

Why past history cannot be infinite: there must be a beginning

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Introduction

The evidence from science points to a beginning for the universe. Some atheists, understanding the possible theological implications of a beginning, prefer to set aside science and assert that the past is infinite either in terms of the number of years this universe has existed, or in terms of a [fantasized](#)¹ infinite series of universes in a multiverse.

Sean Carroll, in his [formal debate](#)² with William Lane Craig, suggested that all we have to do is to build a mathematical model of an eternal universe where 'time runs from minus infinity to plus infinity'. More recently, theoretical physicists Ahmed Farag Ali and Saurya Das have proposed yet [another mathematical model](#)³ of a universe with an infinite past. This is certainly no problem with mathematical models, but in the real, physical world, it is impossible to 'count down' an infinite number of actual years, one at a time, from minus infinity to the present.

Most people find the discussion of infinities somewhat difficult to wrap their minds around, so I will keep this discussion clean and simple.

What does an 'infinite past' mean?

In the real world, an infinite past means that if you were to set this current year as $t = 0$ and count back into the past, there would never be an end to your counting, for there is no year in the past that was the 'beginning'. No matter how long you counted, you would still have an infinite number of years ahead of you to count and, if you were to look back at the set of years you have already counted, it would always be finite. An imaginary past history that is composed of an infinite number of years that have elapsed one at a time can be described as a [countably infinite](#) set⁴.

How many members are in a set that contains a countably infinite number of years? Well, it cannot be described by any particular integer, for any number you picked would always be finite. Therefore, the number of members in a countably infinite set of years is represented by [the symbol \$\aleph_0\$](#) (pronounced 'aleph-null').⁵

¹ <http://www.newscientist.com/article/mg22129520.900-when-does-multiverse-speculation-cross-into-fantasy.html#.VNpw5sbLdy8>

² <https://www.youtube.com/watch?v=X0qKZqPy9T8>

³ <http://arxiv.org/abs/1404.3093v3>

⁴ [Weisstein, Eric W. "Countably Infinite." From *MathWorld*--A Wolfram Web Resource. <http://mathworld.wolfram.com/CountablyInfinite.html>](#)

⁵ [Weisstein, Eric W. "Aleph-0." From *MathWorld*--A Wolfram Web Resource. <http://mathworld.wolfram.com/Aleph-0.html>](#)

Why the age of the universe cannot be infinite

An interesting property of a countably infinite set of years containing \aleph_0 members is,

$$\aleph_0 - \text{any finite set of years} = \aleph_0. \text{ } ^6$$

Why is this a problem for an infinite past?

Well, consider Carroll's suggestion that all we need for an infinite past is for time to elapse from 'minus infinity'. But his suggestion means that past history would have had to 'count through' a countably infinite set of years with \aleph_0 members. Given the above-mentioned property, however, no matter how many members of that set tick by, there will always still be \aleph_0 years to go before it arrives at the present. In other words, if the past is infinite, actual history would never, ever make any progress at all in getting closer to the present, or any other arbitrary point in time. There would always be \aleph_0 years to go before any historical event could occur.

Yet here we are. The only way this can be possible is if the past is not actually composed of \aleph_0 years. The set of years in the past is finite (as opposed to infinite) and there was a beginning, as [science also seems to indicate](#).⁷

Mathworld.wolfram mentions physicist, Paul Renteln's and folklorist, Alan Dundes's humorous [variation of the song](#), *Ninety-nine bottles of beer* as an illustration of this property ... ' \aleph_0 bottles of beer on the wall, \aleph_0 bottles of beer. You take one down and pass it around, \aleph_0 bottles of beer on the wall.'⁸ They describe it as an 'amusing way to keep children occupied a bit longer', due to the above-mentioned property, $\aleph_0 - (\text{any finite set}) = \aleph_0$.

George Ellis and physicist Joe Silk, in a recent article in Nature on [defending the integrity of physics](#), wrote,

*In our view, cosmologists should heed mathematician David Hilbert's warning: although infinity is needed to complete mathematics, it occurs nowhere in the physical Universe.*⁹

⁶ Weisstein, Eric W. "Aleph-0." From *MathWorld*--A Wolfram Web Resource. <http://mathworld.wolfram.com/Aleph-0.html>

⁷ <http://www.scribd.com/doc/77980709/Why-Physicists-Can-t-Avoid-a-Creation-Event#scribd>

⁸ Weisstein, Eric W. "Aleph-0." From *MathWorld*--A Wolfram Web Resource. <http://mathworld.wolfram.com/Aleph-0.html>

⁹ Ellis & Silk (2014) 'Scientific method: defend the integrity of physics', *Nature*, **516**.