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Cosmic doomsday delayed

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Universe won't end for 24 billion years... probably.

You can breathe a sigh of relief: the Universe will last for at least the next 24 billion years, according to astrophysicists who have modelled the mysterious force of dark energy to work out the fate of the cosmos.

Dark energy is bloating the Universe, at least for the next few billion years.

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Andrei Linde, a theoretical astrophysicist from Stanford University, California, leads a team who previously predicted that the Universe might end as soon as 11 billion years from now. But the team's latest research into dark energy, published online at the preprint server arXiv, gives us a stay of execution.

The team's new calculation relies on recent observations from the Hubble Space Telescope, which has found several supernovae that are moving away from us faster than any others seen before, implying that the Universe is expanding faster than we thought. Linde concludes that the Universe is likely to last for almost twice as long again as it has already existed, before collapsing back on itself in a 'big crunch'.

Deeply problematic

Astrophysicists were puzzled when they first noticed in 1998 that the Universe's expansion was accelerating. What could possibly counteract the gravity that drags massive galaxies together? Theoreticians suggested that some unseen force, dubbed 'dark energy', could be counteracting the pull of gravity. Many models describe dark energy as a negative pressure on the Universe: unlike a gas, the pressure of dark energy actually increases as it expands.

Unfortunately, dark energy has never been directly seen. "Even well educated guesses about dark energy are deeply problematic," says Robert Caldwell, an astrophysicist from Dartmouth College in Hanover, New Hampshire.

In Linde's model, which relies on calculations made by Yun Wang, a cosmologist from the University of Oklahoma, dark energy has two sources. One is a hypothetical form of energy produced by the seething mass of particles that spontaneously appear and disappear in a vacuum. The other is a type of force field that is intrinsic to the fabric of the Universe and continually drives its expansion.

"If we assume this model, the Universe will probably be safe for the next 24 billion years," Linde told news@nature.com.

Crunch or rip?

Physicists are still divided about the fate of the Universe. Some say it will keep expanding forever, whereas others believe that at some point in the future it will begin to contract and ultimately collapse in a big crunch. "All bets are off in terms of predicting the fate of the Universe," says Caldwell, who has previously suggested that the Universe could ultimately end in a 'big rip' as it expands into infinity.

"If I had to bet my money now, I'd say that for the next 10 billion years we will see exponential expansion," says Linde. "Over that time, you will be unable to distinguish the Universe from one that will expand forever."

But infinite expansion is just a cosmic illusion, according to Linde's calculations. "The duration of that expansion will ultimately be finite," he says, so that the Universe will end in collapse.

Only more observations will deliver progress on the problem, because astronomers are still unsure about how much the Universe's expansion has speeded up over time. The Supernova/Acceleration Probe (SNAP) could provide much needed data, says Linde. The craft was proposed by scientists at the Lawrence Berkeley National Laboratory, California, who want to study the light from

hundreds of supernovae to track the rate of cosmic bloat, but the project is currently on hold.

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