworthy, since *H. heidelbergensis* is allegedly 1.3 Myr old, whereas Neanderthal is only 400 Kyr old according to the evolutionary timescale. Yet, these *H. heidelbergensis* reads are more similar to the sequence of the modern human genome than to the Neanderthal genome.

When comparing the proportion of reads mapping from *H. heidelbergensis* to hg38 to the proportion of the same reads mapping to pt6, there is a statistically significant difference, with a p-value of 0.003. When comparing the proportion of reads mapping from *H. heidelbergensis* to the Neanderthal WGS to the proportion of the same reads mapping to pt6, the p-value is 0.004.

However, when the proportion of *H. heidelbergensis* reads mapping to hg38 is compared to the proportion of these reads mapping to the Neanderthal WGS, the p-value is insignificant at 0.675. From this we can infer that the *H. heidelbergensis* reads map in the same manner to both modern (hg38) and the archaic genome (Neanderthal); there is no statistically significant difference between the two modes of mapping. This also indicates that *H. heidelbergensis* is just as human as both modern humans and Neanderthal.

Skewed variant frequency

The results presented here must be taken with caution, since sequencing aDNA does have its caveats. These include contamination with DNA from microbes or modern humans, and degradation of the aDNA (Thomas and Tomkins, 2014).

Proportionately slightly less *H. heidelbergensis* reads map to the hg38 genome, compared to reads from ancient ("Paleolithic") humans. Also, there are relatively more variants when mapping *H. heidelbergensis* reads to hg38 as opposed to ancient human reads (see Tables II and III). There are two reasons for this. The first is that DNA variants could have accumulated in the modern human genome over time, compared to the ancient genome of *H. heidelbergensis*. The second could be due to deamination from C to T (mirrored on the reverse strand as G to A). The research group that isolated the DNA from the *H. heidelbergensis* samples claims that the frequency of C>T deaminations rose from 12–17% at the 5' end of the reads to 55–62% at the 3' end of the reads (Meyer et al., 2014)! They found that

Table III. Variant calling statistics for PRJEB22592: reads from an *archaic human* to hg38, Neanderthal and pt6 (with USER treatment).

	% aln hg38	% aln ntal	% aln pt6	No. hg38 vars	hg38 var. density	No. ntal vars	ntal var. density	No. pt6 vars	pt6 var. density	pt6/ hg38 dens. prop.	pt6/ ntal dens. prop.	hg38/ ntal dens. prop.
Mean	0.999	0.996	0.945	2521616	70.737	2975644	59.190	20786182	8.211	74.870	1.180	0.847418
Std. dev.	0.000	0.001	0.006	1066303	58.051	1322310	46.696	11109092	5.688	2.081	1.240	0.806394

this rate of deamination is also similar to the same rate as found in bear remains from the same site at Sima de los Huesos. However, when doing the bioinformatics analysis, it is almost certain that they would have trimmed the edges of these reads where deamination could have been high.

The frequency of each of the twelve possible SNPs (when looking at all of the possible combinations between the four bases A, C, G, and T) was counted for each of the nine *H. heidelbergensis* SRA samples when mapped to both the hg38 and the Neanderthal genomes. This information can be found in Supplementary File 3. The proportion of each of the twelve SNPs between the *H. heidelbergensis* reads and both hg38 and the Neanderthal genome for SRA samples ERR995367–ERR995361 were plotted and can be found in Supplementary Figures 1a and b online. These five SRA samples were chosen, because the other four samples had a very low number of reads, and some of the twelve SNPs did not occur in those samples. The most common SNPs are C/T->G/A, making up 33.2%–47% for hg38 and 33.1–46.7% for Neanderthal. These high proportions cannot be by mere chance.

Guo and Jamison (2005) calculated that about 33.2% of all SNPs are C>T/G>A. The present study also calculated the frequency of C>T/G>A substitutions from the dbSNP to be 32%. The average C>T/G>A substitution rate over the five *H. heidelbergensis* SRA samples is 40.1±2.9%. Thus, the proportion of C>T/G>A substitutions between the *H. heidelbergensis* and modern human genomes is slightly elevated. This corresponds to a Z-score of 2.69, which denotes that the two distributions are significantly different. It suggests that around 6.9% of the C>T/G>A transitions are due to deamination.

The mean number and standard deviation of SNPs excluding C>T and G>A were calculated for these five samples (see "PRJEB10957 SNP hg38 dist." tab, rows "z (C>T)" and "z (G>A)" in Supplementary File 3). A z-score was calculated for C>T and G>T in these five samples to see how extreme they are. For all five samples the z-score was greater than 1.65, meaning that these results are significant at the 5% level. This means that the higher number of C>T and G>A variants are not occurring by random chance. Since the number of C>T and G>A variants are skewed, the genetic distance between *H. heidelbergensis* and modern humans decreases. It also strengthens the conclusion that *H. heidelbergensis* belongs to the human holobaramin.

Table IV. Mean % ± std. dev dissimilarity of 10,000 sequencing reads from SRA samples PRJEB10957 and PRJEB22952 mapped to hg38 and pt6.

	hg38	pt6
Homo heidelbergensis	0.0049±0.0022	0.0283±0.016
'Paleolithic' archaic human	0.0045±0.0030	0.0283±0.014
Z-score	0.108	1.9E-4

Percent dissimilarity of reads mapped to hg38 and pt6

Finally, the first 10,000 read sequences from the fastq file of the samples from PRJEB10957 and PRJEB22952 were mapped to both the hg38 and the pt6 genomes using BLASTN. The mean percent mismatches were noted as well as their standard deviations. The normal curves with these mean and standard deviation values are plotted in Figure 5, and the concrete mean and standard deviations are shown in Table IV. The z-score describes how similar two normal distributions are. Both values listed in the last row of Table IV show that the z-scores comparing *H. heidelbergensis* to hg38 and pt6 and also the 'paleolithic' archaic human to hg38 and pt6 are well below 2.0, meaning that these distributions are almost identical to one another. From this we can conclude that the genetic distance via read sequence mismatches between modern human and 'paleolithic' archaic human and between modern human *H. heidlbergensis* is virtually the same, supporting the idea that *H. heidelbergensis* is human.

Summary and Conclusion

From these analyses, we have seen that *H. heidelbergensis* behaves genetically similarly to modern and archaic humans. Its mtDNA sequence is only slightly different, being an archaic human. *H. heidelbergensis* clusters together with modern humans, Neanderthal, and Denisovan in the baraminogram (heatmap), as well as the baraminic tree, albeit at the base.

When nuclear data is examined in the form of SRA reads, about the same proportion of *H. heidelbergensis* reads map to the genomes of modern humans. A similar inference can be made when examining the average sequence mismatch between read sequences from *H. heidelbergensis* and archaic humans when mapped to hg38 and pt6.

All of these considerations confidently support placing *H. heidelbergensis* within the human holobaramin and are in concordance with prior studies on their morphological characteristics. This study nicely complements previous baraminology studies of this fossil human.

This study also highlights the utility of using aDNA from fossil humans in order to determine their baraminic placement. Here the mtDNA from only

four human subgroups were compared, but if genomes from more fossils could be isolated, such as *Homo erectus*, *Homo naledi*, *Homo floresiensis*, and others, this would sharpen the picture of human baraminic relationships even further.

Acknowledgments

The work in this paper was performed as a part of Creation Research Society grant #68. The author would like to thank Dr. Jeffrey Tomkins of the Institute for Creation Research for discussion on using blastn to compare mismatches when mapping read sequences to the genomes of human and chimpanzee.

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Creation Research Society Quarterly 2023 59:160–175

Why the Sediments Are There
Part 2: A Flood Regression Model

Michael J. Oard, John K. Reed, and Peter Klevberg

Key Words: sediments, continental margin sedimentation, Late Flood Recession Model

Abstract

Global sedimentary thickness (isopach) maps show their distribution on continents and in oceans. Underlying numbers provide volume and average thickness estimates. Of particular interest are thick accumulations on continental margins. For some diluvialists, they represent deposition during the Recessive Stage of the Flood, reinforcing a high post-Flood boundary. A Flood Regression Model proposes that the post-Flood boundary is a time-transgressive geomorphological boundary that links upstream erosion to downstream transport and deposition.

Introduction

Reed et al. (2022) used isopach maps to show marine sediment distribution, to estimate total volumes, and to determine mean thicknesses (Table I and Figure 1). Current total marine sediment volume is mapped as 337,000,000 km^3 (Straume et al., 2019), providing a mean thickness of 927 m for the total ocean and ranging from 3044 m on the continental margins to 404 m for the deep oceans. We follow Straume et al. (2019) in defining (for the purposes of this paper) marine sediments as those starting at the present shoreline. However, estimates of the continental volume and average thickness often overlap some continental margin sediments. Moreover, some continental thickness estimates include Precambrian sediments, some Precambrian sediments, or none at all. Thus, estimates of the volume and average thickness of sedimentary rocks on the continents vary considerably between researchers and, as a result, we cannot use previous estimates.

Very Thick Sediments on the Margins

Figure 1 shows the depth to basement in the oceans, a surrogate for sediment

Table I. The three divisions of the ocean according to Straume et al. (2019): (1) the continental margins, (2) the area between the margins and the deep ocean, and (3) the deep ocean. The area of the deep ocean is defined as the area 200 km oceanward of the subsurface continent/ocean boundary.

PROVINCE	AREA (10^6 km^2)	SED. VOLUME (10^6 km^3)	MEAN THICKNESS (m)
Total Ocean	363	337	927
Cont. Margins	46.9	143	3,044
Transition: margin to deep ocean	37	81	2,189
Deep Ocean	279	113	404

Accepted for publication October 10, 2022

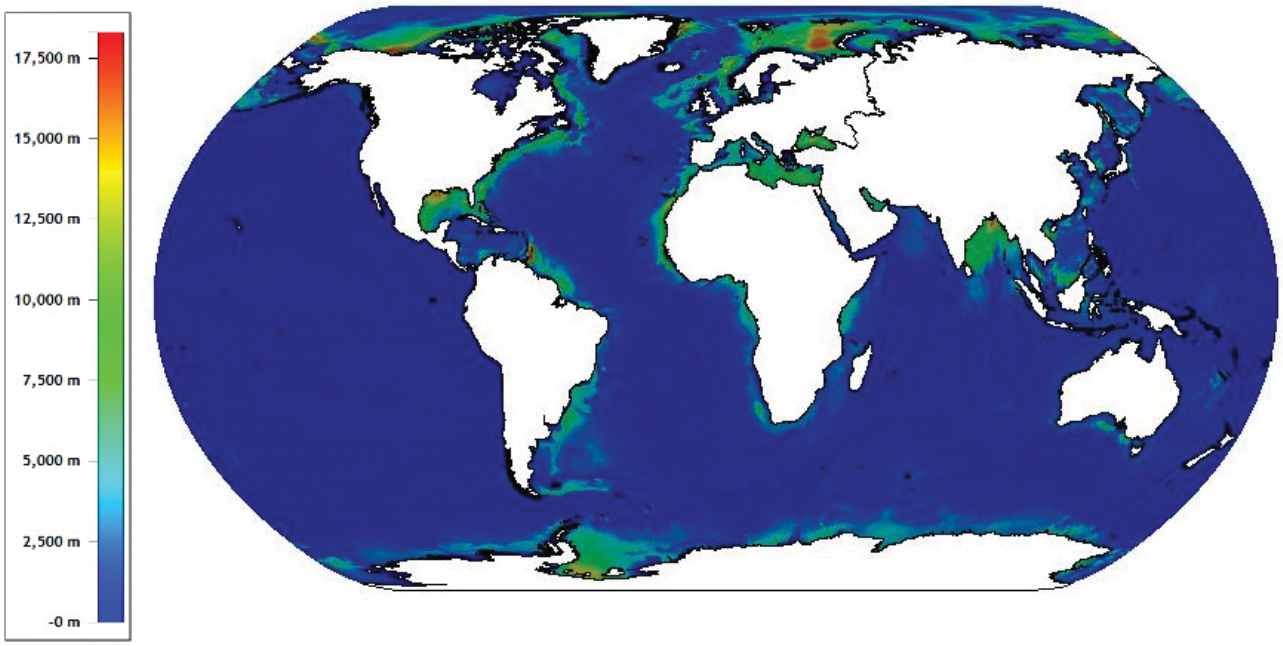

Figure 1. Depth to basement of marine sediments, a general measure of sediment thickness (from Straume et al., 2019).

thickness. The thickest marine sediments are found on continental margins, strongly suggesting that they were sourced from the continents. Figure 2 shows a cross section of the Atlantic, showing very thick sediments on the margins above deep troughs on both sides of the Atlantic. We emphasize the tremendously thick sediments on the margins by a series of cross sections. Figures 3–6 show sediment thickness in the Arctic Ocean. Figures 7–8 show sediment thickness in the Weddell Sea, off Antarctica. Figures 9–10 show sediment thickness in the Bay of Bengal. Figures 11–14 show those off the southeastern United States. Data for all these figures is from Straume et al. (2019).

Possible Sources of Ocean Sediments

There are six logical possibilities for the origin of the ocean sediments in Biblical Earth history (Figure 16A). These include: (1) existing pre-Flood sediments, (2) early-Flood marine sediments redeposited in a marine environment, (3) early-Flood continental sediments transported to marine settings, (4) late-Flood continental sediments transported to marine settings, (5) sediments generated by post-Flood catastrophes, or (6) sediments generated by post-Flood uniformitarian processes (rivers, wind, ice). The Ice Age was not one of these uniformitarian processes, but will be included with number 6.

The first three options at the top half of Figure 16A—pre-Flood and early Flood continental and marine sediments—are rendered insignificant by the mid-Flood realignment of continents and ocean basins (Psalm 104), which would have minimized their contribution, either because the relative volume was low or because they were eroded and redeposited on the present continents or accreted on to the edge of the continents as metamorphic terranes. And if CPT is correct, many of these sediments would have been destroyed by subduction processes. The very low volume of deep-marine sediment supports this conclusion. The other three options at the bottom of Figure 16A—late Flood runoff and post-Flood catastrophic or uniformitarian deposition will be evaluated below.

Did Post-Flood Catastrophes Occur?

Post-Flood catastrophes are one of the possible sources of ocean sediments shown at the bottom of Figure 16A. The magnitude of these possible post-Flood catastrophes can be determined mainly by Cenozoic history. The Flood/post-Flood boundary, whether at or near the K/Pg boundary or in the late Cenozoic (Miocene, Pliocene, or

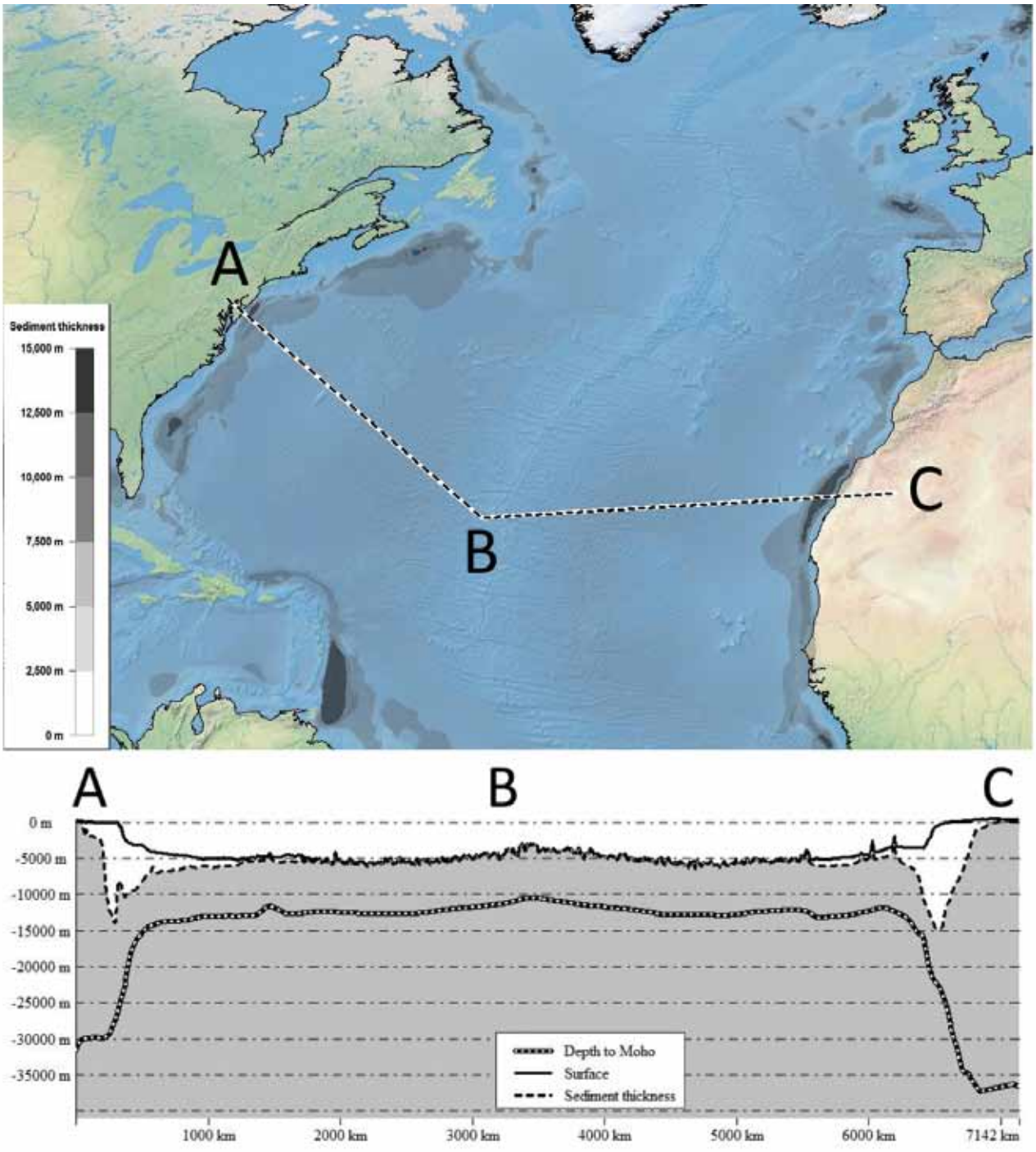

Figure 2. Cross section of Atlantic Ocean showing very thick sediments on the margins and the depth to the Moho. Note deep troughs along the margins of North America and Africa (from Straume et al., 2019).

