Groundwork for Creation Cosmology
Part II: Working Assumptions

Andrew Repp*

Key Words: cosmology, inexplicability, intelligibility, mature creation, quasi-steady state, timescales

* Ph.D., mathematics; Ph.D., astronomy
Accepted for publication September 23, 2024

Abstract

Today's extensive cosmological data sets are a gracious gift of God, inviting us to understand them within a Biblical framework. A previous article (Part I) considered several relevant Scripture passages. This article attempts, in turn, to justify three working assumptions: firstly, that God designed the Universe to be intelligible, given sufficient observational and theoretical perseverance; secondly, that God designed it to maintain roughly invariant characteristics over long periods of time (quasi-steady state); thirdly, that certain features of the Universe are ultimately inexplicable in terms of today's physics.

Simple Summary

This article, "Groundwork for Creation Cosmology—Part II: Working Assumptions," by Andrew Repp, lays out three key ideas to help interpret today's extensive cosmological data within a Biblical framework. First, it assumes the Universe is intelligible, meaning God designed it in a way that we can understand through careful observation and study, reflecting His wisdom and consistency. Second, the author proposes the Universe exists in a quasi-steady state, similar to a mature forest where individual plants grow and die, but the forest as a whole maintains consistent characteristics over long periods. This idea suggests that many astronomical processes which appear to take billions of years ("process time") could have been accomplished rapidly during Creation Week, allowing for an intelligible and diverse Universe from the start. Third, the article argues that certain features of the Universe are ultimately inexplicable by today's physics, such as its initial creation from nothing (creation *ex nihilo*), its remarkable design, and the accelerated rates during Creation Week. These assumptions provide a framework for creation scientists to study the cosmos and integrate its observations with Scripture.

Introduction

Yesterday's cosmologists could only dream of the data available today. These include cosmic microwave background measurements accurate to about 2 parts per million, at a resolution of ten arcminutes (Planck Collaboration et al., 2011, 2020), as well as galaxy surveys (e.g., Sloan Digital Sky Survey: see Eisenstein et al., 2005; Dawson et al., 2013) and weak lensing surveys (e.g., Dark Energy Survey: see Amon et al., 2022; Secco et al., 2022).

To take "every thought captive to obey Christ" (2 Corinthians 10:5b), we must interpret these data in light of a straightforward reading of Scripture. The task is immense and constitutes an area of weakness in young-Earth creationism (see discussion in Repp, 2022a). A planned series of three papers hopes to lay the groundwork for such integration. The first (Repp 2024, hereafter Paper I) considers Hebrews 11:1–3; 2 Peter 3:5–7; and Romans 8:18–23. It concludes that, unless we explicitly include miraculous (supra-providential) action in our models, we will inevitably stray on the subject of origins; that we should limit such action to what Scripture requires; and that in cosmology we can restrict such action to Creation Week.

This paper, the second, attempts to justify the following three working assumptions: the intelligibility of the Universe, its quasi-steady state character, and the ultimate inexplicability of creation. A planned third paper will survey relevant observational data.

Intelligibility

Our first working assumption is that the Universe is intelligible, given

sufficiently detailed observation and analysis. Positively, it postulates that data for an accurate (not exhaustive) understanding of the Universe is, in principle, accessible, though not necessarily in hand.[1] Negatively, it postulates that the Universe is not conspiring to lead us to false conclusions. (By a similar assumption, creation geologists understand fossils to be the result of actual events, not *in situ* creations.)

This assumption is, in fact, required for *any* inference from astronomical observations. Just as we can observe a fossil and deduce information about its burial, we submit that one should likewise be able to deduce, from astronomical observations, information about events that have taken place (or are taking place) in the Universe. The following four lines of reasoning support this assumption.

A Priori Reasons

Firstly, the character of God—specifically His wisdom (rationality) and faithfulness (consistency)—leads us to expect intelligibility from the Universe. His wisdom ensures that no aspect of His work is capricious, and His faithfulness ensures that it is self-consistent and "true"—i.e., though our deductions may be mistaken, we are *not* mistaken to assume the legitimacy of deduction itself. Biblical support is manifold: personified Wisdom was the master Workman in creation (Proverbs 8:22–31); God by understanding established the heavens (Proverbs 3:19); and He establishes His faithfulness in the heavens themselves (Psalm 89:2). The One by whom "all things were made" is the Logos, rationality Himself (John 1:1–2), the Wisdom of God (1 Corinthians 1:30).

In addition, since God's work of providence is intelligible—amenable even to mathematical formulation[2]—one can expect the same from His work of creation, for the same Word which created (Hebrews 1:2) now upholds and sustains (Colossians 1:15–17; Hebrews 1:3). We are not punctuated deists—as if God maintained a hands-off policy apart from occasional miracles. He is always at work (John 5:17) in even the most random-seeming events (Proverbs 16:33). Though creation is not repeatable, having ceased on Day 7 (Genesis 2:2–3), there is a unity between creation and providence, though it is Personal, not mechanical. In addition, the image of God (Genesis 1:26–27; 9:6; James 3:9) is what allows us to comprehend the wisdom of creation. Thus God's character renders the Universe rational, and the *imago Dei* renders it intelligible to *us*.

