

**The Authority of Scripture:
The Story of Evolution & the Genesis Creation Account
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Introduction:

Today we'll be looking into the popular story of evolution according to Neo-Darwinists, and the Genesis creation story. How are they different? Can they be reconciled? Why is this still a hot issue? Obviously there are ways Christians feel threatened by the discussion. Evolution tells the story where the universe began with an impersonal big bang 14 billion years ago, the earth formed 5-6 billion years ago, life started in some chemical soup, and human life is just the latest form of the interaction between random mutations and survival of the fittest. We are nothing more than that. If that is a true story, then Christians – along with Jews and Muslims – are deceived and most to be pitied. But it's not just an issue of truth, but an issue of power. (1) In public schools, Christians feel angry or uncertain that evolution is taught as a fact and not as a theory. So some Christians have taken political action on that. (2) At the same time, most of the biology departments around the country are so strongly Darwinian that it's hard to get tenure unless you publicly bow down to that theory. Even when the data points in another direction, it is very hard for you, if you're a biologist, to hold to anything except the official storyline provided by Darwinian evolution. Otherwise you get laughed at, you don't get funded, you don't get research opportunities, etc. It's hard to believe that scientists are completely objective and disinterested when you have a political environment like that. (3) And there are a lot of issues – like embryonic stem cell research, abortion, the Terry Schiavo case, etc. – that deal with the fundamental question, 'What is human life?' Is human life special? Or are we just overglorified animal tissue? The answer to that question is derived from what story we live in. I'm not saying that it'll *determine* what we think about those questions, but they will be important *pieces* of that discussion.

TWO MAJOR ISSUES UNDER DISCUSSION

1. Diversity of Life (Evolution)
2. Origin of Life

The main purpose of science is to investigate how and when things normally happen in the natural world, using repeatable experiments. The main purpose of Genesis is to explain why the natural world and human beings exist and who is the creator of the world. It describes things that are for the most part unrepeatable. These are distinct but related questions. Many of the 'conflicts between science and Scripture' arise when either science or Scripture is misunderstood or stretched to mean more than it actually says, like when people look to science for ultimate explanations, or when people interpret Genesis 1 as a play-by-play account of natural history. (The flood is another, even more complex, issue that we are not treating here, but see <http://www.creationscience.com/onlinebook/> for info).

CATEGORIES OF MAJOR VIEWS

| Reason for Diversity of Life | Divine Agency | No Divine Agency |
|-------------------------------------|---|-------------------------|
| No Macroevolution | * Literal Creationists (young earth) * Progressive Creationists (old earth ¹ , unique humanity) | |

¹ In refutation of Bishop Ussher, who argued for a creation date of 4004 BC because of the ages specified in the genealogy of Genesis 5, an old earth is possible for two reasons: (1) because the genealogy from Adam in Genesis 5 is selective, not comprehensive; furthermore, (2) an indeterminate amount of time is encompassed by 'father' and 'son' because those terms do not mean descent from one generation to the very next one. Hence, the phrase, 'Seth lived one hundred and five years, and became the father of Enosh' (Gen.5:6) should be translated, 'Seth lived one hundred and five years, and became the ancestor/progenitor of Enosh.' In this Hebrew idiom, I lived 28 years when I became the *progenitor* of my grandson because that is when my own son was born. It does not mean that only 28 years elapsed between my birth and the birth of my grandson.

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|--|--|--|
| Some Macroevolution (from one organism except for humanity) | * Some form of evolution guided by God, special creation of humanity | |
| Macroevolution, Non-Gradual (all from one organism) | * Punctuated Equilibrium, by God | * Punctuated Equilibrium (e.g. late Stephen Gould @ Harvard) |
| Macroevolution, Gradual (all from one organism) | * Actively guided by God (e.g. Michael Behe @ Lehigh) * Utilized by God through natural laws (Francis Collins, <i>The Language of God</i> , Kenneth Miller @ Brown, <i>Finding Darwin's God</i>) | * Predetermined through natural laws, with unexplained source (e.g. Michael Denton) * Neo-Darwinism: random mutations & natural selection |

How We Tend to Hear About the Debate: The Extremes

Neo-Darwinist Evolutionists vs. Literal Creationists
Young earth vs. Old earth

Comment to set expectations: I want to explain why people who believe in God as a Creator have not lost their minds, and why some people who believe in certain forms of evolution have not lost their faith. I will spend 80% of my time discussing the scientific side, simply because they are more complex.

