Cosmologists predict a static universe in 3 trillion years

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When Dutch astronomer Willem de Sitter proposed a static model of the universe in the early 1900s, he was some 3 trillion years ahead of his time.

Now, physicists Lawrence Krauss from Case Western Reserve University and Robert J. Scherrer from Vanderbilt University predict that trillions of years into the future, the information that currently allows us to understand how the universe expands will have disappeared over the visible horizon. What remains will be "an island universe" made from the Milky Way and its nearby galactic Local Group neighbors in an overwhelmingly dark void.

The researchers' article, "The Return of the Static Universe and the End of Cosmology," was awarded one of the top prizes for 2007 by the Gravity Research Foundation. It will be published in the October issue of the *Journal of Relativity and Gravitation*.

"While physicists of the future will be able to infer that their island universe has not been eternal, it is unlikely they will be able to infer that the beginning involved a Big Bang," report the researchers.

According to Krauss, since Edwin Hubble advanced his expanding universe observations in 1929, the "pillars of the modern Big Bang" have been built on measurements of the cosmic microwave background radiation from the afterglow of the early universe formation, movement of galaxies away from the Local Group and evidence of the abundance of elements produced in the primordial universe, as well as theoretical inferences based on Einstein's General Relativity Theory.

What appears almost as a story from science fiction, the cosmologists began to envision a universe based on "what ifs." Long after the demise of the solar system, it will be up to future physicists that arise from planets in other solar systems to fathom and unravel the mysteries of the system's origins from their isolated universes dominated by dark energy.

But the irony of the presence of that abundant dark energy, the researchers report, is that future physicists will have no way to measure its presence because of a void in the gravitational dynamics of moving galaxies.

"We live in a special time in the evolution of the universe," stated the researchers, somewhat humorously: "The only time at which we can observationally verify that we live in a very special time in the evolution of the universe."

The researchers describe that modern cosmology is built on Einstein's theory of general relativity, which requires an expanding or collapsing universe for a uniform density of matter. However, an isolated region can exist inside of an otherwise seemingly static universe

They next discuss implications for the detection of the cosmic microwave background that provide evidence of the baby pictures of an early universe.

That radiation will 'red shift" to longer and longer frequencies, eventually becoming undetectable within our galaxy. Krauss said, "We literally will have no way to detect this radiation."

The researchers followed up that discussion with one tracking early elements like helium and deuterium produced in the Big Bang. They predict systems that allow us to detect primordial deuterium will be dispersed throughout the universe to become undetectable, while helium in concentrations of approximately 25 percent at the Big Bang will become indiscernible as stars will produce far more helium in the course of their lives to cloud the origins of the early universe.

"Eventually, the universe will appear static," said Krauss. "All evidence of modern cosmology will have disappeared."

Krauss closed with a comment that he suggested is implicit in the paper's conclusions. "We may feel smug in that we can detect a host of things future civilizations will not know about, but by the same token, this suggests we wonder about what important aspects of the universe we ourselves may be missing. Thus, our results suggest a kind of a 'cosmic humility'".

Source: Case Western Reserve University