A second reason to expect intelligibility is that the heavens *declare* God's glory (Psalm 19:1–2). Romans 1:20 teaches that creation (including the heavens) causes God's "invisible attributes, namely, His eternal power and divine nature" to be "clearly perceived" by all. Thus, we can expect a detailed study of the Universe to reveal His wisdom and faithfulness ever more clearly. Considering the stars in particular, their designated purpose of serving "for signs" (Genesis 1:14) seems to require at least some intelligibility. Further, because the works of the Lord are great, they are "studied by all who delight in them" (Psalm 111:2)—and study of the unintelligible ends quickly in frustration.

Mankind's primeval mandate (Genesis 1:28; Psalm 8:6–8) provides a third reason to expect intelligibility, given that God gave humanity (in the person of Adam) responsibility for the biosphere. The wording of Psalm 8:6 suggests that mankind would eventually exercise dominion over the entire Universe ("all things," cf. also the analysis in Paper I)—and we know that redeemed humanity will do so in the Person of Christ Jesus (the Last Adam). Universal dominion implies the capacity to make sense of the Universe. Even the biosphere is affected by heavenly events, most obviously in the link between tides and seasons and the lives of various organisms. The ability to understand these cycles would be necessary to properly exercise dominion.

The Experience of Science

The arguments above make intelligibility plausible, but they are not conclusive. The wisdom of God in framing the Universe might far surpass our capacity. The heavens might display God's wisdom by *being* incomprehensible, demonstrating the height of God's thoughts above ours (Isaiah 55:9). The stars could serve as signs by simply remaining in place for navigation and timekeeping. And detailed knowledge of astrophysics is not necessary for intelligent supervision of the biosphere.

Thus, we must also consider the experience of science itself, whereby careful observation has consistently revealed regularities in nature—laws which express the wisdom, power, and faithfulness of God. These laws exist because His rationality guides His action in mathematically regular ways; because His sovereign power permits not one deviation from His decree (Daniel 4:35); and because His faithfulness includes "no variation or shadow due to change" (James 1:17).

1 Obtaining and interpreting such data might require technological and theoretical advances. Furthermore, as Paper I argues, these data points and/or sets must include the statements of Scripture.

2 One could define science as the branch of knowledge describing the laws laid down by Christ as He upholds the Universe.

These attributes led early investigators to *expect* intelligibility from the natural world, which did not disappoint. In biology, chemistry, and physics—careful, painstaking study has yielded ever-greater understanding of the underlying structure and laws. Why would we expect astronomy (and cosmology in particular) to be any different?

As Jaki (1986) writes, the Christian worldview—with its expectation of intelligibility—was the historical foundation for the rise of modern science:

> The scientific quest found fertile soil only when this faith in a personal, rational Creator had truly permeated a whole culture, beginning with the centuries of the High Middle Ages. It was that faith which provided, in sufficient measure, confidence in the rationality of the universe, trust in progress, and appreciation of the quantitative method, all indispensable ingredients of the scientific quest. (p. viii)

The fact that we have successfully sent probes to all major solar system bodies demonstrates the intelligibility of its operation. Further afield, we can deduce much information from the light curves of eclipsing binaries (e.g., Samec et al., 2022), and we can identify most spectral lines of distant stars. Do we expect cosmology to differ from the rest of astronomy? And if it *does* differ, where should we draw the line, cease deduction, and retreat to mystery? Of course, our data set must always include Scripture (normative over all); we must also remember that many Creation-Week processes ceased on Day 7. But the character of God led early scientists to expect intelligibility from the natural world (given careful, humble, persevering observation)—and subsequent experience has abundantly rewarded that expectation. Would it not then be faithless now to retreat from that confidence?

Implications

To summarize, this working assumption postulates that even if we do not yet possess it, the data for an accurate understanding of the cosmos is in principle accessible (though it might require theoretical and technological development). It also implies that the Universe does not embody a sort of conspiracy to lead us to false conclusions.

Readers might wonder why so much time has been spent on a point many will regard as self-evident; among other reasons, this working assumption provides guardrails for our cosmological modeling. In particular, under this assumption, we can expect the following:

- Dedicated investigation will uncover real, true properties of the Universe—whether the operation of stars, the process of gravitational collapse, the nature of dark matter, etc. More fundamentally, it also presupposes that our observations are "real"—that is, they reveal true information about an objectively existing external world—and that God's Word gives us sufficient context to correctly understand this data (see Paper I).
- In particular, patterns tell us something. Whether main sequence turnoffs (Faulkner and DeYoung, 1991), Hubble's Law, or the mass-metallicity relation (Tremonti et al., 2004)—the patterns we observe point to something deeper, just as in chemistry or physics. The "something deeper" might be scientific or (possibly) theological. But if the Universe is intelligible, we may not simply ignore these patterns.[3]

Relinquishing this assumption would require abandonment not only of creationary cosmology but also (if we are consistent) of science itself.

Quasi-Steady State

The second working assumption is that God designed the Universe to operate in a quasi-steady state. This phrase does not here denote the cosmological theory of that name (Hoyle et al., 1993).[4] Rather, it states that the Universe was designed to exhibit essentially the same characteristics over vast (but not infinite) periods of time.