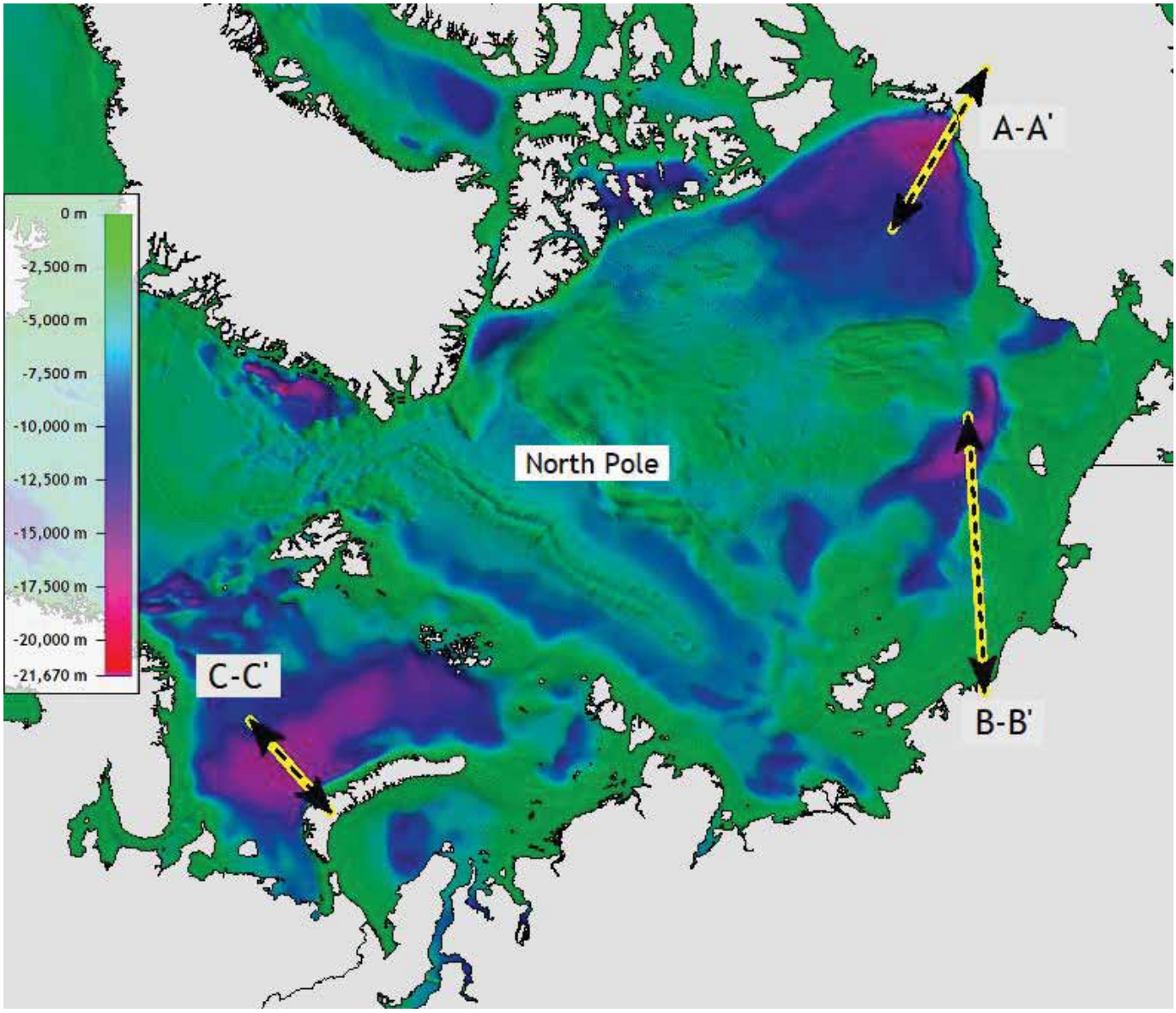

Figure 3. Sediment thickness of the Arctic Ocean (from Straume et al., 2019).

Quaternary[1]) depending upon location (Oard, 2022a), has been extensively examined and debated. Oard (2014a, 2016, 2017a, 2017b, 2018, 2019) developed 33 criteria (Table II) supporting a Late Cenozoic boundary. Any one criterion may be equivocal, which is why multiple criteria are required to determine the boundary at a particular location. Clarey (2017, 2020) reinforced several of these criteria and added two additional lines of evidence not mentioned by Oard: (1) the early Cenozoic Whopper Sand is thick and widespread in the Gulf of Mexico, pointing to large, powerful currents well out into the Gulf, and (2) traditional landing site for the Ark in Turkey is surrounded by uninterrupted Cenozoic marine strata (Clarey and Werner, 2019). Both are readily explained by the Flood but inexplicable by post-Flood catastrophes.

1 In some locations, the Flood/post-Flood boundary could be below the Miocene due to arbitrary uniformitarian dating methods. Examples are the Antarctic Ice Sheet (Ivany et al., 2006) and the mid-to-late Cenozoic marsupials from Australia (Oard, 2022b).

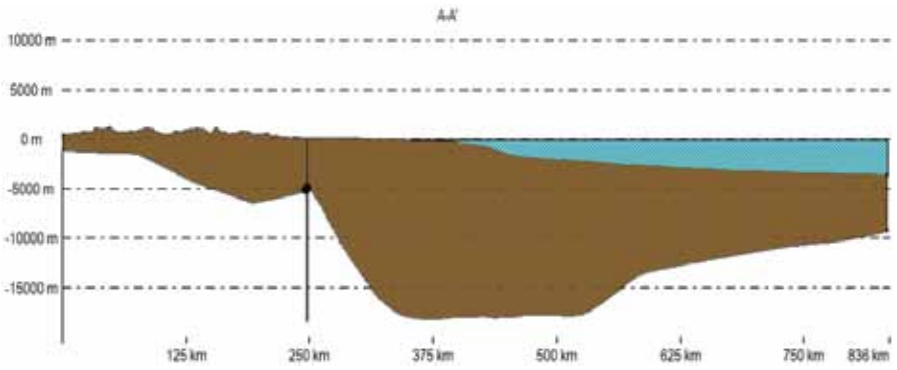

Figure 4. Line A-A´ from Figure 3 (from Straume et al., 2019). Blue is ocean and brown is sediments. This same color scheme is used for the other cross sections. Vertical line shows the shoreline.

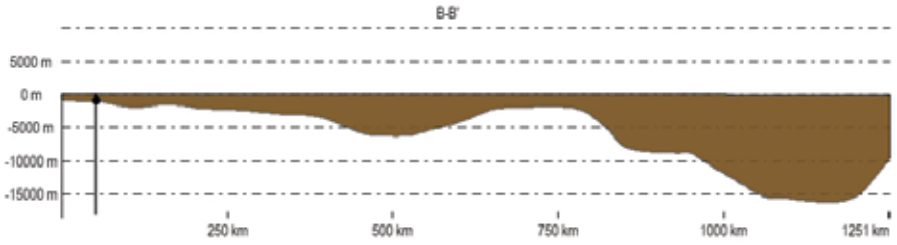

Figure 5. Line B-B´ from Figure 3 (from Straume et al., 2019). Note that the continental shelf is so shallow that the blue ocean is not visible.

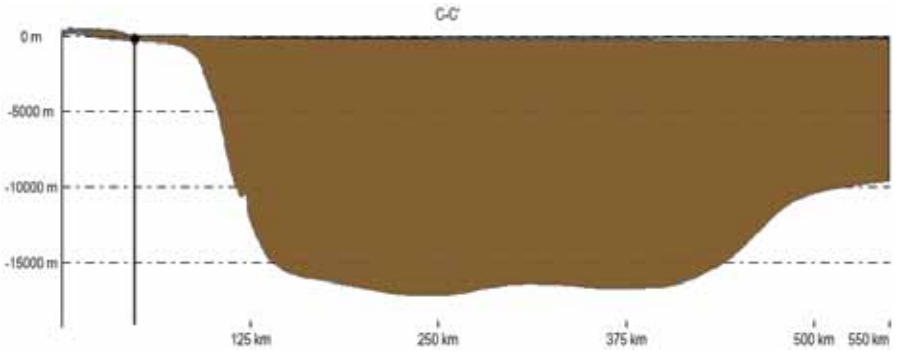

Figure 6. Line C-C´ from Figure 3 (from Straume et al., 2019). Note that the continental shelf is so shallow that the blue ocean is not visible.

Tomkins and Clarey (2022) have further marked the boundary as near or at the Neogene/Pleistocene boundary.

Despite Oard and Clarey presenting 35 criteria for a late Cenozoic Flood/post-Flood boundary, Ross (2012) and Arment (2020) hold that the boundary is at or just above the K/Pg boundary—based primarily on only one criterion, fossil data. They have not examined the 35 criteria and presented alternative mechanisms supporting their placement of the Flood/post-Flood boundary. But, the lead author has examined the fossil arguments (Oard, 2022b, 2022d). He found that Australian marsupials, dated as old as late Oligocene, were at first dated as Pleistocene, which would be expected in Biblical Earth history. And then later, paleontologists found "primitive" features in some marsupials and gradually pushed back the dates, finally ending in the late Oligocene, based on the "stage of evolution." Oard (2022b) has argued these marsupials are post-Flood, agreeing with Arment, and explained them by rafting on log/vegetation mats into Australia early in the Ice Age (Oard, 2022c). In this case, the Flood/post-Flood boundary is in late Oligocene, but only at those limited unique fossil locations. Oard (2022d) also discovered that Ross's (2012) North American mammal arguments are equivocal in that many mammals, supposed to be unique to only North America, are not unique to North America. Some North American Pleistocene (assumed post-Flood by Oard) and some Tertiary mammals (assumed from the Flood by Oard) are also found on other continents. Moreover, Ross and Arment have not demonstrated that the "defined genera" they claimed that crossed the Flood/post-Flood boundary, as believed by Oard, are *precisely* the same and not just similar. Why can't there be similar genera and families within a Genesis kind existing both before and after the Flood?

Some creation scientists have suggested hypercanes as causing post-Flood catastrophes. Hypercanes are hypothetical super hurricanes generated over water temperatures around 40°C or greater that generate concentrated areas of heavy rainfall for erosion. Just like hurricanes, hypercanes take time to develop,

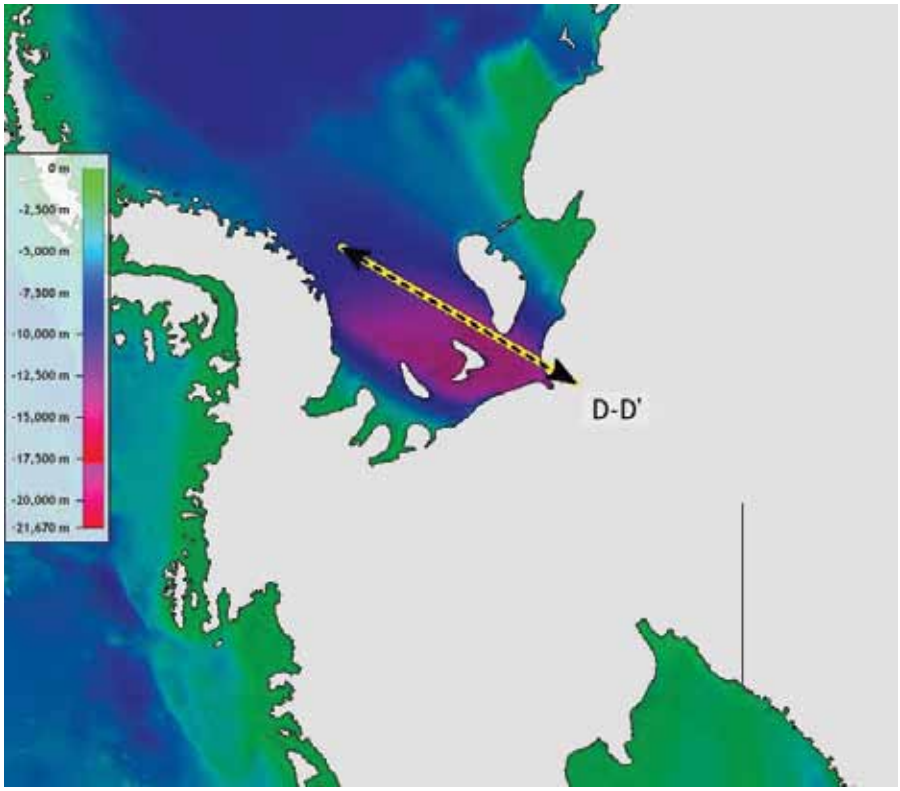

Figure 7. Sediment thickness of the Weddell Sea, Antarctica (from Straume et al., 2019).

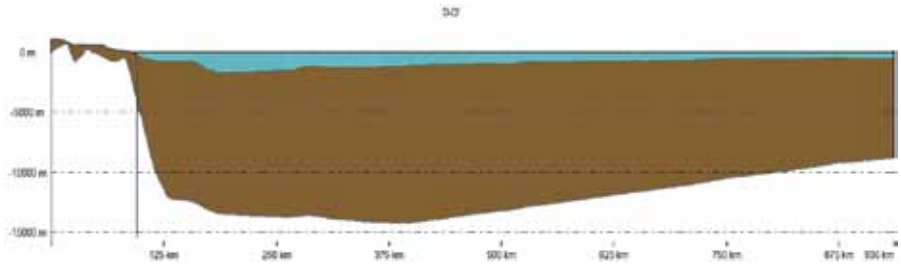

Figure 8. Line D–D´ from Figure 7 in the Weddell Sea, off Antarctica (from Straume et al., 2019). Note that shelf depth increases landward, due to the weight of Antarctic Ice Sheet.

so the initial storm must intensify slowly over a hot water source hundreds of kilometers wide, possibly generated by hot ocean-bottom rocks. So, both the atmosphere and water must almost be at *rest* to generate hypercanes. Moreover, hypercanes can only produce a limited amount of rain caused by moisture input into the storm, and once they move over land, they weaken fast. Hypercanes are unlikely after the Flood, and if they occurred would not be significant enough to produce huge post-Flood catastrophes as deduced from Cenozoic history.

The Flood Regression Model concludes that the Flood/post-Flood boundary is in the Late Cenozoic and proposes that the boundary is especially geomorphological, with two conjoined sets of landforms created by upstream erosion and downstream deposition. Upstream are large planation surfaces, erosional remnants (inselbergs), and long transported resistant rocks formed by the Sheet Flow Phase 4 (Figure 15). The subsequent Channelized Flow Phase 5, produced more linear to localized landforms, such as valleys, canyons, water and wind gaps, and pediments. Downstream are vast continental margin sedimentary wedges from continental erosion, with planar upper surfaces formed during the Sheet Flow Phase. These were incised by channels of various scales during the Channelized Flow Phase forming deep submarine canyons. Both upstream and downstream features show decreasing energy over time as currents narrowed with time and are only superficially modified by comparatively low-energy, present-day rivers, currents, storms, and slumps.

