What's up in Astronomy By Eric Erickson

Offered Title: Einstein's Blunder?

Albert Einstein is still making scientists and engineers sweat the details as they devise technology that can test his theories. The most recent took about 50 years from design concept until completion. It took convincing federal, state, and local governments, sweat, tears, and patience to realize. Many brilliant minds were involved in this latest confirmation of Einstein. His equations predicted gravitational waves, the resulting disruption of spacetime when black holes merge. The very fabric that holds our existence gets pushed out as waves. While not the first to suggest the existence of gravitational waves Einstein was the first to formally describe them in theory. A gravitational wave was first detected, measured, and confirmed in 2015. Einstein's math predicted this in 1915!

With his theory of relativity (gravity), Einstein presented us with a manual for how our larger universe works. Yet he could not, would not believe his own math when it described an expanding universe. Albert was steadfast in his belief that the universe is static and infinite. So, what did he do? He slipped lambda (Λ) into the equations. Lambda represented the value Einstein assigned to the then hypothetical vacuum energy. When used in his equations lambda counteracted the apparent expansion, thus describing a static universe. Einstein called lambda the cosmological constant. All was well in his universe…but not for long.

Alexander Friedmann, a Russian/Soviet physicist, was first to recognize that using lambda resulted in a very unstable equilibrium. He went on to confirm Einstein's equation without the need for lambda, but his solution proposed our universe's apparent expansion. Einstein acknowledged Friedmann's work but disagreed.

Then, in 1927 Georges Lemaitre, a Belgian Roman Catholic priest and astrophysicist published his own work on Einstein's equations, also proposing an expanding universe. Einstein disagreed.

Next came the red-shift and distance relationship of galaxies, confirmed by Vesto Silpher and Edwin Hubble. Silpher's equations predicted the relationship and Hubble's observations confirmed it. This relationship means the greater a galaxy's spectrum is red-shifted the farther away it is and the faster it is moving away. This describes an expanding universe.

Einstein dropped the cosmological constant like a hot potato and called it his greatest blunder. But was it really a blunder?

As technology improved in the decades after the discovery of expansion, measurements of our universe's expansion became more precise. With this came Inflation theory, measurement of the cosmic microwave background, and the discovery that our universe is expanding at an increasing rate. Now there is evidence for dark matter, something stronger than gravity, holding galaxies together. And then there's dark energy, the anti-gravity thought to be causing our universe's accelerating expansion.

Just so happens, the value derived for dark energy is essentially, with tweaks, Einstein's cosmological constant.

What's in the Sky?

October 23 & 24: Go out at dusk or a little later and see Saturn and a waxing crescent Moon in the southwest.