ISSUE 1: EVOLUTION

Addressing the Extremes: *Biblical Objections to Literal Creationists*

The concern among literal creationists is the Slippery Slope: in the Bible, what is metaphorical and what is not? Once you start saying that Genesis 1 is not literal, does that get you into trouble elsewhere? Why not say that Jesus was not actually born of a virgin? Or not actually resurrected from the dead? One question is, 'Does Genesis 1 ask us to interpret itself in a poetic fashion?' Genesis 1 seems to indicate itself that it's not literal but *literary*.

Days: Are these 24-hour days?

- The word 'day' could be taken as not just a 24 hour period. I think Day 7 is meant to be read as ongoing. There is no end to Day 7 because we still live in it. We still live in God's completed work. Furthermore, in Genesis 2:4, the 'day' that the Lord created the heavens and the earth – what 'day' was that? Clearly the word 'day' can refer to more than just a 24 hour period.
- It is true that 'evening and morning' seem to involve 24 hour periods. But the sun doesn't settle into a stable relationship with the earth until Day 4 (I assume that Genesis 1 describes how atmospheric conditions on the earth did not allow for the sun and moon and stars to be regularly seen *from the earth*; the sun, moon, and stars existed from Day 1 to provide light, but they could not regulate light and darkness on the earth before Day 4). How do 'evening and morning' have meaning when the sun couldn't serve that purpose yet? The terms 'evening and morning' are metaphorical for the bookends of these eras.

Death: Literal creationists also sometimes argue that death did not exist at all until the Fall. But in fact, death in general existed before the fall.

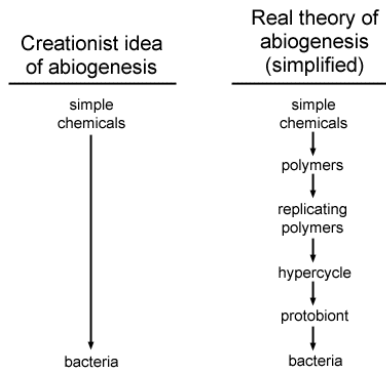
- Adam had probably seen death even on that day in the animal and plant death, since animals eat plants.
- Human death is the focus of the Fall, not death categorically.

The Framework Hypothesis, which we emphasize in our teaching of Genesis 1:1 – 2:3 seems to better explain what the purpose of Genesis is: emphasizing God's lordship over His creation, and the way He has built order and life into it.

Addressing the Extremes: *Scientific Objections to Darwinian Evolution*

Two main issues that Gould agreed were problems:

1. Insufficient time and material in the history of the universe for evolution: 14 billion years on the outside for universe. 4-6 billion for the earth. The famous astronomer Sir Fred Hoyle and Professor Chandra Wickramasinghe (both atheists) calculated the probability of human life forming by chance in five billion years on earth. Hoyle said the probability of life evolving anywhere in the universe is as likely as a tornado sweeping through a junkyard and assembling a Boeing 747. There is a problem with this type of reasoning, in that it ignores the developmental steps taken by life forms. The idea of natural selection is not equivalent to random shuffling.



However, while the odds are perhaps not as stark as Hoyle put them, they are still hard to surmount. This is why Gould says there is not enough time for evolution to happen, given the longest estimates of the universe and the earth. The probability of radiation or DNA transcription errors causing the sort of mutations necessary for evolution is very low, if not non-existent. And radiation and genetic transcription errors (the hypothetical causes of genetic mutation) tend to be overwhelmingly destructive (e.g. a tornado) and not constructive (e.g. assembling a Boeing 747).

