The Night Sky By Eric Erickson

Offered Title: Tuning into The Universe

Anybody have a radio telescope? Not many individuals have the knowledge, wherewithal, or space! I sure don't. Radio astronomy has for decades provided information about our universe that optical astronomy cannot.

What is a radio telescope? It is a receiver of radio signals in a specified range of wavelengths. Sounds like a radio, no? Well, sort of. Radio waves of specified ranges are used to carry information such as music from a transmitter to a receiver, the radio. A radio telescope is designed to receive radio signals from sources beyond our Earth. Anything that produces energy in the form of electromagnetic radiation (EMR) usually produces radio waves.

EMR is the result of accelerating charged particles, such as electrons. Think about home wiring. It has a spectrum of wavelengths from 1 picometer (1 trillionth of a meter), such as gamma rays, to 1 megameter (1 million meters), such as extremely low frequency (ELF) radio waves. One meter is equal to 39.37". A million meters is 621 miles. That's a long wave! Radio waves are also measured by frequency but for our purposes we will stick with wavelength. Between gamma and radio waves this spectrum includes x-rays, UV, visible light, infrared, and microwave (included with radio waves in radio astronomy). Radio waves are on the EMR spectrum from 1 millimeter (1/1000 of a meter) microwave, to ELF.

So, why use radio waves? Radio telescopes "see" radio waves emitted from objects where optical telescopes cannot. Radio waves add information to optical information for analysis of an object, such as the presence of and polarization state of hydrogen. This helps us better understand the nature of that object.

Due to the vast range of wavelengths available, radio telescopes are configured based on the wavelength range of interest. They range from simple dipole antennas to arrays of multiple dishes or antennas, spanning many miles. The largest single dishes are Arecibo in Puerto Rico at 305 meters and FAST (Five hundred meter Aperture Spherical Telescope) in Guizhou province, China at 500 meters. Large dishes and arrays of dishes or antennas also improve resolution for a better-defined image.

As with most observational tools, radio astronomy has challenges. One challenge is our atmosphere, as it blocks wavelengths longer than about 30 meters. Another challenge comes from our use of the radio spectrum for communication, use of electric power, and spark plugs. It is called EMI (Electromagnetic Interference), akin to light pollution with optical telescopes. Because of EMI, radio telescopes are typically situated in remote areas, where radio interference is lowest. Radio astronomy does have one advantage over optical astronomy regarding interference. There are wavelengths and frequencies reserved for radio astronomy and this helps.

What's in the Sky this Week?

Early risers get a treat as Saturn, then Mercury rise just before the Sun, in the southeast.

Comet 45P/Honda-Mrkos-Pajdusakova is a binocular sight at dusk in the southwest about 10 degrees above the horizon.