What's up in Astronomy
by Eric Erickson

Offered Title: We Just Keep on Growing

Einstein predicted it…what else is new but was convinced his math didn't make sense. His equations revealed a force counteracting gravity, causing the universe to expand. He didn't believe it. He was so convinced he developed a correction for his "error". Einstein was not in error and his original relativity equations described our universe's expansion very well. His "correction", called the Cosmological Constant became useful later.

How could this genius be so adamant about his math being wrong? It was his bull-headed belief that our Milky Way universe, was a "Steady State" universe. At that time the Milky Way was the universe. That changed in 1929 after Edwin Hubble (Hubble Telescope namesake) provided observational evidence for an expanding universe, as also predicted by Alexander Friedmann and Jesuit priest astronomer Georges Lemaitre. Hubble also discovered the bombshell that our Milky Way is only one of billions of island universes (galaxies), each with billions of stars. These discoveries changed everything.

Einstein's cosmological constant, also called lambda (Λ) became the term used to represent the energy causing our universe's expansion. Using less exacting and sensitive tools than today's, Lemaitre and Hubble characterized the expansion using Λ along with supernovae and galaxy redshift. It was called the Hubble-Lemaitre Law, eventually to be named the Hubble parameter, around 500 kilometers/second/Megaparsec (500 km/s/Mpc). A Megaparsec is one million parsecs or 3.3 million light years distance.

Einstein's cosmological constant is a blunder astronomers, astrophysicists, and cosmologists still grapple with. What is this force, this energy so strong it counteracts all the gravity from everything in the observable universe?

In the 1990s observations of type Ia supernovae in very distant galaxies showed our universe's expansion to be accelerating. Most everyone expected the expansion to be slowing, due to gravity. This changed everything, again.

What is the universe's expansion rate? How do we measure it? Will it stop or just go on…and on?

Einstein's lambda (Λ) approximates what we now call dark energy, the driving force of the universe's accelerating expansion, we think. Interestingly, the current values for cold dark matter (CDM) in concert with Λ (dark energy) correlates very well with what is seen in the Cosmic Microwave Background data.

Two approaches have recently been used to calculate the Hubble parameter. One team used cold dark matter and dark energy (Λ) values. Their value equals 67.4 km/s/Mpc (+- 2%). Another team used Cepheid variable stars, supernovae, and redshift of distant galaxies, arriving at 73.5 km/s/Mpc (+-2.2%). Obviously, they do not agree so more work is needed. We do know the acceleration is real, just not exactly by how much yet, and over time the Hubble parameter changes as a result of the acceleration.

Will it slow? Unknown. Don't worry about it, it's expanding very, very slowly.

What's in the Sky?

June1; pre-dawn; northeast: Venus and a sliver of a Moon share the sky

Noctilucent Clouds; west; after sunset: Caused by meteoritic dust