Uniformitarian Marine Sediment Sources Since the Flood

Uniformitarian sediment sources after the Flood are a second possible source of ocean sediments shown at the bottom of Figure 16A. Sediments are transported by water, wind, ice, and volcanic eruptions or are authigenic: chemical and biogenic. The direct precipitation of chemicals, carbonates, and evaporites, limited to specialized environments, is relatively insignificant. Microorganism blooms, on the other hand, supply the water column with a steady rain of carbonaceous and siliceous skeletons. Most dissolve in the deep ocean, but some accumulate on the bottom as carbonaceous or siliceous oozes.

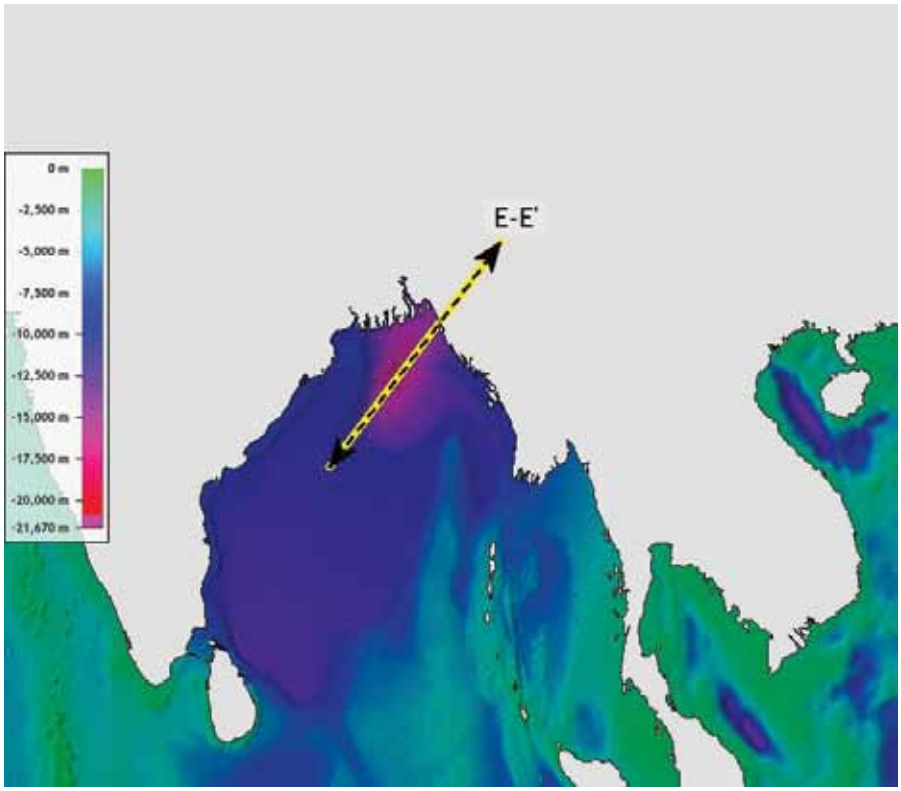

Figure 9. Sediment thickness in the Bay of Bengal (from Straume et al., 2019).

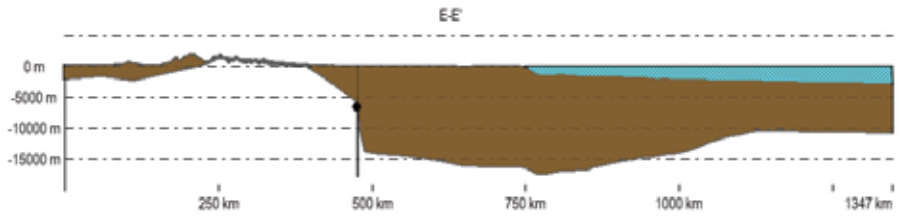

Figure 10. Line E–E´ from Figure 9 (from Straume et al., 2019).

Sediment Added from Continental Erosion

Continents supply clastic sediment primarily through rivers today. To estimate the volume from rivers and streams since the Flood, we use Roth's (1998, p. 263) estimate that the continental erosion rate is 61 mm/ka. Applying strict actualism, the average depth eroded during 4500 years would be only 0.275 m. The area of the oceans is 3.61 x 10^8 km^2; the continents is 1.49 x 10^8 km^2. So, the 0.275 m would be dispersed over 2.4 times the source area, resulting in 0.115 m of marine sediment, mostly added to the continental margins. Higher Ice Age erosion would have increased this amount, but even an order of magnitude increase would be nothing compared to the oceanic average 975 m or the 3044 m average of the continental margins.

Sediment Added by Wind

Dust blown from deserts supplies some marine sediments (Froede, 2003). It is estimated that the Sahara Desert supplies 70% of the total annual dust input—800 Tg (teragrams) (Prospero and Mayol-Bracero, 2013). This works out to 0.062 km^3/yr. or 279 km^3 since Flood, which is also insignificant.

Ice Age dust contributions would probably not have been much greater because of the wet global climate in the early- to mid-Ice Age (Oard, in press). More dust would have originated from eastern Asia, Australia, and southern South America, but only at the end and after the Ice Age, when conditions become drier and windier (Oard, in press). The contribution from the Sahara Desert would have been less, since it was not a desert until well after the Ice Age (Oard, 2021).

Sediment Added by Ice and Volcanism

The amount of sediment added since the Ice Age by ice and volcanism is expected to be small. This input may have been more significant immediately after the Flood, since volcanism was high compared to the present, but we would expect the relative contribution to also be small compared to the total.

A recent estimate of the proportion of sediments added by ice and wind to the oceans today is approximately 20% of the river flux (Regard et al., 2022), which justifies our assumption that this input is small. The amount of sediment added to the oceans by coastal cliff erosion has been estimated to be only 2–4%. However, the researchers were surprised that coastal cliff erosion in

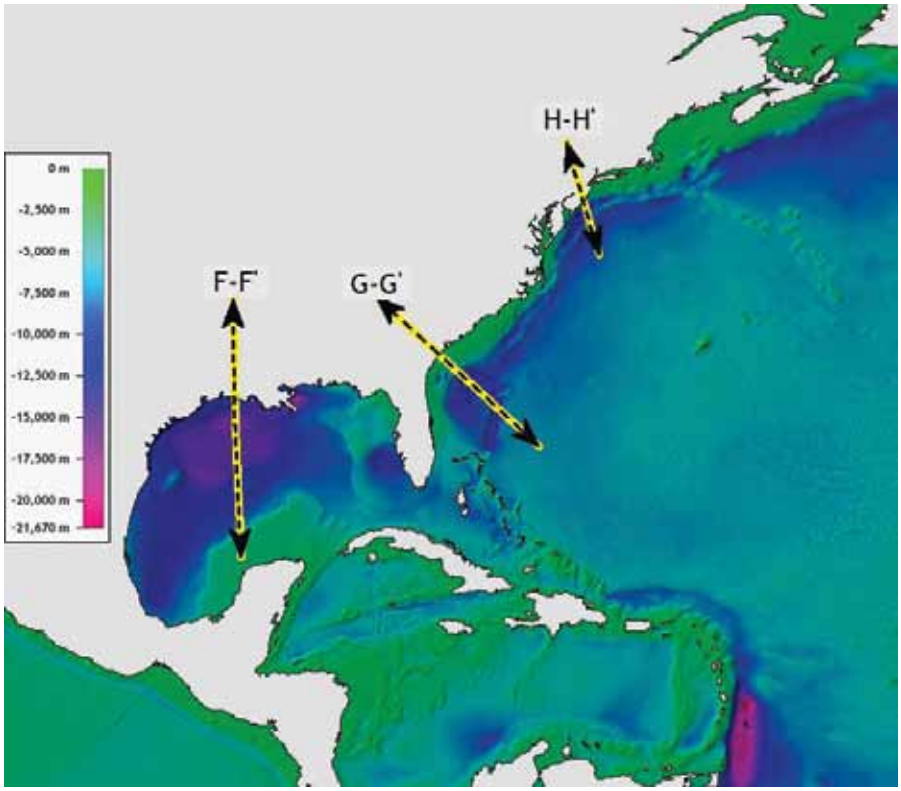

Figure 11. Sediment thickness off southeast United States (from Straume et al., 2019).

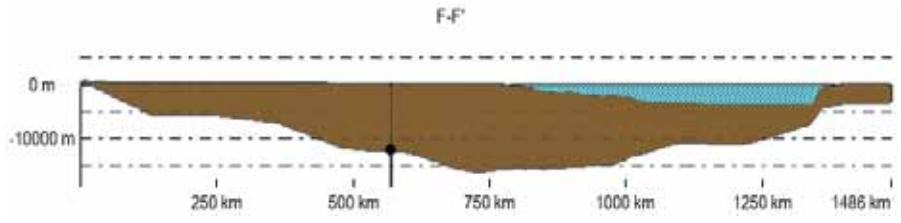

Figure 12. Line F–F´ from Figure 11 (from Straume et al., 2019).

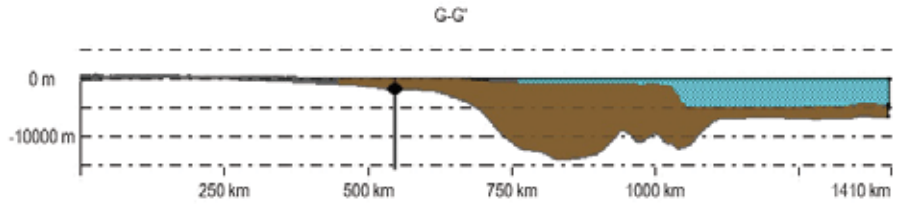

Figure 13. Line G–G´ from Figure 11 (from Straume et al., 2019).

Europe amounts to about 33% of the river flux. Regardless, this amount is small for our purposes.

Therefore, we have determined that practically all the margin sediments are from continental erosion during Flood runoff (Figure 16B). This volume and thickness represents erosion of 1500 m of sediment from the continents.

The Oceanic Microorganism Source

The largest potential source of post-Flood marine sediment comes from microorganism skeletons. At the present rate of accumulation of 1–3 cm/1000 years for carbonate skeletons (Kennett, 1982), deposition over 4500 years would be only 0.01 m. The deposition by siliceous organisms, such as diatoms and radiolarians, is probably similar but more important in the deep ocean.

However, the volume was likely much greater in the Ice Age, given the great vertical overturning of the oceans from cooling of the new, warm oceans from the top down (Oard, in press). Water near the surface was cooled by evaporation and contact with a cooler atmosphere. It sank, forcing warmer, deeper water to the surface. Since nutrients tend to collect in the deep ocean, a strong vertical overturn would have brought them to the surface layers, resulting in massive blooms and concomitant deposition of their skeletons.

Therefore, some part of the 404 m-average sediment thickness of the deep-sea floor could have occurred after the Flood. We do not know the relative contributions because no creation scientist has examined the ocean sediments in detail. We do not trust evolutionary dates of microorganisms, mostly calculated by biostratigraphy. More investigation is required.

In order to determine the amount of microorganisms and other sediments added to the deep ocean, we calculate a range of possibilities (left-hand side

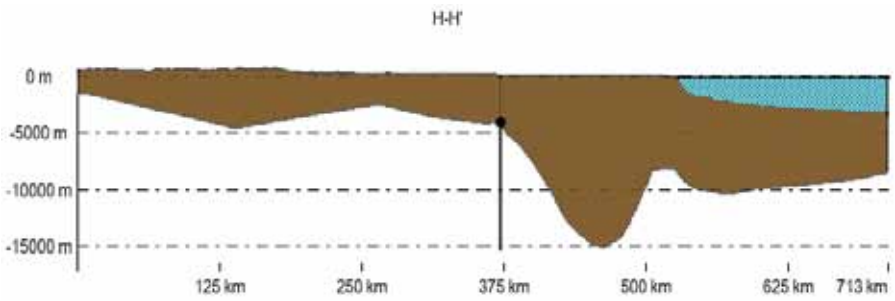

Figure 14. Line H–H´ from Figure 11 (from Straume et al., 2019).

of Table III). There are five options, depending upon what percentage of the deep-sea sediments are from the Flood. The range is from none of the deep-sea sediment (0%) is from the Flood to all of it (100%) is from the Flood. The right side of Table III is the corresponding depth of eroded sediment during Flood recession by adding the possible proportions of deep-sea Flood sediments to 1500 m. At this point, we will arbitrarily use 50% of the deep-ocean sediments from the Flood with an average depth of 1886 m eroded from the continents.

Strong Differential Vertical Tectonics

During the Recessive Stage, sediment was transported from continents by strong currents and deposited in velocity traps created by a dramatic depth change at the continent/ocean boundary (Figure 17). These deepening ocean margins provided significant accommodation space, keeping sediments predominantly at the margins, instead of spreading to the abyssal plains. We call this Differential Vertical Tectonics (DVT), which means that part of the continents rose, the ocean basins sank, or both.

DVT was especially prominent along the continental margins. For whatever reason, the eastern United States underwent many km of DVT, generating significant potential energy (Figure 2). Pazzaglia and Gardner (1994) describe this DVT as epeirogenic uplift of the Ap-

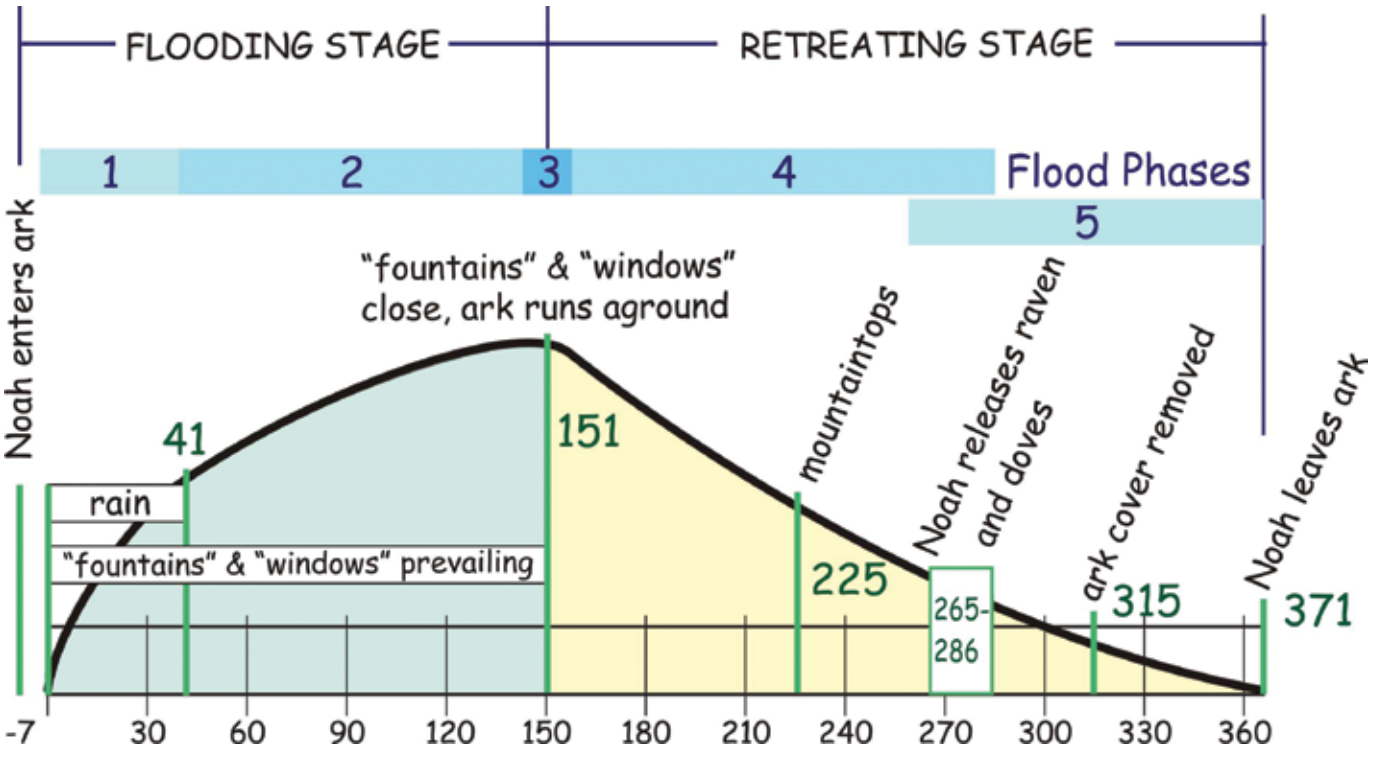

Figure 15. Timeline of the stages and phases of Flood from the Bible using Walker's (1994) Biblical geological model.

