Does the expansion of the universe apply to atoms and objects like me?

30 June 2021

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The expansion of the universe is so tiny that it can only be noticed over vast timescales or huge distances, or some combination of both.

The expansion rate is approximately 70 kilometres per second per megaparsec (a parsec is a unit used to measure large distances between astronomical objects). This means that a ruler that is 1 metre long might be expected to expand by about 2 × 10-18 metres every second.

Over one year, a region of space 1 metre across would expand by about the diameter of an atom, pretty much immeasurable from a human perspective.

The atoms in a human won't expand in their lifetime, nor will their remaining atoms aeons after.

Herman D'Hondt

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At present, the expansion of the universe is only visible on the grandest scale. There are three forces that keep this expansion under control: gravity, the electromagnetic force and the strong nuclear force.

Gravity keeps planets in their orbits, stars circling around the centres of galaxies and galaxies bound within clusters. The electromagnetic and strong nuclear forces are what bind you and me and other objects together.

While gravity keeps me sitting on my chair, the electromagnetic force controls the atoms and molecules of my body and of the chair, so we don't collapse in a heap. Finally, the strong nuclear force is what keeps the nuclei of atoms together.

These forces are the reason why objects behave as they do at present, but things may be different in the distant future.

It is now generally accepted that the expansion of the universe began accelerating about 4 billion years ago. The cause of this acceleration is dark energy. Scientists have no idea what dark energy is, and hence cannot predict what will happen to it in billions of years, though there are several possibilities.

One is that dark energy will increase, causing the expansion to speed up further. If that happens, it is possible that dark energy will eventually become so powerful that it overcomes all attractive forces. Over billions or trillions of years, galactic clusters will evaporate, then galaxies themselves will break up. Later still, stars won't be able to hang on to their planets.

If dark energy continues to grow, it will eventually overpower the electromagnetic and strong nuclear forces, and all matter will cease to exist, in a scenario known as the big rip. It is also possible that dark energy will reverse, and start acting against the expansion. If so, the universe may eventually collapse into what is called the big crunch.

Eric Kvaalen

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When Edwin Hubble made his estimation of what we call the Hubble constant, which describes the rate at which the universe's expansion accelerates, he needed to take measurements from galaxies as far as the Virgo Cluster, about 50 million light years away. So no, the expansion of the universe doesn't include atoms or objects such as you.