

Fine-Tuning of the Universe (part 4 of 8): Extreme Examples of Fine-Tuning

Description: Three *extreme* examples of fine-tuning are given along with illustrations of just how big the numbers are and how fine-tuned our universe is.

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First, physicists identify four fundamental forces of nature. In terms of increasing strength, they are gravity (G_0), weak force ($10^{31} G_0$), electromagnetic force ($10^{37} G_0$), and the strong nuclear force ($10^{40}G_0$).

Second, since *extreme* examples of fine-tuning deal with extraordinarily large numbers, we need to have an idea of just how big they are. It will give us some perspective of how delicate fine-tuning is:

- average number of cells in a human body is 10^{13} (i.e. 10 trillion)
- age of the universe is roughly 10^{17} s
- number of sub-atomic particles in the known universe is estimated to be 10^{80}

Keeping these numbers in mind, consider the following three examples of fine-tuning:

1. Weak Nuclear Force

One of them, the 'weak nuclear force' which works inside the nucleus of an atom is so sensitive (finely-tuned) that even an alteration of one part in 10^{100} would prevent life in the universe![\[1\]](#)

2. Cosmological Constant

The cosmological constant is a term in Einstein's theory of gravity that has to do with acceleration of the universe's expansion. It is described as self-stretching property of space (or more accurately space-time).[\[2\]](#) Unless it is within an extremely narrow range around zero, the universe will either collapse or it will expand too rapidly for galaxies and stars to form. The constant is fine-tuned to an unimaginably precise degree. If it were changed by as little as one part in 10^{120} , the universe would have no life![\[3\]](#)

3. Penrose Number: The *Most Extreme Example of Fine-Tuning*

That is not it. According to standard cosmology model, the accepted model of the universe today, if you were to go back some 14 billion years, you can think of the universe as condensed to less than the size of a golf ball. The initial state of the space-time, and

material systems could exist. This is a widely recognized fact.

Endnotes:

[1] Davies, Paul. 1980. *Other Worlds*. London: Dent. 160-61, 168-69.

[2] Ross, Hugh. 2001. *The Creator and The Cosmos*. Colorado Springs, Co: NavPress. 46.

[3] Krauss, Lawrence. 1998. *The Astrophysical Journal*. 501: 465

[4] Entropy is a measure of disorder.

[5] Penrose, Roger. 2004. *The Road to Reality: A Complete Guide to the Laws of the Universe*. London: Jonathan Cape. 730.

[6] Penrose, Roger. 1991. *The Emperor's New Mind: Concerning Computers, Minds, and the Laws of Physics*. New York: Penguin Books. 343.

[7] Spitzer, Robert. 2010. *New Proofs for the Existence of God: Contributions of Contemporary Physics and Philosophy*. Grand Rapids/Cambridge: Wm.B. Eerdmans Publishing Co. 59.

[8] Ross, Hugh. 2001. *The Creator and The Cosmos*. Colorado Springs, Co: NavPress. 151.

[9] Lecture at Pepperdine University titled '*Is [it] True?*' hosted by the Veritas Forum on Feb 18, 2013.

[10] Ross, Hugh. 2001. *The Creator and The Cosmos*. Colorado Springs, Co: NavPress. 150.

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