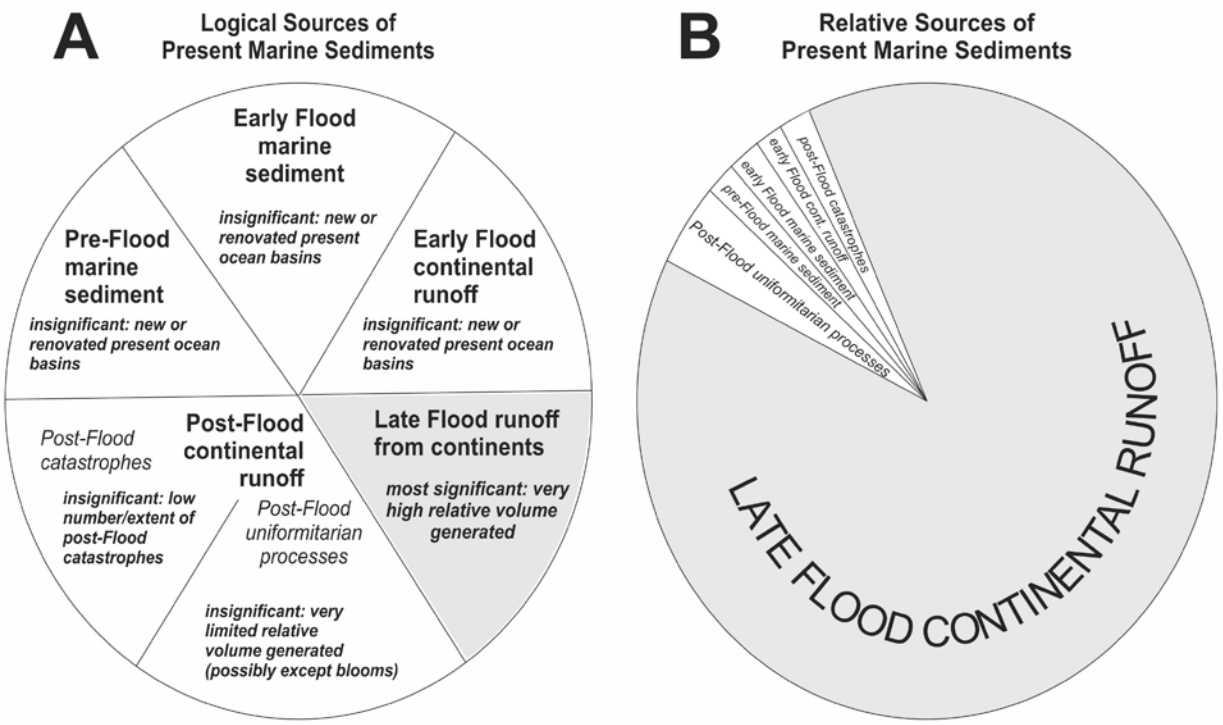

Figure 16. If potential logical sources of present marine sediment (A) are assessed for their volumetric contributions (B), it becomes clear that the vast bulk of actual sediments are best attributed to late-Flood runoff. Volume of minor components are exaggerated at right to allow room for text.

palachian Piedmont and subsidence of the offshore area. Early in the Recessive Stage, the Floodwater rushed over and off the Appalachians, eroding up to 6 km (Oard, 2013, Appendix 4). Resulting debris was rapidly transported east and deposited in a seaward-prograding wedge, as the margin sank. As the Flood water level dropped on the continents, erosion and deposition migrated downgradient.

Current strength can possibly be retrodicted, as conditions of water volume, current width, gradient, depth, etc., are approximated, first using present topography. These estimates can be checked against the volume and geometry of the downgradient sediment wedge, particularly where it requires broad sheet-like currents early in the event.

During the Flood runoff, some sediment would have likely continued out onto the abyssal plains, where it first preferentially filled lows in the rough igneous basement. Downslope debris flows may have helped transport some sand onto the abyssal plain. This continues today via slides off the continental slope. Turbidity currents can be initiated by submarine landslides and travel on nearly flat slopes. Figure 17 is a schematic of the Flood formation of the continental margin off southeast Africa.

The vast majority of marine margin sediments was deposited as water velocity dropped. Water draining into those new oceans generated upgradient erosion and downgradient deposition, forming the time-transgressive post-Flood boundary, from upgradient planation surfaces to downgradient sediment wedges. The average erosion of the continents was estimated at about 1900 m, which is about 280,000,000 km^3. We shall round off to 2000 m.

How Much Sediment at the Peak of the Flood?

We can add the amount of sediment eroded during the Recessive Stage of the Flood to the sedimentary rocks left on the continent to determine the amount of sediments piled on the continent at the peak of the Flood. Since we do not know the average sedimentary rock thickness left on the continents at the beginning of Flood runoff, we are calculating the average depth for various states of the United States. In the results so far, we estimate as a first guess about 2000 m. If about 2000 m was eroded off during Flood runoff and about 2000 m is left, then the total sediment thickness at the peak of the Flood was around 4000 m (Figure 18).

Most commentators believe that the peak of the Flood was reached on Day 150 (Boyd and Snelling, 2014; Johnson

Table II. Evidence for a late Cenozoic boundary. Relative strength refers to the difficulty for a K/Pg boundary explanation.

Summary of Cenozoic Evidence for High Flood Boundary

Sedimentary Rock Evidence	Strength	Reference
1. Significant volume of sedimentary rocks	strong	Oard, 2016
2. Thin, widespread strata	moderate	
3. Consolidated sedimentary rocks	moderate	
4. Deposition of widespread, thick 'evaporites'	strong	
5. Phosphorites	weak	
6. Formation of carbonates	moderate	
7. Significant continental margin rocks	strong	
Organic Evidence		Oard, 2017a
8. Mineralized fossils	moderate	
9. Thick, pure coal seams	strong	
10. Amber	strong	
11. Oil and gas formation	moderate	
12. Large, pure layers of microorganisms	moderate	
13. Jump in number of mammal fossils	strong	
14. Fossil order and large extinctions	moderate	
Tectonic Evidence		Oard, 2017b
15. Significant vertical tectonics	strong	
16. Significant horizontal tectonics	modrerate	
17. Ophiolites	moderate	
18. Metamorphic core complexes	weak	
19. Ultrahigh-presssure minerals	moderate	
Geomorphological Evidence		Oard, 2018
20. Significant erosion of continents	strong	
21. Erosional escarpments formed	moderate	
22. Tall erosional remnants, like Devil's Tower	strong	
23. Widespread planation surfaces	strong	
24. Long-distance transport of hard rocks	strong	
25. Deep valleys	strong	
26. Pediments	moderate	
27. Wind and water gaps	strong	
28. Submarine canyons	moderate	
Climate Evidence		Oard, 2019
29. Mid and high-latitude warm-climate fossils	strong	
30. Volcanic winter	strong	
31. Meteorite or comet impacts	weak	
Other Evidence		Oard, 2019
32. Accelerated radiometric decay	strong	
33. Middle East geology	strong	

and Clarey, 2021). If our estimates of erosion and deposition are correct, then an approximate average of 4000 m of sediment existed at that time on the present-day continents. That is an average of more than 25 m of deposition per day. Since activity would have been greater at particular places and times, and less at other places at other times, the maximum volume deposited on any given day in any given location would have been much greater. But this is not surprising. The scale of processes taking place was unprecedented and unique. Analogies help us understand how great it *might* have been. For example, the Lake Missoula Flood eroded 125 km^3 of soft silt and hard basalt in several days (Oard, 2004, 2014b). Deposition in some of the tributary valleys of eastern Washington was likely several meters per hour. We know that large-scale, energetic processes accomplish significant geological work. Now, we are starting to reach a point where we can constrain and begin to understand the scale of processes during the Flood.

Geomorphological Features Contrary to Uniformitarianism

Many geomorphological features resulting from a Flood Regression Model confound uniformitarians because modern processes would never create them (Oard, 2013). Following, are a few examples.

Sediments Carried off the Continents

Slow, gradual erosion over millions of years would have resulted in massive flood plains on the continents, the residue of lower-energy processes. However, we see planation surfaces that generated large volumes of sediment, *not* deposited on the continents, but along the continent-ocean margin. Powerful currents would have been required to erode the estimated 1900 m of sediment off the continents.

Continental Margin Profiles Look Young

Continental margins do not steadily drop in elevation from the shore. Instead, they create the distinct profile of the shelf, slope, and rise (Figure 19). The continental shelf is a seaward extension of the coastal plain to the shelf break or shelf edge, which marks the beginning of the continental slope. The continental shelf dips very gently—less than 0.1° and widths vary; the average is 80 km. At least one shelf is over 1,000 km wide (Hedberg, 1970). The widest shelves are found along the Arctic Ocean, in the Bering Sea, and the Grand Banks, off Newfoundland.

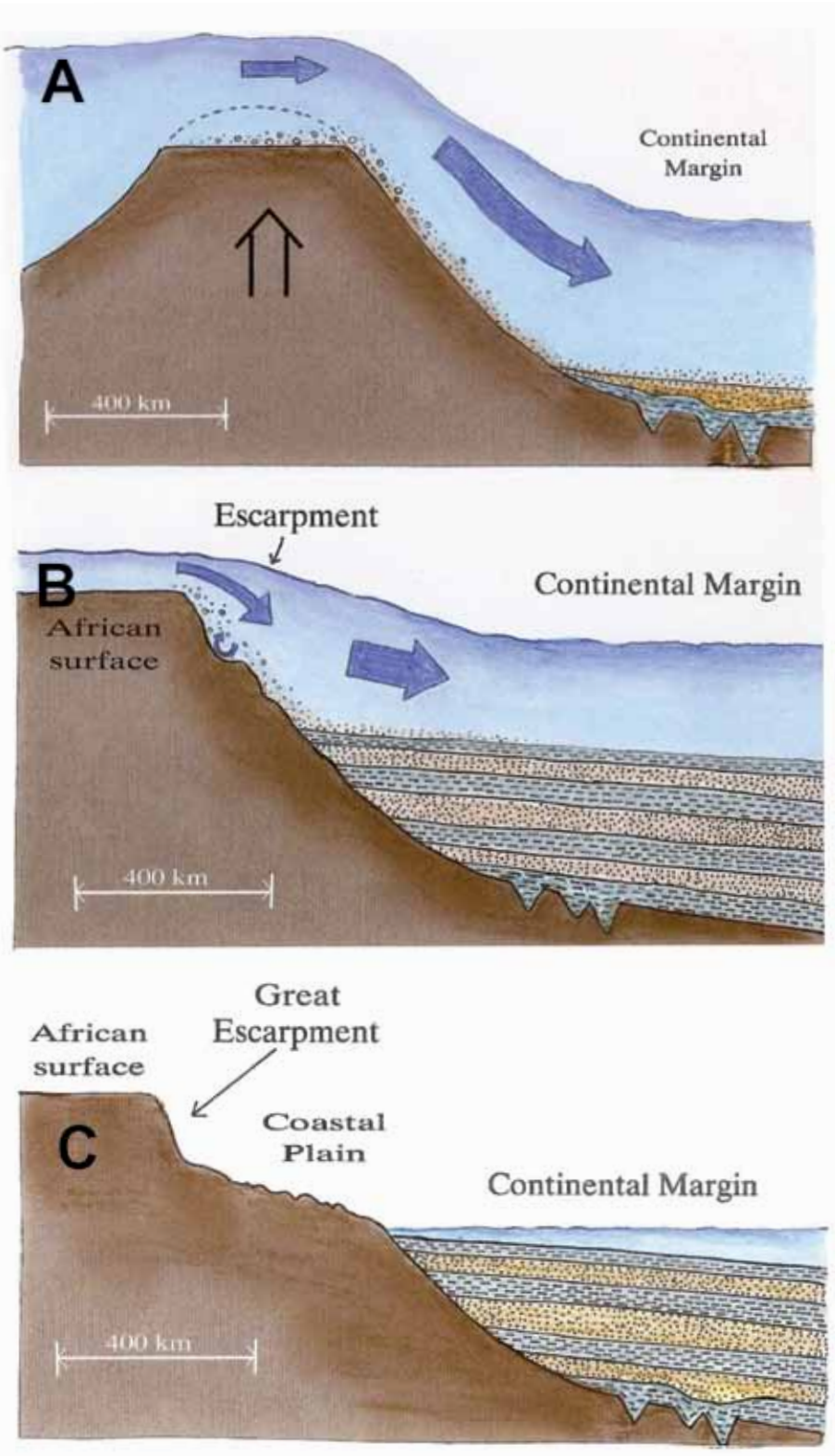

Figure 17. Flood formation of the continental margin off southeast Africa (drawn by Melanie Richard).

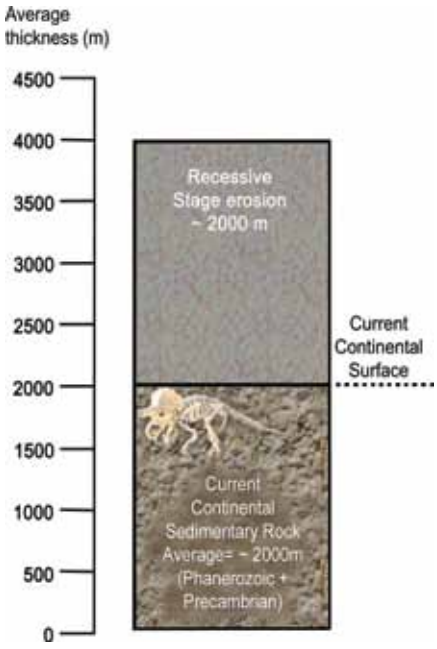

Figure 18. A block diagram representing the sediments and sedimentary rocks at Day 150 made up of about 50% remaining continental sediments and 50% that has been eroded during the Recessive Stage (modified by Mrs. Melanie Richard).

Continental shelves break at a consistent average depth of about 130 m, except off Antarctica where ice has depressed the shelf. Beyond the shelf break, the surface slopes seaward at about 4°, from 130 m to 1500–3500 m. Slopes vary: some reach 35° to 90°. Slope widths are narrow compared to shelves. Slope topography changes more rapidly: faulting, submarine slides, and submarine canyons leave their imprint. Yet the slope is majestic. If water were removed from the oceans, the continental slope would be the *most conspicuous geomorphological boundary on Earth* (Figure 20). No one knows why the shelf-slope break occurs at 130 m, but its global consistency suggests the synchronous end of the Flood. Otherwise, deposition of the margins would be more chaotic. It could simply be the

type of crust beneath the continent and the ocean causing the relief.

Extensive continental rises exist only along passive margins with no offshore deep-sea trench. Rises show a gradual decline in slope seaward of the continental slope and provide the transition down to the deep abyssal plains. The rise can vary from 100–1,000 km wide with a much lower relief than the slope.

Though few uniformitarians address it, the continental margin profile is unexpected, if they are really millions of years old as claimed. Present processes, over time, would favor a gradual slope from continents to deep ocean (the dashed line on Figure 19). King (1983, p. 199), described the problem:

> There arises, however, the question as to what marine agency was responsible for the leveling of the shelf in early Cenozoic time, a leveling that was preserved, with minor modification, until the offshore canyon cutting of Quaternary time? Briefly *the shelf is too wide, and towards the outer edge too deep*, to have been controlled by normal wind-generated waves of the ocean surface (emphasis mine).

When King wrote, it was believed that submarine canyons were Quaternary, but uniformitarian scientists have pushed the origin of submarine canyons well down into the Cenozoic. King implies that present processes cannot form the existing margin profile because winds generate most ocean currents (Wunch, 2006) and resulting currents, e.g., the Gulf Stream, run parallel to the coast (Kennett, 1982). Continental sediments are moved to the margins by rivers and their deltas, which show seaward, nearly-flat progradation to a slope break. Longshore currents and storms spread the sediments along the continental margins. Sediments are transported into deep water by slumping and other mass movements, ubiquitous along the continental slopes today. Such slumping over deep time would create a more gradual profile (dashed line in Figure 19.)

Thus, the continental shelf and slope are like a giant delta, occupying continental margins. Such continental scale bodies were formed by water flowing off the continents in "rivers" thousands of km wide.

Table III. Five estimates of percent of deep-ocean sediments from the Flood and the corresponding average depth of erosion from the continents. We assumed that all the sediment from the margin and the area between the margin and the deep-ocean sediments, 2.24 x 10^8 km^3, are from Flood runoff. The area of the continents is 1.49 x 10^8 km^2 and placing this sediment back on the continents results in erosion of 1500 m.