2. *The nature of DNA*: Gerd Kostoff, atheistic evolutionist, argues for neo-Darwinian evolution, but says on 12/10/2002: 'If a human designer implements his design in wood and if his product must be permanent then he should prevent rot. If a human designer uses iron to implement his design he should prevent oxidation if his creation must be permanent. He had better use gold instead or eliminate oxygen from the atmosphere. If a human designer implements his design in DNA he should know that DNA is mutable. If he wants a permanent product then DNA is not the best choice. Beforehand it is known that mutations arise with a predictable frequency. That follows from the laws of physics and chemistry. And that is what we observe. [But] In scientific language we say that mutations create, modify or destroy genes. DNA is stable enough to permit long term inheritance, but unstable enough to permit evolution.'

Additional issues that are often brought up and hotly debated:

3. *Lack of transitional forms in the fossil record*: fish to amphibian, reptile to bird, etc. From fish to amphibian, we should find thousands but we have none. Lack of evidence isn't conclusive, since the conditions for fossil-formation were sporadic, but it poses a serious challenge to gradualism.² It's like having a crime scene, but no fingerprints, no DNA, no smoking gun.
 - a. Says Gould, 'At the higher level of evolutionary transition between basic morphological designs, gradualism has always been in trouble, though it remains the 'official' position of most Western evolutionists. Smooth intermediates between Baupläne are almost impossible to construct, even in

² Gradualism is not supported by the fossil record, says Gould: 'Three billion years of unicellularity, followed by five million years of intense creativity and then capped by more than 500 million years of variation on set anatomical themes can scarcely be read as a predictable, inexorable or continuous trend toward progress or increasing complexity.... It is tempting to say that the victors won by virtue of greater anatomical complexity, better ecological fit or some other predictable feature of conventional Darwinian struggle. But no recognized traits unite the victors, and the radical alternative must be entertained that each early experiment received little more than the equivalent of a ticket in the largest lottery ever played out on our planet - and that each surviving lineage, including our own phylum of vertebrates, inhabits the earth today more by the luck of the draw than by any predictable struggle for existence. The history of multicellular animal life may be more a story of great reduction in initial possibilities, with stabilization of lucky survivors, than a conventional tale of steady ecological expansion and morphological progress in complexity.'

- thought experiments; there is certainly no evidence for them in the fossil record (curious mosaics like Archaeopteryx do not count.)' 'Baupläne' is a German word basically meaning morphological designs.³
- b. This is why Gould argues for a model of evolution called 'punctuated equilibrium.' Life stayed much the same for most of the time. There were short, unexplained bursts of creativity and mutations, and then a long period of stabilization. Gould joked that evolution either happened by 'creeps' or by 'jerks.'
4. *Irregularities and anomalies in the fossil record (of low importance in this particular discussion), such that organisms supposedly from different time periods are found together in the fossil record in certain places. This is hard for gradualist theories to explain.*
 - a. Fossilized trees standing straight through multiple layers of sedimentary strata. Fossilized trees with clear hatchet markings. In Utah, a human sandal print found crushing a trilobite. In Uzbekistan, 86 consecutive hoofprints of horses were found in rocks dating back to the dinosaurs. In Turkmenistan and Arizona, dinosaur and humanlike footprints were found together. Human skeletal remains and implements found deep in coal-mines. Dinosaur, whale, elephant, horse, and other fossils, plus crude human tools, have reportedly been found in phosphate beds in South Carolina. Pictographs of dinosaurs found on cave and canyon walls.
 5. *Extreme interdependencies in nature are hard to explain.* Many different forms of life are completely dependent upon each other. Examples include:
 - a. Fig trees and the fig gall wasp, the yucca plant and the yucca moth, many parasites and their hosts, and pollen-bearing plants and the honeybee. Even members of the honeybee family, consisting of the queen, workers, and drones, are interdependent. If one member of each interdependent group evolved first (such as the plant before the animal, or one member of the honeybee family before the others), it could not have survived.

