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HEADLINE: Scientists Find Clues That **Universe** is Running Away With Itself

BYLINE: David Perlman, Chronicle Science Editor

BODY:

There's new evidence from more than a dozen exploding stars in the most distant reaches of space that a mysterious kind of "antigravity" energy is speeding the expansion of the **universe**, and astronomers are amazed.

The evidence freshly gathered by an international team of scientists strengthens a startling conclusion that the **universe** -- defying common sense -- appears to be running away with itself and its outer edges could continue running forever without ever slowing down.

The latest findings were reported earlier this month at an astronomy meeting in Marina del Rey and were described in more detail yesterday in the journal Science.

But the very idea of an **expanding universe** pervaded by such an unknown "repulsive force," as the astronomers call it, is so astonishing to astronomers that even its supporters are cautious and want more evidence.

To cosmologist Adam Riess at the University of California at Berkeley, the confirming evidence isn't likely to come for another decade, when two international satellites begin studying the faint microwave radiation pervading space that is left over from the Big Bang that gave birth to the universe some 14 billion years ago.

Riess and astronomer Alex Filippenko, together with colleagues from the United States, Australia, Europe and Chile, have been using the Hubble Space Telescope and other instruments around the world to study distant galaxies and the exploding stars called supernovas.

Their first conclusions, Riess said in an interview Thursday, came from another group's observations of four supernovas about 7 billion light years away. That team was led by Saul Perlmutter of UC's Lawrence Berkeley Laboratory, and now Riess's team has examined a total of 14 exploding stars at distances ranging up to 10 billion light-years away, and the Perlmutter group's revolutionary but highly tentative ideas apparently hold up.

As to what the "repulsive force" is that has accelerated the distant star bursts and placed them at least 10 percent farther away than earlier calculations had indicated, Riess could only say:

"We haven't the haziest idea what it is, and in fact we're still not absolutely certain that it even exists."

When Albert Einstein formulated his general theory of relativity in 1906, he believed that the force of gravity acting on all the stars and galaxies would eventually crunch them together and collapse the universe into itself.

So in order to explain why it does not collapse, Einstein proposed a new property of space- time -- a kind of tiny force he called the "cosmological constant" that would prevent the collapse and hold the universe steady just as it is today.

But in the 1920s, astronomer Edwin Hubble discovered that the universe was not steady at all. It was expanding rapidly, and today astronomers are convinced the expansion began when the universe was born in the inconceivably violent instant of the Big Bang.

The big question has been whether the expansion of the universe must eventually slow down, due to the collective gravity of all its billions of galaxies and the presence throughout space of a mass of unseen "dark matter" that might add even more gravity to end the expansion.

Now, said Riess, the evidence points toward a vastly expansive future for the universe. Einstein's cosmological constant was much larger than what Riess and others suspect, but there still appears to be a very weak "repulsive force" that, over large enough distances, is enough to overcome gravity and actually speed the outward rush of the cosmos. The universe, if this is right, will expand forever, faster and faster.

"Even the mostly conservative explanations for the results are quite amazing," cosmologist Edward W. Kolb of the Fermi National Accelerator Laboratory told Science. An accelerating universe, Kolb said, "would be such a fundamental result that I think everyone should reserve judgment."

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