The Great American Eclipse

by Dr. Patrick Treuthardt, *Assistant Head of the Astronomy & Astrophysics Research Lab*

What many are calling the "Great American Eclipse" will be a celestial display exclusively for those in North America on August 21 this year. During this total solar eclipse, the Moon's shadow will journey across 14 US states starting near Lincoln Beach, Oregon and ending near Cape Island, South Carolina, moving at a speed between 1,100-5,000 mph. While some form of solar eclipse happens approximately every six months somewhere on Earth, the last time a total solar eclipse was visible from anywhere in the lower 48 states was in 1979. North Carolinians haven't had the opportunity to see a total solar eclipse so close to home since 1970 when the moon's shadow passed almost directly through Greenville, North Carolina as it sped north along the East Coast. The next time the Moon's shadow will pass over a large swath of the United States won't be until 2024.

While merely witnessing a total solar eclipse is spectacular in its own right, for scientists such events have offered rare opportunities to observe the cosmos. The second most abundant element in the Universe, helium, was discovered during an eclipse in 1868 by a French astronomer named Pierre Jules César Janssen. By examining the spectrum of the Sun's atmosphere during a total solar eclipse, Janssen determined that the line of yellow light everyone assumed was due to sodium came from a yet unknown element. It was the first discovery of an "extraterrestrial" element, since helium wouldn't be found on Earth until 30 years later.

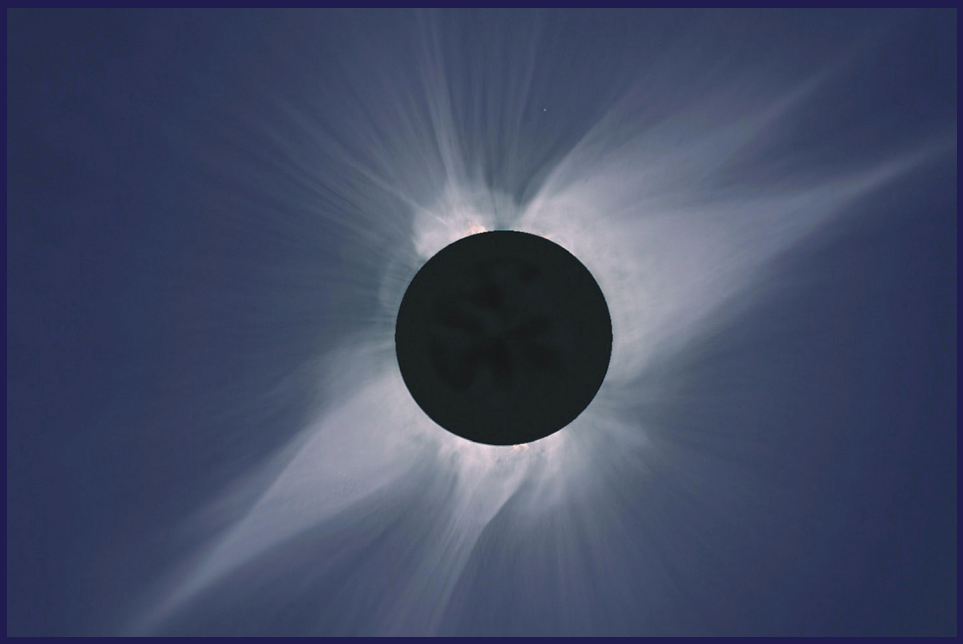
The first experimental test of Einstein's theory of general relativity also made use of a total solar eclipse in 1919. An aspect of the theory states that mass will bend the space-time around it and the path of a light beam through that portion of space-time will also be bent. To test this theory, astronomers set out to measure the positions of stars seen near the edges of the Sun during the eclipse. These astronomers found that the stars' positions appeared shifted by the amount predicted in Einstein's theory due to the distortion of space-time around the Sun. It became the first observational evidence of Einstein's theory.

During the eclipse in August, scientists and citizen scientists alike will attempt to gain clues into how the atmosphere of the Sun works and even record the behaviors of animals during the event. For astronomers, total solar eclipses offer a rare glimpse at the lower portions of the Sun's outer atmosphere, the corona, which can't be replicated through other technological means. One of the burning questions solar astronomers have is why the corona is a million degrees hotter than the visible layer below it, the photosphere. Several ground-based observational experiments, in conjunction with satellite observations, are scheduled to collect data to help understand why this is.

In the past, biologists have noted changes in animal behavior during eclipses around the world. During such an event, it was found that cicadas would go silent, rock bees would leave and return to a hive in dramatically increased numbers, birds would fly home and settle in for sleep, and most remarkably, a group of captive chimpanzees would climb structures, orient their bodies and faces toward the Sun and Moon, and even gesture in the direction of the eclipse.

Of course, viewing the eclipse is weather dependent and unfortunately, predicting the weather is more complicated than predicting when an eclipse will occur. For those that miss the opportunity to see the Moon pass in front of the Sun on August 21, there's always another chance on July 2, 2019 in Chile and Argentina.

The California Academy of Sciences, in collaboration with iNaturalist, has set up a citizen science project called Life Responds to help track and record eclipse-related animal behavior in August. Visit inaturalist.org and search under Projects for more information.



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This photo mosaic shows a view of the sun from Baja California during an eclipse on July 11, 1991, with the moon sliding in front of the sun.