³ Steven J. Gould and Niles Eldredge, *Paleobiology*, 3:147, (1977) Also, Dr. Colin Patterson, a senior paleontologist at the British Museum (Natural History), was asked by Luther D. Sunderland why no evolutionary transitions were included in Dr. Patterson's recent book, *Evolution*. In a personal letter, Patterson said: 'I fully agree with your comments on the lack of direct illustration of evolutionary transitions in my book. If I knew of any, fossil or living, I would certainly have included them. You suggest that an artist should be asked to visualise such transformations, but where would he get the information from? I could not, honestly, provide it, and if I were to leave it to artistic licence, would that not mislead the reader? ... Yet Gould and the American Museum people are hard to contradict when they say that there are no transitional fossils. As a palaeontologist myself, I am much occupied with the philosophical problems of identifying ancestral forms in the fossil record. You say that I should at least "show a photo of the fossil from which each type organism was derived." I will lay it on the line—there is not one such fossil for which one could make a watertight argument.' Copy of letter, dated 10 April 1979, from Patterson to Sunderland.

ISSUE 2: ORIGIN OF LIFE

Hypothesis 1: The Ocean Surface and the Early Atmosphere

In 1953, a graduate student at the University of Chicago named Stanley Miller did a now famous experiment in Professor Harold Urey's lab. In a glass jar, he did an experiment to simulate how life began in the primitive earth. Water for the ocean. Methane, ammonia, and hydrogen for the atmosphere. Sparks for lightning and other forms of electricity. One week later, he found in his jar a sticky goop of organic chemicals, including large quantities of amino acids, the building blocks of proteins that make up cells. Case closed, or so many thought. Forty years later, Christopher Chyba, a White House fellow, had this to say about the experiment: 'It was a beautiful picture. Unfortunately, it was probably wrong.' Why?

First, this experiment required a tremendous amount of energy. While it is believed lightning storms were extremely common on the primitive Earth, they were not continuous as the Miller/Urey experiment portrayed. Thus it has been argued that while amino acids and other organic compounds may have been formed, they would not have been formed in the amounts which this experiment produced. Second, it is now believed that the early earth's atmosphere had oxygen. Oxygen causes amino acids, sugars, purines, etc. to break down. Amino acids and sugars react with oxygen to form carbon dioxide (CO₂) and water. Because it is impossible for life to evolve *with* oxygen, evolutionists theorize an early atmosphere *without* oxygen. This is what Stanley Miller did. But there is a problem if you consider the ozone (O₃) layer which protects the earth from ultraviolet rays. Without this layer, organic molecules would be broken down and life would soon be eliminated. It is impossible for early life to evolve *without* oxygen. Therefore, we have a 'catch-22' situation (Denton 1985, p.261-262):

| | | |
|---------------------------|-------------------|----------------------|
| Atmosphere with oxygen | => No amino acids | => No life possible! |
| Atmosphere without oxygen | => No ozone | => No life possible! |

And, there are geological evidences for the existence of an oxidizing atmosphere as far back as can be determined. Among these are: the precipitation of limestone (calcium carbonate) in great quantities, the oxidation of ferrous iron in early rocks (Gish 1972, 8) and the distribution of minerals in early sedimentary rocks (Gish 1984T).

