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Readings in Religious Epistemology

Handout #11

The Universe, Design, and Fine Tuning

The cosmological argument for God's existence attempts to argue to God's existence from the Universe, either from the fact that it has a beginning (Kalam cosmological argument) or from the mere fact that it exists, whether for infinite or finite time (non-Kalam cosmological argument). That anything should exist is exceedingly surprising. The contingency of the Universe cries out for explanation. But it may be thought that however improbable the Universe is, independent of a God hypothesis, theism does not lead us to expect any Universe at all. God's freedom suggests that a Universe is not probable. But whatever the limitations of such arguments, there are additional evidential considerations that are relevant to the prospects for constructing a good argument for God's existence. These evidential considerations involve specific features of the Universe, not simply its existence. The features in question are what can be referred to as the *temporal regularities* and *fine-tuning* of the Universe.

I. Temporal Regularities and Fine Tuning

The Universe is a complex physical system of material objects of varying sizes, shapes, and characteristics that are connected in space and time, and which behave and interact according to a relatively small number of physical laws. These physical laws mark important temporal regularities in the Universe. Moreover, these laws are themselves uniquely related to the emergence of life in the cosmos. The fine-tuning of the Universe refers to the widely held position (of many physicists, cosmologists, and philosophers) that the Universe's physical laws and boundary conditions are calibrated within a very narrow range so as to make the Universe conducive to life.

A. Strength of Forces and Mass of Elementary Particles

The fine-tuning of the Universe includes the claim that the constants of the laws of the Universe are such that if they had been slightly different, the Universe would not have been life conducive. More precisely, given the four fundamental forces and basic array of fundamental particles, these forces and particles must have particular values and ratios to each other, otherwise the Universe could not produce life at any stage of its evolutionary development.

1. If the strong nuclear force is increased by 2%, there would be no protons (and hence no atoms) or protons would be bound to diprotons so that stars would burn a billion times faster than the sun.

2. If the weak nuclear force is increased by 3.4%, then there would be no hydrogen in the Universe, for it would have all been converted into helium shortly after the Big Bang. (b) If the weak nuclear force were decreased by 9%, then there would no elements heavier than hydrogen (or possibly no hydrogen at all if neutrons did not decay into protons).
3. If electromagnetism were slightly increased or decreased, stars would be too cold or too hot. Gravity is 10^{39} weaker than electromagnetism. If it were 10^{33} weaker, stars would be a billion times less massive and burn a million times faster.
4. Stable nucleides, essential to all biology and chemistry, require neutron-proton mass difference to be about twice the electron's mass (otherwise neutrons would all be turned into protons or vice-versa).

How are these points significant for the evolution of life in the Universe?

The only likely form of life in a Universe such as ours is carbon-based life. Carbon compounds are very stable over long periods of time, and (along with hydrogen, nitrogen, and oxygen) can form long complex molecule chains. Carbon can enter into various chemical combinations and is able to store more information than any other element. This is particularly important with respect to reproduction, since self-replicating molecules are needed that can contain and transmit genetic coding. Nucleic acids perform this task, and they are built up from carbon entering into combinations with hydrogen, nitrogen, and oxygen.

Hence, the relationships here may be schematically represented as follows:

life => carbon => stable and massive stars => hydrogen atoms

The fine-tuning facts above are all crucial to the existence of carbon in the Universe, and the successful combination of carbon with other elements to produce DNA. DNA requires stable nucleides, and without DNA there is no reproduction and hence no life. Carbon is produced in stars, specifically in stable, massive stars. Their thermonuclear processes produce carbon and the heavier elements, eventually blowing these out into space when the star dies a violent death in a supernova. Changes in electromagnetism would negatively impact the sort of stars that would exist. If slightly increased most stars would spend 90-95% of their life as cooler red stars, unable to produce the heavier elements and encourage the evolution of life. If slightly decreased, the life of all stars would be relatively short lived and spent mostly as very hot blue stars. Similarly, if gravity (10^{39} weaker than electromagnetism) were 10^{33} weaker than electromagnetism, then stars would not have stable long lives, something that would surely constitute an obstacle for the evolution of life in planetary systems. A slight reduction of weak nuclear force would have meant a Universe with no elements heavier than hydrogen, thereby eliminating carbon. A slight increase in the weak nuclear force would have meant the elimination of hydrogen atoms altogether shortly after the Big Bang. Hence, there would have been no stars at all. A slight increase in the strong nuclear force would have meant the elimination of protons and hence all atoms.

