

§ 4. Excursus on Natural Theology
Lecture 16
Is the Fine-Tuning Explained By Chance?

Today we want to continue our discussion of the design argument for God's existence based upon the fine-tuning of the universe. We saw that the fundamental constants and boundary conditions of the universe are fine-tuned for the evolution and existence of embodied conscious agents in a degree that is incomprehensibly delicate as well as complex. There are three explanations for this incredible fine-tuning available in the literature. One is physical necessity – that the constants and quantities have to have the values they do. The other is chance. And the third is design. We've already seen that the first alternative – that this is a matter of physical necessity – is highly implausible. This is contrary to the best evidence of science. The best evidence indicates that these constants and quantities are independent of the laws of nature, and that there is nothing physically that would determine that they should have the finely tuned values that they do.

That leads us to the second alternative, and that is *chance*. Could the fine-tuning of the universe just be the result of chance? According to this alternative it is just an accident that all of the constants and quantities fall into the infinitesimal life-permitting range. We just basically lucked out. The fundamental problem with this explanation is that the chances of a life-permitting universe's existing are so remote that this alternative becomes unreasonable.

Sometimes people will object that it is meaningless to speak of the probability of a fine-tuned universe's existing because there is, after all, only one universe. So you can't say, for example, that one out of every ten universes is finely tuned to be life-permitting. I've already addressed that question in our discussion time, but I do want to go through it again just to cement the point.

John Barrow, who is a Cambridge University physicist, gives the following illustration of the sense in which it can be said that it is highly improbable that a finely tuned universe should exist. Barrow said let's imagine a sheet of paper and put on it a dot representing our universe. Now alter some of the fundamental constants and quantities by just tiny amounts. That will then be a description of a new universe. If that universe is life-permitting, make it another red dot. If it is life-prohibiting, we will make it a black dot. Then do it again, do it again, and do it again until your sheet of paper is filled with dots. What you wind up with is a sea of black with only a couple of pinpricks of red in the field. It is in that sense that it is overwhelmingly improbable that the universe should be life-permitting. There are simply many more life-prohibiting universes than life-permitting universes in our local area of possible universes.

Sometimes people will appeal to the example of a lottery in order to justify the chance alternative. In a lottery in which all of the tickets are sold it is fantastically improbable that any one person should win the lottery. Yet, *somebody* has to win if all the tickets have been sold! So it would be unjustified for the winner (whoever he might be) to say something like, “Well, the odds of my winning were twenty million to one. The lottery must have been rigged to make me win!”¹

In the same way, these people will say *some* universe out of the range of possible universes had to exist, and the winner of the universe lottery would also be unjustified if he thought that because his universe exists this must have been the result of design and not chance. *All* of the universes are equally improbable, and yet some universe had to exist. So the one that does exist would exist simply by chance alone and it would be unwarranted to conclude that it was a result of design.

This lottery analogy is actually very helpful because I think it enables us to see where the objector has gone wrong – where he has misunderstood the argument from fine-tuning – and then to offer a better and more accurate analogy in its place. Contrary to popular impression, the argument for design is not trying to explain why *this* particular universe exists. Rather it is trying to explain why *a life-permitting* universe exists. The lottery analogy was misconceived because it focused on why a particular person won.

The correct analogy to the fine-tuning argument would be a lottery in which billions and billions of white ping pong balls were mixed together with just, say, one or two orange ping pong balls, and you were told then that one ball will be randomly selected out of this horde. If it is orange, you will be allowed to live. If it is white, you will be shot. Notice that any particular ball that is chosen is equally improbable. No matter which ping pong ball rolls down the chute, the odds against that particular ping pong ball will be fantastically improbable. But some ball must roll down the chute. That is the point that is illustrated by the first lottery analogy. Somebody has to win. Just because that particular ball is highly, highly improbable would not justify a design inference. But that point is irrelevant because we are not trying to explain why this particular ball was picked.