Hypothesis 2: Outer Space

If these compounds were not created in a reducing atmosphere here on Earth as Miller suggested, then where did they come from? New theories have recently been offered as alternative sites for the origin of life. But this simply pushes the same problem farther out.⁴

Hypothesis 3: Deep Ocean Hydrothermal Vents

Some abiogenesis theories claim that life arose at hydrothermal vents in the ocean. However, recent studies show that molecules can't form cell membranes in salt water.⁵ Other studies show that the early oceans were at least twice as salty as they are now.⁶

Hypothesis 4: A World of RNA or pRNA or TNA

⁴ Many of the compounds made in the Miller/Urey experiment are known to exist in outer space. On September 28, 1969, a meteorite fell over Murchison, Australia. While only 100 kilograms were recovered, analysis of the meteorite has shown that it is rich with amino acids. Over 90 amino acids have been identified by researchers to date. Nineteen of these amino acids are found on Earth. The early Earth is believed to be similar to many of the asteroids and comets still roaming the galaxy. If amino acids are able to survive in outer space under extreme conditions, then this might suggest that amino acids were present when the Earth was formed. More importantly, the Murchison meteorite has demonstrated that the Earth may have acquired some of its amino acids and other organic compounds by planetary infall.

⁵ Szathmáry, E. 2000. The evolution of replicators. *Philosophical Transactions: Biological Sciences* 355: 1669-1676)

⁶ Knauth, L.P. 2000. *Life on Land in the Precambrian and the Marine vs. Non-Marine Setting of Early Evolution*. First Astrobiology Science Conference, April 3-5, 2000, NASA Ames Research Center, 403 (Abstract 353); and Knauth, L.P. 2002. *Early Oceans: Cradles of Life or Death Traps?* Astrobiology Science Conference 2002, April 7-11, NASA Ames Research Center. p. 9. 'The high temperatures in the vents would not allow synthesis of organic compounds, but would decompose them, unless the exposure time at vent temperatures was short. Even if the essential organic molecules were available in the hot hydrothermal waters, the subsequent events of polymerization and the conversion of these polymers into the first organisms would not occur as the vent waters were quenched to the colder temperatures of the primitive oceans.' (S.L. Miller and J.L. Bada, *Nature*, Vol. 334, p:609-611 1988)

This seems to be the family of theories about which scientists are currently most hopeful, so I have some more material below that explores this. RNA, DNA, and all the genetic *NA stuff looks like a coiled up zipper on a backbone. In order to duplicate itself, it has to unzip completely, and then draw in new individual objects that match the teeth that used to be there on both sides. We know that DNA is too unstable in its early formation, so we look at RNA.

Problems: First, there's a chicken and egg problem. You need enzymes to form the backbone of RNA and DNA. But you need RNA to have enzymes. So DNA, RNA and enzymes look like they all arrived at the same time. Second, chemical reactions in prebiotic soups produce other sugars that prevent RNA and DNA replication. Third, oxygen is still a problem because it prevents amino acids from forming. So it seems like DNA, RNA, enzymes, and oxygen all arrived at the same time. For this reason, scientists are looking at pRNA⁷ and TNA,⁸ but prospects are unlikely. But this would mean that an organism starts using different stuff as its genetic material, and then switches to RNA and DNA.

Quotations from evolutionists:

- 'There is now overwhelmingly strong evidence, both statistical and paleontological, that life could not have been started on Earth by a series of random chemical reactions.... There simply was not enough time... to get life going.' Niles Eldridge, paleontologist at the American Museum of Natural History.⁹
- 'There is no agreement on the extent to which metabolism could develop independently of a genetic material. In my opinion, there is no basis in known chemistry for the belief that long sequences of reactions can organize spontaneously -- and every reason to believe that they cannot. The problem of achieving sufficient specificity, whether in aqueous solution or on the surface of a mineral, is so severe that the chance of closing a cycle of reactions as complex as the reverse citric acid cycle, for example, is negligible.' Leslie Orgel, 1998, The Salk Institute for Biological Studies.¹⁰
- 'Prebiotic chemistry would produce a wealth of biomolecules from non living precursors. But the wealth soon became overwhelming, with the 'prebiotic soups' having the chemical complexity of asphalt (useful, perhaps, for paving roads but not particularly promising as a wellspring for life). Classical prebiotic chemistry not only failed to constrain the contents of the prebiotic soup, but also raised a new paradox: How could life (or any organized chemical process) emerge from such a mess? Searches of quadrillions of randomly generated RNA sequences have failed to yield a spontaneous RNA replicator.' Steven A. Benner, 1999, professor of Chemistry at the University of Florida.¹¹

Even origin of life researchers are now admitting that getting the basic building blocks for an RNA world is virtually impossible, or a 'near miracle.'¹² Similar things are being said about pRNA and TNA research so far. So the question of the origin of life is far from being resolved, even though you'd think that with our technology, this would be an easy question to answer.

