

WHY IS THE UNIVERSE FINE- TUNED FOR LIFE?

MAIN TOPICS

- What does the Fine Tuning mean?
- Historical background.
- The “Goldilocks” Universe.
- Types of the Fine Tuning.
- Why the Universe is fine-tuned for life?
- The Fine Tuning Argument.

WHAT DOES THE FINE TUNING MEAN?

- The fine-tuned Universe is the proposal that the conditions that allow life in the Universe can only occur when certain universal fundamental physical constants lie within a very narrow range.
- If any of several fundamental constants were only slightly different, the Universe would be unlikely to lead to the establishment and development of matter, astronomical structures, elemental diversity, or life as it is presently understood.
- Fine-Tuning is perhaps modern Theology's Strongest Design Argument for the Existence of God

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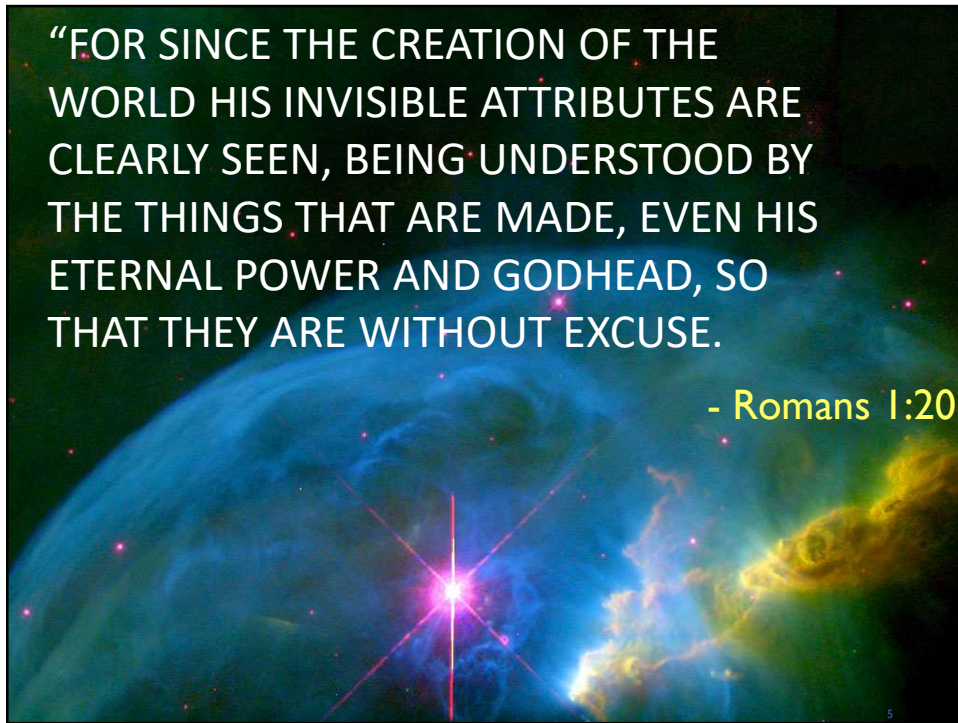
HISTORICAL BACKGROUND

- In 1913, Lawrence Joseph Henderson wrote *The Fitness of the Environment*, one of the first books to explore concepts of fine tuning in the universe.
- In 1950, Fred Hoyle, an atheist British Astronomer, worked in the intelligent design area that support the claim that the universe was fine tuned in order to allow intelligent life to be possible.
- In 1961, physicist Robert H. Dicke claimed that certain forces in physics, such as gravity and electromagnetism, must be perfectly fine-tuned for life to exist in the universe.
- In Late 60's the first conference regarding the fine-tuning in Chicago.

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“FOR SINCE THE CREATION OF THE WORLD HIS INVISIBLE ATTRIBUTES ARE CLEARLY SEEN, BEING UNDERSTOOD BY THE THINGS THAT ARE MADE, EVEN HIS ETERNAL POWER AND GODHEAD, SO THAT THEY ARE WITHOUT EXCUSE.

