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TASC

TASC's mission is to rebuild and strengthen the foundation of the Christian faith by increasing awareness of the scientific evidence supporting the literal biblical account of creation and refuting evolution.

December 2021

Review of *Return of the God Hypothesis* by Stephen C. Meyer: Part 4

By Dan Reynolds, PhD

This article concludes the review[1] of Stephen Meyer's new book *Return of the God Hypothesis: Three Scientific Discoveries That Reveal the Mind Behind the Universe*.

Chapter 16: One God or Many Universes?

As the previous chapters showed, the likelihood of our universe having the physical laws, constants, and dimensions required for our existence is essentially zero. However, new theories posit that our universe is but one of an infinite number of universes, each with its own unique set of laws, constants, dimensions, and initial conditions. In such scenarios, a universe like ours becomes not only likely but inevitable, presumably explaining fine tuning. Meyer refers to these theories as types of *exotic naturalism*. The collection of all universes is called the *multiverse*. Meyer will address multiverse and quantum cosmologies in chapter 16 and the next few chapters.

There are two major multiverse theories: inflationary cosmology and string theory. Each theory includes quantum mechanics. Each theory proposes a universe-creating mechanism. In both cases, other universes are considered to be isolated from ours so that what happens there does not affect what happens here and vice versa. There is no known way to detect other universes.

Meyer discussed inflation first. Recall from chapter 6 that inflation was proposed to help explain the horizon and flatness problems associated with the big bang theory. As the theory goes, an instant after space-time, matter, and energy began to exist, an extremely brief and rapid period of expansion of space occurred followed by a slower paced expansion similar to what we observe today. The start of the initial expansion, the rate of expansion, the duration of expansion, and the slowing of the expansion are critical to our universe being as it is and, therefore, provide more evidence of fine tuning. According to a theory called *eternal chaotic inflation*, our universe was born when the energy of an expanding field of vacuum energy (called an *inflaton*) varied at a specific location in the field. This localized variation gave birth to our "bubble universe." As the inflaton continued to expand, other variations in the field lead to the creation of other bubble universes. Presumably, this has been going on forever. Each bubble universe has the same physical laws but different initial conditions. Hence an infinite number of universes would have been produced by this process. We just happen to be living in the lucky universe.

The second multiverse cosmology Meyer discussed is string theory. String theory proposes that the most basic reality is a set of one-dimensional vibrating strings of energy. These form elementary particles that make up matter (*fermions*) and the force-carrying particles (*bosons*). Each universe has 10 or 11 dimensions, but all except four are *compactified* into unobservable scales (10^{-35} meters, the Planck length). Each unique set of compactified dimensions is known as a *vacuum*. Each universe has a unique set of dimensions. The vibration of the strings and the geometry of the dimensions determine physical laws and constants, but not the initial conditions. String theory holds that there are *gravitons*, massless closed rings of string that transmit the gravitational force. Gravitons have various vibrational modes, each producing a force carrier of the four fundamental forces (the bosons). String theory, in combination with a theory called supersymmetry, posits the existence of *gravitinos*. Gravitinos are strings that produce fermions.

The universes created by string theory all have unique physical laws, constants, and dimensions, but similar initial conditions. There are an infinite number of solutions to the mathematics of string theory. Each solution is viewed as a separate universe with unique physical laws and constants. Those solutions which have a positive cosmological constant like our universe are thought to number between 10^{500} and 10^{1000}. These

[1] For Part 1, see: <https://tasc-creationscience.org/sites/default/files/2021-09/sept2021_0.pdf>
For Part 2, see: <https://www.tasc-creationscience.org/sites/default/files/2021-09/oct2021.pdf>
For Part 3, see: <https://www.tasc-creationscience.org/sites/default/files/2021-10/nov2021.pdf>

universes represent the "string landscape." In such a scenario, our universe would seem inevitable. Many physicists consider the multiverse hypothesis as metaphysical because no one can think of ways to test its validity. String theorists proposed a mechanism whereby a universe with a certain set of dimensions, laws, constants, particles, and forces could morph into a different universe with a different set of dimensions, laws, constants, particles, and forces. Then, this new universe would morph into yet another type of universe, and so on. Presumably, this mechanism would allow a search of all the possible types of universes, a search that would eventually and inevitably find a universe like ours.

