

Impact of the Multiverse Hypothesis on the Anthropic Cosmological Principle as Evidence of God's Existence

By Deacon Dennis B. Fleming

Introduction

Throughout history, man has searched for definitive evidence of the existence of an intelligent being capable of creating us and all we see around us. This inquiry was historically the exclusive province of philosophers and theologians.

However, in more modern times the focus of evidence gathering has shifted from philosophy and theology to physics, astronomy, chemistry, and biology. Only in modern times has the deductive and inductive methods of pure logic yielded to the scientific method, technological tools, and advanced mathematics in discovering new paths toward demonstrating God's existence.

Beginning with Kepler, Copernicus, and Galileo, our access to the heavens has been enhanced through technology. We have been challenged in our philosophical assumptions with scientific evidence that indicates those assumptions might not have been completely correct. These discoveries have unlocked more and more scientific and physical information about the universe in which we live. These undeniable facts have challenged long-held theological beliefs such as the physical place of man in the universe, or even the uniqueness of the universe itself. But, at the same time they have exposed more magnificent truths about the creation, existence, workings, and probable future of all of physical existence.

Aristarchus of Samos, an ancient Greek philosopher, astronomer and mathematician, is first credited with the proposing the idea that the earth revolves around the sun. His ideas at the time were rejected in favor of the geocentric philosophies of Aristotle and Ptolemy. However, in more modern times, Copernicus, based upon his own observations, postulated the idea that human beings do not occupy the privileged place in the universe, thereby resurrecting Aristarchus' ideas and challenging the then widely-accepted Aristotelian view of our universe. From the time of Aristotle, it had been generally accepted that the earth was the center of the universe and all other astronomical bodies revolved around it. This was considered evidence that man occupied a special place in the universe, and for theologians this was confirmation that man was a special creation of God.

However, Galileo's telescope gave clear evidence that Copernicus' heliocentric view of our solar system was valid, and with that the understanding that much of the philosophical and

theological interpretation of the workings of our physical universe expressed in the geocentric view to that date was wrong. This ushered in a time, which continues to the present day, in which scientific theory after theory, and discovery after scientific discovery, have generated conflict between some scientists and some theologians as to whether physical science could trump God's power. Two types of issues are the source of conflict:

- New scientific theories or discoveries that seemed to contradict accepted theological and philosophical thought.
- The question of whether the natural world, with its self-expressed laws, was self-sufficient to supplant the role of God, or was God the originator and effector of all reality.

The Anthropic Cosmological Principle

In 1973, a symposium was held in Krakow, Poland, marking the 500th anniversary of Copernicus' birth. At this symposium, a physicist named Brandon Carter presented a paper which introduced the strange idea that, "Although our situation is not necessarily central, it is inevitably privileged to some extent."¹ Thus, he introduced the idea that the mystery of the fine-tuned universe that physicists had wondered about for the past seventy years was, in fact, a pattern and not simply happenstance.

In their book, *The Anthropic Cosmological Principle*, John Barrow and Frank Tipler describe the Weak Anthropic Principle (WAP) as: "The observed values of all physical and cosmological quantities are not equally probable but they take on values restricted by the requirement that there exist sites where carbon based life can evolve and by the requirement that the Universe be old enough for it to already have done so."² This is simply a complicated way of saying that we, as observers of our universe, have discovered a number of basic laws of nature that incorporate fixed values (mathematical constants) for some key characteristics of our universe. Those values must be very precisely what they have been found to be to enable our universe to be suitable for life. Furthermore, there is no theoretical or scientific reason, which we've so far discovered, for these values to be what they are.

Barrow and Tipler distinguish this Weak Anthropic Principle, known commonly as WAP, from the Strong Anthropic Principle or SAP. They define the SAP as "the Universe must have properties which allow life to develop within it at some point in its history."³ This can be distinguished from WAP in that WAP observes that the universe we know has properties uniquely suitable for life, but makes no statement about how such properties occurred. The

¹ Carter, p. 75.