- Romans 1:20



THE QUESTION IS;

- Was the universe designed, or did it just happen to come into existence by itself?
- The Bible strongly suggests that God is the creator/designer of the universe.
- Two verses that imply this are:
- GENESIS 1:16 Then God made two great lights: the greater light to rule the day, and the lesser light to rule the night. *He made* the stars also.
- PSALMS 102:25 You laid the foundation of the earth, And the heavens *are* the work of Your hands.

WHY FINE-TUNED FOR LIFE?

THE “GOLDILOCKS” UNIVERSE

- Over the past 40 years, it has become increasingly apparent to astronomers and cosmologists that the:
 - Forms of the laws of physics and the values “**constants** of nature,” and
 - The **initial conditions** at the Big Bang (for example the amount of entropy),
- Seem extremely “fine-tuned” to give rise to life.
- Very slight differences in the laws of physics, or the constants of nature, or the initial conditions at the Big Bang, would have resulted in a sterile, lifeless universe.
- *In other words:* the form of the law of physics, the values of the constants of nature, and the values of the initial conditions at the Big Bang are “just right” for the evolution of life.

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WHY FINE-TUNED FOR LIFE?

THE “GOLDILOCKS” UNIVERSE

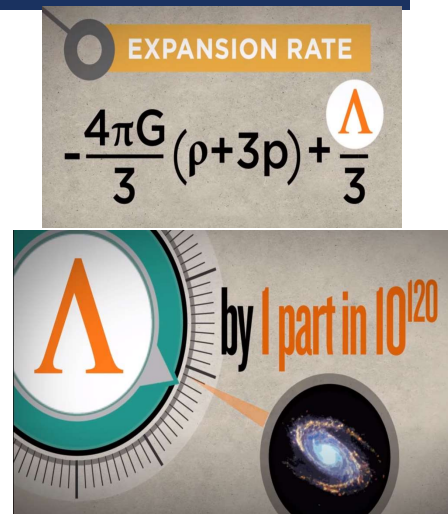
- We live in a “**Goldilocks**” universe. Not too hot not too cold, the forces are not too strong and not too weak. The speed of light not too fast not too low and the expansion rate of the universe not too rapid and not slow. All these things which govern the universe are just right.
- Hoyle, *was an atheist*, who resisted the discovery of the Big Bang, because he thought it implied a creation event and eventually a creator. He came with alternative theory called the “Steady-State”, however, after the fine-tuning he realized that there must be some sort of design behind the universe.
- The Fine Tuning is about it’s powerful evidence of design that come out of physics.

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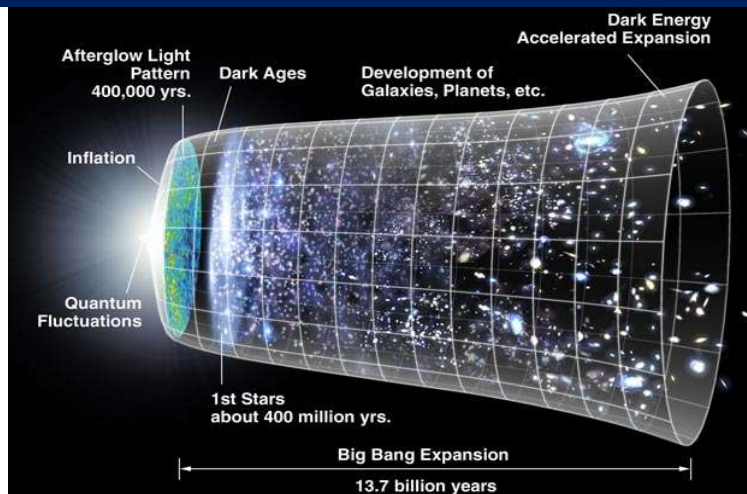
Expansion Rate of the Universe