CONCLUSIONS

What do you do with the literary questions raised regarding Genesis 1:1 – 2:3? I hope I've persuaded you that it is certainly possible to hold Genesis 1:1 – 2:3 as inerrant once we perceive its literary nature, and without sliding down a 'slippery slope'. In terms of what position you take, I think there is more than one way to reconcile belief in the God of the Bible with the findings and utility of science.

⁷ 'Consequently, pRNAs and RNAs are not able to form duplexes with each other, which would preclude exchange of information between these two molecules, suggesting that pRNAs are unlikely to have been the genetic material that preceded RNA.' Leslie Orgel, 2000. 'Origin of Life: A Simpler Nucleic Acid'. *Science* 290: 1306-1307.

⁸ Pairs of complementary pRNAs form double helices that are structurally very different from those formed by DNA and RNA. Researchers have suggested that threose-based nucleic acid (TNA) were precursors of RNA and DNA. Complementary TNA's do form double helices among themselves and even with complementary RNA's and DNA's. But how could a primitive organism that used TNA as its genetic material suddenly switch to RNA? This remains an unsolved problem; prospects for resolution do not look favorable.

⁹ quoted in Schroeder, G.L. 1992. *Genesis and the Big Bang*, NY, Bantam Books, p. 25.

¹⁰ Orgel, L. 1998. 'The origin of life -- a review of facts and speculations'. *Trends in Biochemical Sciences*, 23: 491-495. (pp. 494-495)

¹¹ Benner, S.A. 1999. *Old views of ancient events*. *Science* 283: 2026.

¹² W. Keller, 1999, 20

What do you do with the questions raised regarding biology? It's a philosophy of religion and science question. Gould's response is that you have to keep looking for a natural explanation, in contrast with a God of gaps (the idea that every time there is a problem that we don't understand, God did it).

The first problem is that as Christians, we believe in a God who does intervene in history. It affects our *philosophy* of science. The second problem is that if God has done something, then you may never know what actually happened using scientific tools. For example, was humanity created in a special and unique way? I (Mako) think so. This is not necessarily the same as the scientific theory of 'Mitochondrial Eve,'¹³ where if we trace through the DNA in all our mitochondria, it does suggest that we are all descended from one woman who lived approximately 100,000 – 200,000 years ago. But that theory does corroborate the biblical story. Incidentally, there is also the theory of Y-Chromosomal Adam, who lived approximately 50,000 – 140,000 years ago, who is the oldest common male ancestor to all human beings, based on DNA evidence. This can fit the biblical idea that all of us are descended from Eve on the female side and Noah as the oldest common male ancestor on the male side. How will we ever know using the tools of science?

This is very important to biology because the fields of physics, chemistry, and mathematics are all acknowledging that there are limits to what we can know. Physicists, chemists, and mathematicians are finding that we can know only a fraction of all the things we would like to know. Biologists on the other hand confidently assert that we can figure out everything. But if biology depends on chemistry and physics, then there are going to be gaps.

Perhaps evolutionary biologists have a blind faith in natural causation. No matter what problems come up, no matter what evidence is missing, no one will ever be allowed to think that God was involved. So is a 'science of the gaps' so different from a 'God of the gaps'? There will never be admitted that something more has happened. God was eliminated before the whole investigation started. Within this debate, we must continue to ask good questions.

¹³ Bryan Sykes, *The Seven Daughters of Eve*, Bantam Press, 2001. Richard Dawkins, *River out of Eden*, Basic Books, 1995. Daniel C. Dennett, *Darwin's Dangerous Idea*, Simon and Schuster, 1995.

