

15.12: Questions Regarding the Eventual Fate of the Universe

What is the Universe expanding into?

There is nothing whatsoever that we have measured, or can measure, that will show us anything about this larger space. Everything that we measure is within the Universe, and we see no edge or boundary or center of expansion. Thus the Universe is not expanding into anything that we can see, and this is not a profitable thing to think about.

Will the Universe keep expanding, come to a stop, or begin to collapse?

This depends on the ratio of the density of the Universe to the critical density necessary to support continued expansion. If the density of the Universe is higher than the critical density, the Universe would recollapse in a **Big Crunch**. But current data suggest that the density is less than or equal to the critical density so the Universe would expand forever.

Even if the Universe continues to expand, what will eventually happen to the Universe?

From our current knowledge and understanding, the Universe will continue to expand. Matter will be converted to energy. This is understood from the Laws of Thermodynamics: matter cannot be created out of nothing; the Universe would undergo the conversion of its matter to energy. Finally, with matter converted into energy, eventually the Universe will become dark. This would happen in about 100 trillion years!

Astronomers believe Dark Matter and Dark Energy exist. If so, why can't we see either?

Probably because our sensors cannot register Dark Matter and/or Dark Energy. Yet every time scientists turn a higher fidelity instrument toward the Universe, they find something new. Consider this as a science history lesson: we didn't see individual cells until the microscope was invented and scientists theorized about the atomic nucleus; now we see the parts of the nucleus.

What of Parallel Universes or Multiverses?

Some current thinking points to the possibility of numerous universes, of which we are in one universe. Think of our Universe as a bubble; now, think of multiple bubbles. Is there any evidence? Yes, what appears to be "bumps" in our bubble. These bumps appear in the Cosmic Microwave Background images. It has been hypothesized that the bumps represent distinct collisions between Universes (December 2010).

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