

## WHAT'S UP IN NOVEMBER

By Bernie Reim

Nature's brilliant display of our fall foliage is winding down now and soon the trees will be bare and the landscape will become bleak in preparation for winter. The celestial wonders overhead always offer new and exciting views and possibilities and they don't pass through any bleak seasons.

The nights are getting colder and longer now, but there are several very interesting highlights this month, as happens every month. Jupiter reaches opposition on the third when it shines at its best and brightest for the year; about two months after Saturn did the same thing. Mercury puts in an evening appearance and Venus is still a brilliant morning "star". The annual Leonid meteor shower peaks on the 17<sup>th</sup> and 18<sup>th</sup> and there is a new comet that you can see in Cancer the Crab near the Beehive star cluster with a telescope that might become almost as bright as the brightest stars by next October if it survives its passage around the sun on Christmas day of this year.

I just returned from Texas to see the entire Ring of Fire annular eclipse. It was worth the trip, but only because I was able to see and experience many other things including Big Bend National Park and the Rio Grande river and the tall canyons it is still carving in the Chihuahuan Desert, the largest desert in all of North America. West Texas is completely different from New England in almost every way. It exhibits a rugged beauty all of its own with very strange shaped eroded mountains and hundreds of species of cacti and smaller trees and grasses that are well adapted to this harsh life. Big Bend is prime ground for all kinds of fossils and dinosaur bones since it was once at the bottom of the Cretaceous Seaway which split our country almost in half connecting the Gulf of Mexico to the Arctic Ocean until 65 million years ago.

I also visited the McDonald Observatory in Ft Davis nearly 7000 feet high in the Davis Mountains, home to the third largest telescope in the world, the 11 meter Hobby-Eberly. You were allowed to go inside and look at the telescope, but obviously not through it. It is mostly being used for spectral analysis to decode the light from stars and galaxies to study their properties. It is starting a new project to search for dark energy in the early universe called Illuminating the Darkness, which will produce the largest map of the cosmos ever created and hopefully uncover the true nature of this dark energy which comprises about two thirds of the entire universe.

Then I visited the Odessa meteor craters, the largest one of which was nearly 2 football fields in diameter and about 50 feet deep, created by a roughly 25-foot wide asteroid that broke up and hit us about 63,000 years ago with the force of 20,000 tons of TNT, or about the force of the first atomic bomb we dropped on Hiroshima in 1945. By comparison, the Tunguska event over Siberia and the Barringer Meteor crater 700 miles west of Odessa were created with a force of about 20 megatons, or 1000 times more powerful, or equal to the hydrogen bomb.

I was also able to experience the beauty of some of the darkest skies in this country and how a scorching hot day quickly turns into a cool and windy night over the sand dunes near Odessa. For a few fleeting moments I could clearly see the earth's shadow sharply etched on our atmosphere across the eastern horizon with its subtle purple and gray hues, its upper edge tinged with the pink belt of Venus. The endless expanse of sand and scrubby vegetation all the way to the horizon for days on end made all of this possible. A few hardy yet delicate flowers were able to bloom right in this sand along with numerous bunches of 5-foot-tall western

sunflowers called *Helianthus Anomalous*, a fairly young and still evolving new species of sunflower only about 100,000 years old that contributed a great sense of joy and color to this harsh, hot, and monochromatic landscape. The first flowers appeared on Earth about 130 million years ago.

The story of how all of this sand got here over 500 miles from the nearest ocean is extremely fascinating and shows how far geographical connections can reach. These sand dunes form a narrow band of sand that stretches for hundreds of miles into New Mexico. It was all carried here one grain at a time by the Pecos River from the erosion of the Rocky Mountains about 40,000 years ago. Then the plants that anchored the sand died off during the last ice age and the sand was further transported eastward by the strong winds and is still constantly changing and moving today.

Jupiter is at opposition now, which means that it will rise right at sunset and remain in our sky all night long and that it is closest and largest and brightest now for the whole year from our perspective. You can see it high in the sky by 10 pm in Aries the Ram near the Pleiades open star cluster in Taurus the Bull in the Winter Hexagon shining at a brilliant magnitude of minus 2.9, or about 30 times brighter than Saturn which is already starting to fade in Aquarius, two constellations to the west of Jupiter. Saturn had its own opposition back on August 27 and it will end its retrograde loop in the sky and return to its normal eastward motion on November 4, one day after Jupiter's opposition.

Mercury will be visible low in the southwestern evening sky in Scorpius towards the end of the month right after sunset. Venus is still the brilliant morning star in Virgo. It will pass near Spica, Virgo's brightest star on the 27<sup>th</sup>. It is getting more illuminated by the sun even as its disk is getting smaller and farther away from us as it is traveling faster than we are around the sun. Notice that Venus is about 3 times brighter than Jupiter and exactly 100 times, or 5 magnitudes brighter than Saturn.