A mature forest biome provides a good analogy. The individual plants within this community change on a variety of timescales. Some will grow and die in a matter of years, while others last centuries. But multiple self-renewal processes maintain roughly the same proportion of flowering shrubs to trees, as new growth replaces dying plants. Over time, the forest, viewed as a whole, retains the same characteristics, presenting essentially the same look for millennia; thus, we could say it is in a "steady state." The state is not in fact perfectly steady, since over millennia the soil depth would presumably increase, etc. Thus, we should say rather that the forest is in a *quasi*-steady state.

Likewise, this working assumption proposes that the Universe was designed to present essentially the same look over vast periods of time.[5] Again, this would not be a true steady state, for as stars fuse hydrogen into helium—

3 For in-transit-creation models, for instance, this assumption implies that information encoded into the proposed virtual history (regarding, e.g., stellar development) gives us true insight into the operation of those processes in today's (non-virtual) Universe.

4 A reincarnation of the old steady-state cosmology, which blatantly violates both Scripture and energy conservation.

5 This would have been the original design. Scripture reveals that both the Earth and the heavens will need to be renewed because of sin (2 Peter 3:10–13).

and helium into heavier elements—the amount of helium (and metals) in the Universe increases; likewise, by the Second Law of Thermodynamics, entropy increases. Thus, we term this condition a *quasi*-steady state.

At least three lines of reasoning support this working assumption.

(Originally) Designed Timescale of Universe

Many astronomical processes involve vast timescales. Sometimes they are the result of great distances. If two galaxies are 50,000 light years across and approach each other at 150 km/s, simple mathematics sets the timescale for their merger—in this case, at least 100 million years.[6] Other timescales are set by the rate at which stars produce energy. The Sun radiates with a power of 3.8×10^{26} watts; to generate this power, it must fuse roughly 600 billion kg of hydrogen into helium each second. Hence, if the core of the Sun (where fusion occurs) consisted of pure hydrogen with a mass of 6×10^{29} kg, the Sun would have enough fuel to last over 30 billion years.[7] Thus, even without an evolutionary bias toward long ages, basic mathematics—the same mathematics by which we calculate how long a trip will take or a fire can burn—demonstrates that the natural timescales for astronomical processes can reach billions of years.

However, while these timescales are vast compared to the current human lifespan, they are *not* vast compared to man's original lifespan. Man was created to be immortal, for human death came by sin (Romans 5:12). It should therefore not surprise us to find that the Universe was designed to last—and the Earth to be habitable—for millions or possibly billions of years.[8] Hence, the fact that the Universe was designed to house a community of immortal beings makes sense of the immense astronomical timescales and suggests that the Universe was created in a quasi-steady state, with built-in self-renewal processes to sustain it for vast periods of time.

Designed to Display Glory

Secondly, Scripture teaches that the Universe was created to bring glory to God (Psalm 19:1; Colossians 1:6; Revelation 4:11), and one God-glorifying feature of a quasi-steady state Universe is its diversity. A mature forest contains both saplings and full-grown trees, which display God's glory in different ways. Likewise, a quasi-steady state Universe would contain stars with many different (apparent) ages, thus better displaying God's multifaceted glory. An unfallen Adam and Eve would not need to wait millions of years to witness the power of a supernova, nor tens of millions of years to see the beauty of a planetary nebula.

Designed to be Intelligible

Thirdly, and perhaps most significantly, a quasi-steady state Universe is more intelligible (see above) than the alternative. Even immortal humans would live within the rhythms of our own planet—days, months, and years. Stars' composition—and thus their characteristics—change as they fuse hydrogen into helium, helium into carbon, etc.—but without a steady state Universe, Adam would have had to wait billions of years to observe these changes. In the real Universe, even fallen man with his fleeting lifespan can see stars in all stages of development, allowing us to compare our observations with predictions. In the same way, by observing a mature forest (with trees in different stages of growth), one could piece together a reasonably accurate picture of the life of a tree, even without waiting for any one tree to go through the whole process.

Likewise, a quasi-steady state Universe allows us to use it as a vast physics lab, where we can observe "experiments" running on time-, distance-, and energy-scales utterly inaccessible on Earth. And yet because so many of these experiments are running simultaneously, at so many stages of completion, we can observe and make sense of the results.

Mature Creation

We noted above that a mature forest exists in a quasi-steady state, in which individual plants change but the population does not. This is a consequence of maturity; an open field *would* change,[9] giving rise to shrubs and then conifers. Only in the climax community does it reach a quasi-steady state. Likewise, the cells of Adam's body would (like ours) presumably have been replaced over time, but he himself would not substantially age. Once again, this steady state is a result of maturity; children *do* exhibit change as they grow, until they reach adulthood. In the same way, one can view a mature creation as a means to the quasi-steady state end. On Day 7, God *finished* and rested from His work; nothing else was necessary for completion, and since that time His work of providence has

6 It is in fact expected to take much longer, because a merger requires several passes before completion.

7 Its main sequence lifetime is expected to be about a third of this, since the core is not believed to be pure hydrogen.