If Λ varies by 1 parts of 10^{120}

The Universe would be life prohibiting

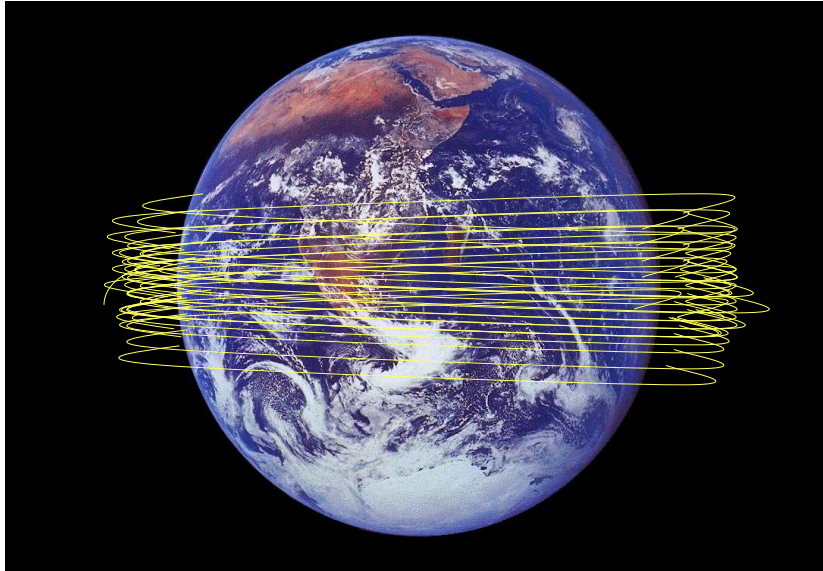


STANDARD [CREATION?] MODEL - THE BIG BANG WAS FINE-TUNED



When the universe was one second old, its expansion had to be exactly the right value to within 10^{-17} sec → Let examine this small number

Suppose you are driving at 60 mph for 40 years → 21,024,000 miles
= 800 rotations around the earth (plus or minus one hair width)



WHY FINE-TUNED FOR LIFE? THE “GOLDILOCKS” UNIVERSE

- What is the best explanation for the “Goldilocks” nature of the universe?
- There are only three possibilities:
 - **1. Physical Necessity.** The assertion that it is physically impossible for the laws of physics, the constants of nature, and the initial conditions of the universe to have any value other than the values they do have.
 - **2. Chance.** Everything is “just right” for life by pure chance. We were very, very, ... very lucky.
 - **3. Design.** Everything is “just right” for life because it was designed by some entity beyond the universe, beyond all space-time, to be that way.

WHY FINE-TUNED FOR LIFE?

THE DESIGN ARGUMENT FOR GOD

■ **Premises:**

1. The fine-tuning of the Life Permitting Universe (LPU) is due to either physical necessity, chance, or design.
2. The fine-tuning of the LPU is not due to physical necessity or chance.

■ **Conclusion. Therefore:**

3. The fine-tuning of the LPU is due to design.

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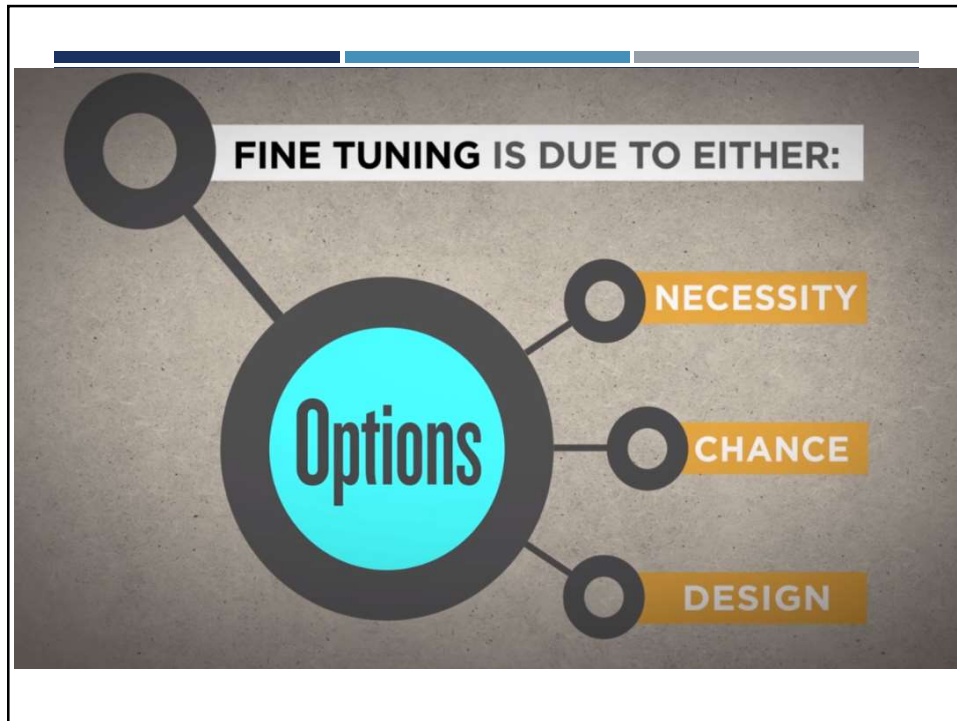
WHY FINE-TUNED FOR LIFE?