In order to have a theory that addresses *both* the initial conditions as well as physical laws and constants, theorists developed the *inflationary string landscape model*. These theories postulate several hypothetical/theoretical entities that have never been observed: [2]

1. An inflaton field exists.
2. The decay of inflation fields will produce new bubble universes with different initial conditions.
3. The process of inflation will continue eternally into the future.
4. An infinite number of bubble universes exist (or will eventually exist).
5. Unimaginably small vibrating strings exist.
6. Six or seven extra hidden spatial dimensions exist.
7. The vibrating strings of energy within string vacua create the physical phenomena we observe.
8. Lines of flux around the compactifications of space exist, making them quasi-stable with a positive cosmological constant.
9. Supersymmetry applies to fundamental strings, so that both gravitons and gravitinos exist and their different vibrational modes correspond to all forms of radiation, matter and the fundamental forces of physics.
10. Every mathematical solution to the equations of string theory corresponds to an actual existing universe with different laws and constants of physics (i.e., the string landscape exists).

One reason Meyer prefers theism to the multiverse is that it is simpler (Ockham's razor). Multiverse cosmologies propose several theoretical and potentially untestable entities (strings, inflatons, hidden dimensions, gravitinos, etc.). Inflationary cosmology posits an inflaton and finely tuned mechanisms to start and stop inflation. String theory posits vibrating strings and extra dimensions. The inflationary string landscape model proposes a landscape of universes, each with its own unique set of physical laws, constants, dimensions, particles, and initial conditions.

String theory, inflation theory, and a combination of the two invoke mechanisms that are themselves finely tuned. To form our bubble universe, the inflaton would have to have a specific energy variation in a specific location finely tuned to between 1 part in 10^{53} and 1 part in 10^{123}. The timing and extent of inflation would also be critical. According to theorists, inflation began 10^{-37} seconds after the big bang, stopped 10^{-35} seconds after the big bang, and resulted in the universe expanding by a factor of 10^{26}. Calculations show that only 1 out of $10^{66,000,000}$ universes formed by this mechanism would be life friendly. As it turns out, obtaining our universe through inflationary cosmology actually requires more fine tuning than does our universe in the standard big bang cosmology; inflation only makes the fine-tuning problem worse.

Since, according to the Borde-Guth-Vilenkin theorem, even inflationary and string theory cosmologies have a beginning, there has not been an eternity past for the cosmological mechanisms to explore the entire landscape of universes. Hence, the probabilistic resources available for finding our universe are limited. Thus, the only way our universe could have been generated in these scenarios is for there to have been some fine tuning that increased the likelihood of our universe being created. Hence Meyer says that even if some multiverse hypothesis turned out to be true, it too would require enormous fine tuning.

There are observational reasons to doubt both inflation and string theory. First, the most likely versions of inflation theory predicted variations in the temperature of the cosmic microwave background (CMB) that were larger than observed. Second, the CMB radiation was predicted to have a type of polarization which has not been found. Third, gravity waves associated with the expansion have been predicted but not yet observed. The data have lead Paul Steinhardt, one of the architects of inflationary cosmology, to abandon the theory.

String theory predicts new particles and unseen dimensions. However, experiments at the Large Hadron Collider in Europe have so far failed to discover any evidence for the predicted particles or dimensions.

