Essay

Is Multiverse Real?

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Abstract

In this essay, I discuss whether multiverse is real. If multiverse is not real due to spacetime being emergent, how will the scientists solve the fine-tuning problem without invoking some sort of intelligence behind the beginning of everything? And what will the atheists do then? Will they still cling to the multiverse hypothesis by denouncing science?

Keywords: God, space-time, emergent, multiverse.

Scientists who are working with the quantum theory of gravity are saying that space and time are not fundamental entities, but epiphenomena arising from other yet more fundamental entities. Below are some relevant quotes:

While different approaches to quantum gravity are often based on rather different physical principles, many of them share an important suggestion: that in some way spacetime as we find it in our existing theories is not a fundamental ingredient of the world, but instead, like rainbows, plants or people, `emerges' from some deeper, non-spatiotemporal physics. What replaces spacetime and what aspects of spacetime remain in the ontology of fundamental physics differs, as one would expect, from approach to approach. But the idea that the universe and its material content might not, at bottom, be `in' space and time, that these seemingly fundamental ingredients are just appearances of something more fundamental, would, if borne out, shatter our conception of the universe as profoundly as any scientific revolution before. - The emergence of spacetime in quantum theories of gravity by Nick Huggett and Christian Wuthrich

Nobel Laureate David Gross observed, “Everyone in string theory is convinced...that spacetime is doomed. But we don't know what it's replaced by.” Fields medalist Edward Witten also thought that space and time may be “doomed.” Nathan Seiberg of the Institute for Advanced Study at Princeton said, "I am almost certain that space and time are illusions. These are primitive notions that will be replaced by something more sophisticated." - Donald D. Hoffman in The Abdication Of Space-Time (Edge.org)

If there were a dividing line between the quantum and the classical worlds, we could use the space and time of the classical world to provide a framework for describing quantum processes. But without such a dividing line—and, indeed, without a truly classical world—we lose this framework. We must explain space and time as somehow emerging from fundamentally spaceless and timeless physics.

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That insight, in turn, may help us reconcile quantum physics with that other great pillar of physics, Einstein's general theory of relativity, which describes the force of gravity in terms of the geometry of spacetime. General relativity assumes that objects have well-defined positions and never reside in more than one place at the same time—in direct contradiction with quantum physics. Many physicists, such as Stephen Hawking of the University of Cambridge, think that relativity theory must give way to a deeper theory in which space and time do not exist. Classical spacetime emerges out of quantum entanglements through the process of decoherence."
-VlatkoVedral, Living in a quantum world, Scientific American, June 2011

There aren't many things in quantum gravity that everyone agrees on," says Eleanor Knox, a philosopher at King's College London who specializes in the philosophy of physics. "Yet the one thing many people seemed to agree on in quantum gravity was that we were going to have to cope with space and time not being fundamental. - Are Space and Time Fundamental? – The nature of reality - PBS by Kate Becker, Mar 2012

Now what would be the consequences if space and time are not fundamental but emergent? Here are some thoughts:

That space and time are emergent would have at least two implications. It would imply that those fundamental entities from which space and time have emerged cannot be within any space and time and it would also imply that they cannot be material. They cannot be within any space and time simply because space and time have emerged from them and therefore there was no space and time prior to the emergence of space and time. Thus they would be spaceless and timeless. However scientists are not describing these fundamental entities as spaceless and timeless, they are describing them as non-spatiotemporal.

In whichever way they are described, the truth remains the same: those fundamental entities from which space and time have emerged cannot be within any space and time. Being thus spaceless and timeless (or non-spatiotemporal) they would also be immaterial. This is because general relativity has shown that space, time and matter are so interlinked that when there would be matter, there would be space and time as well. So, if those fundamental entities were material, then there would also be space and time along with those material entities. In that case there would already be space and time prior to the emergence of space and time, which would be an absurdity.

That means the fundamental entities from which spacetime has emerged were spaceless, timeless and immaterial. However it can be shown that only one entity be there in spaceless and timeless condition which would further mean that spacetime has emerged from one single entity only that is spaceless, timeless (or non-spatiotemporal) and immaterial.

Atheists' lack of belief in the existence of God: It is not that there is only one reason due to which atheists have a lack of belief in the existence of god/gods; there are several reasons. Out of these several reasons two reasons are that as per atheists nothing can be spaceless and timeless

and that nothing can be immaterial. Atheists can no longer deny the existence of god/gods on the basis of these two reasons without denouncing science. The case is closed for them forever.

However, there are other reasons also. Does the universe need any god? No, because everything in the universe, including its origin also, can be explained by natural means without invoking any kind of god/gods. At least this has been claimed by the atheistic scientists in general. But this is not true. There are some controversial cases also. Two such cases are origin of the universe and fine-tuning problem.

Here atheists will say that fine-tuning problem is not at all a problem, because eternal inflation would give rise to infinite number of universes and fine-tuning problem can be solved very easily with multiverse hypothesis. But two scientists have raised serious doubt about the efficacy of multiverse hypothesis for solving the fine-tuning problem.

Ethan Siegel in his article Yes, The Multiverse Is Real, But It Won't Fix Physics [1] has written that 'If cosmic inflation, General Relativity, and quantum field theory are all correct, the Multiverse likely is real, and we're living in it.' But he has also added this reminder that 'Just don't expect it to solve your most burning questions about the Universe. For that, you need physics you can put to an experimental or observable test. Until that day arrives, the consequences of a Multiverse will likely remain in the realm of science fiction: where they presently belong…The Multiverse is real, but provides the answer to absolutely nothing.'

But Hyun Seok Yang in his article Emergent Spacetime: Reality or Illusion? [2] is more radical in his approach than Ethan Siegel, because as per him there would be no multiverse at all even if there would be inflation. Inflation theory was developed based on the assumption that spacetime was fundamental. But in case of emergent spacetime there would be no eternal inflation and so, there would be no multiverse.

If multiverse is gone forever due to emergent spacetime, how will the scientists solve the fine-tuning problem without invoking some sort of intelligence behind the beginning of everything? And what will the atheists do then? Will they still cling to the multiverse hypothesis by denouncing science?

A time-delay of almost hundred years: In special relativity, it has been shown that at the speed of light time totally stops and that even infinite distance becomes zero for light. The first one is the scientific explanation for timelessness and the second one is the same for spacelessness. As God has been called spaceless and timeless for thousands of years, so here either science was flawed, or if science could not be flawed, then definitely there was something objectively real in man's imagination of God; God could not be purely imaginary. If scientists have argued like that at that time, then they could have very easily come to the conclusion that even if there was no God, still there was something spaceless and timeless in the universe for which special relativity

had provided requisite explanation. So they could have said the same thing hundred years earlier what they are saying now that there is something non-spatiotemporal in the universe.

Reference

1. https://www.forbes.com/sites/startswithabang/2018/01/25/yes-the-multiverse-is-real-but-it-wont-fix-physics/
2. http://arXiv.org/abs/1504.00464