Teleological Argument

God is the best explanation for the fine-tuning of the universe

Like the previous argument, this is a probability argument. Are the premises more probable than their negation?

For since the creation of the world His invisible attributes—His eternal power and divine nature—have been clearly seen, because they are understood through what has been made. (Rom 1:20)

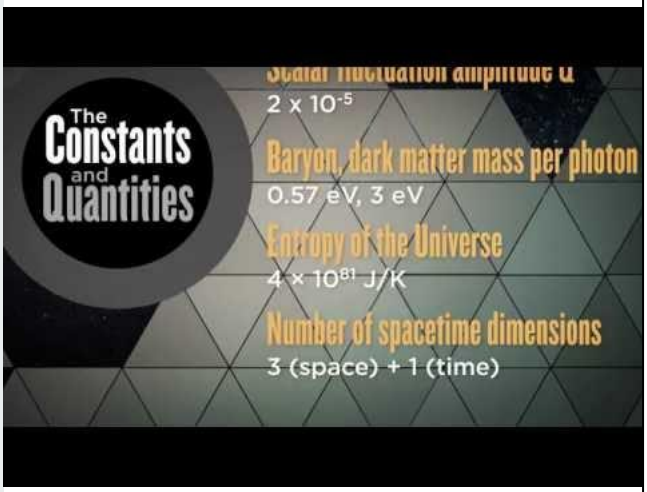
The universe testifies to the existence of God the Creator and Sustainer.

Contemporary Physics Demonstrates Fine-Tuning

- In order for *any life*, of *any kind*, to exist, the universe's fundamental constants must fall within a VERY small range.
- Intelligent life depends upon a complex and delicate balance of initial conditions given in the Big Bang itself.

- The teleological argument notes that empirical evidence suggests that the universe is exquisitely fine-tuned for the existence of intelligent, interactive life.
- The **fundamental constants and quantities of nature** must fall into an incomprehensibly narrow life-permitting range.
- Each one constants and quantities are astoundingly precise by themselves (we'll look at this for six of them below), but remember, all them must also be there at the same time and play nicely together with the others. This makes the odds that much crazier!
- It might help to visualize what I'm saying. Take a look at this great video from William Lane Craig's ministry, *Reasonable Faith*.

Fine-Tuning Argument



What is Fine-Tuning?

- It does *not* mean "designed." (That would make the argument circular.)
- Intelligent life depends upon a complex and delicate balance of initial conditions given in the Big Bang itself.

The term fine-tuned does not mean "designed." The expression is a *neutral* term that doesn't say anything about how the fine-tuning is best explained. Fine-tuning just means that *the range of life-permitting values for the constants and quantities is extremely narrow*. If the value of even one of these constants or quantities were to be altered by a hairsbreadth, the delicate balance required for the existence of life would be upset and the universe would be life-prohibiting instead.

Two Kinds of Fine-Tuning

1. Physical laws of nature contain *constants* (e.g., Gravitational Constant) with particular values.
2. Certain arbitrary *quantities* that are put in just as initial conditions on which the laws of nature operate (e.g., amount of entropy).

1. The physical laws of nature, when given mathematical expression, contain various *constants* (e.g., gravitational constant) whose values are *not determined by the laws of nature*; a universe governed by such laws might be characterized by any of a wide range of values for these constants. These unchanging quantities are called constants. *The laws of nature do not determine the value of these constants*.
2. Certain arbitrary *quantities* that are put in just as initial conditions on which the laws of nature operate (e.g., amount of entropy). Because these quantities are *arbitrary*, they're also not determined by the laws of nature.

What would happen if any of these were changed?

Answer: Minute Change = Great Death

Example: change in the strength of the atomic weak force by only one part in $\mathbf{10^{100}}$ would prevent life

Remember, the slightest change leads to total death.

The Teleological Argument

1. The fine-tuning of the universe is due to either physical necessity, chance, or design.

Premise 1

There are only three options. If you can come up with another alternative, please let me know what that is.

The Teleological Argument

1. The fine-tuning of the universe is due to either physical necessity, chance, or design.

2. **It's not due to physical necessity or chance.**

Premise 2

This is an assertion that will have to be defended.