Hence, the preconditions for life in the Universe depend on finely calibrated laws.

B. Boundary Conditions

Given the actual laws of nature (or laws relatively close to them), the boundary conditions of the Universe must lie within a very narrow range.

What are boundary conditions?

Boundary conditions refer to those factors in the Universe that determine the possible states of the Universe in its history, whether for finite or infinite time.

If the Universe had a beginning, boundary conditions would be the arrangements and properties of the stuff of the Universe when it began. If the Universe had no beginning, its boundary conditions would be the arrangement and properties of the stuff of the Universe at any given time that determine the Universe's past and future states. If the Universe began with a singularity (as the standard Big Bang model suggests), conditions at the moment of the Big Bang must have values that lie within a very narrow range if the Universe was to be life conducive.

1. If the velocity of expansion were one part in a million greater than its actual value, then no stars or heavier elements would form.
2. If the velocity of expansion were one part in a million, million greater than its actual value, then the Universe would have collapsed before it was cool enough to form the elements.

Hence, the boundary conditions given an expanding Universe from a singularity are calibrated just so as to yield a Universe with the right conditions for the emergence of life.

Of course, if the Universe is infinitely old, then the boundary conditions will, at any given time, be those factors that determine all past and future states of the Universe. It is certainly possible that these conditions would be such as to require the Universe to exhaust all logically possible states of energy-matter. And if so, then the Universe is bound eventually to produce the right sorts of conditions for life and life itself. However, it is doubtful that the Universe is infinitely old, and even if it were, some sort of principle of conservation of energy will place significant constraints of what states such a Universe could pass through. They would probably be limited to rearrangements of the energy-matter at any given time. But a Universe that is temporally infinite is surely one in which the emergence of life is more likely than one that is temporally finite, for the former provides more time for the requisite arrangements of energy-matter.

For further reference on fine-tuning:

These observations on fine tuning are discussed in detail by John Leslie, "Anthropic Principle, World Ensemble, Design," *American Philosophical Quarterly* 19:141-151 (1982), "How to Draw Conclusions from a Finely-Tuned Universe" in *Physics, Philosophy, and Theology*, ed. Russell, Stoeger, and Coyne (Vatican Observatory Foundation, 1988), and J.D. Barrow and F.J. Tipler, *The Anthropic Cosmological Principle* (Clarendon Press, 1986), Richard Swinburne, "Argument from the Fine-Tuning of the Universe" in *Modern Cosmology and Philosophy*, ed. John Leslie (Prometheus Books, 1998).

II. The Evidential Force of Temporal Regularities and Fine Tuning

Do these bits of evidence support the existence of God? And if so, how well?

Recall the following with respect to inductive or probabilistic reasoning in the form of *inference to best explanation*. A body of evidence *e* supports or confirms some hypothesis *h* to the extent to which (i) *h* leads us to expect *e* and (ii) *e* is otherwise inexplicable (e.g., other hypotheses do not lead us to expect *e*). Furthermore, we may add that (iii) when competing hypotheses both lead us to expect *e*, the simpler hypothesis is more likely to be true. In certain cases, (iv) fit with background knowledge is also important. (See below).

I will combine temporal regularity and fine-tuning into a single category, *significant cosmic order*, *O*. Let *G*, then, refer to the claim that there is a God, i.e., an immaterial, eternal, perfectly free, all-knowing, all-powerful, all-good being. *O* will support *G* to the extent to which *G* is a simple hypothesis that leads us to expect *O*, and where *O* is otherwise inexplicable or there are no alternative hypotheses that would lead us to expect *O*.

A. Does Theism Lead Us to Expect O?

Although theism may not lead us to expect any Universe at all (assuming that God is a perfectly free being), theism does lead us to expect O.

