

# What Is Fine Tuning?

3 min. read · [View original](#)

---

## The Anthropic Principle and the Multiverse

One of the earliest attempts to come up with a scientific explanation for fine tuning was framed as the anthropic principle. It states that humans should not be surprised to discover themselves in a universe that has the exact conditions to support intelligent life, since we could not observe it otherwise. In the past 20 years, versions of the anthropic principle have found new currency with theories of a multiverse. This theory suggests that our cosmos is one of a near-infinite number of universes, some of which by chance have the right physical features to support life.

Multiverse theory (as explained either through post-big-bang inflation, or as part of String Theory) is not without its critics, many of whom view it as fundamentally untestable and thus not a legitimate scientific explanation.

## Other Possibilities

One answer to the problem of fine tuning is to argue that it is not a problem at all. The existence of a life-sustaining set of arbitrary physical laws may be less improbable than many physicists think.

Additional theories to explain fine tuning include the idea that the universe might have undergone cyclic expansions and contractions, which could account for some of the apparent improbability of its current observed attributes. Another, posited in 2006 by Stephen Hawking and Thomas Hertzog, uses the idea of superposition — that quantum objects exist in multiple states until they are measured — and applies it on the level of the universe. When we make observations of the past, they argue, we select out the possible history that would lead to our existence.

### **What's Next for the Science and Philosophy of Fine Tuning?**

A number of scientific experiments have been proposed or are underway. These efforts might be able to detect evidence of the existence of a multiverse, or lead us towards a new fundamental theory of nature in which the values of physical constants are explained more deeply.

One key area for the refining of discussion about fine tuning is a growing documentation of [the different ways that fine tuning arguments have been made](#). Within the sciences, it often requires specialized knowledge to assess whether a system is fine-tuned: cosmologists focus on things like the densities of various kinds of energy and matter (both directly observable and “dark”), as well as the

cosmological constant, which is the energy density of space. Philosophers and theologians have used scientific findings of fine-tuned physical symptoms to reach metaphysical conclusions, sometimes without a detailed understanding of the science involved. Because of that, much of the work to be done around fine tuning is less about finding new fundamental scientific discoveries than about helping physicists to become better philosophers, and vice versa.

### Still Curious?

The John Templeton Foundation has supported numerous projects related to fine tuning, including funding [a field guide to fine tuning](#) as it is used across disciplines. Learn more on fine tuning's [philosophical implications](#), and read the full [research review](#) on fine tuning.

Luke Barnes' book [A Fortunate Universe](#) offers a good overview of the topic. Barnes also [debated fine tuning and its implications](#) with Sean Carroll on the Unbelievable podcast.

Robert J Sawyer's Hugo-nominated best-selling science fiction novel [Calculating God](#) (2000) explores fine tuning and its possible causes in a fictional form.

*If there's a specific term you'd like to see featured in the Templeton Ideas Index, you*

*can reach out to us at  
communications@templeton.org*

---

## Key Takeaways

- Fine tuning is a metaphor derived from music and mechanics that is used to describe apparently improbable combinations of attributes governing physical systems.
- Discussions of fine tuning are often used as a launching point for broader scientific, philosophical or theological questions.
- The key question is whether the apparently arbitrary set of fundamental physical constants and forces that govern the universe make it highly improbable that a universe would exist that is capable of supporting intelligent life.
- Multiverse theory — in which there are a near infinite number of universes with different combinations of physical attributes — may offer the most plausible explanation for the existence of an improbable universe such as ours. Some critics worry that it is inherently untestable.
- There are two key areas of current work on fine tuning: direct scientific work to chip away at the questions fine tuning raises, and more work to chart the range of ways that scientists, philosophers and others talk and think about fine tuning.