The relevant point, rather, is that whichever ball rolls down the chute it is overwhelmingly, incomprehensibly more probable that it will be white rather than orange. Getting the orange ball is no more improbable than getting any particular white ball, but it is incomprehensibly more probable that whichever ball you get it will be white rather than orange. So if the orange ball does roll down the chute allowing you to live, you certainly should suspect that the lottery was rigged to let you live.

If you don't see the point of this analogy, imagine then that an orange ball had to be picked five times in a row randomly in order for you to live. If the odds against the

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orange ball being picked even once are great enough, having it happen five times in a row won't materially affect the probabilities. But obviously if such a thing happened – if five times in a row the orange ball came down the chute – everyone would recognize that it did not happen by chance. Somehow this was rigged.

So in the correct analogy you are not interested in why you got the particular ball that you did; rather, we are puzzled by why, against overwhelming odds, you got a life-permitting ball rather than a life-prohibiting ball. That question just isn't addressed by saying "some ball had to be picked, and any particular ball is equally improbable." In exactly the same way, some universe has to exist, but whichever universe exists it is incomprehensibly more probable that it will be life-prohibiting rather than a life-permitting universe. We still need some explanation as to why a life-permitting universe exists.²

START DISCUSSION

Student: To comment more on the objector's analogy that something had to be chosen, you could say yes one has to be chosen but what about if you had the conditions that the person selected to win the lottery also had to be a 46-year old male, 5 foot 10, 195 pounds, and on and on and on.

Dr. Craig: Yeah, I use life-permitting but William Dembski, I think, used an example of what if every time the lottery was won it was won by someone who was a member of the Mafia. Wouldn't you get a little bit suspicious? It is kind of similar here. Why is it that against all the odds it is a life-permitting universe that exists?

Student: On the lottery analogy, don't you think it is not the case that some lottery player has to win. I think in, like the Power Ball that we just saw last week, it could be that nobody matches all the numbers so nobody wins and the jackpot rolls over. On the universe side of the discussion, it could be that no universe would exist. It is not that some person had to win. Somebody has to match all the numbers in order to win, and that may not happen at all.

Dr. Craig: I used the analogy of a lottery in which all the tickets are sold so that a winner is guaranteed of buying the winning ticket.

Student: That is a different kind of game, though.

Dr. Craig: The reason I did that is because if you say it is not true that some universe has to exist – there could have just been nothing – it seems to me that that kind of bleeds over into the Leibnizian cosmological argument asking "why is there something rather than nothing?". That is a great question – why does a contingent universe exist at all? Couldn't there have been nothing? But just for the sake of argument, to keep the fine-tuning argument as independent from these other arguments as possible, I was willing to

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concede for the sake of argument that some universe had to exist. But, as you say, that is not true. If the universe is a contingent being, no universe had to exist.

Student: Isn't it true that there really is no true random lottery? That they use some mathematical algorithm that can be solved? Is that the case that you could reverse engineer any lottery? I thought I read about that.

Dr. Craig: I haven't read about that. In one sense, when we are talking about winning by chance, we don't mean that it is indeterministic. Obviously there are factors that cause which ball to be chosen than some others. You are dealing with a deterministic situation here. I think that is true. Unless you believe in quantum indeterminacy and had some sort of quantum indeterminacy device be responsible for selecting the winning ball. But if you are dealing with ordinary classical physics then you are quite right in saying that it is by chance only in the sense that independent causal lines come together to produce the effect. But not that it is uncaused or literally indeterminate.

END DISCUSSION

Some people have argued that no explanation is needed for why we observe a life-permitting universe because that is the only kind of universe we could observe. If the universe were not life-permitting then we wouldn't be here to ask about it. This is the so-called *Anthropic Principle* which says that one can observe only properties of the universe which are compatible with our existence. Obviously, it would be impossible for us to observe properties of the universe incompatible with our existence because we wouldn't be there. So the Anthropic Principle says you can only observe properties of the universe which are compatible with our existence, and therefore since you observe those kinds of properties, you shouldn't be surprised about it. There is no explanation necessary.³

This reasoning is fallacious. The fact that we can only observe life-permitting universes does nothing to explain why a life-permitting universe exists. The fact that that is the only kind that we can observe doesn't remove the need for an explanation of why such a universe does exist.