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[2] Meyer SC (2021) *Return of the God Hypothesis: Three Scientific Discoveries That Reveal the Mind Behind the Universe*, Harper One, New York, NY, 337

Chapter 17: Stephen Hawking and Quantum Cosmology

As mentioned previously, Stephen Hawking was the first physicist to show theoretically why the universe must have begun as a singularity. Recall that running the expansion of the universe backwards in time results in an ever-shrinking universe. Once the universe would have been the size of the Planck length, theorists believe that quantum mechanical effects would have to be taken into account to get an accurate description. As the universe approaches being a singularity, the mathematics of general relativity break down. Hence, physicists have long sought a theory that combines quantum mechanics with general relativity into a *quantum theory of gravity*. However, so far, that goal has not been realized.

Hawking nevertheless attempted to come up with part of such a theory. However, during the calculations, Hawking found it necessary to utilize *imaginary time* ($t = it$)[3] instead of real time t in order to make the mathematics tractable. Once the step using imaginary time was complete, he could revert back to real time to finish the computations. As long as Hawking used real time, there were singularities, but in the step where imaginary time was employed, the singularities disappeared. Hawking claimed that his calculations showed that once the universe entered into imaginary time, there was no singularity and hence no beginning of the universe. But many physicists and philosophers have commented that imaginary time, while an acceptable mathematical tool for making mathematical expressions tractable, had no actual physical significance or reality and could not, therefore, be used to explain away the singularities that always appeared in *real* time.

Meyer then discussed wave particle duality, the double slit experiment, and the Schrodinger equation. The double slit experiment showed that light sometimes behaves as if it were made of particles, and particles sometimes behave as if they consisted of waves. The Schrodinger equation when solved provides a wave function that describes the position, momentum, and energy of subatomic particles. But the position and momentum of particles the wave equation describes are depicted as probability distributions instead of discrete values. Hence quantum mechanics can't tell us where a particle is, only where it is likely to be. There are many interpretations of quantum mechanics. One interpretation is that a particle does not have a specific location until it is observed. The particle might be in any number of places at any given time until it is observed, then the wave function "collapses" to one value.

Scientists have synthesized concepts from quantum mechanics and general relativity to come up with a what is known as the Wheeler-DeWitt equation. When the Wheeler-DeWitt equation is solved, a wave function for possible universes is produced. "In other words, the universal wave function, the solution to the Wheeler-DeWitt equation, describes the different possible spatial geometries and configurations of matter (in 'superposition') that a universe could adopt."[4] The wave function allows calculation of the probability that a universe with "a specific gravitational field with a specific curvature mass-energy pairing will emerge (or be observed)."[4]

Solutions to the Wheeler-DeWitt equation that afford wave functions that render our universe as probable are considered theories for the origin of our universe. But in order to produce wave functions that make a universe like ours probable, constraints are necessary when solving the Wheeler-DeWitt equation. These constraints included consideration of "only isotropic, closed, and spatially homogeneous universes and only those with a positive cosmological constant."[5]

The universal wave functions that render our universe as probable still start from a singularity. And these wave functions are likely solutions to the Wheeler-DeWitt equation only when specific constraints are applied. But applying constraints to achieve a desired outcome is the same as introducing information into the calculations that would otherwise not exist. Hence such artificially guided calculations don't represent a "physics-only" approach to the problem. Moreover, these solutions all still assume the universe had a beginning.

Chapter 18: The Cosmological Information Problem

In this chapter, Meyer looks more deeply into quantum cosmologies. He explains that to say physical law explains the origin and nature of the universe is to make a category error. That's because physical laws are merely descriptions of the behavior of matter and energy in space-time; they are not causative. This fact has been noticed by more than one physicist:[6]

"What is it that breathes fire into the equations and makes a universe for them to describe?" – Stephen Hawking

"Does this mean that the laws are not mere descriptions of reality and can have an independent existence of their own? In the absence of space, time, and matter, what tablets could they be written upon? The laws are expressed in the form of mathematical equations. If the

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[3] i = the square root of –1

[4] Meyer SC (2021), 362

[5] Meyer SC (2021), 366

[6] Meyer SC (2021), 373

medium of mathematics is the mind, does this mean that *mind should predate the universe*?" - Alexander Vilenkin

Meyer explains that even if the laws could somehow exist in some immaterial realm without space, time, matter and energy, their mathematical nature suggests they would most likely reside in a *transcendent intelligence*.