The Teleological Argument

1. The fine-tuning of the universe is due to either physical necessity, chance, or design.

2. It's not due to physical necessity or chance.

3. **Therefore, it's due to design.**

Conclusion

If the second premise is adequately defended, then the conclusion follows.

The Teleological Argument

1. The fine-tuning of the universe is due to either physical necessity, chance, or design.

2. It's not due to physical necessity or chance.

3. Therefore, it's due to design.

Let's take a look at each of the premises and see if they hold water.

Premise 1

- **Physical Necessity** - The constants and quantities must have the values they do. It can *only* be this way.
- **Chance** - The constants and quantities have the values they do simply by accident. We got lucky.
- **Design** - The constants and quantities were designed to have the values they do. An intelligent mind (God) created the universe.

Very few people object to Premise 1 because there are just no other options. Can you think of another option?

The first alternative, physical necessity, states that the universe *had to be that way*, and there was really little to no chance that the universe would not be life-permitting. It would impossible for the universe to be otherwise.

The second alternative, chance, states that a life-permitting universe is entirely due to chance. It's just a happy accident.

The third alternative, design, favors an intelligent Mind that designed the cosmos to be life-permitting.

Premise 2 - Which of these in the first premise is most probable?

- **Physical Necessity** - constants are *independent* of nature's laws
- **Chance** - the probability is too slim
- **Design** - most plausible by default

But what about Premise 2 — it is not due to physical necessity or chance?

Premise 2 addresses the question: *Which of these alternatives is the best explanation?*
–Alternative 1 is implausible because the constants and quantities are independent of the laws of nature. Now on the face of it, this alternative seems fantastically implausible. **It would require us to say that a life-prohibiting universe is a physical impossibility.** But why take such a radical view?
–Alternative 2 is implausible because the odds against such a universe is so incomprehensibly great that it can't be reasonably faced.
–Alternative 3 is the most plausible explanation.

We can rule out physical necessity because these constants are independent of the laws of nature.

But what about chance? Maybe there is a good chance that this universe could be balanced like this?

In order to make sense of this, we need to understand something about the constants. Let's look at 6 of them. (Martin Rees' book, *Just Six Numbers*).

We must also understand something about probability. When numbers get large, scientists use shorthand to describe the numbers. You'll remember "powers" or "exponents" from math class.

For example, the number of seconds in the history of the universe is about $10^{17.64}$.

Grains of Sand on Earth

10^{20} - 10^{24}

One grain of sand contains about 78 quintillion atoms (78,000,000,000,000,000,000 or 7.8×10^{19}). Imagine how many grains of sands there are on the earth [about 10^{22}]. Numbers with exponents are deceptively large despite how small they can be written in such shorthand. Consider that there are about 10^{80} atoms in the entire universe; this seems like such a small number, but it is unimaginably large.

Number of Atoms in the Universe

10^{78} - 10^{82}

Consider that there are about 10^{80} atoms in the entire universe; this seems like such a small number, but it is unimaginably large.

Remember, there are about 78 quintillion atoms in a grain a sand — not the whole beach — and now we're talking about how many atoms there are in the whole universe!

It's important that we try to wrap our minds around the immensity of these numbers as we start talking about probability or chance and the fundamental constants of the universe.

Fundamental Constants (6)

1. **The number *N***: the ratio of the strength of the electrical forces that hold atoms together to the strength of gravity. It's about **10^{36}**.

2. **Epsilon (ε)**: defines how firmly atomic nuclei bind together. It's about **0.007**.

What is a fundamental constant?: The physical laws of nature, *when given mathematical expression*, contain various constants (e.g., gravitational constant) whose values are not determined by the laws of nature; a universe governed by such laws might be characterized by any of a wide range of values for these constants.

Sir Martin Rees (*Just Six Numbers*; syllabus) chose dimensionless constants. The Standard Model has 25 freely adjustable parameters. Perhaps there are 31.

We're going to look at 6 of these numbers (really, 7).