The Universe exhibits many good states of affairs. Some of these, symmetry and beauty, are directly the result of O. But many others are indirectly related to O. The temporal regularities and fine-tuning of the Universe are necessary preconditions for the emergence of life, especially intelligent life. The existence of living organisms, especially intelligent ones that are conscious, free, and have the power to act on their world in various ways is presumably a good thing. It is a good thing to be living (as opposed to non-living), conscious (as opposed to unconscious), to acquire knowledge (as opposed to being ignorant), and to act on the world by deliberate choice (as opposed to being a preprogrammed robot). But these goods are not possible without O. Furthermore, intelligent beings will be able to appreciate O or the beauty of the cosmos generated by O, and this is itself a good thing.

Does theism lead us to expect O? Yes, to the extent to which theism leads us to expect that, if there is a Universe at all, it will be one that exhibits many good states of affairs. First, God being all-powerful is able to bring about all these states and their prerequisites. Second, being all knowing, God would know exactly how to bring them about. Third, being all good, he has overriding reason to bring about these states. A good being will seek to bring about good states and not bring about bad states, and if the being is perfectly free, nothing will hinder Him from doing so. Hence, it is quite likely that, if God willed to create a Universe, that he would create one that exhibited the variety of intrinsic and instrumental goods exhibited in our Universe.

1. He would create a beautiful world, and orderly world is beautiful, whereas a chaotic world is ugly. The Universe is a theatre of great beauty: the movements planets around stars, the variety of stars, the billions of galaxies, each full of hundreds of billions of such stellar variety, vast cosmic regions of gaseous nebulae that glow with lovely colors and shapes. Then there is the evolution of this entire complex physical system itself from an initial subatomic particle to the formation of stars and galaxies stretching out over 10 to 15 billions years, as well as the process of biological evolution on at least our own planet and perhaps many others, a process of amazing ingenuity whereby nature itself brings forth a plethora of living beings. Even if there were no other beings to perceive this beauty other than God himself, it would still be a good thing.
2. But God would have good reason to create a Universe with living beings that are conscious and can learn and perform intentional actions. These are good states and animals exemplify these states. They have mental lives and experience pleasant sensations. The temporal regularities of the world allow them to learn and act on the basis of their knowledge.
3. But God would have an overriding reason to create human beings with a unique mental life, self-consciousness, and the ability to acquire knowledge and to freely choose and act on the basis of our knowledge, so as to bring about calculated effects. In this he would be making beings very much like himself. Furthermore, he would have good reason to make them with bodies. Embodied intelligent beings have a close relationship to their environment, are able to control their bodies and learn through the use of their body, and experience pleasant sensations. In this way, human beings, and other intelligent beings like us elsewhere in the Universe (if there be others like us) share in the creative likeness of their maker. God's generosity strong suggests that He would want to share these very qualities with other beings. And since there being actualized depends on the existence of temporal regularities, God has good reason to create a Universe that operates according to physical laws.

(1)-(3) are points made by Swinburne in *Is there a God?*

A. *Is O otherwise Inexplicable?*

1. Chance?

It should first be noted that given our background knowledge (the knowledge about the world we bring to this question), O is indeed very improbable. It is often argued *a priori* that since there are more ways a

system can be disordered than ordered, a Universe with significant order is indeed *a priori* unlikely. O certainly ranks in the category of significant cosmic order. Surely there are far more less interesting ways the Universe could have turned out. There are far more possible histories of the cosmos in which it is full of black holes, has no stars, is short-lived, or produces no life at all. Suppose we were to write down on separate pieces of paper all of the possible non-O-Universes (perhaps labeling them with blue marks), and do the same with all O-Universes (labeling them with red marks). If there are vastly more non-O-Universes than O-Universes, then a random draw is more likely to turn up a piece of paper labeled with a blue mark. The greater the number of blue labeled pieces and the fewer red labeled ones, the more inadequate an appeal to chance becomes to "explain" why a piece of paper with red labeling turned up on the first draw. The evidence of fine-tuning implies that the order exhibited in our Universe is striking. It is significant. O is quite unlikely if left wholly to chance.

