What's up in Astronomy By Eric Erickson

Offered Title: Dark Matter… We're Still in the Dark

This is an update; Dark Matter is still mysterious, and we still don't know what it is. Thank you for your attention.

OK, I jest. Yes, we still don't know what dark matter is, but it's pretty interesting.

In case you haven't been following the dark matter topic, I'll start from the beginning. Get comfortable as I fire up my way-back machine.

First there was *aether*, the fifth element from Greek philosophy. It was the stuff in which everything on the celestial sphere existed.

The Romans introduced *quintessence*, another name for aether, the fifth element. It was thought to make up all the heavenly bodies, and Earth could be affected by their movements. Sounds like astrology.

In the 17th, 18th and 19th centuries aether was the medium for propagation of light waves, magnetic waves, and gravity. Christiaan Huygens introduced the idea that the universe was filled with a medium having zero density called aether, to allow propagation of light waves.

The idea of an aether was eventually replaced as better explanations for the propagation of light waves, magnetic waves, and gravity were formulated. Bye-bye aether eh? Not so fast.

Lord Kelvin, Henri Poincaré, Jacobus Kapteyn, and Jan Oort all proposed the existence of invisible matter or dark bodies, due to unexpectedly high stellar velocities in our galaxy's outer reaches. The velocities were too fast, so something besides what they could see was causing it. In 1933 Swiss astrophysicist Fritz Zwicky coined the term 'dark matter'. In the 1960s and 1970s Vera Rubin and Kent Ford proposed additional evidence for dark matter. Something massive is causing significant gravitational effects, but what is it?

Fast forward to now. There are numerous experiments ongoing, hoping to detect this dark matter. They come in two flavors: Direct detection and indirect detection. *Direct* detection experiments are looking for interaction with an atomic nucleus that results in release of energy. They use huge amounts of pure xenon, argon, or germanium at near absolute zero temperature, in deep underground vessels to protect them from interference by cosmic rays. *Indirect* detection experiments are looking for annihilation or decay products of dark matter particles in outer space. I love it, we don't know what dark matter is, but we think we can detect its decay products. They are focused on regions in our galaxy with a supposed high density of dark matter. This experimental method is subject to misinterpretation because some normal particles can mimic dark matter decay products. It requires many detections and a lot of verification.

Another investigative method uses the Large Hadron Collider, hoping to produce dark matter.

Candidates for dark matter include these theoretical particles: WIMPs (Weakly Interacting Massive Particles), axions, sterile neutrinos, GIMPs (gravitationally interacting massive particles), and supersymmetric particles. WIMPs are still the favored candidate but so far all experiments have been fruitless.

What's in the Sky?

10/11; dusk; southwest: A crescent Moon hangs above bright Jupiter. Should be a nice sight.