8 Note that Zhivkov and Tounchev (2022) demonstrate the long-term ($\gtrsim 10^5$ years) stability of the Solar System; they also discuss the possibility of extending the proof to 10^6 or 10^9 years.

9 Assuming appropriate climate conditions.

been one of *upholding* and *maintaining* (Colossians 1:17; Hebrews 1:3). It was intelligible to His image-bearers, it displayed His manifold glory, and it was an appropriate home for beings designed to live forever.

Implications

If this working assumption is correct—and it seems to fit what we observe—then we are like mayflies in Eden.[10] Intelligent mayflies (with correspondingly fast thought processes) could conceivably take snapshots of trees in various stages of development and piece together the life cycle of a tree. By observing cellular division (and keeping careful records) they might be able to estimate how long it would take for a tree to grow from seedling to maturity. Accordingly, they could deduce that the trees they observe had experienced centuries of growth, and they might thus deduce a correspondingly large age for the garden.

Their conclusion about the *process* would be correct. According to Genesis 2:9, "Out of the ground the Lord God made to spring up every tree that is pleasant to the sight and good for food." Since the trees did not pop into existence fully formed but grew up from the ground, the mayflies' deduction of a tree-growth process would be right. But the age they obtain would be hopelessly wrong, if they did not believe that God had accomplished all of this work in one day.

In the same way, the assumption of naturalism—which willingly ignores God's creative work (2 Peter 3:5)—inevitably errs regarding the age of the Earth and Universe. However, if our first two working assumptions are correct, then the processes we infer from our "snapshot" observations are presumably accurate.

This idea—many years' worth of processes occurring in the heavens during Creation Week—is no novelty. For instance, Samec (2016) writes,

> The conclusion of this study is that the observable events in the cosmos outside of the solar system really did happen and are therefore objects of scientific study for the creation scientist. Phenomena were not just created with appearance of age. The events are as follows: The stars were created, and perhaps many coalesced from clouds of gas and lived out their lives, and are living out their lives. Normal solar-type stars went through their nuclear burning cycles…became semidetached, and then contact binaries that we presently observe. Their abundance conveys a message that should be heeded by the creation community.

Humphreys (2017) also suggests that millions—or even hundreds of millions—of years could have occurred in distant galaxies during a short period of Creation Week.

The RATE team (Radioisotopes and the Age of The Earth, Vardiman et al., 2005) reached similar conclusions in a different field. They noted evidence that billions of years of *processes* (radiometric decay) have indeed taken place, but that these processes occupied only a short period of time—i.e., the process inferred by standard science is essentially correct, but not the amount of time. As part of the same project, Baumgardner (2000) also notes the possibility of accelerated geomorphological processes during Creation:

> This implies a major aspect of the Earth's formation involved the cycling of a major fraction of the mantle through a partial melting process near the planet's surface to produce the continental crust with its high concentrations of incompatible elements….If such processes unfolded in a brief period of time as the account in Genesis 1 indicates, then this also places constraints on the nuclear decay histories of the radioactive elements. (p. 80)

It is thus helpful to distinguish two measures of time and/or age. The first is *process time*; rather than measuring time directly, it quantifies the amount of a given process that has occurred and uses current rates to convert to time. The second measure we call *elapsed time*, which is the true amount of time occurring on Earth.

For instance, as measured by certain types of radioactive decay, over four billion years of process time have occurred in some terrestrial rocks,[11] but the elapsed time would be measured in days. A distinction between these time measures almost necessitates supernatural intervention; thus, we expect such a distinction (on any large scale) only during Creation Week and the Flood Year (see analysis in Paper I).

There is no reason to restrict this distinction to geology. The process age of a globular cluster could be billions of years when measured by stellar development; the elapsed age would be five orders of magnitude less, as measured by the actual passage of time on Earth. Thus, this distinction resolves the tension in creationary discussion of stellar development.[12] As Faulkner and DeYoung (1991) note, the physics behind the standard the-

10 For the sake of illustration, we assume that mayflies are not *nephesh* life and would have died as quickly in Eden as they do today (after the Genesis 3 Curse).

11 Austin (2005) notes that for terrestrial rocks the amount of process time depends on the element studied. The results of Snelling (2014a,b,c, 2015a,b) seem to indicate this is not the case for meteorites.

12 This article uses the phrase "stellar development" rather than the more standard "stellar evolution," given that the changes occurring in stars have little in common with Darwinism.

ory of stellar development is, for the most part, well-understood; however, the timescale for this development at first appears to be in tension with a young Universe. If we understand that, during Creation Week, process time need not correspond to elapsed time—and that God used accelerated development to create a quasi-steady state Universe—then the tension disappears.

Ultimate Inexplicability

However, even when we assume an intelligible, quasi-steady state Universe—and thus make every allowance for accelerated Creation-Week processes—the Bible indicates that the work of creation is ultimately inexplicable. Since God ceased this work on Day 7, deductions from currently-observed phenomena will inevitably mislead us when we consider origins (Hebrews 11:1–3). God's ways are, in the end, inscrutable (Romans 11:33–34).