Percent of Deep-Ocean Sediment from Flood	Depth Eroded from the Continents
0% (0 km^3)	1500 m
25% (0.28 x 10^8 km^3)	1692 m
50% (0. 57 x 10^8 km^3)	1886 m
75% (0.85 x 10^8 km^3)	2074 m
100% (1.13 x 10^8 km^3)	2262 m

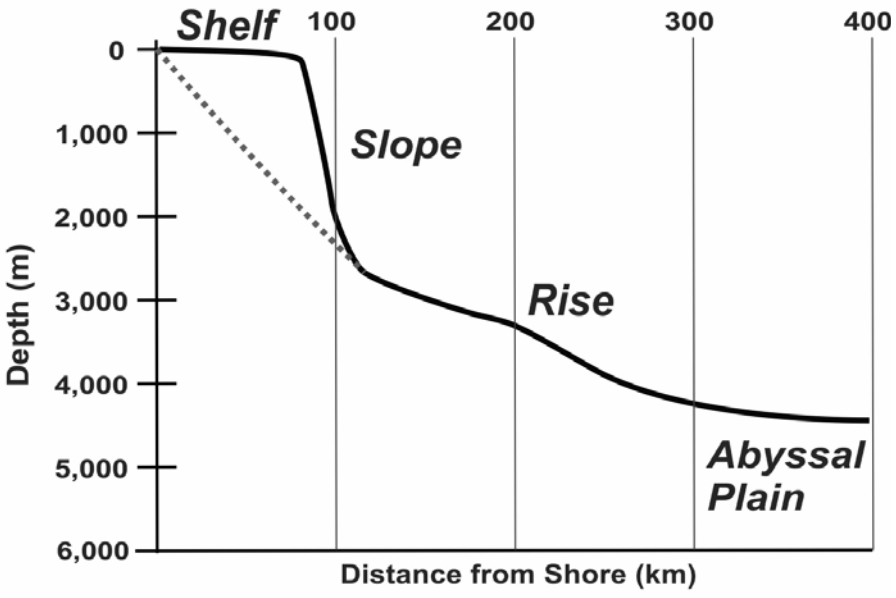

Figure 19. Profile of continental margin off Cape Hatteras, North Carolina, exhibiting classic shelf-slope-rise architecture. Modified from Sauter (2004). Vertical exaggeration = 50x.

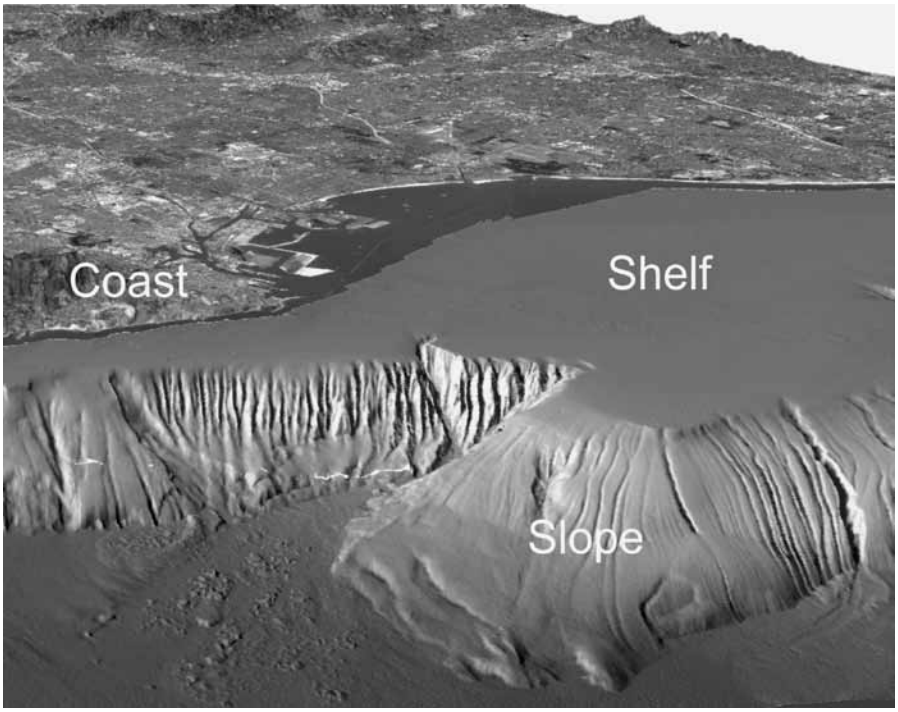

Figure 20. Continental shelf and slope near Los Angeles, California, showing dramatic geomorphology hidden underwater. Modified from USGS Coastal and Marine Hazards and Resources Program Decadal Strategic Plan, 2020–2030.

A small-scale example is the delta of the Colorado River at Lake Mead, in the narrow Lower Granite Gorge (Figure 21), that formed as the lake filled. There were no longshore currents to spread the sediment, which was deposited in a narrow gorge. The top of the delta is nearly flat until it reaches a steep drop off. This example sheds light on the formation of the continental shelf and slope by wide, Flood sheet currents.

Summary and Future Directions

A Flood Regression Model seeks to understand processes associated with the vertical restructuring of Earth's crust into its present configuration. Of particular interest is the linked triad of erosion, transport, and deposition of sediments

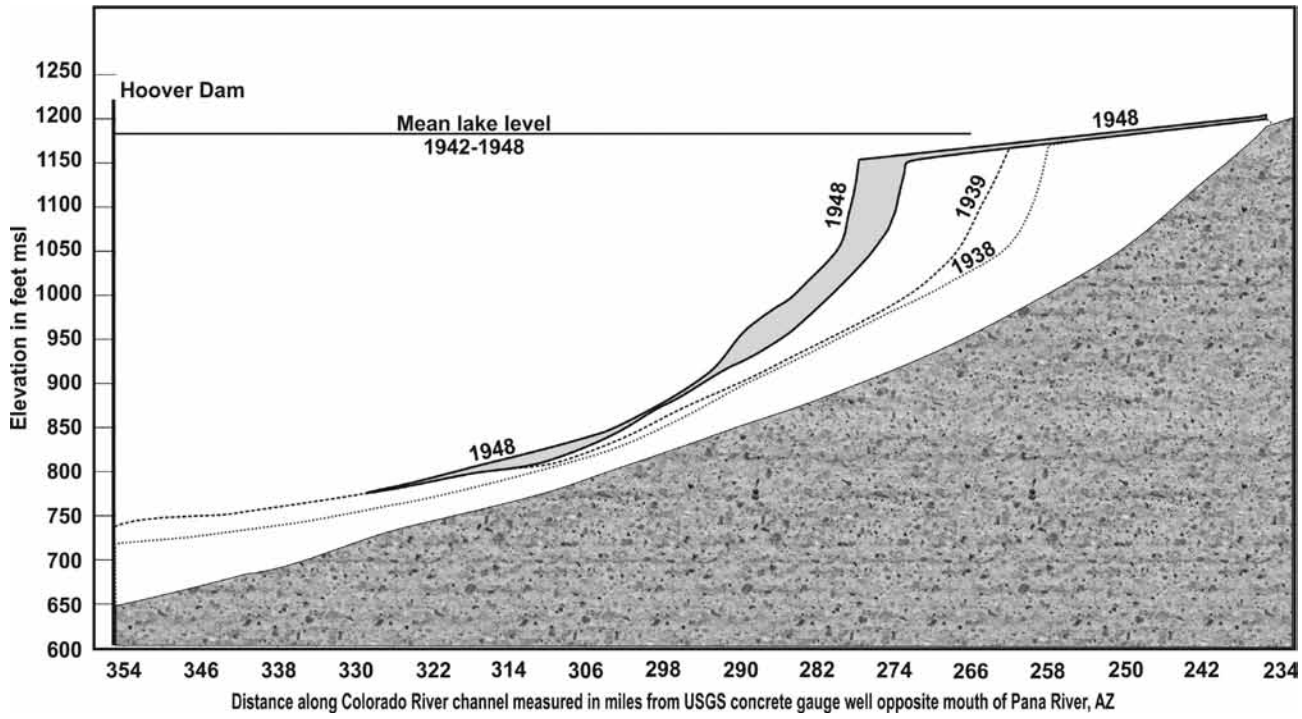

Figure 21. The yearly prograding Colorado River delta into Lake Mead in the Lower Granite Gorge as the lake was filling (modified by Mrs. Melanie Richard). There could be no lateral movement of the sediments, providing a schematic of the formation of the continental shelf and slope by offshore sheet currents during Flood runoff.

off the continents and mostly onto the continental margins.

Determining a stratigraphically high post-Flood boundary from 35 criteria and post-Flood uniformitarian processes that deposit very little sediment in the oceans, we conclude that most marine sediments are the products of the Recessional Stage of the Flood. We seek to describe and understand specific processes of: (1) DVT as it relates to erosion, transport, and deposition; (2) the nature of the post-Flood boundary as a time-transgressive geomorphological boundary; (3) the extent of erosion off the continents and its implications for earlier Flood conditions; and (4) the manner of deposition of that sediment in broad, prograding sheets at the margins. The margin deposition was aided by rapidly deepening ocean basins needed to create velocity traps for the sediment. We estimate an average continental thickness of ~2000 m was deposited mainly at the margins (Figure 1).

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Conference Reports

11th Annual CRS Conference Review

2022 CRS Conference Abstracts

July 22–23, 2022 • Lynchburg, VA

On July 22–23, 2022, the Creation Research Society held its eleventh conference on the campus of Liberty University, Lynchburg, Virginia. There were nearly 190 registered, plus CRS staff. This was the largest CRS conference to date. Great fellowship was enjoyed by all attendees, especially during the opening reception on the evening of July 21. Professor Andy McIntosh delivered the Henry M. Morris Memorial Lecture the evening of July 22. His talk was entitled, *The Legacy of Henry M. Morris in Uncertain Days*. This presentation was open to the public and was received very well.

In addition, there were four separate workshops or field trips on Thursday, July 21. An astronomy workshop led by Danny Faulkner, a biology/genetics workshop by Rob Carter, an education workshop by Mike Riddle. and a geology field trip to several local sites led by Marcus Ross.

The opening plenary session was given by CRS Board member Robert Carter on Friday morning, July 22. The title of his talk was *A Revised, 4D Baramin Concept*. Saturday's plenary session was co-authored by Ying Liu and Robert Carter, entitled, *Multiyear Changes in the Genome of SARS-CoV-2 Reveal a Trend of Degeneration*.

The primary purpose of the meeting is to provide a venue where people can present preliminary research and gain valuable input from their peers. We hope that some of the research presented at these meetings will eventually be published in the *Creation Research Society Quarterly* as full papers. Since these are works in progress, no attempt was made to record them. However, below are the abstracts from the 2022 meeting as submitted. Any typographic or grammar mistakes are the responsibility of the authors.

The Geology Workshop group went on a geology field trip, exploring the Precambrian-to-Cambrian metamorphic rocks of the Lynchburg, Virginia area. Over 30 participants joined the trip, which included visiting a local greenstone/metabasalt quarry for mineral collecting. The Biology Workshop group discussed topics that ranged far and wide, covering topics like population modeling, problems in baraminology, genetic entropy, the meaning of "information" in biology, and the ethical issues involved in stem cell and cloning research, specifically as this relates to the use of fetal cells derived from abortion.

The Education Workshop group discussed why the Church is losing the education wars and how to fight back with well-prepared, engaging, and informative presentations that ensure students are equipped to defend their faith.

Next year, the CRS will not host the annual conference in support of the International Conference on Creationism to be held at Cedarville University in Ohio (https://www.internationalconferenceoncreationism.com/).

All meetings were well-attended. Following the plenary talks, Friday's and Saturday's conference sessions featured twenty-four, 30-minute presentations followed by question-and-answer periods and breaks that allowed time for networking and encouraged the free flow of ideas among fellow creation scientists.

ABSTRACTS

John Baumgardner

Language Falsifies Philosophical Naturalism

Philosophical naturalism is predicated on the claim that no nonmaterial realities exist. Hence, a single substantive counterexample of this foundational truth claim means the collapse of that framework. A category of reality which plays a huge role in the world around us is that of linguistic entities. Formal language, which involves the assignment of abstract meaning to a set of arbitrary symbols to form a vocabulary, together with a set of rules by which elements from the vocabulary may be joined together to form more complex meaning structures, encompasses not only human languages but also machine languages, mathematics, and the genetic specifications found in the DNA of living organisms. Formal language in its ultimate essence is nothing more than encoded meaning. Because meaning is abstract and non-material, so is formal language in all its diverse manifestations. The reality of the non-material linguistic realm within our daily experience is readily illustrated using a smartphone. Erasing the machine language software from a smartphone causes all its smart capabilities to vanish, even though its physical mass does not change by even a single atom. Similarly, living systems are unthinkable apart from the non-material linguistic specifications on which they rely. Indeed, all our thoughts and communications with others are manifestations of non-material formal language. Thus, the claim that non-material realities do not exist is obvious nonsense. There is hence no reason to allow philosophical materialists to continue to operate without challenge in our academic and other institutions of influence.

Some of the nearly 190 attendees at the CRS conference.

James L. Brenneman

Proper Bible Interpretation Must Constrain Creationist Models: Illustrated by Interpretations of Genesis 7:11

Creationists are confident that their scientific models are correct because they begin with the simple sense of Scripture: for example, interpretations of "day" (Gen. 1) and "was" (1:2). Yet as models develop, that simple intent of the Text may be lost, as the likely sense is exchanged for possible or even barely plausible meanings. This paper exposes faulty translation methodologies and illustrates the need for grammatical-historical interpretation with examples from the vocabulary of the Flood (Gen. 7:11; 8:2): 1.) Broken Up does not mean rupture of the crust; 2.) Fountains of the Great Deep cannot mean geysers or volcanoes; 3.) Tehom carries no sense of depth or downward dimension; and so 4.) The Flood was the ocean overflowing the land, not underground water shooting to the sky. Creationist models will become more accurate as our science and observation of natural reality is informed from the perspective of what is indeed the most probable intended sense of God's declarations about origins.

David Boyd

Analysis of Natural Selection Conceptual Inventory Question Responses among Freshman and Upper-class Biology and Premed Students at a Christian University

Natural Selection represents a relatively easy-to-understand concept that many people misrepresent. Since natural selection is considered by naturalistic scientists to be a major

Liberty University School of Engineering Research Professor Emeritus Dr. John Baumgardner, who spoke on how "Language Falsifies Philosophical Naturalism," also mentored four different younger creation scientists who gave presentations at the conference.

component of evolution, scientists from a biblical perspective should be able to understand natural selection and represent it accurately. I have used a Conceptual Inventory developed by secular educators when assessing student comprehension of Natural Selection in Freshman and Upper-level biology courses to determine student understanding. These questions uncover common student misconceptions and allow professors to appropriately instruct students and assess progress through their courses.

Stuart Burgess

Why the ankle joint is a masterpiece of engineering: And a rebuttal of Nathan Lents' bad design arguments

This paper will describe the ingenious design features of the human ankle joint. The paper will also give a rebuttal of the 'bad design' arguments of Nathan Lents that are given in his book *Human Errors*. The ankle joint is a complex joint that performs diverse functions, including joint movements, strength, flexibility and balance. According to Nathan Lents, the ankle joint contains mostly pointless bones. However the paper will show that each bone has specific functions that lead to an extreme level of optimal design. The ankle contains an ingenious integrated triple-arched structure comprising a medial longitudinal arch, a lateral longitudinal arch and a transverse arch. These arches enable five main functions to be performed: flexion, pronation, strength, flexibility and balance. Scientific results from the field of biomechanics research will be used to expose the errors of Nathan Lents. The research was carried out at Clare Hall College, Cambridge University in 2021 during a prestigious Visiting Research Fellowship. A related paper was published by the author in the Journal of biomimetics and bioinspiration (UK Institute of Physics): A review of linkage mechanisms in animal joints and related bioinspired designs.

Robert Carter

A Revised, 4D Baramin Concept

God clearly designed life to change and adapt over time. He preplanned this using direct (i.e., created diversity) and indirect (e.g., mutation and random recombination) means. What is not clear, however, is the nature of the created kinds/baramins. In the past, creationists have pointed out that the 'creationist lawn' is a false concept and that reality is closer to a 'creationist forest,' with discrete trunks (kinds) replete with many branches (species). Here, I present a revised, 4D baramin concept that amplifies and improves on older ideas. Baramins can be grouped into four categories, depending on the initial number of individuals, the degree of separation between any initial subpopulations, and the amount of created diversity within each baramin. This allows some baramins to be species rich, some to be species poor (even monotypic), some with the ability to adapt to radical new environments, and some to be pigeonholed into restrictive niches. A proper understanding of the baramin concept allows us to explain the appearance and disappearance of species over time, the lack of major transitions in the fossil record and the reason why so many 'species' can interbreed today.

