Understanding Dark Energy

Scientists on the Dark Energy Survey have catalogued millions of galaxies over billions of light-years to solve one of the universe's biggest mysteries.

What is dark energy?

Scientists at Fermilab and other institutions spent six years using one of the world's most powerful digital cameras to map a portion of the southern sky in unprecedented detail, cataloguing hundreds of millions of astronomical objects. Their goal is to understand the mysterious force known as dark energy, which makes up the majority of our universe. Scientists have discovered that the universe is expanding faster and faster, when gravity should cause that expansion to slow. Data from the Dark Energy Survey will help us understand why.

The Dark Energy Camera

The primary instrument of the Dark Energy Survey is one of the world's best digital cameras. Built at Fermilab and mounted on a telescope in the Andes Mountains in Chile, the camera can see light from galaxies billions of light-years away. Though only about the size of a phone booth, the camera has allowed scientists to create the most detailed galaxy maps ever attempted. Scientists have already used that data to discover some of the faintest and smallest galaxies ever seen and to create the largest map of the universe's dark matter ever made, and they even used the camera to make history by spotting a binary neutron star, the source of a gravitational wave detected in 2017.

The Dark Energy Camera mounted on the 4-meter Blanco Telescope at the Cerro Tololo Inter-American Observatory in Chile.

This image taken with the Dark Energy Camera shows a galaxy that is slightly smaller than our own Milky Way, and 65 million light years away.

By the numbers

174 scientists on the Dark Energy Survey staffed the telescope for 758 nights over six years, taking more than 110,000 digital photographs

The first three years of data have been publicly released, containing information on roughly 400 million astronomical objects.

The survey mapped one-quarter of the southern sky (about one-eighth of the full sky), recording information on 300 million galaxies, 100,000 galaxy clusters and 4,000 supernovae.

The Dark Energy Camera's resolution is 520 megapixels (520 million pixels). A high-end cell phone camera is about 20 megapixels.

The Dark Energy Survey is a collaborative effort between more than 400 scientists at institutions in seven countries.

For more information visit www.darkenergysurvey.org.

The Cerro Tololo Inter-American Observatory in Chile. The center observatory houses the Dark Energy Camera.