The Night Sky

The Great Total Solar Eclipse Month!

This upcoming month of April 2024 has been long awaited for astronomy enthusiasts. It will be the second time in seven years that the Moon's shadow will race across the continental United States. Whereas the August 21, 2017 followed a west-coast to east-coast path across the U.S., the total solar eclipse on April 8, 2024 will follow a southwestern to northeastern path. The path of totality first crosses the Mexican border into Texas, then cuts diagonally across Arkansas just clipping the northwestern tip of Tennessee. Following this, it travels through Illinois, Indiana, Ohio, and New York, before leaving the United States through New England. Let's hope for a clear day on April 8th!

This solar eclipse will not be as "deep" in Johnson City as compared to the 2017 eclipse, about 89% for this eclipse versus 97% in 2017. The eclipse will begin at 1:50 p.m. EDT, reach maximum eclipse at 3:10 p.m., and conclude at 4:25 p.m. in Johnson City**. Make sure you protect your eyes by using special "solar eclipse glasses" or using the "projection method" while viewing the eclipse from Johnson City and the surrounding area.** In order to safely view a partial solar eclipse, make sure your solar eclipse glasses are ISO 12312-2 compliant and CE certified -- these words should be written on the glasses.

If you decide to look up at the sun (again, **safely**) from the Johnson City area, you will see the black silhouette of the moon taking a big hunk out of the Sun. Viewing, in a safe manner, throughout the entire eclipse, one would see the Moon slowly pass across the sun's disk, then after maximum eclipse, slowly watch the moon leave the on the other side of the solar disk. At maximum eclipse, you should be able to notice that the surrounding area will look a bit dimmer than normal at this time of day.

For those people in the path of totality, once the bright disk of the Sun is completely covered, they will see a red ring surrounding the Moon and a much fainter whitish halo surrounding this red ring. The red ring is the region of the solar atmosphere known as the chromosphere (or color sphere, due to this red appearance), which sits on top of the bright photosphere (or light sphere), the bright disk we see on the sky. Whereas this lowest portion of the solar atmosphere (i.e., the photosphere) is about 6,000 degrees Celsius (or about 11,000 degrees Fahrenheit), the chromosphere is about 10,000 degrees Celsius (about 18,000 degrees Fahrenheit). It appears red due to the light being generated by the hydrogen "H-alpha" emission line in the Sun's spectrum which is located in the red part of the visible rainbow of colors that makes up white light. This H-alpha line occurs from photons being emitted by hydrogen atoms as an electron in a hydrogen atom jumps from the 3rd energy state down to the 2nd energy state. Note that 90% of all the atoms in the Sun are hydrogen atoms.

Meanwhile, the white halo arises from the outermost layer of the Sun's atmosphere, the corona. The corona is the hottest layer of the solar atmosphere reaching 1 million degrees Celsius (1.8 million degrees Fahrenheit). Due to this high temperature, hydrogen is completely ionized (which means the one electron of the hydrogen atom is no longer orbiting the proton of the hydrogen nucleus). This whitish halo results from the "free" electrons scattering the white light emitted from the solar photosphere.

There is plenty going on at nighttime too this upcoming month. In the morning sky, Mars continues to rise earlier and earlier before the Sun. As the month progresses, the ringed-planet Saturn returns from its trip in back of the Sun, lying to the lower left of Mars by midmonth. If you have an unobstructed eastern horizon, you may catch the waning crescent Moon just below Saturn the morning of April 6th, ½ hour before sunrise sitting low above the horizon. Throughout the first 10 days of April, the separation between Mars and Saturn shrinks until they reach a close encounter the morning of the 10th. On this date, they will only be ½ degree of arc apart from one another. Unfortunately, this close conjunction will be in the bright twilight before sunrise, so look "sharp!" Binoculars will help you spot this planetary pair.

Turning to the evening sky, the only planet visible is mighty Jupiter, sitting in the constellation of Taurus. Jupiter is in its "last legs" in the evening sky as it sits low above the western horizon one hour after sunset. Jupiter reaches conjunction with the Sun on May 18th, so this will be the last full month to view the "King of the Planets" in the evening sky this year.

On the evening of April 22nd, the Moon has a close conjunction with Spica, the brightest star in the constellation of Virgo. Looking towards the southeast an hour after sunset, you'll be able to spot Spica just to the right of the nearly full Moon. Spica makes its closest approach to the Moon around 11 p.m. EDT on this day.

The Moon will reach full phase at 7:49 p.m. EDT on April 23rd. April Full Moons were known as the Full Pink Moon by many Native Americans. This name came from the herb moss pink, or wild ground phlox, which is one of the earliest widespread flowers of the spring.

The next astronomy open house at the ETSU observatory is on Saturday, April 13th from 8 to 10 pm. At these open houses, the public can view objects in the sky through telescopes and hear talks by faculty of the Physics and Astronomy Department. Note that the open houses are cancelled if the sky is cloudy. This will be the last astronomy open house for the season – they will resume in September. Further information about these open houses and directions to the observatory can be found on the web at https://www.etsu.edu/cas/physics/observatory/starparty.php.

If you would rather explore the night sky indoors, this month's planetarium show will be on April 18th at 7:00 p.m. at the ETSU Planetarium in Hutcheson Hall. A location map of the Planetarium on the ETSU campus can be found on the web at https://www.etsu.edu/cas/physics/outreach/planetarium.php. See this web site for further information.

This month's Night Sky was written by Dr. Donald G. Luttermoser, Chair of the Department of Physics and Astronomy at ETSU. He can be reached at lutter@etsu.edu. Any students wishing to pursue a career in Physics or Astronomy are encouraged to contact him at this email address. Astronomy-related information for the public, including a link to the ETSU Powell Observatory, can be found at http://www.etsu.edu/cas/physics/ by selecting the Public Outreach pull down menu on the lower-left side of this web page.