PREMISE 1

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

- “Fine-tuning” (the “**Goldilocks**” nature of the universe) is an established scientific fact.
- No other options to explain this “fine-tuning” have been proposed other than:
 - Physical necessity, or
 - Chance, or
 - Design.

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WHY FINE-TUNED FOR LIFE?

NOT PHYSICAL NECESSITY

Premise 2. The fine-tuning is not due to physical necessity or chance.

- **Not Physical Necessity**
- Very few scientists believe physical laws and the constants of nature *must* have the form and values they do because of some still unknown “physical necessity.”
 - It is possible to “simulate” simple “mini-universes” on a computer that are perfectly self-consistent and nothing like our universe.
- Furthermore, some unknown “physical necessity” that constrained the form of the laws of physics and the constants of nature to only their current form and values would still not explain the “fine-tuning” of the *initial or starting conditions* at the Big Bang.

WHY FINE-TUNED FOR LIFE?

NOT PHYSICAL NECESSITY

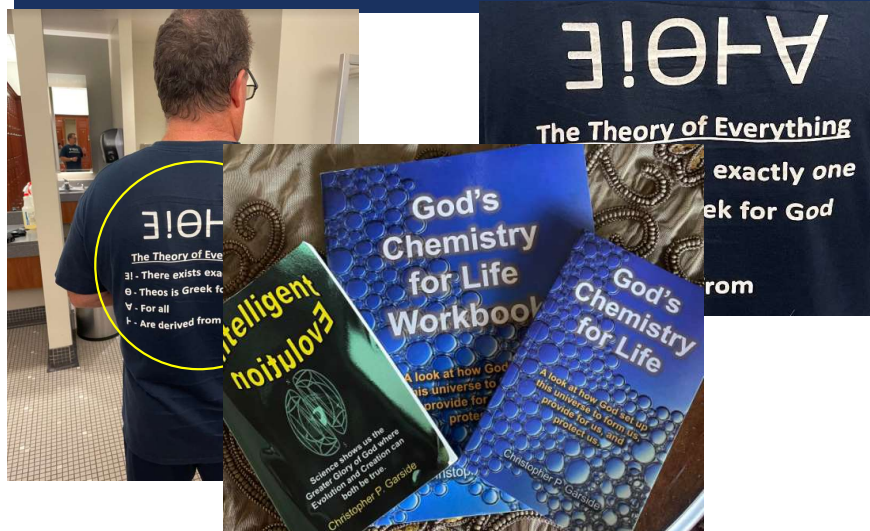
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Not Physical Necessity