² Barrow, p. 17.

³ Barrow, p. 21.

WAP's implications are immediate and obvious. A universe which is required to have properties which must generate life either contains a physical mechanism that not only is friendly to life, but in fact requires it, or the conditions friendly for life are the direct product of an external force, a Cosmic Designer, God. This conclusion was immediately apparent to most scientists and theologians who studied their theories.

Barrow and Tipler make clear distinctions between teleological reasoning, that is order for a specific purpose, and eutaxiological⁴ reasoning, which is order with a planned cause but without a defined or at least understood purpose. The example they give makes these two categories of reasoning clear: consider a mechanical watch. Eutaxiological reasoning would appreciate the intricacies of the watch's construction without understanding what purpose the watch fulfilled. Teleological reasoning would understand that the intricate engineering and construction embodied in the watch was in support of an end, to be able to tell time. Their view is that these Anthropic Variables are teleological in origin; that is, they exist as they do because they support the development of intelligent life. In other words, this is order for a defined purpose: the creation of a universe friendly to life. This is as we can see an argument in favor of SAP rather than WAP.

There are over twenty of these specific variables that have been identified so far, some correspond to what are called "dimensionless variables," for example the value of Pi, and the ratio of mass between proton and electron in physics. Depending upon how broadly the Anthropic Principle is invoked, there are reasons to suspect that others may exist.⁵ We find that these laws are described by mathematical formulae or derived values that can be validated through observation and experimentation. For the purposes of this paper, however, several examples of these variables are more than sufficient to explain the Anthropic Principle. Examples of these variables are:

- Newton's force of gravity between two bodies is defined as $F=G(m_1m_2/r^2)$, where F is the force exerted, m_1 and m_2 are the two bodies in question, r is the distance between the two bodies, and G is the Universal Gravitational Constant. The Universal Gravitational Constant has been found by experiment to be $6.674 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$ (Mohr, 2006).

⁴ Eutaxiology (from the Greek eu – good, and tax – order) is the philosophical study of order and design. It is distinguished from teleology in that it does not focus on the purpose or goal of a given structure or process, merely the degree and complexity of the structure or process.

⁵ Bode's law, the value for the force of dark energy, and the age of the universe have all been mentioned as possible Anthropic Values. There are several others as well.

- The repulsive force of Dark Energy hasn't been reduced as yet to a specific formula; however current observations of the expanding nature of our universe make it pretty clear that this force exists. Further as a contra-force to gravity, its precise value must be as mysteriously anthropic as is gravity itself.
- Nuclear Strong Force Constant, this force is responsible for the "structure of nuclei, fusion reactions between light nuclei, the structure of the stars and the phenomena of elementary particle physics."⁶ This is the force that holds the nuclei of all matter together.
- Proton to Electron Mass Ratio, this number is represented as μ and is approximately equal to 1836.15267245.
- The Electromagnetic Charge value of Elementary Particles known as the Lorenz force.

Observation and experimentation have established values for these constants which yield consistent and correct predictions. However, nothing in any current theory of these laws tells us why these numbers should be what they are. Additionally, these numbers are defined with exceptionally fine tolerances to make our universe hospitable to life.

Paul Davies, in his book *The Goldilocks Enigma*, summarizes seven possible explanations for the strange coincidence of these Anthropic Variables:⁷

1. An Absurd Universe – The universe is what it is through sheer chance. The odds would make it a pretty absurd bet, 1 in 10^{123} are the estimated odds that a universe based upon pure chance would look like ours.
2. A Unique Universe – Some physical theory will unify all the existing partial theories and explain fully why these values are so uniquely suited to the universe as we know it, and can only be as they are.
3. Multiverse – An enormous number (possibly infinite) of universes coexist without interaction, which allows all possible combinations of these variables to be instantiated. As in explanation #1, it would require at least 1×10^{123} different universes to exist to be sure that one of those universes would be suited to life as we know it.
4. Intelligent Design – A creator designed the universe carefully and uniquely selecting these variables to support the evolution of life as we know it.