Biology provides a helpful analogy. Living organisms incorporate many adaptive mechanisms; some of them act quickly (e.g., the response of the pupil to light), but others act across generations (Tomkins et al., 2022; cf. Continuous Environmental Tracking, Guliuzza, 2013). The latter explains much of the observed speciation and, in some cases, may be responsible for taxa up to the family level. However, there are deep and wide discontinuities between the higher taxa, both in the fossil record (e.g., Bergman, 2007) and today (e.g., Frair, 2000); these discontinuities are not explicable in terms of current-day speciation processes. Scripture indicates that God did *not* use any such process to produce created kinds or, for that matter, to produce life from non-life. Instead, "he spoke, and it came to be; he commanded, and it stood firm" (Psalm 33:9).

Likewise, while we can expect many cosmological observations to be explicable in terms of today's physics, we also expect there will come a point—or points—at which it will fail us. If we do not explicitly allow for God's supernatural work, we will encounter apparent causal discontinuities,[13] things which today's physics cannot explain.

Creation *Ex Nihilo*

The most obvious such discontinuity is creation *ex nihilo*, the existence of something rather than nothing. Conservation of energy is a stubborn fact, and modern cosmology is (begrudgingly) rendering an eternal Universe increasingly untenable. Though the Big Bang model is not Biblical, it is too uncomfortably close for many secularists ("like a bad dream," Jastrow, 1978, p. 116). Attempts to explain the origin of the Universe naturalistically typically depend on speculation and ambiguity (e.g., redefining "nothing"; cf. analysis in Repp, 2022b). The fact is, the coming into being of our Universe is inexplicable in terms of present-day processes. This is surely the greatest and most fundamental discontinuity exposed by the study of the cosmos.

Design

Design represents a second discontinuity. Just as the design of living organisms is naturalistically inexplicable (e.g., Dembski, 2002), the fine-tuning of the cosmos defies naturalistic explanation. For instance, to produce today's Universe, naturalistic theories require initial conditions with almost the lowest possible entropy (i.e., a very nearly—but not quite—uniform configuration). Since we cannot appeal to infinite time, the probability of this state having arisen by chance is vanishingly small, estimated at less than 1 in $10^{10^{124}}$ (Penrose, 2010, p. 127). A number this tiny effectively falsifies any hypothesis that such fine-tuning arose via present-day physical laws. And yet this low entropy is but one example of fine-tuning; Lewis and Barnes (2016) list many more. Hence, the design evident in the fine-tuning of the Universe is a second causal discontinuity revealed by cosmology.

Rates and Timescales

The first two discontinuities—the existence of and design in the Universe—powerfully and ineluctably point to its Creator. Mankind in his rebellion must suppress this evidence, rendering us "without excuse" (Romans 1:18–20).

However, another set of discontinuities becomes evident when we interpret our observations in light of Genesis 1—namely, the distinction (see above) between process time and elapsed time. For the Universe to exist in an intelligible and quasi-steady state, eons' worth of processes seem to have taken place, whereas a straightforward reading of Genesis indicates that they occurred in a matter of days.[14] Thus, we have a third set of discontinuities: based on Scripture (Hebrews 11:1–3), we understand that many rates and timescales during Creation Week were vastly different than today—and that this difference is due not to any physical cause but to God's will acting through His Word.

13 "Apparent," because they are discontinuous only in terms of today's processes; their true cause is God's supraprovidential action.

14 It is possible that some of these processes only *appear* to have occurred, as when Jesus turned water into wine; however, Genesis 2:9 describes at least one clear case of actual process-acceleration relative to current rates.

Other Possible Discontinuities

Are other cosmological observations inexplicable in terms of today's physics?

Here we must beware: it is always dangerous to make apologetic capital out of incomplete observation and theory (see Repp, 2022a, for some examples). As Samec (2005) notes, many "creationary writings are negative and 'gap finding' in nature. We need to be concentrating more on producing creationary models rather than on identifying gaps in evolution" (p. 72). At worst, gap-finding argumentation devolves into saying that, since we cannot explain something, God must be responsible for it. This is the "God-of-the-gaps" fallacy. It is fallacious because we are not punctuated deists: God is responsible for *all* physical processes, whether natural (providential) or miraculous (supraprovidential). Not only is God-of-the-gaps fallacious, it is unwise: if (as so often happens) a physical explanation emerges, then unbelievers have occasion to blaspheme (2 Samuel 12:14) by pointing to a falsified proof of God's existence. If instead we begin with a robust understanding of providence, discovery of physical explanations will instead provide additional reasons to delight in our Creator's work (Psalm 111:2).

Therefore, the following (incomplete) list of potential discontinuities is tentative. While these observations seem at present to be inexplicable in terms of known physics, it is quite possible that valid explanations will arise. If these phenomena are indeed inexplicable, they point to God's supraprovidential work of creation; if a valid explanation is found, they point to God's ongoing work of providence.

One such possible discontinuity is the formation of the initial generation of stars. According to the standard model, virtually all elements heavier than helium ("metals" in astronomical parlance) were synthesized in stars. Thus, the hypothetical first-generation stars ("Population III") would have been metal-free, containing only hydrogen and helium. But no metal-free stars have been found (noted by Faulkner, 1993). The standard explanation is that the first stars were massive enough to quickly burn their fuel and explode as supernovae, so that none exist today. Theoretical reasons do indicate that such stars would be more massive on average, but there seems to be no compelling reason for them *all* to be so large (Ishiyama et al., 2016; Chandra and Schlaufman, 2021). Thus, the question remains, "Why do we see none of them today?" If there truly are no Population III stars, it would indicate either that there were metals in the early Universe[15] or that the first stars did not form from pre-existing material. Either option seems inexplicable in terms of today's physics.