The first (*N*) is a ratio of the strength of the electrical forces that hold atoms together divided by the force of gravity between them. It is very large, about 10^{36}, and were it a few zeroes shorter, only a short-lived miniature universe could exist; there would be no time for biological evolution.

The second number (ε) is also a ratio and is the proportion of energy that is released when hydrogen fuses into helium. This number is 0.007, and if it were 0.006 or 0.008 we could not exist.

Fundamental Constants (cont.)

3. **Omega (Ω)**: measures the amount of material in our universe and gives the relative importance of gravity and expansion energy.
   - Value lies between 0.3 and 1
   - In the early universe (say one second after the big bang) Ω would have had to be within **one part in 10^{15} of 1**.

Its present value seems to be somewhere between 0.3 and 1. However, for Ω to be in this range now, according to the laws of physics, in the early universe (say one second after the big bang) Ω would have had to be within one part in 10^{15} of 1.

Putting 10^{15} in Perspective: Ωmega Golf

- The world record hole-in-one distance is apparently 448 yards, or 410 meters.
- One part in 10^{15} would be getting a hole-in-one from 10^{11} km away—which is about thirteen times the maximum distance from Earth to Pluto.

Suppose you are putting a golf ball. A hole must be 108 mm in diameter, and the ball has to be 42.67 mm in diameter, so let us say for simplicity that you have to get the ball within 100 mm of the center of the hole. The world record hole-in-one distance is apparently 448 yards, or 410 meters. So the best hole-in-one has an accuracy of about one part in 4100. One part in 10^{15} would be getting a hole-in-one from 10^{11} km away—which is about thirteen times the maximum distance from Earth to Pluto.

And that's just $10^{15...}$

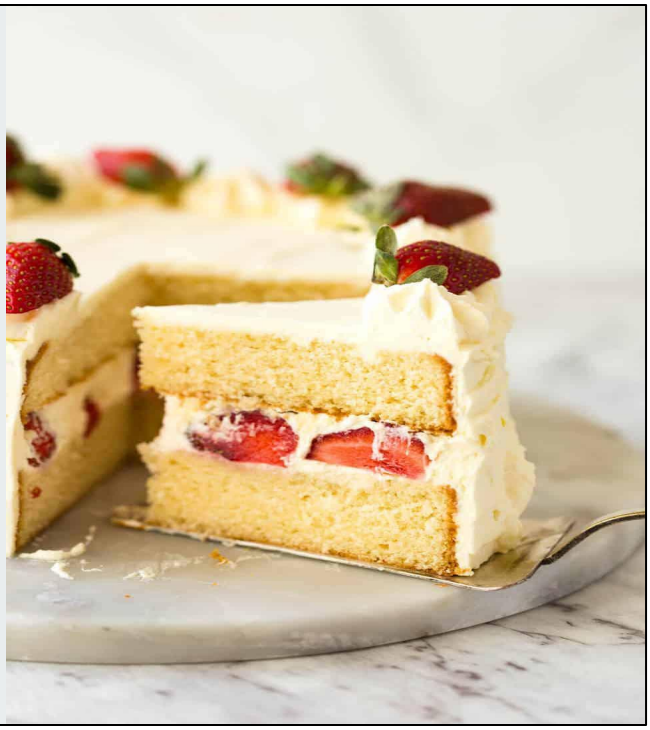
Putting 10^{15} in Perspective: Ωmega Sponge Cake

- A sponge cake recipe calls for equal quantities of flour and granulated sugar.
- In order to get a quantity of granulated sugar right to within one part in $\mathbf{10^{15}}$ we'd need $\mathbf{10^{15}}$ grains of sugar (about 180,000 tons of sugar).

Well, imagine you are making a sponge cake and the recipe calls for equal quantities of flour and granulated sugar. *A grain of sugar is about 600 μm across*, so to get a quantity of granulated sugar right to within one part in 10^{15} you'd need 10^{15} such grains, which would be equivalent to about 180,000 tons of sugar.

