

# Anthropic attitudes

Is the universe the way it is to ensure the emergence of life — and, ultimately, conscious, human life? This assertion, known as the anthropic principle, has been supported by a number of prominent scientists and philosophers. They see it as perhaps the only conclusion to draw from the fact that life, at least as we know it, could not possibly exist if fundamental aspects of the universe were just a tiny bit different.

The uncharged neutron, for example, is heavier than the charged proton — and thank goodness. If it weren't, the instability of the proton would destroy chemistry based on the electromagnetic interaction. Yet the neutron–proton mass difference can't be too large, for otherwise nuclear fusion would not fuel the stars. Stars, and our Sun, require a fine-tuning of neutron and proton masses to within about 10%.

The smoothness of the energy distribution in the early universe appears to have been tuned even more precisely. If the intensity of variations were less than a tenth of current estimates, galaxies would never have formed, while if it had been more than ten times larger, matter would have been too lumpy and there would be no stars, only black holes. The allowed variation is of the order of about one part in 100,000.

Still more evidence comes from the expansion of the Universe. Whether the universe expands forever, or instead ultimately collapses, is determined by matter density, which currently seems to be very close to the critical threshold. For this to be true now, cosmologists believe, it must have been tuned even more precisely in the distant past — right on the boundary to an accuracy of some 55 decimal places.

Without all this incredible calibration, there would be no Sun, solar system, Earth, and certainly no thinking, wondering human beings. So, things do seem to be extraordinarily well designed for our existence, right? Well, not so fast. There are other possibilities, indeed, lots of them, as physicist Klaas Landsman of the Radboud University Nijmegen in the Netherlands notes in a review (<http://arxiv.org/abs/1505.05359v2>; I've drawn on his paper in the preceding discussion). What are the four most common explanations?

The first — advanced by people such as physicist Frank Tipler — simply assumes that if there's tuning, there must have been a Tuner. This 'by design' view



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restores the religious perspective to science, seeing evidence of God and the centrality of human life in the universe. Tipler even wrote a book entitled *The Physics of Christianity*.

A second common response, perhaps just as radical, supposes that our Universe is just one among innumerable many others in a 'multiverse'. If we happen to exist in an unusual universe where life exists, this idea asserts, that's no surprise. There are so many universes that intelligent observers must exist in some of them. And any intelligent observer will, by necessity, experience living in just such an unusual universe.

The third possibility Landsman lists isn't quite so cosmic. Maybe it's all just blind chance and pure luck that the constants of Nature and initial conditions took the rare set of values that has enabled life. Accepting this is, in some sense, turning away from the desire for natural explanations and essentially accepting a miracle. In this, I would say, it also shares a spirit with the first two explanations, by design and by multiverse.

But the fourth common idea on Landsman's list is a little different. He refers to it as the position of 'blind necessity'. Perhaps there was little or no wiggle room in how the Universe got created, and our thinking that there was simply reflects our ignorance. In a universe so vast in both time and space, shouldn't we be a little more humble in thinking we've worked everything out in a few hundred years of modern science? Could the parameters of the universe possibly have been different? We have no idea. This position essentially dismisses the mystery as something we shouldn't expect to be able to handle just yet.

In his article, Landsman surveys some of the arguments going against the first two positions. For example, on the argument for design, the observed apparent 'fine-tuning' certainly doesn't imply that the universe is optimal for life. But why would a Designer

making it with life in mind not do the best job possible? Moreover, those who invoke a Creator would almost certainly do so even if life turned out to be consistent with any choice of the parameters of the universe. Hence, fine-tuning seems to have little to do with this belief.

On the multiverse idea, Landsman argues that it actually only explains fine-tuning if one makes a host of further strong assumptions. One might add that the science behind the multiverse notion is rather extravagantly speculative. Put string theory and inflationary cosmology together and you have a theory claiming to predict almost anything one might possibly see, which seems like a step away from science.

If we try to remain within science, Landsman concludes, we're left with blind necessity, a kind of negative interpretation. "We don't really know" if there is any fine-tuning, because we just don't know enough about the flexibility with which the universe came into creation. "The present state of science," as he writes, "does not allow us to make such a choice now (at least not rationally), and the question even arises if science will ever be able to make it [except] perhaps philosophically."

But Landsman finishes by proposing one further possibility — that "the fine-tuning problem is misguided" and the result of confusion. That it might best be resolved by "some appropriate therapy".

The by-design argument, especially, seems a little too convenient: a species in a perplexing universe looks around itself and — Lo! — finds comforting evidence that its very existence must have been part of the original plan. Rather, Landsman asks, might it not be that 'fine-tuning' doesn't require any explanation at all? Maybe it's not that our Universe has been fine-tuned for life, but merely that life, our particular form of life, has been fine-tuned to our Universe?

He quotes the philosopher John Earman (*Am. Philos. Quart.* 24, 307–317; 1987), who suggested that the best clarification of what the anthropic principle means might take the form of mild satire: "Imagine, if you will, the wonderment of a species of mud worms who discover that if the constant of thermometric conductivity of mud were different by a small percentage they would not be able to survive." □

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