Again, an illustration can help here. Suppose you are traveling abroad and you are arrested on trumped-up drug charges and dragged in front of a firing squad of one hundred trained marksmen at point-blank range, all of them with rifles aimed at your heart. You hear the command given, "Ready! Aim! Fire!" And you hear the deafening roar of the guns. And then you observe that you are still alive! That all of the one hundred marksmen missed! Now, what would you conclude? "Well, I guess I really shouldn't be surprised that they all missed. After all, if they hadn't all missed I wouldn't be here to be surprised about it. Given that I am here, I should expect them to have missed." Well, of

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course not. It is true you shouldn't be surprised that you don't observe that you are dead, because if you were dead you wouldn't be able to observe it. But you should still be surprised that you do observe that you are alive in light of the enormous improbability of all one hundred marksmen missing. In fact, you'd probably conclude if this happened that they all missed *on purpose*, that the whole thing was a set-up, engineered for some reason by someone.

Therefore, theorists have come to recognize that the Anthropic Principle will not eliminate the need of an explanation of the fine-tuning unless it is conjoined with a so-called *Many Worlds Hypothesis* or *multiverse hypothesis*. According to the Many Worlds Hypothesis our universe is just one member of a World Ensemble of parallel randomly ordered universes, preferably infinite in number. Often this ensemble is called the multiverse. If all of these other universes really exist and they are randomly ordered in their constants and quantities then by chance alone life-permitting worlds will appear in the ensemble. Since only finely tuned universes have observers in them, any observers existing in the World Ensemble will naturally look out and observe their worlds to be finely tuned. So the claim is no appeal to design is necessary in order to explain fine-tuning.

So the conjunction of the Anthropic Principle with the Many Worlds Hypothesis or multiverse is said to eliminate the surprise that we have at observing a finely tuned universe and any need of an explanation beyond sheer chance. Given that there is an infinite number of parallel universes, and that they are randomly ordered in their constants and quantities, life-permitting worlds will exist in the Ensemble and only such worlds will have observers in them. So of course the observers see their world to be finely tuned.

Before I comment on the World Ensemble hypothesis, let's just be sure we all understand it – how it is an attempt to rescue the alternative of design, and how it explains the fine-tuning of the universe that we observe.

I think it is worth pausing for a moment here to reflect on what is going on. The current debate over the fine-tuning of the universe has now become a debate over the Many Worlds Hypothesis. I am not exaggerating. This hypothesis is at the heart of the discussion today. In order to explain fine-tuning, we are being asked to believe not only that there are other unobservable universes but that there are an infinite number of these universes, and moreover that they randomly vary in their constants and quantities.⁴ All of this is needed in order to guarantee that life-permitting universes like ours will appear by chance in the ensemble. This is really extraordinary when you think about it. It is a sort of back-handed compliment, if you will, to the design hypothesis. Because otherwise sober

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scientists would not be flocking to adopt so speculative and extravagant a view as the Many Worlds Hypothesis unless they felt absolutely compelled to do so. The fact that many theorists are turning to the Many Worlds Hypothesis to rescue the alternative of chance is perhaps the best evidence that the appeal to chance is in trouble. The odds against the existence of a life-permitting universe are just too great to be faced unless you embrace the hypothesis of a World Ensemble.

In fact, when I was doing the seminar on fine-tuning last summer at St. Thomas University, one of the other professors in the seminar was Neil Manson, professor of philosophy. Neil had done an extraordinary sociological survey of contemporary cosmologists about issues like fine-tuning. I think this is the first and only such sociological survey done by a reputable organization published in a peer-reviewed journal that I know of. What Manson asked the cosmologists was, "Do you think that other theorists who adopt the multiverse hypothesis do so in order to avoid the design hypothesis?" He was very clever to ask it that way. He didn't ask "Do *you* adopt it for that reason?" That would make them have to confess, "Yes, I as a scientist am really trying to avoid design, and that is why I believe in the World Ensemble." No, he said, "Do you think your colleagues who believe in the multiverse are motivated by a desire to get away from design?" He didn't mention God; he mentioned design. What he found was that over 50% of the respondents said that they did believe that in fact a large part of the motivation among contemporary cosmologists for belief in the World Ensemble or multiverse hypothesis was because they wanted to avoid the idea of a cosmic designer.