The situation is even more extreme with early-universe having to be so close to zero. Getting the sugar right to within one part in 10^{100} would be like an accuracy of one grain in a mass of 1.8×10^{95} *tons* of sugar, and the mass of the sun is only 2×10^{27} *kg*. And remember, there is no known reason, other than the emergence of intelligent life, why these constants should be related.

A *Really* Accurate Recipe



The accuracy of just *one* of these parameters Lambda (Λ) is comparable to getting the mix of flour and sugar right to within one grain of sugar in a cake tens times the mass of the sun.

Fundamental Constants (cont.)

4. **Lambda (Λ)**: controls the acceleration of the long-range expansion of the universe in general relativity. Its value is about $\mathbf{10^{-120}}$.

Its value is one part in 10^{120}. Lamda (Λ) or the COSMOLOGICAL CONSTANT is an extra term added by Einstein in working out equations in general relativity that describe the universe in the situation when it is "static," that is, not expanding. Remember that Einstein worked out the solutions before Hubble discovered that the universe was expanding.

Einstein actually thought that introducing Λ was his “greatest blunder” and that it should have been left out (which would have been equivalent to setting it to zero by definition), but very careful measurements have shown that it is in fact slightly positive. It is now usually referred to as “dark energy.”

Fundamental Constants (cont.)

5. **The number Q**: represents the ratio of two fundamental energies (the gravitational energy required to pull galaxies apart and the energy corresponding to their mass, by Einstein's famous formula $e=mc^2$). It is about $\mathbf{10^{-5}}$.

The fifth number (Q) is the ratio of the energy required to break apart a galaxy compared to its 'rest mass energy' and is about 10^{-5}. If this ratio were smaller the universe would be inert and structureless: if much larger the universe would be so violent that no stars or sun systems could survive.

Fundamental Constants (cont.)

6. **The constant *D***: the number of space-like dimensions in our universe.

The sixth number, *D*, surprisingly, is the number of spatial dimensions in our world (3). Life could not exist if this was 2 or 4.

Kant thought it was a necessary truth that this number was 3, but it turns out to be an empirical question. Einstein of course introduced the idea of time as a further dimension. String theorists suggest that space-time may have as many as eleven or more dimensions.

Bonus Number

7. **The number *S***: the entropy per baryon in the universe demands a precision of one part in $\mathbf{10^{10(123)}}$.

Oxford physicist Roger Penrose calculates that the odds of the **special low entropy** condition having arisen sheerly by chance in the absence any constraining principles is at least as small as about one part in $10^{10(123)}$ in order for our universe to exist. *This is an extraordinary figure. One could not possibly even write the number down in full, in the ordinary denary notation: it would be `1' followed by 10^123 successive `0 's!* ***Even if we were to write a `0' on each separate proton and on each separate neutron in the entire universe — and we could throw in all the other particles as well for good measure — we should fall far short of writing down the figure needed.***

The Teleological Argument

1. The fine-tuning of the universe is due to either physical necessity, chance, or design.

2. It's not due to physical necessity or chance.

3. Therefore, it's due to design.

Remember what we're saying: The universe is fine-tuned for the existence of intelligent, interactive life. What best explains this?

It's not physical necessity. It's not chance — or is it? Some people are willing to face any odds just to avoid Theism.

