

Anthropic fever

Science has progressed for 400 years by ultimately explaining observed phenomena in terms of fundamental theories that are rigid. Even minor deviations from predicted behaviour are not allowed, but instead are taken as evidence that the theory must be modified, usually being replaced by a more comprehensive theory that fixes a wider range of phenomena.

Many particle physicists dream of a day when the fundamental laws of nature might be written on the front of a T-shirt (even if the T-shirt can only exist in 10 dimensions!). But with the recognition that the dominant energy in the Universe resides in empty space (something so peculiar that it is difficult to understand within the context of any current theoretical ideas), more and

more physicists have been subscribing to the idea that perhaps physics is an 'environmental science' — that the laws of physics we observe are merely an accident of our circumstances, and that an infinite number of different universes might exist with different laws. It might be that the only way to understand why the laws of nature in our Universe are the way they are is to realize that if they were any different, life could not have arisen, and we would thus not be here to measure them. This is one version of the infamous 'anthropic principle'.

But I have been wondering whether things might actually be much worse. It could be that many different combinations of laws could allow life to form, and that it is a pure accident, not favoured



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by any particular probabilistic explanation, that the constants of nature result in the combinations we experience in our Universe. Or, it could be that the mathematical formalism is so complex that the ground states of the theory might not be mathematically determinable, even in principle.

Whether or not nature is ultimately 'undecidable' in this strong sense, these ideas point to a possible future for particle physics that is very different from the past. Fundamental physics might not be restricted by any underlying grand mathematical structure that would 'explain' why the Universe is the way it is. It's a possibility that I hope will be wrong, but it's a possibility nonetheless.

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