The next time somebody says to you, "Oh, well, it could have happened by chance!" or "The improbable happens!" or "It was just dumb luck!" then ask them, "If that is the case, why do the detractors of design feel compelled to embrace an extravagance like the World Ensemble hypothesis in order to avoid design?" The fact that they would resort to such a metaphysical hypothesis I think is, as I say, the best evidence that the chance hypothesis is in deep trouble.

How might one respond to the Many Worlds Hypothesis? At one level, one might think this is a metaphysical view that would not be susceptible to scientific evidence or adjudication. You just have a standoff between divine design and multiverse or World Ensemble hypothesis. But, in fact, I think that there are some real problems with the World Ensemble hypothesis that make it less preferable to the design hypothesis.

One way to respond to the Many Worlds Hypothesis would be to show that the multiverse itself also requires fine-tuning. In order to be scientifically credible, some plausible mechanism has to be suggested for generating the many worlds in the ensemble. But if the Many Worlds Hypothesis is to be successful in attributing fine-tuning to chance alone, then the mechanism that generates the many worlds had better not be fine-tuned

itself. Otherwise, you've just kicked the problem upstairs, and the whole debate arises all over again on the level of the multiverse.⁵

But the proposed mechanisms for generating a World Ensemble are so vague that it is far from evident that the physics governing the multiverse will be free of any fine-tuning. For example, if M-Theory, or superstring theory, which we briefly talked about the other day, is the physics generating the World Ensemble then it remains unexplained, as we've seen, why exactly 11 dimensions exist. The mechanism that actualizes all of the possibilities in the so-called cosmic landscape may also involve fine-tuning. So just postulating a World Ensemble isn't sufficient to get rid of the alternative of design. You'd have to provide a scientifically credible model of the multiverse that doesn't involve fine-tuning itself. And nobody has been able to do that.

A second response to the Many Worlds Hypothesis is that many theorists are skeptical that these many worlds even exist. Why should we think that a World Ensemble of other invisible universes actually exists? There really isn't any evidence that the sort of World Ensemble required by the multiverse hypothesis is actually real. Even if there were other universes, there is no reason to think that they are randomly ordered or that they are infinite in number. So, as George Ellis, who is perhaps the most famous cosmologist in the world today, has emphasized, the Many Worlds Hypothesis as it stands today is not a hypothesis that is capable of scientific proof. By contrast with this, we have good independent reasons for believing in a designer of the universe; namely, Leibniz's cosmological argument and al-Ghazali's *kalam* cosmological argument. The design hypothesis enjoys independent reasons for thinking that such a being exists whereas there is no independent reason for thinking that the World Ensemble exists. It is simply postulated to explain the fine-tuning without any independent evidence for thinking that there is such a thing.

Moreover, thirdly, the Many Worlds Hypothesis faces what may be a truly devastating objection. Do you remember when we talked about the thermodynamic properties of the universe, we discussed Boltzmann's Many Worlds Hypothesis? You will remember that the Austrian physicist Ludwig Boltzmann tried to explain away the current disequilibrium of the universe by a kind of Many Worlds Hypothesis. He said that the universe as a whole really is in a state of equilibrium but there are just little pockets of disequilibrium throughout the universe, and these are different worlds. He called them "worlds" and we are one of these little pockets. We are one of these worlds. You will recall what sank Boltzmann's hypothesis was that if our world is just a random member of a World Ensemble like this, then it's vastly more probable that we should be observing a much smaller region of order than the vast universe that we do. In order for us to exist, all you would need would be a small fluctuation from equilibrium, say, enough to

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produce our solar system and not an entire universe which exists in such a state. It turns out that a parallel problem faces the Many Worlds Hypothesis as an explanation of cosmic fine-tuning.