Eugene Chaffin

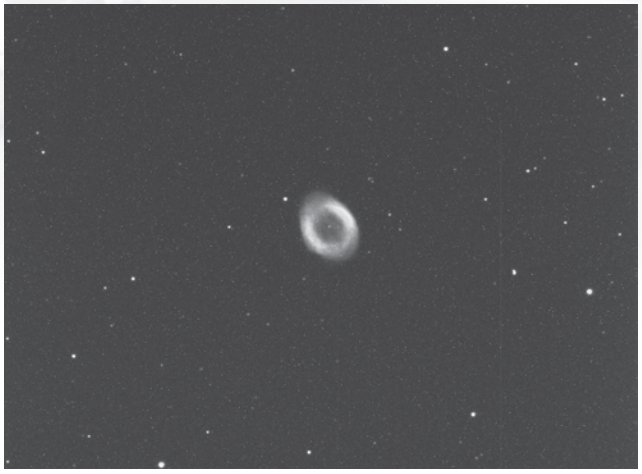
Accelerated Decay, Supernovae, and Uranium

We discuss the abundance of uranium and lead in stars, in the light of Chaffin's (2017) suggestion that the arrival at earth of the initial blast from a supernova may be accompanied by a change in the hypothetical "acceleron" field. This was suggested to lead to an episode of accelerated decay, or a drastic decrease in nuclear half-life of some nuclei. It is well known that the uranium series transforms U-238 into Pb-206. Examples are given of stars with high uranium abundance but very little lead abundance. This could correspond to a location where accelerated decay was not as severe as on earth. Other examples are given of a nonexistent uranium concentration but a finite lead concentration. This would correspond to a location where accelerated decay was predominate. Disturbing factors such as the inheritance of material from a companion star are mentioned.

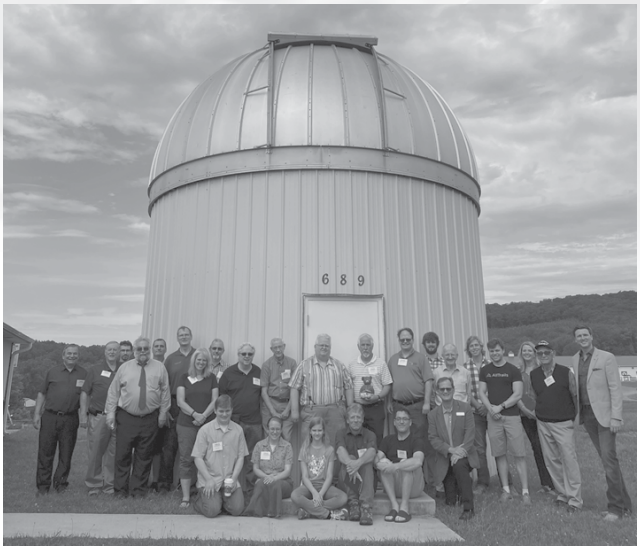
Boaz Baeksung Choi

What Happened at the Tower of Babel? (Linguistic Evidences for the Historicity of the Tower of Babel Account)

Since the Linguistic Society of Paris banned discussion of the origin of language in their 1866 meeting, only seven years after the publication of Darwin's *On the Origin of Species* in 1859, there has been little significant scholarship addressing the origin of language, and virtually none that treats the Genesis account of the Tower of Babel incident as authentic historical record. It is into this vacuum that the Linguistic Energy Theory is proposed by the author. Linguistic pattern analysis is key to this theory on the origin of language which combines the Genesis record with concepts borrowed from Einstein's Theory of Relativity. According to the Linguistic Energy Theory, language is/has literal and figurative energy, which can be traced by analyzing linguistic patterns created



The Astronomy Workshop personnel visited the Liberty University Observatory and will propose to Liberty University a plan to make the observatory a location for creation-science research. Danny Faulkner helped the Liberty University technicians garner the photo of the Ring Nebula.



The Astronomy Workshop personnel along with the Liberty University Observatory team.

by linguistic energy. According to this research, at Babel the original proto-language was catastrophically confounded, but in ways that are more systematic than previously thought. Since the triggering of the confounding of the proto-language at Babel, human language has been changing further and obscuring the proto-language. Most significantly, exceptional common denominators among languages which reflect linguistic distances, synchronic and diachronic, and the extraordinary and never-reported symmetry between these common-denominators are supporting evidences for the claim. Furthermore, the reliability of the biblical text reporting on the Tower of Babel incident as history is affirmed if not validated by this research. Tremendous insights into the character of God as well as pragmatic helps in foreign language acquisition are among the tangible fruits of this research.

Salvador Cordova, Joseph Deweese, John Sanford, Henry Wittler

The Protein Orchard (Rather than a Universal Tree) is Unwittingly Adopted in Modern Bioinformatics

Using modern bioinformatic and experimental data, the discontinuity between major protein forms can be demonstrated to be sufficiently acute such that their origin is more reasonably explained by special creation rather than a gradual process of random mutation and selection. One method of demonstrating the discontinuity is by simply comparing and contrasting the sequences, form, function, and processing of select proteins such as topoisomerases, helicases, transmembrane proteins, collagen, zinc finger proteins, and insulin receptors. Not only do 3D folds demarcate discontinuities, but so also the primary structure, post-translational modifications, post-translational processing, and signal peptide sequences. Though not as forcefully, the protein orchard model can also be somewhat gleaned from databases such as UniProt, CDD, SPARCLE, C-DART and the use of PSSM, etc. The presence of an orchard rather than a universal tree is underscored by the fact these databases can classify members into distinct protein families via objective statistical measures, and they show that each major family cannot phylogenetically resolve to a universal common ancestral biopolymer. Promiscuous domains are a further complication for a universal tree but fit well with the protein orchard model. The protein orchard model may have some bearing on the organismal orchard models and discontinuity systematics in general, but nevertheless, the observable protein orchard pattern in the bioinformatic databases points forcefully in favor of special creation rather than a process of gradual evolution.

Matthew Cserhati

Mitochondrial baraminology of Annelida

Phylum Annelida is made up of 22,000 species of worms, classified as bristle worms (Polychaeta), collared worms

(Clitellata) and leeches. Due to their long, segmented, cylindrical body plans, annelids are most likely to be an apobaramin. The mitochondrial DNA of eighty-three annelids from the NCBI database were analyzed to assess baraminic relationships. The mitochondrial whole genome sequences were aligned, and the gene order similarity was compared between species using the ODL algorithm. The results for the gene order similarity comparison shows three clusters, of which two are statistically significant. Gene order clustering was excellent with a Hopkins clustering value of 0.907. The mtDNA sequence similarity-based clustering shows six statistically significant clusters . Hopkins clustering was very good at 0.856. The six groups discovered by the sequence similarity analysis are: 1. Chaetopterus, Cirriformia, Cryptonome, Eurythoe, Eusyllis, Magelona, Myrianida, Owenia, Pharyngocirrus, Ramisyllis, Spirobranchis, Timarete, Typosyllis, and Urechis. 2. Alitta, Hediste, Namalycastis, Neanthes, Nereis, Paraleonnates, Perinereis, Platynereis, Tylorrhynchus. 3. Amynthas, Duplodicodrilus, Metaphire, Perionyx. 4. Aphrodita, Aporrectodea, Clymenella, Drawida, Erpobdella, Goniada, Lumbricus, Marphysa, Orbinia, Pista, Pontoscolex, Terebellides, Zeylanicobdella. 5. Hirudo, Poecilobdella, Whitmania. 6. Escarpia, Galathealinum, Lamellibrachia, Manayunkia, Oasisia, Ozobranchus, Paraescarpia, Placobdella, Ridgeia, Riftia, Sclerolinum, Seepiophila, Siboglinum, Tevnia. The gene order analysis results indicate that mitochondrial gene order is general even at high taxonomic levels. This analysis broke down the Annelida apobaramin into three smaller apobaramins. However, the mtDNA sequence similarity analysis breaks down the apobaramins derived in the previous step into smaller groups. This indicates that gene order similarity analysis may be good only for initial baraminic estimates, more fine-detailed analysis may be achieved by mtDNA sequence similarity analysis.

Leo (Jake) Hebert, III

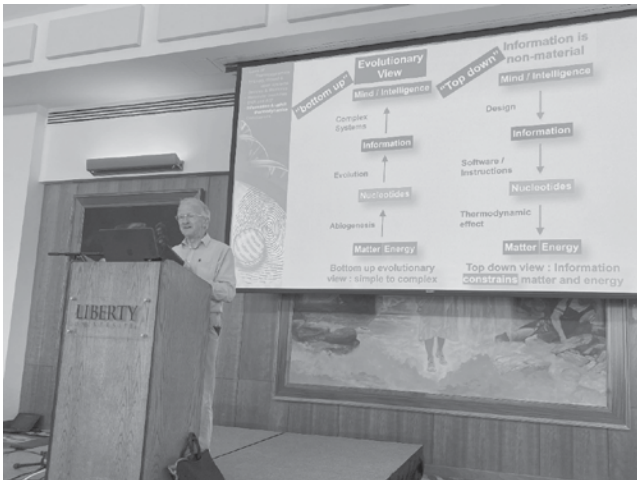
Scaling Laws in Biology: Evidence for Engineering Optimization?

Allometry is the study of the manner in which biological variables scale with body size. For example, very massive organisms like elephants or dinosaurs need thick legs to support their great body weight, whereas smaller creatures do not. Observable biological characteristics are often proportional to the organism's mass raised to some power, often a simple multiple of 1/4. As a well-known example, agricultural scientist Max Kleiber observed that for birds and many mammals, basal metabolic rate is proportional to body mass raised to the 3/4 power. This result was surprising, as biologists, based on simple geometrical reasoning, were expecting an exponent of 2/3, rather than 3/4. In 1997 physicist Geoffrey West and biologists Brian Enquist and James Brown published a theoretical explanation for Kleiber's Law. Among other things, the WEB explanation assumes that biological systems are designed to minimize the amount of energy needed to function. Although the WEB theory and its extensions have been subject to some controversy, they successfully predict the scaling exponents for 16 variables of the mammalian circulatory system, including blood volume, heart rate, blood pressure, aorta radius, and the numbers and densities of capillaries. They also successfully predict the scaling exponents for 17 characteristics of plant vascular systems. Despite the obvious design implications of their own theory, WEB attributed this remarkable result to natural selection rather than a Creator. Here we discuss WEB theory as evidence for Creation and as an example of the successful application of engineering principles to the understanding of biological systems.

Mark Horstemeyer

When the Holy Spirit's Expression is Couched in Terms of Thermodynamics, a Complete Mathematical Description of the Godhead is Realizable

This two-part presentation first describes the Holy Spirit's part of the Godhead manifestations in the space-time-matter continuum as expressions of thermodynamics and then uses thermodynamics to provide a mathematical



Dr. Andy McIntosh, who holds an emeritus chair in thermodynamics at the University of Leeds in Great Britain, gave the Henry Morris Lecture on Friday night.

description of God's omnipotence, omnipresence, and omniscience. The Laws of Thermodynamics are expressed in different energy forms (Chemical, Optical, Magnetic, Electrical, Thermal, Mechanical, Acoustic, and Nuclear) giving rise to an acronym COMETMAN. The Bible shows that when the Holy Spirit moved in the Old Testament and New Testament that the manifestations expressed themselves in all of the COMETMAN forms in one place or another. Because this comprehensive description of the energy, the rate of energy change over time is power, and when power is integrated over all space and time, we arrive at omnipotence. By employing the General Theory of Relativity, we can arrive at another integral form of omnipresence. And finally, when we integrate knowledge in terms of information and wisdom, we can arrive at another integral of omniscience. When the triple integral is developed we find a mathematical trinity of omnipresence, omnipotence, and omniscience

Mark Horstemeyer, Tate Fonville, Andy McIntosh, Stuart Burgess

A Trinitarian Design Methodology was used by the Creator when Engineering the Universe

We present the trinitarian design methodology that the Creator employed when designing the universe based from Romans 1:20 (Amp) "For ever since the creation of the world His invisible attributes, His eternal power and divine nature, have been clearly seen, being understood through His workmanship [all His creation, the wonderful things that He has made]…" Since God's nature is Trinitarian, He engineered the universe after His own nature. We discuss the optimization of the cosmos by using a standard engineering multi-objective design optimization methodology. This entails a multiscale analysis wherein different objectives, constraints, and variables are defined at each particular length scale and are typically different from each other. When considering this framework, trinities arise within each length scale thus revealing the nature of the Godhead. For example, the largest length scale is the cosmos, which comprises the following trinity: astrosphere, geosphere, and biosphere. Each of these second length scale entities are also broken down into further trinities: astrosphere = stars, planets, and satellites; geosphere = core, mantle, and crust; biosphere = vegetation, animals, and mankind. And so on. For each of the different length scales, we discuss the objectives, constraints, and variables. We also discuss this systems design optimization approach in the context of macro-evolutions weakness in explaining the universe and its lack of application of systems engineering.

Marshall C. Jordan

How old is Y-chromosome Adam? Mutation rates give the answer

Y chromosome variant data reveals that all men have descended from a common male ancestor who lived in the recent past. Y-chromosome Adam is thought by Evolutionists to have lived 250,000 years ago while Creationists believe this is Noah who lived 4500 years ago. Because mutations are defined by the ancestral allele, the older timescale produces many more apparent mutations in the data. However, recent pedigree-based mutation rate measurements indicate that the number of mutations found on Y chromosomes today could have accumulated over just 4500 years. As more pedigree-based mutation rates are measured, the age of our most recent common ancestor is resolving in favor of the Creationist view. To provide independent confirmation of the Biblical timescale, mutations defined by this timescale were counted on the Y chromosomes of three large databases and lineage specific mutation rates were computed for 15 haplogroups. While relative rates between haplogroups are the same, the rates differ between databases, which may be an artifact of inadequate depth of coverage or differing quality scores between the databases. Lineages of the A and B haplogroups have significantly higher rates than other haplogroups. The list of haplogroup specific mutation rates from these databases will serve as a corrective for Y chromosome phylogenies based on the evolutionary timescale as more pedigree mutation rates are published. Once again, the historic record of Genesis and the recent antiquity of Noah provides a clear explanation for human genetic data.

Marshall C. Jordan

Tracing Neanderthal descent from Noah using ancient DNA

Recent publication of the Y chromosome sequences of 3 Neanderthals and 2 Denisovans allow these post-Flood sequences to be placed in phylogenetic trees descending from Noah. The ancient sequences were obtained from the European Nucleotide Archive and combined with modern sequences from three large Y chromosome databases. Phylogenetic trees were constructed with online software. Based on a timescale of 4500 years since the Flood, the branch points in the trees show Denisovans and Neanderthals descending from men of the A haplogroups after it split from the B haplogroups about 4100 years ago. The pattern of distribution of the ancient sequences among A haplogroups differed between the three databases, possibly due to differences in depth of coverage and quality scores of the called

genotypes. Denisovans always clustered together, whereas the Neanderthals clustered with one other A haplogroup. Risk of artifactual base calls due to decay of the ancient DNA was countered by running the phylogenetic trees using only transversion mutations. Contrary to the Evolutionary notion that Neanderthals and Denisovans are only distantly related to modern humans, they appear to have descended from men of the A haplogroup in the lineage of Ham. They were contemporaries with men of the patriarchal age. The fact that A haplogroup men are mostly found in sub-Saharan Africa today, whereas Neanderthal and Denisovan remains are found in Europe and Asia suggests that the separation of Neanderthals and Denisovans from modern lineages occurred soon after the Flood, close in time to the Babel event age. The fact that A haplogroup men are mostly found in sub-Saharan Africa today, whereas Neanderthal and Denisovan remains are found in Europe and Asia suggests that the separation of Neanderthals and Denisovans from modern lineages occurred soon after the Flood, close in time to the Babel event.

Eric Katzaman, John Baumgardner

Modeling the Process of Rapid Geomagnetic Reversal During the Genesis Flood

Remnant magnetization in the Earth's igneous rocks document that the Earth's magnetic field reversed its polarity many times during the Genesis Flood. Previous creationist research has argued that strong convective buoyancy within the Earth's liquid outer core during the Flood can cause the expulsion of magnetic flux outward from the core into the overlying mantle which produces rapid reversals of the Earth's surface dipolar magnetic field. This talk reports preliminary numerical results of modeling of this dynamic process in 3D spherical geometry which includes the strong turbulence that develops in these circumstances.

Nayeon Lee

Material Design Found in Ironclad Beetles' Exoskeleton

An experimental study on the southwestern ironclad beetle (Zopherus haldemani) revealed that a remarkable composite design in the exoskeleton led to high damage tolerance. Structural observations revealed nanoarrays on the surface, which function as an antibacterial structure to prevent infection by mechanically hindering bacterial attachments. Structural and nanomechanical tests analyzed multilayered structures where each layer performed a distinct function. In detail, the innermost layer, the epidermis, contains attachment sites for muscle and soft tissue that connect the exoskeleton to the beetle. The next layer, the endocuticle, contained 8–10 GPa of moduli. Nanoindentation testing further reiterated that the various fibrous layer orientations resulted in elastic moduli changing throughout the endocuticle's cross-section. Additionally, this exoskeleton prevented delamination within the composite materials by overlapping approximately 5–19% of each fibrous stack with neighboring layers, which was never reported in manufactured composite design. In the next layer, the exocuticle exhibited the greatest Young's moduli (~15 GPa), which could provide the bulk of the mechanical strength for the exoskeleton. The epicuticle, the outmost layer, with reduced Young's moduli of 2.2–3.2 GPa, exhibited nanopatterns with a polygon shape (2–3 μm in diameter) on the surface. Inspired from this nanotexture, nanopatterns were reproduced on pure titanium (Ti) using hydrothermal etching techniques. The results showed that the nano-patterned structure effectively reduced the adherence of methicillin-resistant Staphylococcus aureus to the surface. This study demonstrated the sophisticated engineering design of the beetle's exoskeleton and showed an example of bio-inspired design material.