Meyer explains why quantum cosmology suggests intelligent design. The mathematical marriage of quantum mechanics and general relativity produced the Wheeler-DeWitt equation. Solving the Wheeler-DeWitt equation produces the universal wave function **Ψ**. Solving **Ψ** provides the probability of our universe. Scientists desiring to derive a purely physical explanation for our universe have done the calculations and have found that our universe does have a reasonable likelihood of existing, but only if *certain constraints are placed upon the calculations*. Hence the "right" solution **Ψ** to the Wheeler-DeWitt equation was obtained only when the paths from the initial singularity were limited to those that lead to universes that were *isotropic, closed, homogeneous, and had a positive cosmological constant*. In turn, our universe was found to be a probable solution to **Ψ** only when certain *boundary conditions* were applied to the calculations. By limiting the possible paths from the singularity when solving the Wheeler-DeWitt equation and imposing boundary conditions when solving **Ψ** scientists had unintentionally smuggled in information into their calculations. The imposed restrictions had no physical justification; they were simply imposed to get the desired outcome. Hence without the infusion of information, our universe would not have been found probable and hence would have remained unexplained. Meyer says this episode implies that our universe required an intelligence to create it.

Chapter 19: Collapsing Waves and Boltzmann Brains

In chapter 19, Meyer discusses the Copenhagen and "many worlds" interpretations of quantum mechanics (QM) and extrapolates them to quantum cosmologies. He also discusses some of the self-refuting conclusions that materialistic quantum cosmologies lead to.

In the double slit experiment, subatomic particles behave as if they were waves when they generate an interference pattern.[7] This result suggests that single particles somehow pass through *both* slits and form waves that create the interference pattern. But when the actual path of a particle through the slits is observed, a given particle only passes through one of the slits and the interference pattern disappears. The wave function that describes the position of a particle says there is a probability that the particle is in various locations simultaneously; the various possibilities are said to be in *superposition*. But when the particle is observed, only one position is seen. The Copenhagen interpretation of QM says that when the particle is observed, the wave function *collapses* to a specific value. On the other hand, the "many worlds" interpretation of QM says that the various possible locations suggested by the wave function are all real; the particle is in all the possible locations in various universes simultaneously. Then when the particle is observed, we see the particle's position in *our* universe, but the other possibilities still exist but in other universes.

Assuming the Copenhagen interpretation is correct, Meyer suggests that a Cosmic Observer is required to collapse the universal wave function in quantum cosmology in order for a universe to form with its specific spatial configurations, forces, particles, etc. This line of reasoning has clear theistic implications.

But what about the "many worlds" interpretation applied to quantum cosmology? In this case, every conceivable universe that could possibly be described by the universal wave function exists in its own reality. But this implies that the *cause* of all the possible universes that the universal wave function describes would be a mere mathematical description. Since we have no knowledge of mathematical descriptions causing anything material to come into existence, the universal wave function is causally inadequate to explain the existence of our (or any) universe. However, Meyer points out that mathematical ideas do exist in minds, suggesting that a personal God could "breathe fire" into the equations so that the universe came into being. An intelligent designer would be causally adequate.

Meyer then reviewed how the Wheeler-DeWitt equation and universal wave functions derived from it suggest our universe is probable only after an infusion of information, suggesting the need for an intelligent intervention.

