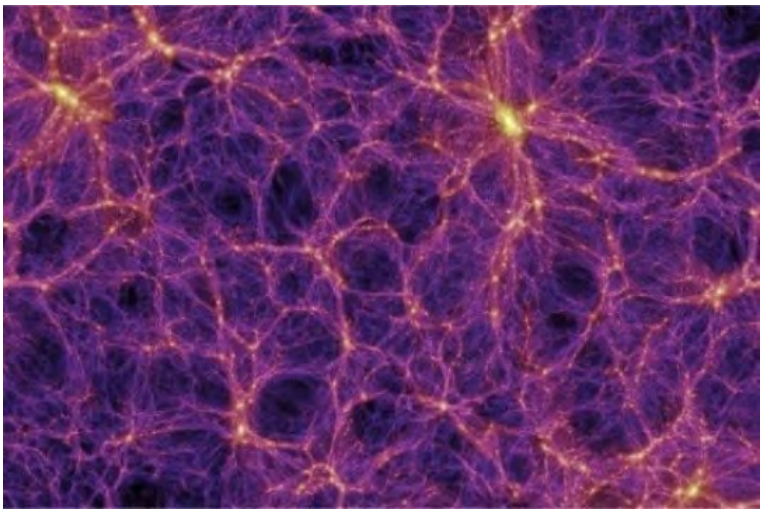
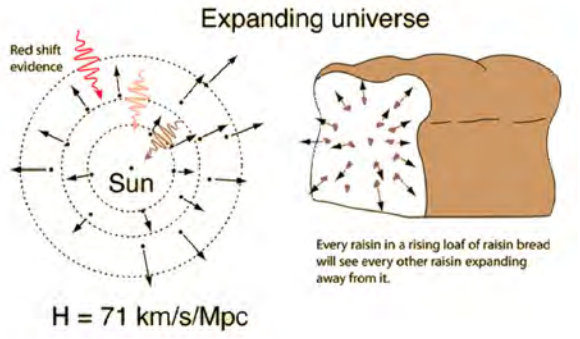
Study supports the idea we live in a void



The universe as simulated by the Millennium Simulation is structured like Swiss cheese in filaments and voids. The Milky Way, according to UW-Madison astronomers, exists in one of the holes or voids of the large-scale structure of the cosmos.

A new study not only firms up the idea that we exist in one of the holes of the Swiss cheese structure of the cosmos, but helps ease the apparent disagreement between different measurements of the Hubble Constant, the unit cosmologists use to describe the rate at which the Universe is expanding today. Its current value is believed to be around 71km/s per million Parsec (a distance of about 30 trillion km). The motion of astronomical objects due solely to this expansion is known as the Hubble flow.

Although widely attributed to **Edwin Hubble**, the law was first derived from the General Relativity equations by **Georges Lemaître** in a 1927 article where he proposed the expansion of the universe and suggested the first estimated value of the rate of expansion. Now, in a 2013 observational study, University of Wisconsin-Madison astronomers **Amy Barger** and **Ryan Keenan** showed that our galaxy, in the context of the large-scale structure of the universe, resides in an enormous void -- a region of space containing far fewer galaxies, stars and planets than expected.



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The new study presented June 6, 2017 by another UW-Madison astronomer, not only firms up the idea that we exist in one of the holes of the Swiss cheese structure of the cosmos, but explains the apparent disagreement or tension between different measurements of the Hubble Constant. The tension arises from the realization that different techniques astrophysicists employ to measure how fast the universe is expanding give different results.

Ben Hoscheit, presenting his analysis of the apparently much larger than average void that our galaxy resides in, says "...fortunately, the suggestion that we live in a void helps us to resolve this tension."

The reason for that is that a void -- with far more matter outside the void exerting a slightly larger gravitational pull -- will affect the Hubble Constant value one measures from a technique that uses relatively nearby supernovae, while it will have no effect on the value derived from a technique that uses the Cosmic Microwave Background (CMB), the supposed leftover light from the Big Bang.

The new Wisconsin report is part of the much bigger effort to better understand the large-scale structure of the universe. Dark Matter and Dark Energy, which cannot yet be directly observed, are believed to comprise approximately 95 percent of the contents of the Universe.

The void that contains the Milky Way, known as the KBC void for Keenan, Barger and **Lennox Cowie**, is at least seven times as large as the average, with a radius measuring roughly 1 billion light years. To date, it is the largest void known to science.

The bright light from a supernova explosion is the "candle" of choice for astronomers, measuring the accelerated expansion of the universe. Because those objects are relatively close to the Milky Way and because no matter where they explode in the observable universe, they do so with the same amount of energy, it provides a consistent way to measure the Hubble Constant.

A direct comparison can thus be made, Hoscheit says, between the 'cosmic' determination of the Hubble Constant and the 'local' determination derived from observations of light from relatively nearby supernovae.

The new analysis made by Hoscheit, says Barger, shows that there are no current observational obstacles to the conclusion that the Milky Way resides in a very large void. As a bonus, she adds, the presence of the void can also resolve some of the discrepancies with techniques used to clock how fast the Universe is expanding based on studies of the Microwave Background.

AK, with EarthSky and Wikipedia Notes