
When will the universe end? Not for at least 2.8 billion years

25/02/2016



For those of you only now discovering that such an end was a possibility, here's a little background. Observations of stars and galaxies indicate that the universe is expanding, and at an increasing rate. Assuming that acceleration stays constant, eventually the stars will die out, everything will drift apart, and the universe will cool into an eternal "heat death".

But that's not the only possibility. The acceleration is thought to be due to [dark energy](#), mysterious stuff that permeates the entire . If the total amount of dark energy is increasing, the acceleration will also increase, eventually to the point where the very fabric of space-time tears itself apart and the cosmos pops out of existence.

One prediction puts this hypothetical "[big rip](#)" scenario 22 billion years in the future. But could it happen sooner? To find out, Diego Sáez-Gómez at the University of Lisbon, Portugal, and his colleagues modelled a variety of scenarios and used the latest expansion data to calculate a likely timeline. The data involved nearby galaxies, [supernovae](#) and [ripples in the density of matter](#) known as baryon acoustic oscillations, all of which are used to measure dark energy.

The team found that the earliest a big rip can occur is at 1.2 times the current age of the universe, which works out to be around 2.8 billion years from now. "We're safe," says Sáez-Gómez.

Time equals infinity

And when is the latest it could happen? "The upper bound goes to infinity," he says. That would mean the rip never comes and we end up with the heat death scenario instead.

Given that the sun isn't expected to burn out for at least [another 5 billion years](#), it would be surprising if the universe ended so early. But pondering our doom could be a worthwhile exercise anyway, Sáez-Gómez says. Scenarios like the big rip result from a lack of understanding of physics in particular our inability to marry quantum mechanics and general relativity, the theory of gravity. Exploring the possibilities could show us a way forward.

"You learn more about a physical theory by looking at the exotic and extreme cases," says [Robert Caldwell](#) of Dartmouth College in New Hampshire, who helped come up with the big rip idea. He thinks Sáez-Gómez's lower bound is very conservative, however – the universe is likely to last much longer. Even if it doesn't, at least we've got a good run ahead of us. he says.