Tim Lewis, John Baumgardner

FEA Analysis of Tsunami Generation During the Genesis Flood

Within the framework of catastrophic plate tectonics, large tsunamis are a plausible mechanism for producing fossil-bearing sediments of the Flood rock record. The focus of this research is to model the behavior of an overriding slab in response to a rapidly subducting plate with the aim of understanding in more detail the tsunami generation process. Key to this process is the locking and unlocking of the overriding and subducting slabs. The unlocking results in the rapid rise of the sea bottom and generation of a tsunami. Several key questions arise in this context that the model seeks to answer. How rapidly can the deformed overriding slab relax mechanically from its deformed shape? What sort of the stresses occur to keep the slabs locked together? How much deformational heating arises when the overriding slab is repetitively loaded? What is the coefficient of friction that allows the plates to be locked sufficiently long to produce large tsunamis? To address these questions in a quantitative manner, we apply the finite element analysis code Ansys. Preliminary results show response the time is short enough (~15 min for 10 km of deflection of the overriding plate). Additionally, stresses look reasonable for the large deflections that are involved.

Ying Liu, Robert Carter

Multiyear Changes in the Genome of SARS-CoV-2 Reveal a Trend of Degeneration

Evolution of SARS-CoV-2, the cause of COVID-19, has been carefully recorded with unprecedented details. We mined the sequence data and relevant literature to study trends in SARS-CoV-2 evolution. We found several characteristics that may apply to evolution of zoonotic viruses and beyond. There was initially a directionless drift followed by sudden emergence of multiple dominant variants. The alpha, delta, and omicron variants swept over the globe in succession. Surprisingly, the latter variants did not originate as a subtype of former ones, but as completely new variants originating from the same root. There was no progression in any direction. Although the viral genome was relatively large (29.9 kilobase), there were only a limited number of adaptive mutations shared by multiple variants. These positively selected mutations involved receptor-binding and immune evasion. Some mutations synergized with each other or mitigated the harmful effect of other mutations. There were more purifying selections than adaptive mutations. However, most mutations went unselected. A driving force of passive viral evolution is the host APOBEC enzyme which deaminates viral cytosine into uracil. Accumulation of mutations in SARS-CoV-2 included deletions which were sometimes positively selected. Newer variants demonstrated enhanced ability to replicate in the airway epithelium and reduced ability to replicate in the lungs, which caused milder symptoms but facilitated transmission. Finally, we used epidemiological data in the commonwealth of Virginia to demonstrate attenuation of the virus even during the early phases of the pandemic. In summary, SARS-CoV-2 displays to the world the nature of molecular evolution: nonlinearity, adaptation with degeneration.

Andy McIntosh

Intelligence, Information, and Thermodynamics

Even in open systems the principles of thermodynamics with energy coming across the boundary, the energy is of no benefit unless there are raised free energy devices able to capture, store, and / or use such free energy. We then explore the connection between information and thermodynamics, and noting that functional coded information (software) is neither matter nor energy, it is evident that such codes sit on a substrate which is itself subject to the laws of thermodynamics. We go on to consider living systems, where the functional complexity of these systems is heavily dependent on the material environment in which such a system is operating, and indeed obeys all the same chemical and physical laws that any man-made machines obey. What then are the laws that coded information in living systems must obey? Can one quantify the organisational structure of these information procedures which use the matter and energy of the hardware in any real system? A major implication is that coded non-material information in living systems constrains the energy and matter which it uses, and when the biochemical system dies, the information system is lost as the free energy devices cease to operate. Matter and energy cannot on its own evolve coded information. Just as there are laws of thermodynamics, we show there are parallel principles governing coded information. John 1:1 states "In the beginning was the Word"—Intelligence before matter and energy.

Nathan Mogk

Oceanfront Property in Arizona: Flood Terminal Boundary at the top of Neogene basin fills

Recent studies have shed new light on the relationship between some of the last deposited sediments in Southern Arizona basins and major tectonic events which occurred at the end of the Genesis Flood. This allows specific Flood terminal boundary formations to be determined accurately for the Higley ("ancestral Salt River deposits," eastern Phoenix area), Tucson (Swan-Craycroft gravels), and associated basins. Final Flood deposition of unconsolidated gravels, sand, and silt is transitional between the catastrophism associated with earlier Flood phases, and modern, low energy depositional events. The determined boundary is consistent with similar findings in the Verde Valley and a new water flow model of the drainage of Floodwaters from the upstream basins through three major water gaps. This study also confirms that metamorphic core complexes were formed during the Flood, and can be upgraded as a Flood boundary criterion.

Nathan Mogk

The High Mountains Under the Heavens

One of the hardest problems in Flood geology is the assignment of pre-Cambrian rocks and events to periods in Biblical Earth history. Arizona's Transition Zone provides an ideal laboratory to study this question owing to numerous and varied pre-Cambrian crustal blocks separated by several major linear high strain zones that are well exposed at the surface. In this presentation I report on field investigations into the Black Canyon Creek Group, Mazatzal Group, and Apache Group rocks and their relationships to each other and the crustal blocks that host them. I discuss four different

possible mechanisms for pre-Cambrian radiometric change and formulate six working hypothetical frameworks for understanding the timing and scope of pre-Flood geological events. Finally, I discuss potential new criteria for distinguishing Creation week, Antediluvian, and early Flood rocks.

Evan A. Navarro, John Baumgardner

Proposed Mechanism for Megasequence Formation

The proposed mechanism for megasequence formation involves an episode of ocean floor cooling that drops the global sea level by 100 m or more. This sudden drop in sea level, combined with ongoing and frequent large tsunamis generated by the locking and slip of plates in subduction zones, bevels the previously deposited continental sediment sequence to form a global-scale erosional unconformity. This unconformity marks the termination of the previous megasequence and the beginning of the next one, as the sea level begins to rise again as a consequence of ongoing rapid seafloor spreading. The presentation will highlight numerical results that affirm this mechanism using the Mabbul code that models the erosion, suspension, transport and deposition of sediment in the context of the Genesis Flood on a rotating sphere. This work is intended to bolster faith in the One who by His mighty power and infinite wisdom created all things but later brought a devastating judgment on fallen humans whose every intent of the thoughts of their hearts was only evil continually, as well as on the earth they inhabited.

Michael J. Oard

Did the Floods on Mars Occur during the Genesis Flood?

Planetary scientists were greatly surprised to discover floods on Mars. And these were no ordinary floods, but at least one was 10–100 times the discharge of the Lake Missoula flood. Two main flood features occur on Mars: 1.) valley networks that are generally 50–350 m deep, 0.5–6 km wide, and up to 4000 km long and 2.) outflow channels that are much wider. Planetary scientists have come to the surprising conclusion t that they were carved by catastrophic discharges of water. Mars valley networks have unique features; they occur predominantly in the southern highlands, have a patchy distribution, immature profiles, often start full size, and follow the topographic slope. Outflow channels initiate from underground in chaos regions or grabens, start full size, and have few tributaries. Planetary scientists have suggested that impacts and volcanism could supply the water for flooding, but each large impact is separated by tens of millions of years and therefore becomes insignificant. Based on many indications of youth and a secular crater dating system that comes up with anomalous results, a biblical model has more explanatory power. I provide an objective relative dating system that shows that the large impacts blasted Mars at about the same general time as the Genesis Flood. This verifies the Day 4 cratering hypothesis, and indicates impacts were either the mechanism of the Flood or contributed to catastrophic plate tectonics.

Savannah Robins, John Baumgardner

Modeling the Laramide Tectonics of Western North America during the Genesis Flood

Western North America is characterized by several distinctive tectonic features, including the Rocky Mountains, the Colorado Plateau, and the Rio Grande Rift. Many of these features have been associated by secular scientists with the Laramide Orogeny, a time of catastrophic volcanism, mountain building, and widespread tectonic activity correlating with the flat-slab subduction of the Farallon Plate beneath North America. However, the geodynamic models in previous scientific studies (e.g., Liu and Currie, 2019) assume noneclogitized subducting crust over several million years in order to sustain low-angle subduction. Previous geodynamic models of the Laramide orogeny also do not include crustal elastic behavior, which precludes correlation of model results with existing topographic features. In this study, we present preliminary results for an updated 2D version of the geodynamics code Terra that treats the Lagrangian aspects of the problem using particles. Results show that Terra is functionally comparable with other peer-reviewed, state-of-the-art geodynamic modeling codes such as SOPALE. We expect soon to incorporate elastic crustal behavior to model crustal deformation with that important realism. As we believe this period of flat-slab subduction and deformation occurred during the Biblical Flood, we will compare Laramide subduction models on both long and short timescales. The capability of Terra to model mantle and crustal dynamics simultaneously has far-reaching implications for future studies of the Genesis Flood, especially pertaining to the global episode of rapid mountain uplift at the end of the cataclysm.

Marcus R. Ross, Todd C. Wood

Evaluating Hypotheses of Hominin Baraminology

Statistical baraminology utilizes data matrices of physical characters among taxa and evaluates them using compu-

tational methods that can identify both continuities and discontinuities (e.g., distance correlation, multidimensional scaling, fuzzy analysis, etc.). Thus, statistical baraminology serves as a means of producing hypotheses of relationships among organisms, and these techniques have been applied to scores of living and extinct groups. Since the first application of statistical baraminology to hominin fossils (Wood, 2010), numerous additional studies have been conducted, and the methods have been both challenged and defended. Recognizing that the outputs of statistical baraminology are hypotheses of relationships involving the number of groups and their composition, one way to test the hypotheses of a broad but unified humanity is to evaluate several classes of evidence that reveal the cognitive capabilities of various hominins. If humanlike intelligence and behavior comport with the members assigned to the human cluster, then our conclusions on the matter become stronger. Characteristic human attributes include: 1.) Construction of tools, 2.) Controlled use of fire, 3.) Linguistic capabilities, recognized through the proxy of seafaring, 4.) Interbreeding among different species within Homo, 5.) Care for sick and/or injured, and 6.) Burial and/or funerary practices. A survey of these evidences indicates broad agreement with many species clustered together within proposed human holobaramins based on statistical baraminology. These include, minimally, H. sapiens, H. neanderthalensis, Desinovans, H. heidelbergensis, H. antecessor, H. erectus/ergaster, and H. naledi. We also include H. floresiensis, which thus far has not clustered with other humans in statistical studies.

Denver Seely

Geosynchronous Moon Disruption-modeling an equatorially aligned geomagnetic dipole with and without the Moon

Paleomagnetic observations indicate the orientation of the geomagnetic pole was located near the equator prior to, or shortly following, the onset of the flood. Two solutions have been proposed: True Polar wander such that both the rotation axis and the co-aligned magnetic pole were oriented at the pre-flood crustal location of the equator, and Apparent Polar Wander (APW) such that only the magnetic pole was aligned near the pre-flood equator. This paper examines the APW for two cases: 1.) the Earth by itself with equatorial aligned dipole, and 2.) An Earth with Moon in geosynchronous orbit (semi-major axis ~6.6RE) with colinear dipole fields aligned with the equator. An analytical method from previous work is employed which models the shielding magnetic field of the magnetopause as a paraboloid of revolution and the magnetic field of the Earth and Moon primary fields modeled as magnetic dipoles. The system is modeled at equinox. For case 1, a magnetic dipole oriented with the equator will sweep the cusp of the magnetosphere into alignment with the solar wind every rotation period, establishing magnetic reconnection to the solar magnetic field, plasma particles from the sun are able to efficiently stream into the magnetosphere reaching Earth. This behavior contrasts with the magnetic shielding effect against encroachment of the solar wind provided by the modern rotation polar field alignment. For case 2, the combined magnetosphere of Earth and Moon would greatly reduce incident radiation from Solar Energetic Particles (SEP) and Galactic Cosmic Rays (GCR) in the sub-Lunar hemisphere.

Denver Seely

Stronger preflood geomagnetic radiation shielding may account for lack of rain and rainbows

Genesis describes a period prior to the formation of man when "the LORD God had not caused it to rain upon the earth" with a mistbased water cycle. The Rainbow was given by the LORD as a sign after the flood such that when "the bow shall be seen in the cloud," He would remember his covenant that "the waters shall no more become a flood to destroy all flesh." We considered the interpretation that no Rainbow forming water cycle existed from creation to the flood. We examined the role of geomagnetic field strength in altering the rain producing cloud cycle through the following steps: 1.) An increased geomagnetic field strength decreases the flux of Solar Energetic Particles (SEP) and Galactic Cosmic Rays (GCR) penetrating into the troposphere. 2.) GCRs and SEPs play a significant role in tropospheric ionization, which is a dominant factor driving both cloud condensation nuclei (CCN) formation (~30nm diameter) and post nucleation water drop growth rate (up to 15μm diameter), combining to determine the maximum condensation rate. 3.) The supersaturation limit of water vapor in air increases with decreasing condensation rate. 4.) An increased water vapor supersaturation limit decreases the temperature lapse-rate of water vapor saturated air. 5.) A lower temperature lapse-rate decreases the convective instability required to drive cloud convection. 6.) Rainbows require convective growth of droplets to diameters between 1mm and 6mm. By reducing mid-tropospheric condensation rates, increased preflood geomagnetic shielding may have forced a mist-based cycle to accommodate daily solar induced evaporation.

Letters to the Editor

The policy of the editorial staff of CRSQ *is to allow letters to the editor to express a variety of views. As such, the content of all letters is solely the opinion of the author, and does not necessarily reflect the opinion of the* CRSQ *editorial staff or the Creation Research Society.*

Comments on Atmospheric Water

It was of interest to me that again this week, July 12, 2022, the "Astronomy Picture of the Day" featured a photo of noctilucent clouds, this time, over Paris, France (https://apod.nasa.gov/apod/ap220712.html). The explanation supplied by a "professional astronomer" stated that these clouds are composed "of small ice crystals forming only during specific conditions in the upper atmosphere" but "much about noctilucent clouds remains unknown and so a topic of active research." The major enigma is the source for these water molecules.

Members of the Creation Research Society have been aware of the existence of these water cluster ions atop Earth's atmosphere ever since the discovery of these charged ions in the early 1970's (Johannessen et al., 1972). Board member Harold Armstrong even suggested a connection between these water cluster ions and the Earth's early canopy. "Thus it may not be wrong to suggest that the ions just discovered may be, so to speak, remnants of the canopy" (Armstrong, 1972).

The Biblical text makes it very clear that liquid water was raised on Day 2 of Creation Week as the atmosphere was being created (Udd, 1975). The Bible is also clear that that water was used as a destructive agent (2 Peter 3:6) in the great Flood of Noah's day (Gen. 6:17). It apparently took 40 days to empty the canopy (Gen. 7:11–12) (Udd, 2015, p. 181). Some have suggested that the canopy of water did not reside atop the atmosphere during that pre-Flood period, instead, the layer of water continued to expand until it represented the edge of the entire created universe (Faulkner, 2016, pp. 40–50). The presence of the noctilucent clouds should be seen as clear physical evidence that that perception is wrong.

The Hebrew account of the Creation Week clearly separates the first heaven (atmosphere) from the second heaven (outer space). To describe the first heaven, the atmosphere, the text uses ***rāqîa***ʿ (Gen. 1:6–8). To describe the second heaven, the starry universe, the text consistently uses ***raqia***ʾ ***hasāmayim***. The Masoretes even accented this unit with ***mûnāḥ*** to show the attachment between the two nouns (Gen. 1:14–17). The 'third heaven' as Paul calls it (2 Cor. 12:2) is the realm of the spirit beings—the angels. This universe was obviously created as the Day 1 "heaven" ***hasāmayim*** (Gen. 1:1) because these created beings (Col. 1:16) were there to herald the birth of the Earth. "Where were you when I laid the foundations of the earth? When the morning stars sang together and all the sons of God shouted for joy?" (Job 38:4a, 7).

I find it interesting that we analyze and even argue about these 'waters above' (McGuire, 2020). And while comparing models, fail to account for the 40-day descent of the canopy. "And the windows of heaven were closed" (Gen. 8:2b). Streaming waters through the atmosphere would have resulted in the buildup of static charges such as we get when putting gas in our tanks. This residual static electricity would have produced a situation at the surface of the oxygen/nitrogen atmosphere such as we find today. Water cluster ions $H^+(H_2O)_6$ are a reminder of what once occupied this area.