Meyer then discusses a theory he calls the *mathematical universe hypothesis* (MUH). This theory says that every possible mathematical expression that could describe a universe has a real physical counterpart. So, in effect, no fine tuning, boundary conditions, or any other mathematical manipulations would be required to make our universe probable since all conceivable universes must exist. So, while this theory may seem to do away with the fine-tuning problem, it suffers from other fatal difficulties. First, it still suggests that mathematical

[7] Watch a five-minute video that explains the double slit experiment: <https://www.youtube.com/watch?v=Q1YqgPAtzho> Accessed 2021 Nov 03.

expressions can somehow create physical things, contrary to observations. Second, this theory ultimately destroys knowledge by destroying any hope of a correct epistemology. If the MUH is true, then any set of laws for a given universe are possible. So, in some universes, physics may behave in a consistent manner over time up to a point, then change directions without notice. The predictability of the natural realm would be lost; past experience might not inform us of future events. Also, in the MUH, everything that is possible becomes inevitable, no matter how unlikely. One such unlikely event would be the emergence of what has been termed Boltzmann brains. A Boltzmann brain is associated with a hypothetical observer that might materialize due to a quantum fluctuation or a chance assemblage of molecules. Some of the Boltzmann brains would have false memories of events that never actually happened. So, in such a scenario, how would anyone know if they had a real history or just false memories? Even worse, in inflationary cosmologies, young bubble universes would be created every time there was a quantum fluctuation, resulting in vastly more young universes than relatively old ones like ours. Therefore, there would be more Boltzman brains with false memories in the young universes than real brains that had evolved in the old universes. So, any conscious observer would be more likely to have a Boltzman brain than a real brain. In such a scenario, real knowledge is impossible.

Part V: Conclusion

Chapter 20: Acts of God or God of the Gaps?

In chapter 20, Meyer reviews the problems he has addressed up to this point with naturalistic explanations for the origin of the universe, the origin of life, and the fine tuning of physics. He then explains how some scientists and philosophers "cry foul" when someone suggests God could be an explanation for these mysteries. Specifically, arguments for God's existence based on the inadequacies of current scientific knowledge have been termed "god-of-the-gaps" arguments. Many scientists believe that the intelligent design movement is guilty of this type of faulty reasoning. But Meyer says this is untrue. Intelligent design advocates not only point out the inadequacies of naturalistic explanations for the origin of the universe, the origin of life, and the fine tuning of physics, *but they explain the causal adequacy of an intelligent agent from our common experience to explain these enigmas*. We know that intelligent agents such as human beings can create information and can manipulate and configure matter and energy for specific purposes. In addition, positing a creator does not destroy epistemology or knowledge. Meyer says that there may be some events in natural history that natural processes cannot explain, even in principle. In that case, waiting for natural explanations would be a futile project.

Our best science says the universe had a beginning. The universe could not have created itself. Scientific laws are mathematical expressions that are not known to be able to create a universe from nothing. Chemistry and physics cannot explain the origin of the information in biochemistry. There is nothing in natural law that requires that the laws of physics and the properties of matter be exactly what is required for our existence, yet here we are. Is it likely we will discover that mathematical expressions have the ability to create matter and energy out of nothing? Will examining more chemical reactions eventually produce a self-replicating chemical system that can evolve into our DNA-RNA-protein world? Can luck or the anthropic principles explain the fine tuning of physics? No. Yet a Creator as described in the bible could create a universe out of nothing by His free will, He could design that universe to have the physics and chemistry necessary for biology. He could also configure atoms and molecules to produce self-replicating chemical systems we call life. Of all the competing hypotheses to explain these big questions, intelligent design offers the simplest explanation with the greatest causal adequacy.

Chapter 21: The Big Questions and Why They Matter

Meyer ends the book with reflections of his own journey through existential and epistemological difficulties. He discusses how apart from theism, there can be no coherent epistemology or meaning to our lives.

Meyer discusses why a mind evolved by a Darwinian evolutionary process would not likely be trustworthy to have an accurate grasp of the truth. Such a mind would have evolved for its survival value, not necessarily for its understanding of reality. In that case, why would anyone trust its conclusions about the world, evolution, morality, or whatever? Hence, a materialistic worldview is self-defeating and self-refuting.

Meyer discussed the impact of materialistic philosophy on young people that he has known. He has seen materialism lead to despair, doubt, and a sense of meaninglessness and purposelessness.