Of course, fine-tuning does not say that life could *not* have arisen in other ways, that the actual laws and boundary conditions are necessary for life to emerge in any Universe. A slight variation in the actual laws and boundary conditions would negate the possibility of life, but change the laws and boundary conditions altogether and you could easily get other mechanisms or processes that would lead to the evolution of life, intelligent and otherwise, in a different sort of Universe. An O-Universe could exist with laws and boundary conditions very different from the ones in our Universe. But this does not show that the emergence of life, or a life conducive Universe, is not a special or unique phenomenon, nor does it in anyway reduce the *a priori* unlikely character of a Universe such as ours. For whatever set of laws or boundary conditions one selects which are conducive to the evolution of life, fine-tuning implies that slight variations in *those* laws and boundary conditions will foreclose the possibility of life emerging in *those* other systems. John Leslie used the example of a randomly thrown dart hitting a cherry hanging on a wall surrounded by a huge cherry-less region. This is no less surprising if there happen to be a handful of cherries in the neighborhood, even if they were scattered about at great distances on the same wall. Anyone who has tried to win a prize at a carnival by hitting a particular object with a dart, land a penny in a glass, or land a small ring around the top of milk bottle understands just how impressive the existence of an O-Universe is.

2. A Temporally Infinite Universe or Infinite Succession of Universes?

It might be argued that the probability of O is increased by postulating a single Universe that is temporally infinite or an infinite series of Universes following one after the other, a series of big bangs and expansions and then contractions ending in big crunches. After all, the likelihood of drawing a red labeled paper from the hat (in the above example) increases with the number of draws one gets, though the exact probabilities here depend on the exact number of blue to red ones and how many draws one gets. And someone eventually takes home the stuffed bear or lion at a carnival after hundreds or players have tossed in a good deal of money on the game.

As stated above, it seems plausible to suppose (setting aside certain qualifications arising from boundary condition constraints) that a Universe that is temporally infinite will likely throw up sufficient number of variations in its arrangements or energy-matter to make O more likely than if we simply assumed a temporally finite Universe of 10-15 billion years. Just how likely is another question though. But suppose the probability of O given a temporally infinite Universe was just as high as the probability of O given theism. Our background knowledge would reduce the plausibility of any infinite Universe theory. For instance, the second law of thermodynamics (according to heat is prevented to flow from cold bodies to hot ones, but is allowed to flow from hot bodies to cold ones) implies that the Universe is moving toward increased entropy or disorder. The principle is that all systems have a built in tendency toward increased entropy. But if the Universe is temporally infinite, it would have reached a stage of maximum entropy a finite time ago. But clearly it hasn't. So the Universe cannot be infinite in age. Also, the background radiation that bathes the Universe (confirming Big Bang cosmology) is somewhat of an anomaly in an infinitely old Universe. These were both problems for the modern version of an infinitely old Universe, the *Steady State* theory of Fred Hoyle.

An alternative view would be the so-called *Oscillating Universe theory*, according to which the present Universe was preceded by a prior Universe that collapsed. Hence, the Big Bang (of the present Universe) was the result of a Big Crunch (of a prior Universe). Would not O be likely given an infinite series of expansion-contraction phases of various Universe's, each with its own boundary conditions and laws? It seems that eventually there will be a Universe like ours in which life evolves because just the right conditions are finally satisfied. Perhaps so, if this hypothesis were otherwise plausible. But current physics and cosmology finds it unacceptable. First, the Universe must have sufficient mass for expansion to halt and initiate a collapse. At present, it is still unknown as to whether it has the critical mass. Secondly, any collapse would have to bounce back into an expansion phase before reaching a singularity (for nothing could come out of a Universe that collapses into a singularity). But there is no known repulsive law of physics strong enough to prevent the Universe from collapsing into a singularity and bounce the Universe back into an expansion phase.

Hence, neither of these views seems plausible as candidates for making O probable. This is not primarily because they don't make O probable (though that is itself controversial), but because they do not fit well with background knowledge. Moreover, one may equally question their overall simplicity as well.