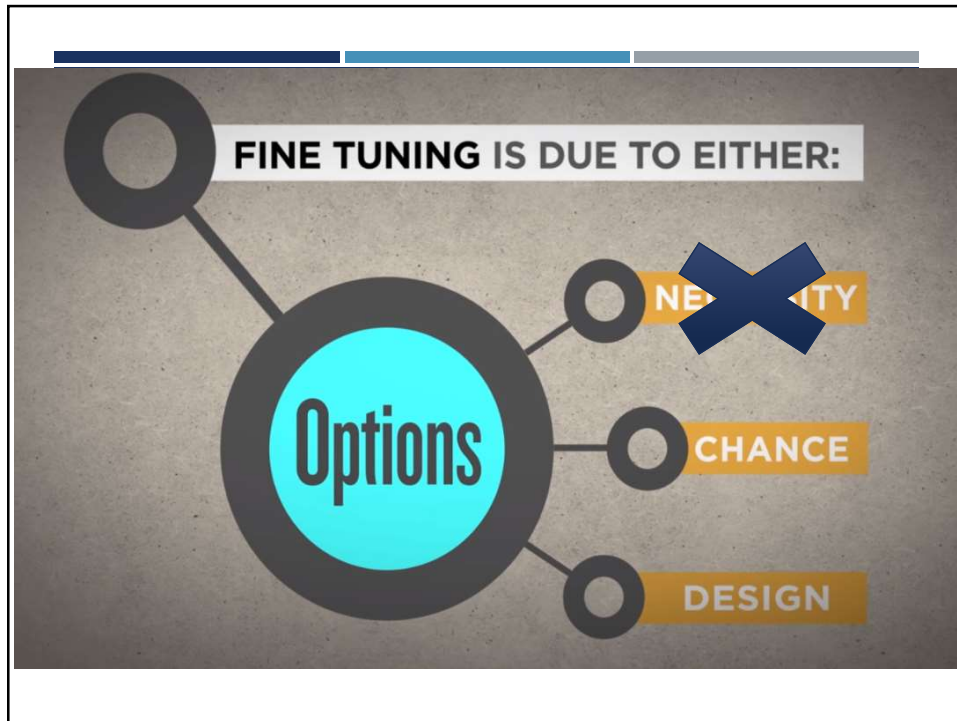
- The Laws of nature and physics are consistent with wide range of these constant.
- Although few scientists believe the “Goldilocks” nature of the universe is due to “physical necessity,” some “pop science” outlets claim someday a “**Theory of Everything**” (TOE) will explain all, including the “Goldilocks” nature of the universe.
- TOE *sounds like* a physical explanation of everything, including the fine-tuning but this label is very misleading.
- A Theory of Everything would try unify and connect all the fundamental interactions of nature: gravity, the strong force, the weak force, and electromagnetism).

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THEORY OF EVERYTHING



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WHY FINE-TUNED FOR LIFE?

NOT CHANCE

Premise 2. The fine-tuning is not due to physical necessity or chance.

Not Chance

- One can imagine and simulate a vast array of possible universes that vary from our own by a tiny difference in some constant of nature or initial condition.
- The vast, vast majority of such possible universes are sterile, incapable of evolving life.
- How can it be that in this vast array of possible universes, we live – **by pure chance** – in the extremely rare exception, a universe capable of evolving life?

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WHY FINE-TUNED FOR LIFE?

NOT CHANCE

Premise 2. The fine-tuning is not due to physical necessity or chance.

Not Chance

- A frequent objection at this point is “Well Duh! If you didn’t live in a universe capable of evolving life, you wouldn’t be around to ask your question. Problem solved!”
- This answer does not solve anything.

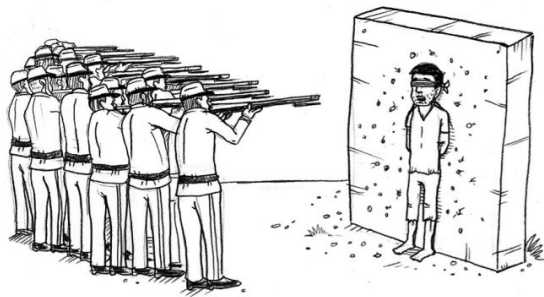
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WHY FINE-TUNED FOR LIFE?

NOT CHANCE

Premise 2. The fine-tuning is not due to physical necessity or chance.

- *Not Chance*
- Imagine you’ve been sentenced to death by firing squad.
- 500 of the country’s best marksmen aim their rifles at you.



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WHY FINE-TUNED FOR LIFE?

NOT CHANCE

Premise 2. The fine-tuning is not due to physical necessity or chance.