And by the way, *what exactly is fine-tuning?*

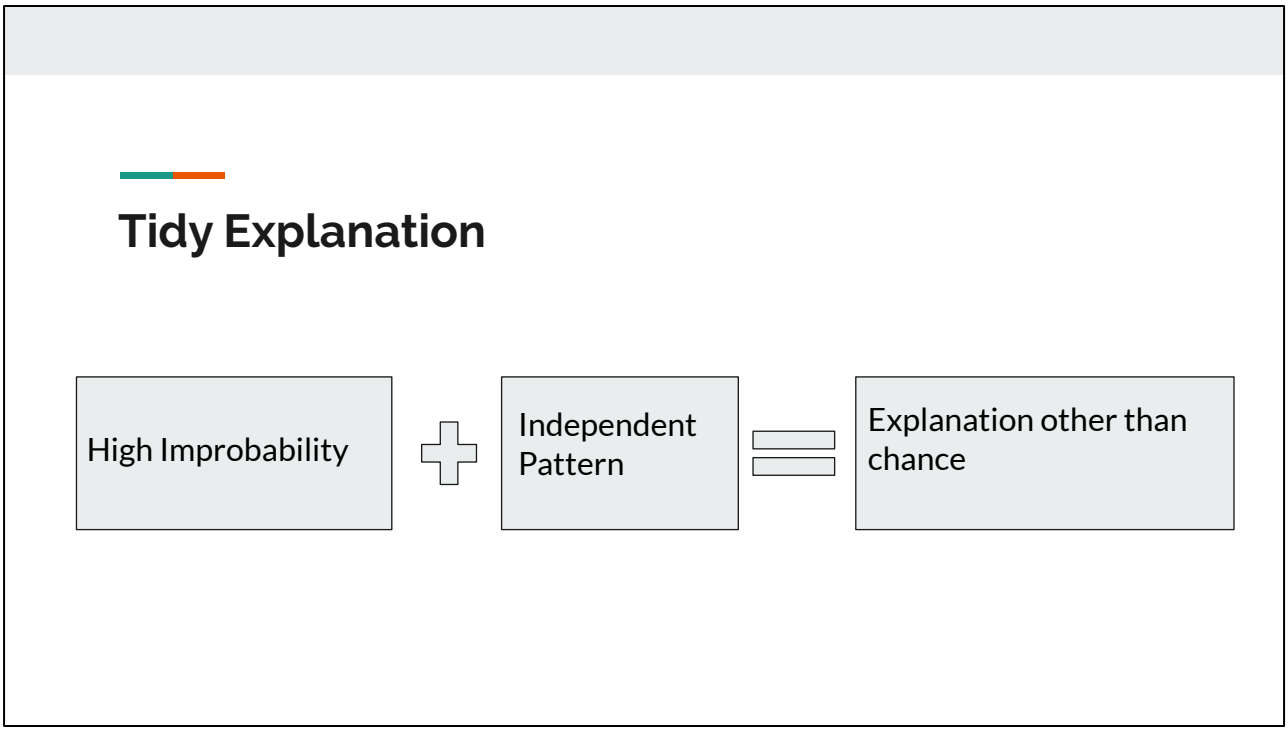
How to explain Fine-Tuning

- Fine-tuning is a case of inference to the best explanation

- A Tidy Explanation:
  - An explanation that not only explains a certain situation but also reveals in doing so that there is something to be explained.

What makes an explanation a tidy one is *not* simply the fact that the *explanandum* (the thing to be explained) is some improbable event, but the fact that the event also conforms to some independently given pattern, resulting in what is called "specified complexity." It is this specified complexity (high improbability + an independent pattern) that tips us off to the need for an explanation in terms of more than mere chance.

Example: Beno is given a new car for his birthday. There are millions of license plate numbers, and it is therefore highly unlikely that Beno would get, say, CHT 4271. Yet that plate on his birthday car would occasion no special interest. But suppose Beno, who was born on February 1, 1983, finds BENO 2183 on the license plate of his birthday car. He would be obtuse if he shrugged this off with the comment, “Well, it had to have some license plate number, and any number is equally improbable . . .” But what makes this case different than the other?



Here's a simple graphic on a tidy explanation.

Atheist Objection

"The odds of me winning the lottery were 20 trillion to 1. Despite that I still won! The lottery must have been rigged!"

Like this example, theists automatically jump to design rather than accept the fact that every universe is just as probable

Some people will refuse to face that there is a God no matter what the odds are. They will often say, even though it's unlikely, people do hit the lottery. Maybe we just hit the cosmic lottery. But this analogy is bad for a number of reasons, not the least of which the odds are very different. The odds against a finely tuned universe are overwhelming greater.

First of all, it's not just as probable:
Odds of winning the Mega Millions: 1 in 302 million
Odds of winning the PowerBall: 1 in 292 million
Odds of winning the Cosmic Lottery: worse than hitting the Mega Millions every week for a year (actually much worse than that).

Plus, the atheist confused what the theist is saying. It's highly improbable that there should be a life-permitting universe.