Stanley Udd

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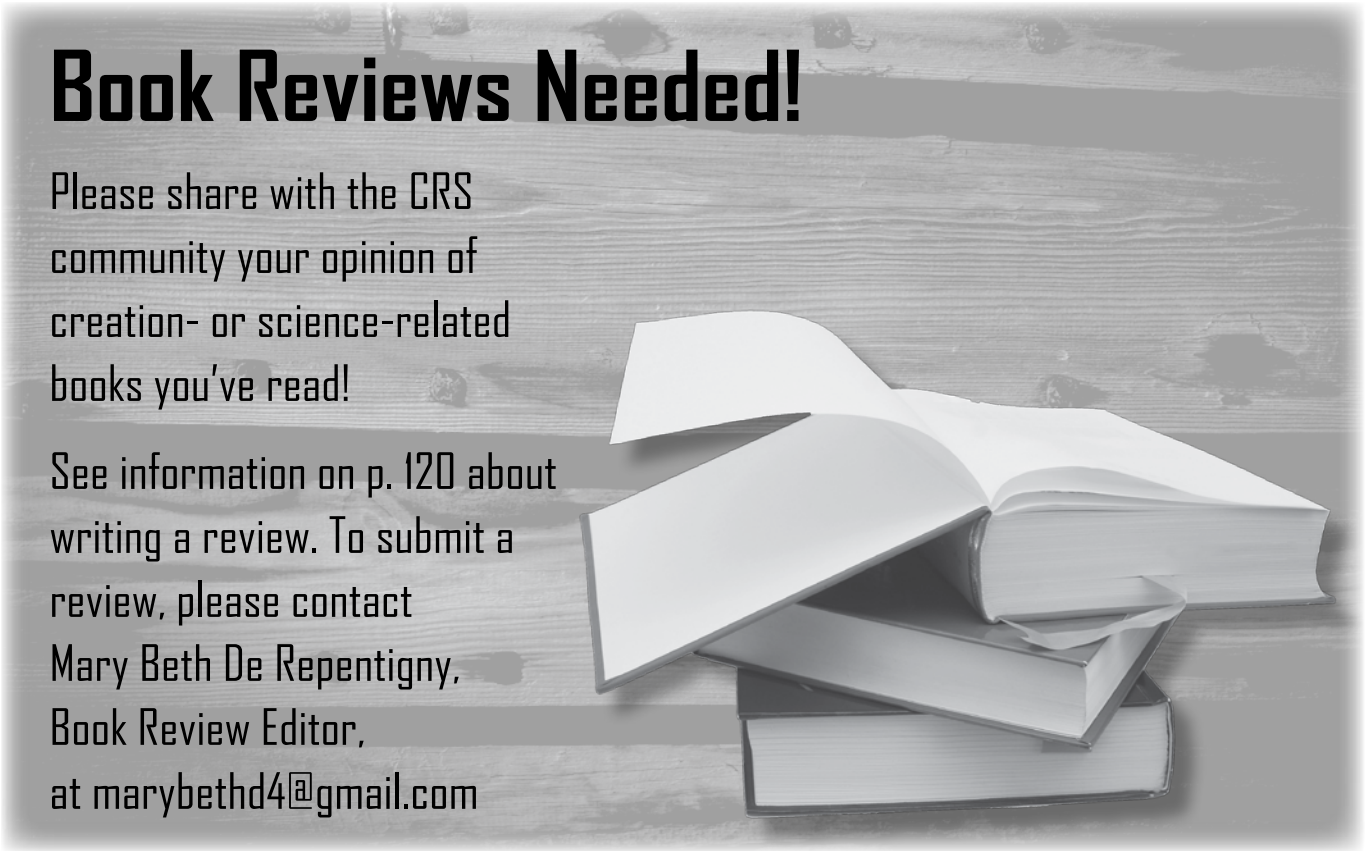
Comments on Williston Basin Oil

After 14 years since my paper on the origin of oil was published (Matthews, 2008), I had almost given up hope that someone would comment on it in a peer-reviewed journal and start a structured discussion. May I therefore thank Peter Klevberg for so doing (Klevberg, 2022). And there are many other good issues in his paper that could form the basis of serious discussion, but I'll focus on oil.

My 2008 paper offered seven reasons why I could not accept a biogenic explanation for the origin of anything other than miniscule quantities of petroleum, and therefore why it had to be 'theobaric.' It is not a 'god of the gaps' explanation. After all, we humans are also 'theobaric' rather than evolved. The 'biogenetic bits' of oil and the 'biomarkers' I believe are just contamination and distract us from exploring the true origin of the bulk of oil.

Since 2008, I have had private discussions with others following their articles in publications confirming their belief in biogenesis. But these have rapidly come to a halt. One key sticking point was often about the nature of the 'oil' that has been produced directly from organic matter (i.e., not starting from kerogen which is somewhat like circular reasoning.) When asked about the individual distribution of the hydrocarbon molecules (such as from a chromatographic analysis), there was no response. I am told that these kinds of laboratory 'oils' match the oils found in their areas. By implication, the North Sea oils on which I based my conclusions are different to those found on the other sides of the world. Maybe it is, but the claimants haven't illustrated their point. The origin of oil in the North Sea still has to be explained. So please can I have a molecule-by-molecule analysis of these synthetic crudes "from slaughterhouse waste, algae, and plastic garbage" (p. 45) to show that they are similar with the Williston and any other oils? Does it produce all alkanes below C15 and a full suite of even- and odd-numbered ones? And what happened to the turkey bones, feathers, blood, (Nordeng, 2013) oxygen, sulphur, chlorine, and nitrogen during the conversion process? Nature cannot naturally reject the wastes in a way that this human-designed industrial plant can. Incidentally, plastic usually comes from ethylene which comes from eth-



ane—a hydrocarbon. Circular reasoning again? And Snelling (1990) rightly says that while we can produce 'oil' quickly, 'nature' must somehow find the alkalis needed to get the process going.

I won't repeat all my other six objections against biogenesis, but if there is one factor that supports a biogenic option, but six strong factors that go against it, then logic tells me to reject biogenesis. Herein, I focus on two of the other factors against biogenesis (and to a lesser extent against abiogenic oil) that are really basic.

Firstly, oil has to exist at the same time as sedimentation occurs when the host reservoirs form. Hence it has to have been made either in Creation Week (my first choice—hence the name 'theobaric') or in the next 1,600 years while there is limited geological activity. I don't go with that second idea. The biogenic route now has time on its side to produce the oil and somehow get rid of all the waste products, but no burial history. So, isn't it a dead end? See my fuller explanation in the subsection '*Compaction and oil-emplacement*' and the associated reference to Wilson's work. I should have included an additional reference to Coleman (1998) in support of this, which is in my Ph.D. dissertation (Matthews, 2004).

But the biggest and easiest way to appreciate that oil has to have existed as the Flood began is to note that there are major groups of reservoirs that are seriously over-pressured (>15 MPa/km). Therefore, the oil in them must have existed before the caprock-seal was emplaced. Otherwise, the oil cannot have entered.

Secondly, even for normal-pressured reservoirs (10 MPa/km), oil cannot enter reservoirs via 'fault system' by Darcy flow (claimed on p. 46). Faults with clay smearing and detrital grains prohibit flow left-to-right, front-to-back, or up-and-down. Capillary entry pressures halt everything. Pushing oil from a higher kerogen area down into a reservoir (claimed on p. 47) goes against gravity rather than seeming plausible. We have the same assumption made by uniformitarians in the North Sea to explain how oil 'moved' from the overlying Heather formation into the 'Brent' sections (my p. 146 with references.) You cannot have 'faults' providing conduits for movement and then suddenly switch them to provide impervious seals. The example I quoted of the Wytch Farm reservoir is surely a good enough illustration of my point (my Figure 8.)

Klevberg admits, "Difficulties forming petroleum from organic matter have caused some to look for an abiogenic source." In contrast, the Nordeng (2013) paper, which did not have a full reference, says "…the only significant source of these [*oil-generating*] compounds is the preserved organic molecules assembled by living organisms at or near Earth's surface." It refers to basin modelling in the target area though not to one of the best treatises on uniformitarian, biogenic, basin modelling that I know of (Allen and Allen, 2005.) To believe that, they, and even the mighty Schlmuberger, have ignored all that has been written about potential abiogenic routes. There was a major Hedberg conference (Katz et al, 2008) on the subject which cannot be ignored. See also Potter and Konnerup-Madsen (2003). But in promoting 'theobaricism,' I've gone one stage further. When you read Hedberg, surely you can only be satisfied with the 'theobaric' option since the other two options are dead ends.

There are a lot of other creationists whom I would welcome commenting on my 'theobaric' conclusion. Please don't think of me solely as a maverick, just offering challenges to things like the geological column (Matthews, 2011), overthrusting (Matthews, 2016), or that Heart Mountain didn't move (Matthews, 2021a, 2021b.) I'm searching for models that we can place before a world reluctant to accept that a global, recent Flood occurred. I hope we all are.

John D. Matthews, Ph.D.
(retired European geologist)
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CRSQ: Creation Research Society Quarterly

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Errata

There was an error on page 112 in the first sentence of the second paragraph in the right-hand column in Charles McComb's paper "Evolution is Modern-Day Alchemy," *CRSQ* 59(2): 111–113.

The sentence should read:

> We have all heard about those explorers and dreamers who came to St. Augustine, Florida, looking for the Fountain of Youth; his search for the Fountain of Youth (even though only a myth) must have been predicated on a prior belief that such an elixir for immortality existed; that belief came from the philosophy of alchemy and the search for the philosopher's stone, which was active during that time.

The original incorrectly said St. Augustine traveled to Florida.

There was an error on page 31 near the end of the second paragraph on the left column in Barbara Helmkamp's paper "Latent Heat Could Solve Accelerated Nuclear Decay's Heat Problem—Part 1," *CRSQ* 59(1):29–38.

The equation should read:

$75^{\circ}C < T < 150^{\circ}C$

The original incorrectly had the numbers reversed.

Klevberg Reply to Matthews

I appreciate questions Dr. Matthews raises about several "settled" ideas in geology, since they often are adopted without proper scrutiny. "All models are wrong, but some are useful," is attributed to the statistician George E.P. Box. While that may be a bit extreme, it is probably pretty close to reality. We should welcome the questioning. In regard to his letter, the main thing he questions is formation of crude oil from organic matter.

I like his idea of a molecule-by-molecule analysis of synthetic crudes, though the analysis should include a wide variety of natural ones as well. In respect to the Williston Basin, I was able to get proportions of light alkanes, various aromatics, etc. A "molecule-by-molecule analysis" would be very difficult, as I am sure he understands, because of the natural variability and huge variety of organic compounds present. This is the challenge faced downstream at the refinery.

Approaching the characterization via chromatograms would be more tractable. In my review of the Williston Basin, I did bring up the possibility of abiogenic oil. The thesis Matthews presents is that neither of these natural means is capable of producing crude oil, at least oil resembling Brent crude. But if the oil originated during Creation Week, then we must explain why compounds found specifically in plants and other organisms show up in these crudes (Nordeng, 2013).

He also believes overpressured reservoirs can only be explained by primordial (i.e. theobaric) oil, though I fail to see how that is possible since the Deluge would have released that oil into the global sea. There are therefore several points of agreement and potentially disagreement between us:

- We can agree that millions of years are not required to form oil, which has been scientifically established (Bruce et al., 1996).
- We apparently disagree about oil migration. Millions of years of migration in various directions per Darcy's Law as Matthews describes in his letter constitute an assumption, not an observation, one that neither I nor many others concur with (e.g. Bruce, 2021). Petrogenesis simultaneous with migration has been observed in the Gulf of California as I mentioned in the paper (Klevberg, 2022).
- Agreement is possible on the characteristics of oil if we can get a multitude of chromatograms and analyze them. This could be a significant challenge but would also provide some potentially valuable data.
- Overpressured reservoirs are not necessarily related to the chromatogram analysis but could be dealt with as a separate problem.

I would welcome the opportunity to work with a team of researchers that would include Matthews and perhaps Bruce or others to advance research into these problems. The fact we may hold different hypotheses is highly advantageous, and I do not believe we even need to arrive at the same conclusions before presenting our findings. I work daily with people who hold to the faith of evolution, but we can agree on the *science* of geology, and I try to encourage them to stick with the *science* and leave the historical speculation out of our reports. Natural history is important, of course, but we do have the advantage there in having the light of divine revelation. What remains to be done is to tackle the problems of characterization, and I recommend it be a team effort.

Peter Klevberg

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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.

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Robinson, D.A., and D.P. Cavanaugh. 1998. A quantitative approach to baraminology with examples from the catarrhine primates. *CRSQ* 34:196–208.

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.

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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.

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Please complete the lower portion of this form and mail it with payment to CRS Membership Secretary, 1 W. Firestorm Way #145, Glendale, AZ 85306, or fax for credit card payment to (928) 636-1153. Applications may also be completed online at creationresearch.org.

✂ ----------

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* Student members are required to complete the bottom portion of this form.
NOTE: Student members may qualify for the *Future Leaders Sponsorship* program. See the CRS website at www.creationresearch.org for details.
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28	☐	☐	☐	☐
29	☐	☐	☐	☐
30	☐	☐	☐	☐
31	☐	☐	☐	☐
32	☐	☐	☐	☐
33	☐	☐	☐	☐
34	☐	☐	☐	☐

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Volume	1	2	3	4
35	☐	☐	☐	☐
36	☐	☐	☐	☐
37	☐	☐	☐	☐
38	☐	☐	☐	☐
39	☐	☐	☐	☐
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41	☐	☐	☐	☐
42	☐	☐	☐	☐
43	☐	☐	☐	☐
44	☐	☐	☐	☐
45	☐	☐	☐	☐
46	☐	☐	☐	☐

	Number			
Volume	1	2	3	4
47	☐	☐	☐	☐
48	☐	☐	☐	☐
49	☐	☐	☐	☐
50	☐	☐	☐	☐
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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 Glendale, Arizona.

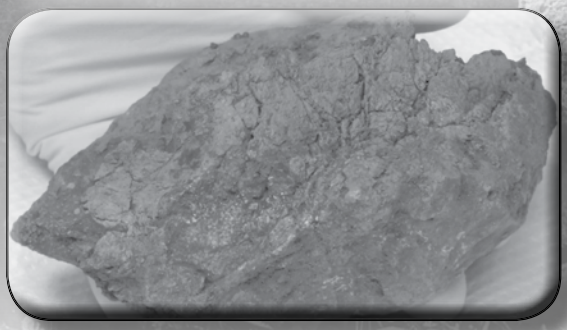
Membership—Voting membership is limited to scientists who have at least an earned graduate degree in a natural or applied science and subscribe to the Statement of Belief. Sustaining membership is available for those who do not meet the academic criterion for voting membership, but do subscribe to the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

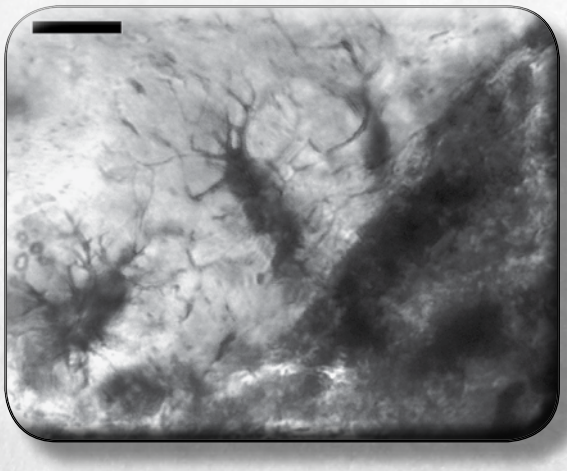
1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.
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

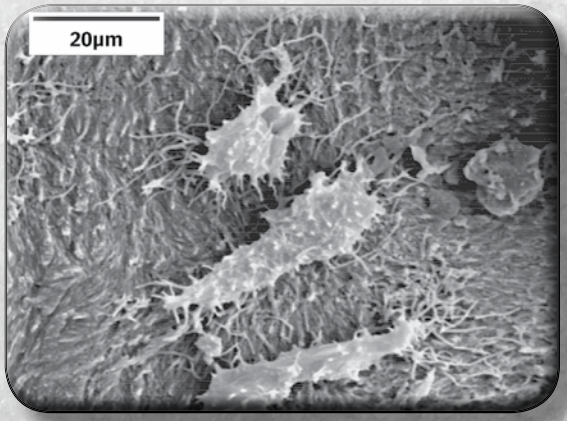
Investigation of Dinosaur Intact Natural Osteo-tissue



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.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