III. Theism and the Many Worlds Hypothesis

A third possibility would be to postulate an infinite *number* of Universes. If there are an infinite number of Universes, and between them all logically possible states of energy-matter are exhausted, then it is highly likely, if not certain, that one of them will exhibit the conditions needed for life. It is highly probable, if not certain, that one of them will be an O-Universe. Compare. Although we may express surprise at the ten expert marksmen who all simultaneously miss the same target 30 feet away, we will not be surprised if this shooting test was conducted with the same ten men over a million times. Indeed, if there were an infinite number of such events, we'd be inclined to say that eventually there would be an event in which they all miss the target. As indicated above, the vastly improbable does happen sometimes given a large enough collection of events or instances.

This is perhaps the best rival hypothesis to theism to explain O. Like the rivals above, it certainly seems to increase the likelihood of O to at least equal that of theism. But unlike the other suggestions above, it does not necessarily come into conflict with any obvious background knowledge. What needs some degree of clarification though is the idea of a "distinct" Universe.

A. Spatially and Temporally Multiple Universes

Some take our Universe to be the observable Universe, or what will be at some point observable to us. Other worlds would, then, be *spatially removed* from our observable region of space. Although it plausible to suppose that there are other worlds in *this* sense, it seems highly unlikely that these other regions of space would differ significantly from the observable Universe with respect to their fundamental laws and boundary conditions. First, these other regions remain causally connected to our own Universe, and this is reason good to suppose that these other regions possess the same fundamental laws and boundary conditions. Otherwise, it would be difficult see what it would mean for them to be *connected* to our space. Secondly, if they are causally connected to us we could in principle have knowledge of them. But we could not acquire any knowledge of these other regions unless we assumed that similar laws obtained there. In other terms, the hypothesis of there being other universes with different laws cannot be falsified, for this would itself presuppose that those regions of space have the same fundamental laws as our own, or at least some of the same ones. Otherwise, we could make no sense of any data coming to us from them. So the inability in principle even to acquire knowledge about these other Universes implies that they are not causally connected to our own, but then they are distinct in some sense other than simply being removed spatially from our region of the Universe. Third, the observable isotropy of the Universe suggests that other distant regions of space have the same arrangement of matter-energy, though in principle we could discover that things were different in distant regions. Distant regions of the Universe, observed through telescopes, are roughly the same in their basic features whether viewed in the southern or northern sky. It seems

reasonable to suppose that what is presently unobservable is like this too, given that successive new observations continue to conform to the isotropy thesis.

Hence, if we treat spatially distinct regions of the Universe as distinct Universes they most likely have the same fundamental laws and boundary conditions of our Universe, and so subject to same fine-tuning argument as our own Universe. Put slightly differently, if the other Universes do not have different laws and boundary conditions, the Many Worlds Hypothesis loses its force. It is only by postulating a variety of Universes that differ with respect to their laws and boundary conditions that one increases the probability that one of them will have the prerequisites for life. Moreover, the same sort of argument will hold if we treat temporally distant parts of our Universe as different Universes. For instance, any evidence we have to the effect that there once was such a Universe would be that it provides a good explanation for the Universe's existence today, but that involves a commitment to the notion that the past and present Universes are causally connected. They would have to have the same fundamental laws and boundary conditions. Big Bang cosmology, for example, allows us postulate a time in the very distant past time, at 10^{-43} sec. of the Universe's existence, when the Universe was no larger than a sub-atomic particle - very different from the Universe for most of its history. But this "quantum Universe" would operate according to quantum laws, which are applicable at later times at the quantum level. And our only reason for supposing that such a Universe existed then is that it explains how the macro Universe evolved. But this presupposes that the micro and macro Universes are causally connected to each other, and so involve the same fundamental laws and boundary conditions. (Similar results would follow with respect to Universes temporally removed into the future).

It would seem advantageous to the Many Worlds Hypothesis that the other Universes be defined in such a way that they are not *causally* connected to our own Universe. If this is not the case then it would seem that the other Universes would not vary considerably from our own, at least not with respect to fundamental laws and boundary conditions. The causal connections that are retained between merely spatially removed or temporally removed regions of our Universe undermines the idea that these worlds would be different in their fundamental features, and that point undermines the point to the Many Worlds Hypothesis, namely to increase the probability of O without appealing to theism.