Appendix A: Cosmology, Scripture, and Science

The Jews of antiquity, the early Christians, and even the medieval Catholic Church do not appear to have been committed to one view of the physical universe. A brief look at the textual data shows why. To other scholars, and to the best that I can tell, the ancient Hebrews seem to be rather agnostic on the precise physical nature of the earth, the solar system, and the universe. They used certain poetic words to describe the *theological* significance of the cosmos. They believed God created it, and that fact certainly affected their theology and their ethics, not least on the topics of marriage and sexuality. But heliocentrism or geocentrism did not affect anything.

While the Hebrew writers clearly stay away from ideas like the ancient Hindu cosmology of a world resting on an endless column of turtles, they simply borrow poetic expressions without seeing much more significance in the strictly 'scientific' types of questions. For example, how did the ancient Hebrews understand the relation between the earth and the heavens? The biblical text uses multiple sets of images: The earth is said to have 'pillars' (Job 9:6; Ps.18:15) which presumably rest on something, which may recall an image of a flat earth resting on 'pillars.' And in Psalm 93:1, the earth is said to have been 'established' by God, which might also implicitly refer to this image.

Yet, quite surprisingly, God is also said to 'hang the earth on nothing' (Job 26:7), and Job is often held to be one of the earliest books of Scripture, if not the earliest, which is very significant for this issue. So the biblical data does not settle the issue one way or the other. While ultimately the 'pillars' establishing the earth seem to be metaphysical-theological and not physical in nature, thus reconciling these two particular verses, the language itself does not seem very interested in deciding this for us. Likewise, the sun has 'a tent,' a 'chamber,' out of which he runs his course (Ps.19:4 – 5), but what does this indicate when the heavens are poetically referred to as a 'vault/dome' or perhaps a 'sphere' (Isa.40:22; Job 22:14; Pr.8:27) suggesting that the sky is the 'roof' of a vast, palatial, temple-chamber understood from Genesis 1:1 – 2:3; a tent suggesting both a residence but also temporariness (e.g. Isa.40:22; Ps.104:2); a molten metal mirror beautifully reflecting colors from the sun and water (e.g. Job 38:18); a scroll on which knowledge is written (Ps.19:1 – 4) but also suggesting temporariness again (Isa.34:4), etc.; and all these words are used poetically in other traditions as well?

Did the ancient Hebrews simply accept the cosmological conception(s) of their neighbors? A good question: Certainly their language shares common poetic images in use at various times, but the answer is indeterminate because their neighbors did not agree on the matter: Homer poetically referred to the earth as a flat circular disk; but the Zoroastrians and Tibetans believed in a spherical earth, so looking to the west and east of the Hebrews doesn't settle the issue. This confirms the clear sense we get in reading the Hebrew Scriptures that the authors of these books did not think the precise relationship between the sun and the earth mattered; what mattered was the relationship between God and the physical universe, and as a major subset of that, God and humanity.

How did the earliest Christians receive the biblical data? The early Christians that I know of – in Augustine's *Literal Meaning of Genesis*, Basil of Caesarea's *Hexaemeron*, Gregory of Nyssa's *The Making of Man*, and John Philoponus' *On the Creation of the World* – were not interested in rooting their cosmological views in Scripture alone. They took Scripture seriously, of course, but they understood that Scripture, in Genesis 1 and in these poetic references elsewhere to the sun and earth, utilized a poetic genre which admitted different plausible interpretations. So they made some use of the 'science' of their day, not uncritically, but in recognition that this was obviously not a major concern of the Scriptures. The origin of the cosmos was, however, a major concern, and they pushed very hard against the reigning Greek 'science' on that, because of their commitment to Scripture and to Christ.