The Oxford University physicist Roger Penrose has pressed this objection with great force. Penrose points out that the odds of our universe's initial low entropy condition existing by chance alone are somewhere on the order of one chance out of $10^{10(123)}$. A truly incomprehensible number.⁶ By contrast the odds of our solar system's forming by just a random collision of particles, Penrose calculates to be about one chance out of $10^{10(60)}$. A number which is so tiny in comparison to $10^{10(123)}$ that Penrose calls this number "utter chicken feed" in comparison with $10^{10(123)}$. What that implies is that it is far more likely, incomprehensibly more likely, that we should be observing an orderly universe no larger than our solar system, since a world like that would be unfathomably more probable than a finely tuned universe like ours.

In fact, we wind up with the same sort of illusionism that attended Boltzmann's hypothesis. A small world with the illusion of a wider universe is more probable than a real fine-tuned universe. It would be more probable that we really do inhabit a little tiny universe and that the stars and the planets we observe are just illusions, pictures as it were, on the heavens and not real stellar extra-nebular bodies that exist out there in the universe. Carried to its logical extreme, this has led to what has been called among physicists "the invasion of the Boltzmann brains" - reminiscent of a 1950s grade-B horror movie. For the most probable universe that could exist would consist of a single brain which fluctuates into existence out of the quantum vacuum by a random quantum process with illusory perceptions of an external world around it! So if you accept the Many Worlds Hypothesis, you would be obligated to believe that you are the only thing that exists and that this class, the people around you, your family, your own body, all of these things are simply illusions that you project. In fact, you are really a Boltzmann brain.

No sane person believes that he is a Boltzmann brain. On atheism, therefore, it's highly improbable that there exists a randomly ordered World Ensemble. In fact, here is the irony, the best hope for the multiverse or World Ensemble Hypothesis is theism. The best hope for this is to say that God has created the World Ensemble and he has ordered its worlds so that they're not randomly ordered. God could give a preference to observable worlds which are cosmically fine-tuned. To be rationally acceptable, the Many Worlds Hypothesis really needs God because if there is no God on naturalism alone it would be highly, highly improbable that we should be observing this fine-tuned universe. It would be far more likely to believe that you are a Boltzmann brain.

START DISCUSSION

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Student: I would think another physical objection would be if we have an expanding universe and we have CBR at a certain temperature coming from all directions that you would have an interference with other universes, especially if they were expanding and they were doing similar things.

Dr. Craig: Here, if I could interrupt in the interest of time, the idea is that our universe is like a bubble in a wider mother universe that is also expanding. So the bubbles don't run into each other because the mother universe is growing so fast that the bubbles don't collide with each other.⁷ They become separated. They can't keep up. Again, you see a little bit of the way in which the hypothesis needs to be finessed in order to avoid these problems.

Student: I was just wondering about when they postulate the multiverse they say an infinite amount of universes. How do they know it's an infinite amount? Setting aside the issues I know you have with actual infinities, how do they know it is not just – what if it's just 100 universes out there? Or maybe there is just 50, or 10 universes?

Dr. Craig: Or even a trillion. That's not going to be enough given the numbers we are dealing with. I think you are absolutely right. This is a particularly poignant question if the universe-generating mechanism that makes these bubbles has only been chugging away for a finite amount of time. We've already seen that the best evidence of contemporary cosmology is that the universe began to exist about 13.7 billion years ago or so. So how do we know, as you say, that there has been enough time for such a World Ensemble to be created? It is completely ad hoc, that is to say contrived.

END DISCUSSION

With the failure of the Many Worlds Hypothesis, the last ring of defense for the alternative of chance collapses. It seems that neither physical necessity nor chance provides a good explanation of the fine-tuning of the universe.

So what about design? Is design any better an explanation of the fine-tuning of the universe? Or is it equally implausible? That will be the question that we take up next week.⁸

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⁸ Total Running Time: 37:27 (Copyright © 2016 William Lane Craig)