⁶ Barrow, p. 295.

⁷ Davies, pp. 261-267.

5. The Life Principle – There is an underlying principle, much like the physical principle in the Unique Universe, that drives the evolution of the universe towards life.
6. Self-Explaining Universe – Only a universe that can generate conscious life can exist.
7. Fake Universe – The universe as we know it is not “real.”

Each of these ideas has some merit. But, for our purposes we will limit ourselves to discussion only of the issues associated with the multiverse hypothesis (explanation #3), and its’ impact both for and against the idea that the Anthropic Cosmological Principle can be seen as evidence of God’s existence.

The Multiverse Hypothesis

The multiverse hypothesis has developed as an answer to many questions about the origin of our finely tuned universe. The current state of the multiverse hypothesis is the confluence of developments in two distinct areas of thought regarding the state and structure of the universe in which we live. The first is the continuing attempt to define a “natural” means of explaining the fine-tuned nature of the universe in which we find ourselves. Why are the Anthropic Variables the values we find them to be? The second stream of thought is a development from particle physics, first proposed by Alan Guth in 1979, known as the inflationary theory of the universe.⁸

While searching for a mathematical structure that explained the behavior of particles, Guth developed a formula to describe what he believed to be experimental evidence for the creation of particles. Guth soon realized that the formula was not limited to particle behavior, but could also be applied to cosmological scale events. From this, he developed the theory of cosmic inflation. In this theory, he explains how the universe expanded from the size of a proton to the size of a grapefruit in an instant.⁹ Further examination of Guth’s theory revealed that there was no obvious inherent limit of its effect to our existing universe, and in given certain conditions cosmic inflation could generate additional universes, perhaps an unlimited number of universes.

As with any controversial hypothesis, the hypothesis of multiple universes is subject to intense debate. The first area for debate is whether such a hypothesis is truly scientific; that is, is study of this hypothesis a scientific study or a philosophical one. Scientific study is generally accepted to be limited to theories that make testable hypotheses and provide predictions

⁸ Davies, p. 55.

⁹ Davies, p. 56.

which can be validated. Robin Collins makes a distinction between a physical and a metaphysical multiverse hypothesis.¹⁰ Physical theories are those that postulate a physical mechanism that results in the generation of multiple universes. In metaphysical theories, the universes are just thought to exist without any physical mechanism to create them. Other areas of debate involve the idea that an infinite number of universes are proposed under some theories. To some, this seems an overly complex answer to the questions raised by the Anthropic Principle. Others question the extreme number of failed universes, those that cannot produce life or in many cases fail to produce a working star or planets, as excessive and wasteful.

The second major debate has to do with the origin of multiple universes. Must they have a beginning and therefore a cause, or could they have always existed? Dutch Astrophysicist Herman Zanstra pointed out in the 1950s that cyclical cosmologies cannot have been eternal.¹¹ They must have a definite beginning due to the Second Law of Thermodynamics, which stipulates that overall entropy must increase over time.¹² This idea was further supported by Arvind Borde, Alan Guth, and Alexander Vilenkin who in 2003 demonstrated mathematically that “all inflationary space times have a beginning in the finite past.”¹³ As we shall see, this is an important concept in establishing an original cause to universes or any multiverse.

Max Tegmark has developed a useful taxonomy for classifying and understanding all of the various types of multiverses that have been proposed:¹⁴

- Level I - An Infinite Universe – This universe contains an infinite number of “Hubble volumes” or what we would think of as an observable universe. All of these separate “Hubble volumes” are theorized to conform to the physical laws and constants that exist in our own “Hubble volume.”
- Level II – Many Universes, Different Physical Constants – In this multiverse hypothesis a variant of the Cosmic Inflation Theory, called the Chaotic Inflation Theory, proposes that the multiverse will as a whole stretch and inflate, however the stretching will not occur uniformly and this will create “bubbles” of Level I universes. These “bubbles” will be internally consistent as to the physical constants, but the different bubbles can experience different symmetry breaking (the physical principle which disunities the

¹⁰ Carr, p. 459.