It is again important to note how exactly 'science' and Christian faith met on the issue of cosmology. There are two main elements. (1) The real clash between Christian and Greek scientific and philosophical thought occurred over whether or not the physical universe and all matter had a beginning. Christians accepted from Scripture God's creation of the universe and of physical matter at a certain point in time. They rejected the reigning Greek view that all matter was co-eternal with the spiritual world, and would always be co-eternal. According to Athanasius, the Epicureans believed all things were self-originated and therefore haphazard, and Plato believed God made the world out of pre-existing and uncreated matter (*On the Incarnation* 1.2). The pagans thus continued to attack Christians for their doctrine of creation. Yet the Christians insisted upon creation *ex nihilo* in the face of the Greek 'scientific consensus' that weighed against them, simply on the bases of Scripture and the Christocentric reality that in and through the resurrection of Jesus, God was bringing about a new type of physical matter, for humanity especially but also for the whole creation. This central and decisive irregularity found in Jesus' bodily resurrection, this 'upgrade'

of physical matter, signified that the physical universe is not static and would not remain the same, contrary to the claims of Greek 'science.'

(2) The Christians also understood quite well what Scripture really insisted upon and allowed the poetic language to simply be poetic, because nothing ethical was affected by whether one believed in a heliocentric or geocentric solar system. Yes, they began by accepting a geocentric view of the solar system with perfectly circular planetary orbits, from Ptolemy and Aristotle. But the Christian philosopher, astronomer, and theologian John Philoponus (490 – 570 AD) rejected much of Aristotle by doing actual empirical research, something the Greek 'scientists' and philosophers refused to do because of their metaphysical presuppositions. Philoponus and others, like Augustine before him, referred to the created universe as a 'book.' It could be read and understood. It could be empirically experimented upon, and the results would be consistent. It operated rationally as opposed to irrationally, because their conception of God was that of a rational creator and law-giver; though to be precise, they knew God to be *more* than a rational law-giver, but not *less*.

By contrast, a significant bloc of Muslims believed that God/Allah continued to actively cause all natural phenomena by personal fiat, which *prevented* them from doing many types of scientific research (Rodney Stark, *The Victory of Reason*). Hence, the Christians understood Scripture itself, not as telling them concrete details about the natural world, but as inviting them to empirically study it. While John Philoponus was at the school of Alexandria, he published, starting from 510 AD all the way until his death in 570, at least 40 books on mathematics, physics, chemistry, theology, and philosophy. Although after his death, Philoponus was declared a heretic for his theological adherence to non-Chalcedonian Christology, this does not detract from his efforts as a scientist and philosopher. He was amply quoted by Galileo and other medieval astronomers and physicists on dynamics and his theory of planetary movement. His career and long presence in the academic circles of Alexandria demonstrates that early on, the Christians regarded the poetic aspects of Scripture as scientifically indeterminate but welcoming inquiry, and were okay with questioning Ptolemy and Aristotle.

The fact that the Catholic Church financially supported Copernicus, Galileo, and other scientists at medieval research universities, encouraged their research, and welcomed their discoveries, was merely a continuation of this tradition of inquiry. The understanding of a heliocentric solar system changed their understanding of *Ptolemy and Aristotle*, but not their understanding of *Scripture*. I understand that the caricature of Christians and cosmology is different, but I think that is because Enlightenment modernists wanted to (and still want to) paint themselves as the heroes who emerged from the so-called 'dark ages' of medieval Christendom, like the gods beating the titans, not because it was factually true.

Whereas people suggest that the ancient Hebrews and early Christians saw things in *only* one way, based *only* on the biblical text alone, regarded the Scriptures as the *only* source of information on the subject, and that *only* scientific knowledge eventually overturned that view, we find instead that the ancient Hebrews seem to have exercised reserve about different cosmological possibilities, that the early Christians did not base their opinions on the biblical text alone, that Christians did not regard the Scriptures as the only source of information on the subject but rather as a broad introduction to the subject, and that the biblical invitation to study the created world as a stable system overturned a particular cosmology that they inherited from the Greek philosophers. On the question of cosmology, Christians understood Scripture not as a textbook *on* science, but an invitation *to do* scientific research because of the stability of God's creation.