Another possible discontinuity is the formation of the supermassive black holes (SMBHs) at the centers of galaxies. These black holes can have billions of times the mass of the Sun; given a steady supply of gas, they are responsible for the extreme luminosities of active galactic nuclei like quasars. The most natural way to form a SMBH would be for a massive star in the early Universe to collapse to a black hole, which would then accrete material until reaching its present size.

However, a back-of-the-envelope calculation (the Eddington limit) sets a maximum rate for black hole accretion (e.g., Carroll and Ostlie, 2007, p. 1112); essentially, if the rate is too great, then radiation pressure from the accretion disk pushes material away and throttles down the rate. It in fact seems unlikely that galaxies could supply gas continuously even at the Eddington rate (see discussion in Volonteri, 2012). However, we find quasars at high redshift, showing that some SMBHs already had one to ten billion solar masses, at a time considered less than 1 Gyr after the Big Bang. This discovery is "by far the greatest challenge to any theory of SMBH formation" (Woods et al., 2019, p. 2). Woods et al. continue, "Even in this most favourable scenario, producing a $> 10^9$ $M_\odot$ [more than a billion solar-mass] quasar from a typical~ 10–100 $M_\odot$ Pop III remnant [10–100 solar mass Population III remnant] would require an accretion time greater than the age of the Universe at $z \sim 7$ [redshift around 7], unless significantly lower radiative efficiencies may be invoked" (p. 2, bracketed notes added). In response to this challenge, astronomers (e.g., Johnson and Upton Sanderbeck, 2022) are considering the possibility of super-Eddington accretion (the "significantly lower radiative efficiencies" of the preceding quotation) as well as mechanisms to form massive SMBH seeds (of, say, 10^5 solar masses). The viability of these possibilities remains to be seen. At present, SMBHs seem inexplicable in terms of current processes.

A third possible discontinuity is the formation of the first galaxies. The James Webb Space Telescope (JWST) has discovered high-redshift galaxies (conventionally dated to 500–700 Myr after the Big Bang) with stellar masses more than ten billion times that of the Sun (Labbé et al., 2023). Another study has detected four galaxies (dated to 300–500 Myr after the Big Bang) with stellar masses roughly 100 million times that of the Sun (Robertson et al., 2023). These detections are in significant tension with the standard ΛCDM [Lambda cold dark matter] model (Forconi et al., 2023), because matter would not clump together fast enough to form these galaxies; even if it did, stars would not form quickly enough to build up the requisite stellar mass. In

15 Note that oxygen in water (Genesis 1:2) would be considered a metal.

other words, the galaxies are too many, too massive, and too early. And yet we have seen them within the first year of JWST's operation. These observations seem inexplicable in terms of the physics operating today.

Conclusion

Deuteronomy 29:29 declares, "The secret things belong to the Lord our God, but the things that are revealed belong to us and to our children forever, that we may do all the words of this law."[16] There are "secret things" which God has chosen not to reveal (see above under Ultimate Inexplicability). We cannot construct an accurate model of origins without recognizing—and resting in—the fact that the creation of the Universe is understood by faith (Hebrews 11:3).

For millennia, almost everything about the workings of the heavens fell into the category of "secret things." Today, however, God has chosen to reveal a wealth of cosmological data, which will expand many times in years to come (e.g., *Euclid*, Laureijs et al., 2011; the Nancy Grace Roman Space Telescope, Green et al., 2012; CMB-S4, Abazajian et al., 2019). The ultimate causes and methods of creation are still—and will surely forever remain—"secret things." This new data, however, falls into the category of "things that are revealed," and therefore these observational riches constitute a gracious invitation from our Lord to investigate them. He did not have to reveal them—He could have created a Universe without a cosmic microwave background, or with a featureless galaxy correlation function, etc.—but reveal them He did.[17]

The third paper in this series shall, Lord willing, examine some of the data which require integration into the creation model. This paper has outlined (and attempted to justify) three working assumptions for this task. The first is that the Universe (not the ultimate methods of creation, but the processes and patterns in the data) is intelligible. Patterns mean something; God did not reveal them for naught. Thus we must seek to understand them in a manner consistent with Scripture.

The second working assumption is that Creation Week left the Universe in a quasi-steady state, like a mature ecosystem. Thus, we are unsurprised to see evidence of multiple processes (including renewal processes) operating on vast timescales. These processes may well have been operative during Creation Week, though at vastly accelerated rates. In any case, present observations must, for intelligibility's sake, nevertheless be valid indicators of how these processes work, even if their rates were different during God's supraprovidential creation.

The final working assumption, ultimate inexplicability, returns to the "secret things" category. At the very least, the existence of the Universe and its design do not have naturalistic explanations. Nor does the acceleration of various processes during Creation Week. We should look for (but not presume upon) the existence of other causal discontinuities as well.