The conditions will be good for the Leonid Meteor shower this year since the 5-day-old waxing crescent moon will set before 10pm on the 17<sup>th</sup> and 18<sup>th</sup>. You can only expect about 15 meteors per hour from a dark sky site, which is less than they used to produce. Created by debris from Comet 55P/Temple-Tuttle, which orbits the sun every 33 years, these meteors tend to be very swift, many of which will leave glowing and persistent trails behind them.

This comet last returned in 1999, which created some spectacular Leonid meteor showers for several years due to all of the extra debris we were passing through then. I was lucky enough to be able to see nearly 1,000 Leonids per hour officially called a Meteor Storm, during the early morning hours of November 18 of 2001. We had just built our new observatory in Kennebunk and about 30 of us gathered there that cold morning to witness this unforgettable natural event, second only to experiencing a total solar eclipse. It was literally raining meteors all night long, averaging one every 4 seconds with not a single lull of over 10 seconds. I even saw 7 meteors in one second emanating from Leo, as if we were being fired on from space, but it was all perfectly safe since these tiny particles are about the size of a grain of sand and they burn up at the edge of space about 70 miles above us totally harmlessly.

That was the first and only time that I ever got the sense of our constant 18.6 mile-per-second motion through space around the sun as we plowed through this huge debris field of tiny particles. We also saw 15 brilliant bolides that illuminated the entire sky and made it appear bright as day for a split second. We all saw many lifetimes worth of meteors and

fireballs during those few hours. To top off this incredible experience, we were even treated to the zodiacal light towards dawn, sometimes also called the “false dawn”. This pyramid-shaped cone of light stretches along the ecliptic for 30 degrees or so and is best visible before dawn in the east in November and after dusk in the west in March. You can look for it this month around new moon from a dark sky site with no light pollution. It is caused by sunlight bouncing off trillions of tiny particles of dust in our ecliptic plane, caused by comets and asteroids.

The last major highlight this month will be Comet Tsuchinshan 1 passing right through the Beehive open star cluster in Cancer on its way east from Gemini into Leo. You will need at least a 4 inch telescope to see it and the moon should not be in the sky to wash it out, which will be around the middle of the month. Try to get some photographs of it in this scenic part of the sky if you can. The best part of this comet is that it may become as bright as zero magnitude by next October if it survives its hazardous journey around the sun which will occur on Christmas Day of this year. Many comets don’t survive this journey and either plunge right into the sun or lose much of their mass due to the powerful solar winds so close to the sun, almost like Icarus flying too close to the sun. There is even a bonus comet visible this month also with a telescope, 103P/Hartley rising in Hydra at 2 am.

Nov.2. Harlow Shapley, an American astronomer was born on this day in 1885. He discovered the sun’s place in our Milky Way galaxy along with where the center of our galaxy is by using Cepheid variable stars as cosmic yardsticks or standard candles and by studying the globular clusters forming a halo around the center.

Nov. 3. On this day in 1957 the Russians launched Sputnik 2. This was the first rocket to carry a live creature into space, a dog named Laika. Jupiter is at opposition.

Nov. 4. Saturn is stationary in Aquarius, ending its retrograde motion for the year.

Nov. 5. Last quarter moon is at 3:37 a.m. EST.

Nov. 6. Tycho Brahe discovered a supernova on this day in 1572 in Cassiopeia without a telescope.

Nov. 8. Edmund Halley was born on this day in 1656. I first saw his famous comet on this day in 1985.

Nov.9. Carl Sagan was born on this day in 1934. The moon passes just one degree north of Venus this morning at 4 am. Albert Einstein won his only Nobel Prize on this day in 1921, for discovering the photoelectric effect. He never won one for general relativity, which was a far greater discovery.

Nov.13. New moon is at 4:27 a.m. Uranus is at opposition in Taurus near Jupiter.

Nov. 14. The moon passes near Antares in Scorpius.

Nov. 16. Mercury passes near Antares, an orange giant star that is 700 times bigger than our sun and about 500 light years away, similar to Betelgeuse in Orion.

Nov. 17. The Hungarian physicist Eugene Wigner was born on this day in 1902. He contributed to our understanding of quantum mechanics and won the Nobel Prize in physics in 1963. His famous thought experiment called “Wigner’s Friend” is similar to Schrodinger’s Cat and could show that there is no objective reality and that consciousness creates all of reality.

Nov. 25. The moon passes 3 degrees north of Jupiter this morning.

Nov. 26. This moon passes 3 degrees north of Uranus this morning.

Nov. 27. Full moon is at 4:16 a.m. This is the Frosty or Beaver Moon.