¹¹ That is, those that postulate “big bang” followed by “big crunch”, followed again by “big bang”, again and again, ad, not quite, infinitum.

¹² Greene, p. 122.

¹³ Spitzer, p. 75.

¹⁴ Greene, pp. 172-180.

basic forces of our universe). This results in different physical constants in each “bubble.”

- Level III – Many Worlds Interpretation of Quantum Mechanics – This version of the multiverse hypothesis depends upon an interpretation of quantum mechanics. A characteristic of quantum mechanics theory is Heisenberg’s Uncertainty Theory, which results in certain predictions of the conditions of the physical universe being stated in terms of probability. Under this theory, these probabilities are resolved in separate universes, defined as separate quantum branches.
- Level IV – Ultimate Ensemble – Tegmark calls this level the “Ultimate Ensemble.” However, it really incorporates all the levels mentioned so far and any other mathematically consistent universes that can be described.

Thus, the multiverse hypothesis is a complex collection of several ideas, each proposing the creation and existence of some form of multiple universes. In some forms, they provide a mechanism that could explain the “fine-tuned” nature of the universe we find ourselves in. They attempt to explain the extreme unlikelihood of the conditions we find in our universe through the postulation of other universes, possibly an infinite number, which vary in the values for these anthropic constants, and thus our universe happens to be the one with the values we see.

The Impact of Multiverse Hypothesis on the Anthropic Cosmological Principle

So how can we make sense of this multitude of “multiverse” theories? Not all of the four types of “multiverse” categorized by Tegmark can have a specific impact on the Anthropic Cosmological Principle. Some do not vary in terms of the Anthropic Values from universe to universe:

- Level I – Because there is no variance between our physical environment and each of the alternative universes proposed in Tegmark’s Level I category, there is no real bearing in terms of the Anthropic Principle in this type of multiverse since each of these values will be the same for each alternative universe.
- Level II - Our universe would be only one of many different universes having different Anthropic Values for each Level II universe. These types of universes are most often raised as a multiverse explanation for the Anthropic Principle.
- Level III – In this category, it seems unlikely that Anthropic Variables would differ from probable universe to probable universe, since as the probabilities of quantum choices are resolved they must resolve to a single “real” universe.

- Level IV – this seems a “catch-all” category, something like Tegmark’s name for “Other.” It includes the set of all universes that can be defined in a mathematically consistent way and would incorporate each prior category in addition to those that are unique.

While some of these levels seem to overlap with others, our consideration will be limited to Level II as it seems to cover all multiverse possibilities that can provide an explanation for the Anthropic Values whose origin we question.

So, what does Level II propose? It seems that under Level II, all possible universes with all possible values for the Anthropic Variables exist. However, there is significant debate as to whether this number can be infinite.¹⁵ All of these universes are generated from a spontaneous quantum fluxation of an overall energy field. “Big Bangs” come and go. They create universe after universe, as bubbles in a pot of boiling water. If that is so, one can easily see how all possible values and combinations of values for Anthropic Variables can be represented in one or more of these universes.

As Brian Greene says, “to ask why the constants have their particular values is to ask the wrong kind of question. There is no law dictating their values, their values can and do vary across the multiverse. Our intrinsic selection bias ensures that we find ourselves in that part of the multiverse in which constants have the values with which we’re familiar simply because we’re unable to exist in parts of the multiverse where values are different.”¹⁶

Conclusion

The objectives of this paper are twofold; first, to explore how the various hypotheses regarding possible multiverses affect the Cosmological Anthropic Principle, and second to examine whether this synthesis strengthens or weakens evidence that this principle makes for the existence of God.