B. Simplicity and the Many Worlds Hypothesis

But the postulation of many worlds not spatially (or temporally) related to our own seems to be a very complex theory for which there is little evidence (and no evidence other than that it would lead us to expect O). The Many Worlds Hypothesis offers an alternative hypothesis to explain O. It does not deny that theism explains O. It merely points out that there is some other hypothesis, consistent with there being no God, that explains O equally well.

Here it is important to remember that the probability of a hypothesis given certain evidence is not merely determined by the extent to which the hypothesis leads us to expect the evidence or observation in question, but also on the simplicity of the postulated hypothesis. When two hypotheses each leads us to expect what we observe, the simpler hypothesis is more likely to be true. Theism is simpler than the Many Worlds hypothesis on two counts. First, theism postulates only a single being, not many entities, let alone an infinite number of entities. It is far simpler to postulate a single entity to explain one other entity than to postulate many or an infinite number of entities to explain one. Secondly, in theism the being postulated is itself very simple. Theism postulates a being with unlimited power, knowledge, and freedom. If theism were to postulate a being with only limited power or knowledge, the question would arise as to why the being had just that amount of power and knowledge and not more. Some other cause or condition must be assumed to account for the fact that the being is limited in the way that it is. Hence, a hypothesis involving a being with finite capacities is less simple than a hypothesis than involves a being with unlimited capacities, for in the latter case there is no implicit commitment to the existence of additional conditions or causes.

For this reason, "zero" and "infinity" is each a simple state. This explains their frequency in science. According to Newtonian physics gravitational force travels with infinite velocity, even though a finite

number here would have had the same predictive power. In the medieval period, people believed that light traveled with an infinite velocity. Of course, both of these assumptions were in fact incorrect, but they were not rejected until alternative hypotheses permitted greater predictive power. Similarly, photons are said to have zero mass when stationary, as opposed to some finite value, though both would be equally useful in making successful predictions.

Now the Many Worlds Hypothesis fails to equal the simplicity of theism on two counts. One postulates either trillions or an endless *number* of entities instead of one, so it is quantitatively more complex than theism. Furthermore, even if we suppose that an *infinite* number of Universes is simpler than a finite number of Universes and at least as simple as a single being, it is what this infinity modifies that creates problems. For although there is no limit to the number of Universes if there is an infinite number of them, each Universe raises independent questions of complexity, which is not avoided when they are considered collectively under the category of an "infinite" number. Most of them will be limited in various ways as spatial-physical systems and consist of various bits and chunks of matter and operate according to various laws. Many of the vast number of Universes postulated in the Many Worlds hypothesis will be ontologically complex due to their spatial and temporal extension, as well as their ontological constitution of matter-energy, laws, and boundary conditions. So determining simplicity requires that one consider the sort of entities being considered, as well as the number of them. Theism comes out in far better shape given this criterion of simplicity.

As Swinburne writes:

The postulation of the actual existence of an infinite number of worlds, between them exhausting all the logical possibilities, many of them consisting of an infinite quantity of matter-energy behaving in accord with simple laws over infinite time, which are not caused by anything else, which do not, which do not causally affect each other, but which between them exhaust the logical space without any one being qualitatively identical to any other, is to postulate complexity and non-prearranged coincidence of infinite dimensions beyond rational belief. ("Argument for the Fine-Tuning of the Universe," in *Modern Cosmology and Philosophy*, p. 178)

Also, even if the Many Worlds hypothesis and theism were equally simple, theism would still have an explanatory advantage. Although each hypothesis would lead us to expect an O-Universe, the Many Worlds hypothesis would still leave the existence of an infinite number of worlds a brute fact. But surely this will be just as mysterious as the existence of one world, if not more so. Theism has the ability to explain this fact. Hence, when the evidence in question includes the very existence of the Universe, or an infinite number of them, since such states of affairs are highly unlikely in themselves, theism has the power to explain to some degree. What is otherwise inexplicable can be made explicable by the theistic hypothesis.