- **Not Chance**
- The rifles fire.
- You are still alive.
- You have to wonder:
 - Are you alive because by *pure chance* all 500 marksmen happened to miss you?
 - Are you alive because someone rigged it so they all missed you? (by design)
- Even though you know you would not be around to speculate if the most likely scenario (500 bullet holes in you) had actually happened.

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WHY FINE-TUNED FOR LIFE?

NOT CHANCE

Premise 2. The fine-tuning is not due to physical necessity or chance.

- **Not Chance**
- The extremely, extremely small chance that **by pure chance** we live in a “Goldilocks” universe fruitful of life (by pure chance “we survived the firing squad”) is such a *glaring problem* in modern cosmology that the common explanation now is that we must live in a “multiverse” (**Multiverse or Many Worlds Hypothesis**)

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CHANCE –ARE WE JUST LUCKY?!



There's no scientific evidence
for the existence of the multiverse.



If there is a Multiverse generator
then it should be fine-tuned itself!

WHY FINE-TUNED FOR LIFE?

NOT CHANCE

Premise 2. The fine-tuning is not due to physical necessity or chance.

- **Not Chance**
- **Multiverse or Many Worlds Hypothesis:** the hypothesis that an unimaginably enormous array of possible “universes” *actually* exists, the vast majority of these universes sterile and lifeless.
 - If there are gazillions upon gazillions of 500 marksmen firing squads, eventually we might find one where all 500 *do* miss their victim, **by pure chance**.

WHY FINE-TUNED FOR LIFE?

NOT CHANCE

Premise 2. The fine-tuning is not due to physical necessity or chance.

- **Not Chance**
- Problems with the **Multiverse / Many Worlds Hypothesis**:
 - 1. The “laws” governing the multiverse may still need “fine-tuning” for it to contain a “Goldilocks” universe like ours capable of evolving life.
 - 2. A Multiverse must have had a beginning (see the *Kalam* argument Premise 2) and may not have had sufficient time to spawn a “Goldilocks” universe with reasonable probability.

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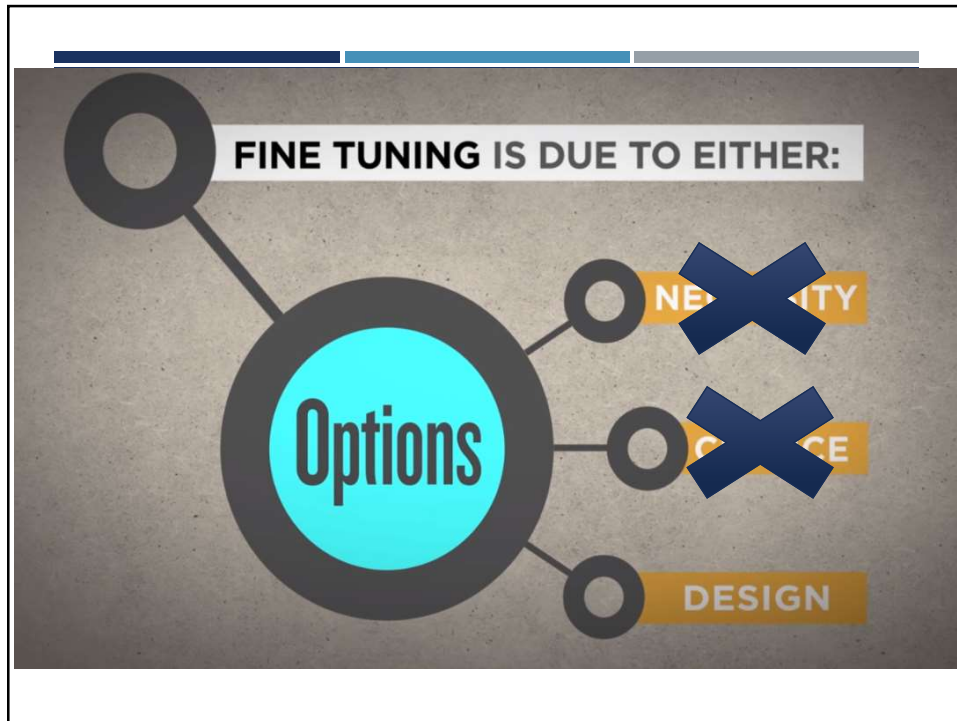
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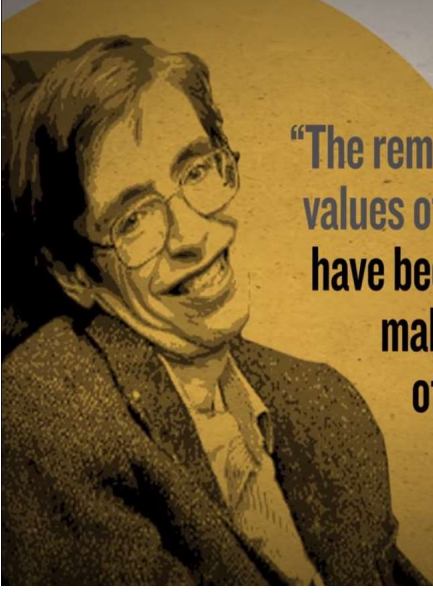
- **Not Chance**
- Problems with the **Multiverse / Many Worlds Hypothesis**:
 - 3. If “Goldilocks” worlds are products of **pure chance variation** within an ensemble of mostly sterile, lifeless worlds, then “fine-tuning” of the rules governing the Multiverse / Many Worlds may be necessary to prevent an **“Invasion of the Boltzmann Brains.”**