It’s entirely possible that the Level II multiverse hypothesis is the true explanation for the amazing fidelity of the Anthropic Variables to the values necessary to ensure life develops, as it indeed has, in our universe. As long as the postulated number of possible universes exceeds 1×10^{123} , the various known variables in physics as we know them could possibly cover all imaginable combinations. We could be living in one of very many universes, one uniquely suited to our kind of life, and thus we would expect to see exactly what we see. We could not observe a universe not suited to our existence, because, obviously we couldn’t exist there.

¹⁵ Greene, p. 175.

¹⁶ Greene, p. 165.

However, whether the Level II multiverse hypothesis is true, or simply an interesting conjecture that is the result of creative and ultimately incorrect speculation, several facts pertinent to the synthesis of this hypothesis and the Anthropic Principle remain:

1. Just as the existence of God defies absolute scientific proof, Level II multiverse theories that speculate the existence of multiple unconnected and exclusive universes seem to be outside the ability of science to test or prove. Science is limited in its tools to the time, space, matter, and natural laws that are bound by the universe in which we live. That is, it seems that no scientific tools can definitively determine what happens or exists outside or before our universe. Thus, this multiverse hypothesis can only remain speculation.
2. Whether the means of establishing the current values of the Anthropic Variables was through chance and multiple choice (the multiverse hypothesis) or the specific and singular action of a Divine Creator, this universe as we see it today is a logical development of a series of events that have an ultimate and, to use Aquinas' terminology, uncaused cause. The ideas of Borde, Guth, and Vilenkin show mathematically the validity and perception of Aquinas' philosophical reasoning.
3. Eternal physical existence (infinite in the past and infinite in the future) violates the laws of nature as we understand them (e.g., entropy and the Second Law of Thermodynamics), at least as it relates to the infinite past. Thus, such experience is only possible outside our universe where we have no framework for any kind of scientific understanding. As a result, the only type of speculation beyond our universe that can be valid is philosophical or theological reasoning, as these are the only rational tools that can apply outside our observable physical world.

Could God have used the multiverse as his tool to accomplish our creation? Of course. Which is the greater act: creation of a universe in which all laws work in harmony, from the moment of creation, to achieve God's purpose; or one in which constant tuning and tinkering is necessary to get creation where God wants it to go? An omniscient, all-powerful God is not bound by the laws of nature, which he created, in his ability to change the universe. However, God does seem, in most cases, to prefer to be law abiding from day to day. Exceptions to this are called miracles.

C. S. Lewis called miracles, "An interference with Nature by supernatural power."¹⁷ True miracles are events that incontrovertibly violate the established and proved laws by which nature operates, not the mere action of yet undiscovered physical refinements or modifications to natural laws. Raising oneself from the dead would seem to fall in this category, as does

¹⁷ Lewis, p. 5.

feeding over five thousand people with five barley loaves and two fishes. No new discovery, no additional mathematical parameter, no new interpretation of scientific theories can explain these things.

Much spirited discussion has been generated in discussing the magical vs. the merely miraculous. In the end though, there isn't enough scientific or mathematical evidence today to prove or discount the hypothesis of multiverse. If it is ultimately proved some will point to it and say, "See, it wasn't God who was responsible for the anthropic nature of our universe." I think it's important in that case to remember it isn't the hammer that builds the house. If multiple universes exist, each with their own specific values for the anthropic variables we must ask ourselves where did these universes come from? What is the ultimate "uncaused cause" to use St. Thomas Aquinas' terminology? We have shown through the analysis done by Borde, Guth and Vilenkin building on the work of Dutch astrophysicist Herman Zanstra that the universe or any universes must have had a definite beginning.¹⁸ Thus, there must be an original cause of everything. Multiverse may be the tool used by God to create a universe suited to His purpose, however it cannot have been the primary cause itself.