Lottery Analogy: The universe is a lottery in which *a single white ball* is mixed into a billion billion billion *black* balls, and a ball is then selected randomly from the collection. True, any ball that rolls down the chute will be fantastically and equally improbable; nevertheless, it is overwhelmingly more probable that whichever ball rolls down the chute, it will be black rather than white.

Response - Cosmic Lottery

- The universe is a lottery in which a *single white ball* is mixed into a trillion, trillion *black* balls;
- A ball is then selected randomly from the collection;
- True, any *particular* ball that rolls down the chute will be equally improbable;
- Nevertheless, it is overwhelmingly more probable that the ball will be black rather than white.

Look over this response carefully.

Anthropic Principle in a Nutshell

We can observe only those values of the fundamental constants and quantities that are compatible with our existence.

Note: Don't confuse Anthropic Principle with Anthropic Fine-Tuning

Anthropic Principle: *We ought not to be surprised at observing the universe to be as it is and therefore no explanation of its fine-tuning need be sought.*

Now the first part of this principle is obvious, but it's the part after the word "and" that doesn't follow and is fallacious.

Fallacious Logic of Anthropic Principle

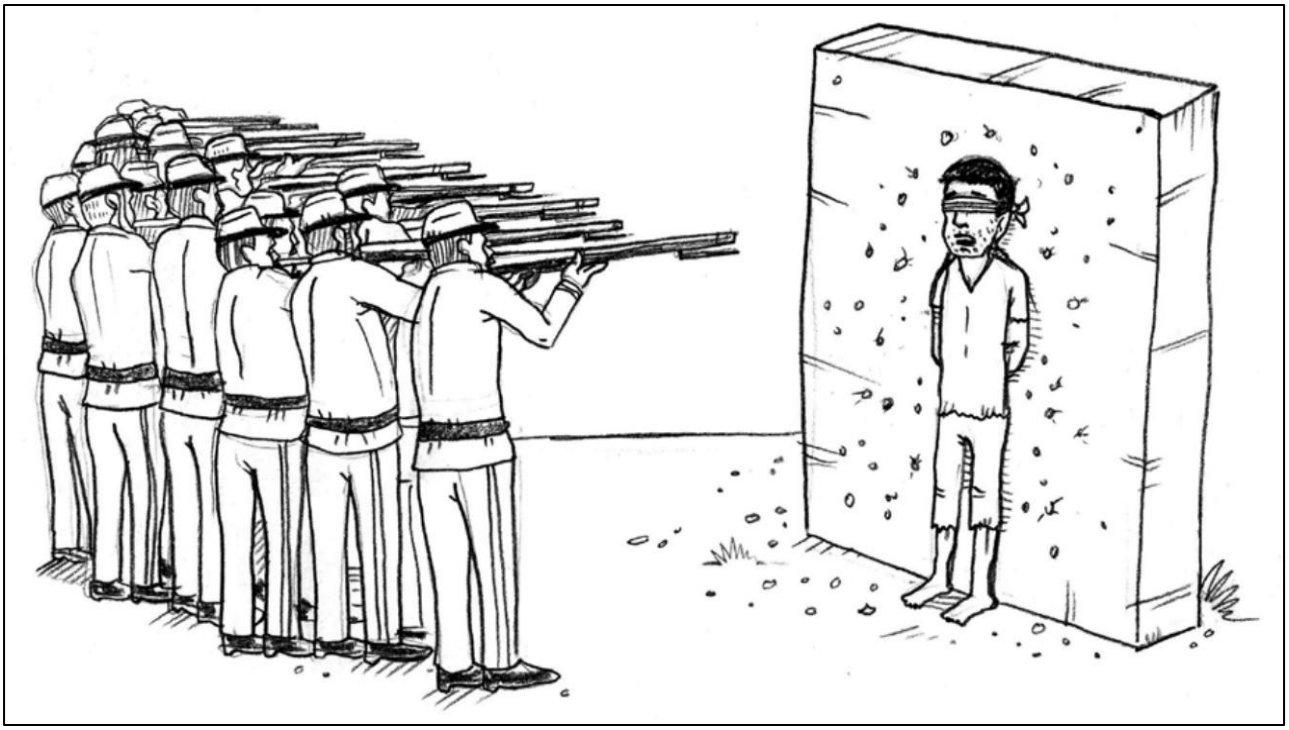
A. If observers who have evolved within a universe observe its constants and quantities, it is highly probable that they will observe them to be fine-tuned for their existence. [True]

A'. It is highly probable that a universe exist which is finely tuned for the evolution of observers within it. [False]

Notice the difference between the true and the false claims in this example.