On the other hand, a theistic worldview is logically coherent. A good and rational God created the universe and humans. He made humans in His image and gave us dominion over the natural realm. Hence humans would be endowed with faculties that could reliably understand a comprehensible natural order as well as their status as created beings. Theism facilitates meaning to human existence because of our relationship to our creator; our lives can have eternal significance because of the possibility of eternal life with God.

Summary and Conclusion

Modern science arose in Christian Europe because Christianity uniquely held the correct presuppositions about nature[8] and the human mind. A good God created nature and human beings. Humans were made in the image of God and given dominion over nature. The divine law giver who does not change created a physical realm that would behave consistently over time. Hence nature was made comprehensible to humans. But humans are fallen, so their ideas are fallible. Hence to understand nature, humans must form ideas that are testable by observations in order to arrive at valid explanations. The testing of theories meant to explain observations is the scientific method.

Most branches of modern science were founded by theists. These men saw no conflict between their faith and the practice of science. But as scientific knowledge grew and material explanations for various phenomena came to light, many began to assume that everything, including origins, could be explained by purely physical causes; God became unnecessary in their thinking.

Over the last century, science has discovered the universe had a beginning, the cell is more complex than any human invention, physics is fine tuned for life as we know it, the fossil record is inconsistent with Darwinian evolution, and living things contain information written in chemical codes. The probability of the formation of even a modest protein using all the probabilistic resources of the entire universe over trillions of years is essentially zero. Chemistry and physics are causally inadequate to explain the origin of life. The sudden appearance of most phyla at the base of the fossil record without precursors is the opposite of what Darwinian evolutionary theory predicts. There is no evidence for other universes, hidden dimensions, or the large particles predicted by supersymmetry. And based on the best theories and observations, the universe had a beginning, *even if quantum cosmologies (inflation and string theory) and the multiverse are correct (BGV theorem)*. The fine tuning of the laws and constants of physics, the properties of the fundamental particles, the expansion rate of the universe, the initial low entropy of the universe, the flatness of space-time, and many other properties have no known physical explanation; these properties of nature just happen to be what they must be for our existence. However, we do know that intelligent agents such as ourselves can create information, have foresight, can specify initial conditions, and can constrain and plan the construction of inventions. Hence intelligence is causally adequate to explain the phenomena above. The evidence from modern science points to a creative intelligence as the best explanation for origins. Moreover, that intelligence must transcend and precede the material realm. And from what we know of natural phenomena, God would have needed to infuse information into the universe at various times in its history. Hence Christian theism is the most likely explanation for the origin of the universe and life. ☙

[8] Nature includes physical laws, dimensions, particles, matter, energy, and all biology, including humans.

COMING EVENTS

TASC Zoom Meeting, Thursday, December 9, 7:00 pm EST

Mark Stephens, MCS, will speak on "Trust Genesis Foundations; Trust Christ for Salvation and Eternal Life." Mark will provide his personal testimony and summarize 15 "foundations of creation beliefs," which he learned more thoroughly to clear his confusion on origins through participation as a member of TASC. This helped Mark hold and strengthen his faith in God and Christ, as it can you, going forward as a faithful, joyful witness for God our Creator, and Christ our Creator and Savior. (Genesis 1–11, Colossians 1:10–21)

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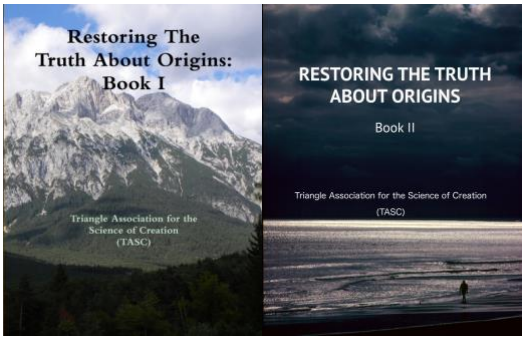

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