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Einstein's Theory of Relativity Proven Right by Stanford-NASA Space Probe

By Rob Waters - May 4, 2011

A U.S. space probe carrying four gyroscopes has confirmed two key elements of Albert Einstein's theory of relativity about 95 years after he postulated it and 56 years after he died.

Gravity Probe B, built by Lockheed Martin Corp. (LMT) and designed by scientists from Stanford University near Palo Alto, California, measured how space and time are warped by gravitational bodies, a phenomenon called the geodetic effect. The probe launched in 2004 also analyzed frame-dragging, the way spinning objects pull space and time around them.

The effects were demonstrated by having Gravity Probe B point at a star, IM Pegasi, while orbiting Earth. If gravity didn't affect space and time, the gyroscopes aboard the probe would point in the same direction forever during their orbit, as Isaac Newton had theorized. Instead, they showed tiny, measurable changes in the direction of their spin as Earth's gravity tugged at them, as Einstein had predicted.

"Imagine the Earth as if it were immersed in honey," Stanford physicist Francis Everitt, who led the project funded by the National Aeronautics and Space Administration, said in a statement. "As the planet rotates, the honey around it would swirl, and it's the same with space and time."

The project was one of the longest-running efforts in the U.S. space agency's history, beginning in 1963, and cost about $750 million, NASA spokesman Trent Perrotto said today in a telephone interview. The findings were the culmination of 49 years of work by Everitt, who came to Stanford in 1962 to help build the most precise gyroscope ever designed and produced, according to NASA.

"The mission results will have a long-term impact on the work of theoretical physicists," said Bill Danchi, senior astrophysicist and program scientist at NASA Headquarters in Washington, in a statement. "Every future challenge to Einstein's theories of general relativity will have to seek more precise measurements than the remarkable work Gravity Probe B accomplished."

The findings were published today in the journal Physical Review Letters. Lockheed Martin is based in Bethesda, Maryland.

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