Paul Davies characterizes religion as, "the first systematic attempt to explain the universe comprehensively."¹⁹ Many scientists today are uncomfortable with the concept of God as a true force in our reality or even as the seminal cause of its existence. This introduces an inevitable bias into scientific inquiry. Many would prefer to see religion relegated to the dust heap of superstition or failed theories. Davis goes on to say, "Many scientists who are struggling to construct a fully comprehensive theory of the physical universe openly admit that part of the motivation is to finally get rid of God, whom they view as a dangerous and infantile delusion. And not only God, but any vestige of God-talk, such as 'meaning' or 'purpose' or 'design' in nature. These scientists see religion as so fraudulent and sinister that nothing less than total theological cleansing will do."²⁰

What a shame. *Where have we lost the objective nature of science that told us to go where the evidence takes us?*

In the same way, we see theologians and people of religious stature resisting the evidence that science provides. As early as Galileo, we see the challenge of scientific evidence to the notions of then existing theological thought. Suppression and persecution of scientific ideas resulted. We see the same today with those who believe that the Bible should be interpreted literally, even when this flies in the face of logic and scientific evidence, and

¹⁸ Greene, p. 122.

¹⁹ Davies, p. 205.

²⁰ Davies, p. 264.

requires an absurd degree of blind faith that would lead us to question why God gave us the tools of science, mathematics, and logic which He did.

Again, what a shame. *Where have we lost the understanding of a loving God who created us to use all the tools he's provided us with to understand him and love him in return?*

A final word from Davies on God when he says, "The God of scholarly theology, by contrast, is cast in the role of a wise Cosmic Architect whose existence is manifested through the rational order of the cosmos, an order that is in fact revealed by science."²¹

God wants us to know him as well as is possible with our limited human ability. In truly knowing him, we cannot help but love him in our own imperfect way. In truly loving him, we cannot help but do his will, again in our own imperfect way. God gives us many tools to accomplish this goal. He gave us the ability to reason abstractly as a tool that takes us beyond mere animal instinct and allows us to wonder and discover beyond what is necessary for mere survival and procreation. And, God gave us Scripture as a tool to understand his nature. He gave us science, too, as a tool to understand the nature and workings of his creation.

None of these paths to God are exclusive. To accept one and reject the others is a primary failure on our part. It's a bit like filtering out all but the high notes in a concerto, or only reading the 7th and 8th bits of each byte of computer data. The meaning of the music or the computer message simply doesn't come through. To do as God intends for us we must hear his entire message in all the ways he communicates it to us.

The Anthropic Cosmological Principle is a signpost on the path to God. It screams "I AM" to those who can or will read it. Time and further research will tell if the words on the sign were written through the mechanism of multiverse, some other physical mechanism, or through the direct action of God (as in, these values, though they be unbelievably improbable, just are). Today, the multiverse hypothesis (Level II) seems to be a valid **possibility**, but not a proven fact; nor is it clear that scientific means exist or will ever exist to prove it. What's important is that we not close our minds to what God is revealing to us, and listen.

²¹ Davies, p. 265.

Bibliography

Barrow, J. D., *The Anthropic Cosmological Principle* (Oxford, UK: Oxford University Press, 1986)

Carr, B. ed., *Universe or Multiverse?* (Cambridge, UK: Cambridge University Press, 2009)

Carter, Brandon, "Large Number Coincidences and the Anthropic Principle," *Cosmology*, 1974

Davies, Paul, *The Goldilocks Enigma: Why is the Universe Just Right for Life?* (Boston: Mariner Books, 2008)

Greene, Brian, *The Hidden Reality* (New York: Random House Inc., 2011)

Lewis, C. S., *Miracles* (New York: Random House, 1947)

Mohr, P. J., *CODATA Recommended Values of the Fundamental Physical Constants*, 2006

Spitzer, Robert J., *New Proofs for the Existence of God* (Cambridge, UK: William B. Eerdmans Publishing Company, 2010)