It is the author's hope that these working assumptions, combined with the testimony of Scripture, will facilitate the construction of a comprehensive creationary approach to cosmological data.

16 In context, "the things revealed" are the contents of the Torah ("all the words of this law"); however, the principle manifestly applies to any situation concerning which God has chosen to reveal some—but not all—information.

17 Note however that we must not treat nature as a 67th book of Scripture. Cosmological observations are general, non-verbal, and non-propositional revelation, with no guarantee of inerrancy to protect against observers' fallibility; they are thus subordinate to the special, verbal, propositional, inerrant revelation of Scripture.

References

CRSQ: Creation Research Society Quarterly

Abazajian, K., G. Addison, P. Adshead, Z. Ahmed, S.W. Allen, D. Alonso, M. Alvarez, et al. 2019. CMB-S4 science case, reference design, and project plan. *arXiv e-prints* arXiv:1907.04473.

Amon, A., D. Gruen, M.A. Troxel, N. MacCrann, S. Dodelson, A. Choi, C. Doux, et al. 2022. Dark Energy Survey year 3 results: Cosmology from cosmic shear and robustness to data calibration. *Physical Review D* 105(2):023514.

Austin, S.A. 2005. Do radioisotope clocks need repair? Testing the assumptions of isochron dating using K-Ar, Rb-Sr, Sm-Nd, and Pb-Pb isotopes. In Vardiman, L., A.A. Snelling, and E.F. Chaffin (editors), *Radioisotopes and the Age of the Earth*, Volume 2, pp. 325–392. Institute for Creation Research, El Cajon, CA.

Baumgardner, J.R. 2000. Distribution of radioactive isotopes in the Earth. In Vardiman, L., A.A. Snelling, and E.F. Chaffin (editors), *Radioisotopes and the Age of the Earth*, Volume 1, pp. 49–94. Institute for Creation Research, El Cajon, CA.

Bergman, J. 2007. Lack of fossil evidence for arthropod evolution is a major difficulty for neo- Darwinism. *CRSQ* 43(3):222–230.

Carroll, B.W., and D.A. Ostlie. 2007. *An Introduction to Modern Astrophysics,* 2nd edition. Pearson Addison Wesley, San Francisco, CA.

Chandra, V., and K.C. Schlaufman. 2021. Searching for low-mass Population III stars disguised as white dwarfs. *Astronomical Journal* 161(4):197.

Dawson, K.S., D.J. Schlegel, C.P. Ahn, S.F. Anderson, É. Aubourg, S. Bailey, R.H. Barkhouser, et al., 2013. The Baryon Oscillation Spectroscopic Survey of

SDSS-III. *Astronomical Journal* 145(1):10.

Dembski, W.A., 2002. *No Free Lunch: Why Specified Complexity Cannot be Purchased Without Intelligence*. Rowman and Littlefield, Lanham, MD.

Eisenstein, D.J., I. Zehavi, D.W. Hogg, R. Scoccimarro, M.R. Blanton, R.C. Nichol, R. Scranton, et al. 2005. Detection of the baryon acoustic peak in the large-scale correlation function of SDSS luminous red galaxies. *Astrophysical Journal* 633(2):560–574.

Faulkner, D.R., 1993. The role of stellar population types in the discussion of stellar evolution. *CRSQ* 30:8–11.

Faulkner, D.R., and D.B. DeYoung. 1991. Toward a creationist astronomy. *CRSQ* 28:87–92.

Forconi, M., A.M. Ruchika, O. Mena, and N. Menci. 2023. Do the early galaxies observed by JWST disagree with Planck's CMB polarization measurements? *arXiv e-prints* arXiv:2306.07781.

Frair, W. 2000. Baraminology—Classification of created organisms. *CRSQ* 37(2):82–91.

Green, J., P. Schechter, C. Baltay, R. Bean, D. Bennett, R. Brown, C. Conselice, et al. 2012. Wide- Field InfraRed Survey Telescope (WFIRST) final report. *ArXiv e-prints* arXiv:1208.4012.

Guliuzza, R.J. 2013. Continuous environmental tracking: An engineering framework to understand adaptation and diversification. In Whitmore, J.H. (editor). *Proceedings of the Eighth International Conference on Creationism*, Volume 8, pp. 158–184. Creation Science Fellowship, Pittsburgh, PA.

Hoyle, F., G. Burbidge, and J.V. Narlikar. 1993. A quasi–steady state cosmological model with creation of matter. *Astrophysical Journal* 410(2):437.

Humphreys, D.R. 2017. Biblical evidence for time dilation in the cosmos. *CRSQ* 53(4):297–305.

Ishiyama, T., K. Sudo, S. Yokoi, K. Hasegawa, N. Tominaga, and H. Susa. 2016. Where are the low-mass Population III stars? *Astrophysical Journal* 826(1):9.

Jaki, S.L. 1986. *Science and Creation: From Eternal Cycles to an Oscillating Universe*. Scottish Academic Press, Edinburgh, Scotland.

Jastrow, R. 1978. *God and the Astronomers*. W.W. Norton, New York, NY.

Johnson, J.L., and P.R. Upton Sanderbeck. 2022. A simple condition for sustained super-Eddington black hole growth. *Astrophysical Journal* 934(1):58.