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THE FINE TUNING ARGUMENT

1. Given the fine-tuning evidence, a life permitting universe (LPU) is very, very unlikely without existence of a fine-tuner (Designer)
2. Given the fine-tuning evidence, LPU is not likely under either Necessity or Chance.
3. Therefore, LPU strongly supports a fine-tuner (Designer) over Necessity or Chance.
 - There must be a cause for design in the universe.
 - The designer must be *extremely* intelligent.

A black and white portrait of Stephen Hawking, smiling and wearing glasses and a suit. The background is a solid dark color.

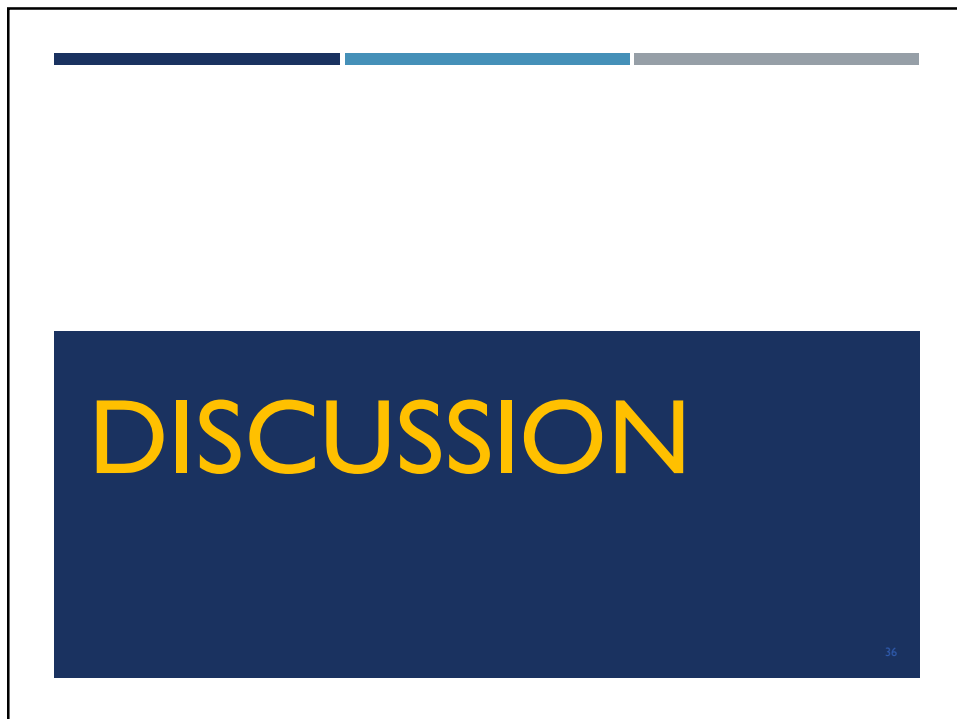
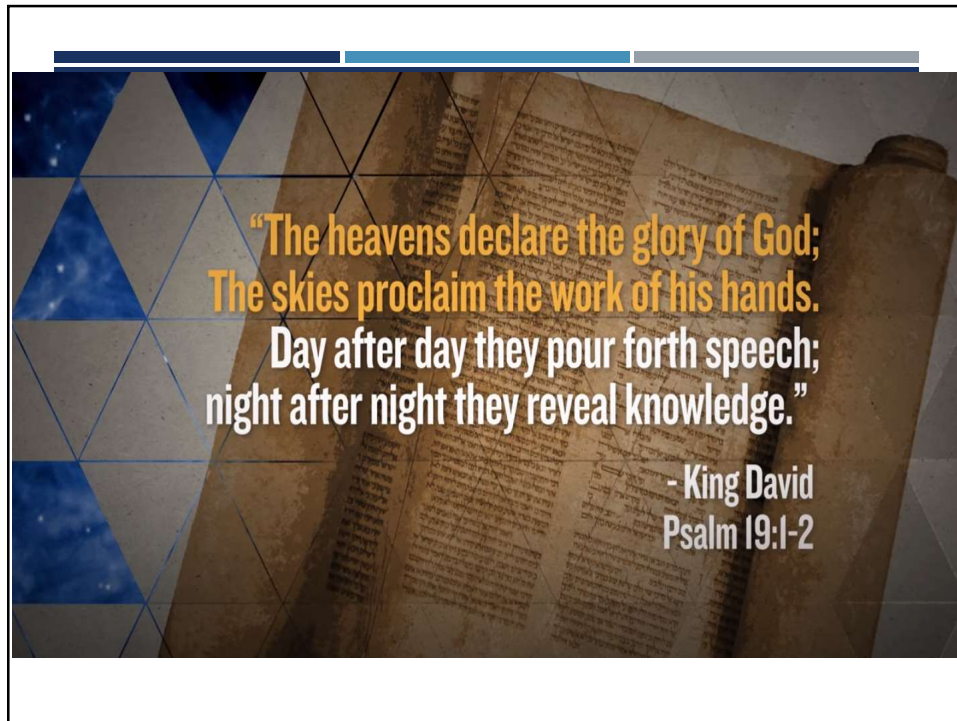
“The remarkable fact is that the values of these numbers seem to have been very finely adjusted to make possible the development of life.”

-Stephen Hawking
*Theoretical physicist and cosmologist
Director of Research at the Centre for Theoretical Cosmology within the University of Cambridge*

A black and white portrait of David Deutsch, smiling and wearing glasses. The background is a solid dark color.

“If anyone claims not to be surprised by the special features the universe has, he is hiding his head in the sand. These special features are surprising and unlikely.”

- David Deutsch
*Physicist at the University of Oxford.
Visiting Professor in the Department of Atomic and Laser Physics at the Centre for Quantum Computation (CQC) in the Clarendon Laboratory of the University of Oxford.*



RESPOND TO THIS SKEPTICAL STATEMENT

- *If the universe is fine tuned, might that also means God is fine tuned by some sense?*
- There is no reason to think that the designer would require a designer himself. God is not a physical being to be fine-tuned.

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RESPOND TO THIS SKEPTICAL STATEMENT

- *A lot of people disprove the existence of a supernatural God and claim that there is a supernatural machine that creates the multi-verses.*
- The multi-verse is a metaphysical hypothesis.
- As yet, there is no evidence for the existence of a multiverse.
- It is highly improbable that we could ever do any measurements of another universe; it is inaccessible to us.
- Whether universe or multiverse, **God** is the Creator.

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RESPOND TO THIS SKEPTICAL STATEMENT

If God made the universe, why he has to fine tuned at all, why wouldn't he have humans being able to live in any place or any planet?"

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CONCLUSION

- “For since the creation of the world His invisible attributes are clearly seen, being understood by the things that are made, even His eternal power and Godhead, so that they are without excuse”. Romans 1:20

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