Atheists claim that *if observers who have evolved within a universe observe its constants and quantities, it is highly probable that they will observe them to be fine-tuned for their existence*. This is obvious. But it confuses that claim with this false claim: *It is highly probable that a universe exists which is finely tuned for the evolution of observers within it*. An observer who has evolved within the universe should regard it as highly probable that he will find the constants and quantities of the universe fine-tuned for his existence; but he should not infer that it is therefore highly probable that such a fine-tuned universe exist.

An example might help to clarify the problem in logic here. Consider this illustration about a firing squad.



Imagine that you are being dragged before a firing squad of one hundred trained marksmen to be executed. The command is given: “Ready! Aim! Fire!” You hear the deafening roar of the guns. And then you observe that you’re still alive, that all the one hundred trained marksmen missed! Now what do you conclude? “I really shouldn’t be surprised at the improbability of their all missing because if they hadn’t all missed, then I wouldn’t be here to be surprised about it. Since I am here, there’s nothing to be explained!” Of course not! *While it’s correct that you shouldn’t be surprised that you don’t observe that you are dead (since if you were dead, you could not observe the fact)*, nevertheless, *it doesn’t follow* that you shouldn’t be surprised that you do observe that you are alive. In view of the enormous improbability of the marksmen’s all missing, *you ought to be very surprised that you observe that you are alive* and so suspect that more than chance alone is involved, even though you’re not surprised that you don’t observe that you are dead.

Many Worlds Hypothesis - The Multiverse

Two Problems

1. No empirical evidence to suggest any plausibility
2. The Universe we live in should be much different
   a. All scientific estimates would be wrong
   b. Things should pop in and out of existence

If there is a multiverse, it is far more probable that all our astronomical, geological, and biological estimates of age are wrong and that the appearance of our large and old universe is a massive illusion.

If there was a multiverse, things should be popping in and out of existence all the time.

Remember the multiverse is a hypothesis, not even a bonafide theory. No one has, nor could, observe such a thing, so there is no empirical evidence for it. It's far more likely that a single mind would come into being and be the single observer of the universe, if the multiverse hypothesis was true.

What about a Theory of Everything? - String Theory

As of now, the only plausible type of Theory of Everything is M-Theory which only operates with 11 dimensions.

- If it is correct, it multiplies problems for atheists because they have to account for extra constants

If string theorists are right (they postulate 10 or 11 dimensions), there will probably be *extra* constants that are mysteriously fine-tuned, not fewer.

String theory permits a vast range of around 10^{500} different possible universes, all consistent with the same laws but varying in the values of the constants of nature. Almost all of these possible universes are life-prohibiting. So some explanation is needed why, out of all these possibilities, a life-permitting universe exists.

This just multiplies the problem for atheists.

Human Genome Evolving

$$4^{-180(110,000)}$$

to

$$4^{-360(110,000)}$$

BONUS: Moving from the macro to the micro, from the gigantic universe to the building blocks of people, consider this:

Barrow and Tipler, two physicists in their book *The Anthropic Cosmological Principle* list *ten steps* in the course of human evolution, *each of which is so improbable* that before it would occur the sun would have ceased to be a main sequence star and incinerated the earth. And they calculate the probability of the evolution of the human genome to be between $4^{-180(110,000)}$ and $4^{-360(110,000)}$. Think about how vanishingly small these odds are when you consider the exponents.

Question

Suppose someone says that appealing to God as Creator or Designer is not a legitimate explanatory hypothesis but just a way of expressing our ignorance. How might you respond?