



Alexander Vilenkin: “All the evidence we have says that the universe had a beginning.”

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In honor of Stephen Hawking’s 70th birthday, a meeting of the minds took place to discuss the state of cosmology. *New Scientist*[1] reported on the events of the night, one of which was a talk delivered by famed cosmologist, Alexander Vilenkin, describing why physical reality must have a beginning. But first, a little background is in order.

For a long time scientists held that the universe was eternal and unchanging. This allowed them to avoid the God question—who or what caused the universe—because they reasoned that a beginningless universe needed no cause.[2] They recognized that if the universe began to exist in the finite past that it begged for a cause that was outside of the time-space-continuum. As Stephen Hawking told his well-wishers in a pre-recorded message, “A point of creation would be a place where science broke down. One would have to appeal to religion and the hand of God.”

Scientific discoveries in the early and mid-20th century, however, forced cosmologists to the uncomfortable conclusion that our universe came into being in the finite past. The scientific consensus was that the origin of our universe constituted the origin of physical reality itself. Before the Big Bang, literally nothing existed. The universe came into being from nothing and nowhere. This sounded too much like the creation *ex nihilo* of Genesis, however, and seemed to require the God of Genesis to make it happen. As a result, some cosmologists were feverishly looking for ways to restore an eternal universe.

Several theories have been put forward over the last 50 years. None of them have enjoyed the empirical confirmation that supports the Big Bang model. They are either

lacking in empirical support, or have been disconfirmed by the empirical evidence. But every time one theory goes down in flames, cosmologists think up a new possibility or a variation of an older one.

In the not-so-distant past, Vilenkin himself has advocated cosmogenic theories that entail an eternal universe, but based on cosmological theorems he developed with Alan Guth and Arvin Borde, as well as an examination of the various candidates for an eternal universe, Vilenkin has come to see that all the evidence points in a singular direction: the universe had an absolute beginning in the finite past.

Vilenkin discussed three models for an eternal universe in his presentation, describing why each cannot deliver on what it promises. The first is Alan Guth's eternal inflation model which proposes eternally inflating bubble universes within a multiverse that stretches both forward and backward in time. In 2003 Vilenkin and Guth discovered that the math for this model will not work because it violates the Hubble constant. Speaking of the inflationary multiverse, Vilenkin said "it can't possibly be eternal in the past," and that "there must be some kind of boundary."

The second cosmological model was the cyclical model, which proposes that the universe goes through an eternal series of contractions and expansions – our Big Bang being the latest contraction in an eternal series. Vilenkin shows that this model cannot extend infinitely into the past either because disorder would accumulate with each cycle. If the universe has been going through this process eternally, we should find ourselves in a universe that is completely disordered and dead. We do not, hence a cyclical universe cannot extend infinitely into the past.

The final cosmological model Vilenkin deconstructed is the cosmic egg model. On this model the universe exists eternally in a steady state, but then it "cracked" resulting in the Big Bang. The problem with this model is that quantum instabilities would not allow the "egg" to remain in a steady state for an infinite amount of time. It would be forced to collapse after a finite amount of time, and thus cannot be eternal.

Vilenkin concluded by saying "All the evidence we have says that the universe had a beginning." The power of this statement, and its source, should not be underestimated. Like many other cosmologists, Vilenkin was not satisfied to conclude that the Standard Model (Big Bang) was the end of the story. He wanted the universe to be eternal. He has been involved in projects trying to restore an eternal universe, and yet based on the evidence, he is willing to admit that an eternal universe does not appear to be a physical possibility. All the evidence points to a beginning. And if there is a beginning, then the question of what caused the universe to come into being needs to be answered.

Science cannot answer this question because science trades on material causes, and you can't have a material cause before the origin of material reality itself. Whatever caused the universe to come into being must be immaterial, timeless, non-spatial, powerful, and intelligent. Furthermore, the cause must be personal as well. As William Lane Craig has argued: "[I]f the cause of the universe were an impersonal set of

necessary and sufficient conditions, it could not exist without its effect. The only way for the cause to be timeless and changeless but for its effect to originate *de novo* a finite time ago is for the cause to be a personal agent who freely chooses to bring about an effect without antecedent determining conditions.”[3] And again, “As a free agent God is able to exercise His causal power without any antecedent determining conditions. That is what differentiates a personal agent from an impersonal cause. ... Thus, the moment of God’s creating the universe is the moment at which the universe begins to exist. So God exists changelessly (though not immutably) without creation with a timeless intention that a world with a beginning exist, and by exercising His causal power brings such a world into being at the first moment of time.”[4] An immaterial, timeless, non-spatial, powerful, personal, and intelligent agent sure sounds a lot like the God of theism!

The scientific evidence for a temporally finite universe continues to mount, and this fact leads us toward a theological conclusion about its origin. As Robert Jastrow famously wrote, “For the scientist who has lived by his faith in the power of reason, the story ends like a bad dream. He has scaled the mountains of ignorance: he is about to conquer the highest peak; as he pulls himself over the final rock, he is greeted by a band of theologians who have been sitting there for centuries.”

[1]Lisa Grossman, “Why physicists can’t avoid a creation event,” *New Scientist*, Issue 2847, 11 January 2012, pp. 6-7.

[2]Arguably, even an eternal universe needs a cause. Indeed, the Greeks believed the universe was eternal and unchanging, but still believed an Unmoved Mover was necessary to explain motion in the universe. I am reporting what the early cosmologists believed, not necessarily claiming that they were correct.

[3]William Lane Craig, “Beyond the Big Bang”; available from <http://www.bethinking.org/viewall.php?ID=51>; Internet; accessed 20 May 2010.

[4]William Lane Craig, “Wes Morriston on Divine Creation”; available from <http://www.reasonablefaith.org/site/News2?page=NewsArticle&id=7001>; Internet; accessed 03 January 2011.