There is fresh evidence for the existence of dark energy, a peculiar entity that is hastening the expansion of the cosmos. Dark energy amounts to at least three-quarters of the universe’s energy content. It appears to be accelerating the distances between galaxies and working against gravity, but its nature is still unknown.

The new evidence is the discovery of an effect called the Sachs–Wolfe effect, first discussed in 1967. But its influence on the CMB was recently verified by an international collaboration of astronomers led by Benoit Weill at the High-Z Supernova Search Team, with John Kovac at the Harvard–Smithsonian Center for Astrophysics.

Here’s how the ISW effect works. Gravity is a property of matter, so matter exists in “gravity wells” in space-time. More matter makes a galaxy move slower, so there is a change in the distance between a galaxy and a photon as it travels across the universe. But dark energy stretches out deep wells of gravity into which matter falls, then CMB photons cross the well, and matter leaves. The recent observations of these subtle changes in the CMB provide further evidence for the existence of dark energy.

This additional evidence is good news to astronomers who first detected a gravity-defying dark energy in 1998. At that time, two teams of astronomers were measuring the rate of a collection of very distant Type Ia supernovae. These supernovae are created by the explosion of a white dwarf. The teams at the Space Telescope Cosmology Project at Lawrence Berkeley National Lab and the High-Z Supernova Search Team had intended to measure the rate at which the universe’s expansion was slowing down.

Instead, they found that the distance between Earth and these supernovae was growing, and at an increasingly faster rate. Starting about five billion years ago, some unexplained “dark” energy began to overwhelm the force of gravity and push galaxies apart. The researchers chose to name it dark energy, because its presence cannot be directly observed.

Dark energy is the key to explaining the history of the universe. For example, the universe is expanding, and the rate of its expansion has been increasing. This increase in the rate of expansion is attributed to dark energy.

There are several theories being proposed to explain dark energy. Some of these ideas have been very hard to do. The key to solving this problem is new readings on changes in the large-scale structure of the universe and on light originating from the most distant galaxies.

The further we look into the cosmos, the more puzzling it all is. That’s why cosmologists are working to find out the energy composition of the universe. They need to understand what the overall matter and energy composition of the universe is. Knowing the matter composition, they hope to be able to work out the energy composition. They find new matter composes 4% of the universe, dark matter is 23% of the universe, and the energy is about 73% of the universe. The energy is called dark energy.

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