Labbé, I., P. van Dokkum, E. Nelson, R. Bezanson, K.A. Suess, J. Leja, G. Brammer, K. Whitaker, E. Mathews, M. Stefanon, and B. Wang, 2023. A population of red candidate massive galaxies 600 Myr after the Big Bang. *Nature* 616(7956):266–269.

Laureijs, R., J. Amiaux, S. Arduini, J. Augu`eres, J. Brinchmann, R. Cole, M. Cropper, et al. 2011. Euclid definition study report. *ArXiv e-prints* arXiv:1110.3193

Lewis, G.F., and L.A. Barnes, 2016. *A Fortunate Universe: Life in a Finely Tuned Cosmos*. Cambridge University Press, Cambridge, UK.

Penrose, R. 2010. *Cycles of Time: An Extraordinary New View of the Universe,* 1st U.S. edition. A.A. Knopf, New York, NY.

Planck Collaboration, P.A.R. Ade, N. Aghanim, M. Arnaud, M. Ashdown, J. Aumont, C. Baccigalupi, et al. 2011. Planck early results. I. The Planck mission. *Astronomy and Astrophysics* 536:A1.

Planck Collaboration, N. Aghanim, Y. Akrami, F. Arroja, M. Ashdown, J. Aumont, C. Baccigalupi, et al. 2020. Planck 2018 results. I. Overview and the cosmological legacy of Planck. *Astronomy and Astrophysics* 641:A1.

Repp, A.S. 2022a. Fifty-seven years of creation astronomy—Part II: Issues and advances. *CRSQ* 59(2):81–91.

Repp, A.S. 2022b. Inflation, the multiverse, and the creator. *CRSQ* 58(3):162–174.

Repp, A.S. 2024. Groundwork for creation cosmology—Part I: Scripture. *CRSQ* 61(1):32–39.

Robertson, B.E., S. Tacchella, B.D. Johnson, K. Hainline, L. Whitler, D.J. Eisenstein, R. Endsley, et al. 2023. Identification and properties of intense star-forming galaxies at redshifts z > 10. *Nature Astronomy* 7:611–621.

Samec, R.G. 2005. On Eugenie Scott's address to the American Astronomical Society, Winter 2005. *CRSQ* 42(1):70–72.

Samec, R.G. 2016. The apparent age of the time-dilated universe II: Gyrochronology, magnetic orbital decay of close solar-type binaries and errata. *CRSQ* 53(1):42–57.

Samec, R.G., D. Caton, and D. Faulkner. 2022. New photometric observations and the first Wilson Program analysis of the totally eclipsing, solar-type binary, UU Camelopardalis. *Journal of the American Association of Variable Star Observers* 50(2):212.

Secco, L.F., S. Samuroff, E. Krause, B. Jain, J. Blazek, M. Raveri, A. Campos, et al. 2022. Dark Energy Survey year 3 results: Cosmology from cosmic shear and robustness to modeling uncertainty. *Physical Review D* 105(2):023515.

Snelling, A. 2014a. Radioisotope dating of meteorites: I. The Allende CV3 carbonaceous chondrite. *Answers Research Journal* 7:103–145.

Snelling, A. 2014b. Radioisotope dating of meteorites: II. The ordinary and enstatite chondrites. *Answers Research Journal* 7:239–296.

Snelling, A. 2014c. Radioisotope dating of meteorites: III. The eucrites (basaltic achondrites). *Answers Research Journal* 7:533–583.

Snelling, A. 2015a. Radioisotope dating of meteorites: IV. The primitive and other achondrites. *Answers Research Journal* 8:209–251.

Snelling, A., 2015b. Radioisotope dating of meteorites: V. Isochron ages of groups of meteorites. *Answers Research Journal* 8:449–478.

Tomkins, J.P., S. Arledge, and R.J. Guliuzza. 2022. Blind cave fish (*Astyanax mexicanus*) as a model system for continuous environmental tracking and adaptive engineering. *CRSQ* 58(4):289–296.

Tremonti, C.A., T.M. Heckman, G. Kauffmann, J. Brinchmann, S. Charlot, S.D.M. White, M. Seibert, et al. 2004. The

origin of the mass-metallicity relation: Insights from 53,000 star-forming galaxies in the Sloan Digital Sky Survey. *Astrophysical Journal* 613(2):898–913.

Vardiman, L., A.A. Snelling, and E.F. Chaffin (editors). 2005. *Radioisotopes and the Age of the Earth: Results of a Young-Earth Creationist Research Initiative*, Volume 2. Institute for Creation Research, El Cajon, CA.

Volonteri, M. 2012. The formation and evolution of massive black holes. *Science* 337(6094):544.

Woods, T.E., B. Agarwal, V. Bromm, A. Bunker, K.-J. Chen, S. Chon, A. Ferrara, et al. 2019. Titans of the early Universe: The Prato statement on the origin of the first supermassive black holes. *Publications of the Astronomical Society of Australia* 36:e027.

Zhivkov, A., and I. Tounchev. 2022. A computer-assisted proof for 100,000 years stability of the solar system. *arXiv e-prints* arXiv:2206.13467.