C. The Range of Many Worlds

Also, it would seem that the infinite number of Universes must either range over all logical possibilities or not. If not, then a question arises as to whether an infinite number of Universes would inevitably contain one that is life conducive. If the Universes exhaust logical possibilities, surely this is inevitable. But if they do not exhaust all logical possibilities one would have to guarantee enough diversity between these Universes to make a life conducive Universe likely, while putting some sort of limit on what these worlds could be like. But the limit would have to be something other than logical possibility, and it looks like all such limitations would be highly arbitrary. After all, why should each of the other Universes be significantly different from ours? But if the Universes exhaust all logical possibilities, then theism is ultimately unavoidable. One logical possibility is that God created all the Universes. So if the Universes exhaust logical possibilities, they would all have to be created by God. In fact, this follows simply from God being the creator of one of the many Universes, if we take God's necessity to be logical. If there is a single Universe, from among the infinite number of Universes, that is created by God as a logically necessary being (certainly a logical possibility), then every one of the infinite number of Universes will be created by God. A logically necessary being exists in all possible worlds, so since the infinite number of

worlds represents the actualization of all possible worlds (since they exhaust what is logically possible), God must be the creator of all of them.

Hence, the Many Worlds hypothesis that allows logical possibility to determine the range of variation among worlds creates an interesting paradox. It certainly entails the existence of a Universe with temporal regularities and fine-tuning, but it also entails the existence of God! Avoiding this seems to require an arbitrary restriction on the variation of the infinite number of Universes.

IV. Final Thoughts

A. The Anthropic Principle

There is one additional argument that might be used to reduce the plausibility of the theistic argument from temporal regularities and fine-tuning. This is the so-called *anthropic principle*, or more specifically a particular interpretation of the anthropic principle. This principle states that the laws and boundary conditions must be the way they are, otherwise no one would be present in the Universe to observe the fact. The particular interpretation of this that is relevant here is the notion that since we would not be here to observe things if there were no order, then the fact that there is order is not very surprising. We could observe nothing else!

The answer to this is quite simple. Although it is certainly true that we would not be present to observe a Universe that lacks the prerequisites for life, a Universe with significant disorder, it hardly follows that the order that exists is not surprising. The objection here is analogous to the following. If 100 marksmen aim at a prisoner to execute him, and they all fire simultaneously and miss, surely the prisoner could say, "I would not be able to make this observation that 'they all missed me' if they had not missed." In other words, "I am able to make this observation only because they missed." Yes indeed. But it seems absurd to suppose that this fact undermines the need to find an explanation for the fact that the marksmen did in fact miss. Naturally the prisoner could not have observed anything but what he observed, but his observation still demands some sort of explanation. The argument from temporal regularity and fine-tuning does not depend ultimately on the fact that we observe order, but that the order is there, independent of us. So this objection, based on the anthropic principle, is not a good one to undermine a theistic argument from temporal order and fine-tuning.

B. Summarizing the Argument

A theistic argument following the pattern of inference to best explanation properly depends on (at least) three relevant bits of evidence: (e1) the existence of the Universe, (e2) the temporal regularities of the Universe, and (e3) the fine-tuning of the Universe. Theism is made probable by $e1, \dots, e3$ to the extent to which theism is a simple hypothesis that leads us to expect $e1, \dots, e3$, and $e1, \dots, e3$ is not otherwise to be expected. The claim here is with respect to theism these conditions are satisfied, and thus that there is a significant likelihood of there being a God given $e1, \dots, e3$.

Alternate explanations of $e1, \dots, e3$ are inadequate.

1. Chance does not lead us to expect $e1, \dots, e3$.
2. A temporally infinite universe, or infinite succession of universes, might lead us to expect $e2$ and $e3$, but neither would lead us to expect $e1$, and neither would fit with our relevant background knowledge (in the area of physics and cosmology).
3. The Many Worlds hypothesis leads us to expect $e2$ and $e3$, but not $e1$. But it is a more complex hypothesis than theism. Furthermore, too many constraints on the range of diversity of worlds reduces the probability of $e2$ and $e3$, but too few constraints open the way for theism, as for

instance if logical possibility determines the range of worlds, for a world created by God is one such logical possibility.