# WHAT'S UP IN DECEMBER

**By Bernie Reim**

The month of December always marks the beginning of winter for us in the northern hemisphere. That will happen at exactly 10:59 am on Tuesday the 21st this year. That will be the longest night and shortest day of the whole year. The word "solstice" means "sun stands still". That is what the sun appears to be doing for a day or so, but that is only from our limited perspective on Earth. It is not really standing still at all, it is only reaching its lowest point in our sky for the year, which for us at this latitude is only 24 degrees low in the sky with the days being less than 9 hours long versus 15 and a half hours long by the time we reach the summer solstice half a year later.

There will be no great and extremely rare Jupiter conjunction with Saturn this year on the solstice. These two gas giants made their closest approach to each other from our perspective in about 800 years last year exactly on the winter solstice. They were less than one tenth of a degree apart. Now they are 18 degrees apart, at opposite ends of Capricorn.

However, there will be several excellent highlights during this last month of the year to more than make up for that great event last year. All five of the brightest planets will be visible again this month, but not at the same time. Four of them will be in the evening sky and only Mars will inhabit the morning sky after all the others have set. Venus will reach its greatest brilliancy for the year and there is a comet named Leonard that should become visible to the naked eye by the second week of this month. There will be not one, but two good meteor showers, the Geminids on the 13th and the Ursids on the 22nd. Then there will be a total solar eclipse over western Antarctica on the 4th to follow the near total lunar eclipse we just had in November. To top all of that off, the long-awaited James Webb Space Telescope is finally set to launch on Saturday the 18th from the South American country of French Guiana. So we have a way above average month in store for us.

Both Jupiter and Saturn continue to fade a little as they fall further behind us in their orbits. They also both continue to set about 4 minutes earlier each night along with the stars in Capricorn. The King of the Planets will set by 8 pm by the end of the year and Saturn will set an hour earlier. So this will be your last chance to get some good views of Saturn through a telescope before it turns into a morning planet in early February.

Venus will reach its greatest brilliancy for the year on the 4th at magnitude -4.9, one full magnitude or two and a half times brighter than Venus is at its least bright. See if you can catch the phases of Venus with just a pair of binoculars as it will be undergoing a rapid transformation this month from being 28% lit by the sun and spanning 39 arc seconds of the sky to nearly doubling in size to just over an arc minute and shrinking to only 2% lit by the sun by the end of the year. It will pass through its inferior conjunction with the sun early next year when it will disappear for a couple of weeks and then become a morning planet once again.

Notice that Venus is also rapidly closing the gap with Saturn while it is undergoing all of these transformations. Venus will be just 18 degrees to the west of Saturn by the end of the month, which is the same distance as Saturn to Jupiter. Saturn will appear halfway between Jupiter and Venus to make an impressive and bright trio in our evening sky later this month. Watch closely as the waxing crescent moon, complete with its ghostly earthshine, will join Venus on the 6th and then proceed to point out each of the other bright planets in that picturesque and fairly rare sequence on successive nights. As a bonus, our first planet, Mercury will appear out of the

sun's glare late this month and it will be only 6 degrees below and to the left of Venus on the night after Christmas, now forming an even more impressive quartet.

Comet Leonard, discovered by Greg Leonard back on January 3 of this year at the Mt.Lemmon Observatory in Arizona exactly one year before its perihelion with the sun on January 3 of next year. It was only a faint 19th magnitude speck when he discovered it, fully one million times fainter than the 4th magnitude brightness that this cosmic visitor is expected to reach by the 14th of this month, easily visible with the naked eye. This comet will pass within 20 million miles of Earth and within only 2.6 million miles of Venus. Look for it just 5 degrees below Venus on the 17th in the evening sky. This will be a welcome celestial Christmas gift for everyone to enjoy in our sky, the brightest comet since NEOWISE back in the summer of 2020.

The Geminid meteor shower will peak on Monday the 13th into Tuesday the 14th. This is usually the best meteor shower of the year, even more prolific and consistent than the August Perseids. You can expect well over 100 meteors per hour out of the Geminids from a dark sky site away from any towns or cities and all light pollution. The moon will interfere for a while this year, since it will be waxing gibbous 4 days before full and it will not set until about 3 am. However, meteor showers are usually much better after midnight and towards morning anyway since the earth is then spinning into their source instead of away from it, so plan to get up early to catch tons of these unique meteors. Caused by an asteroid named 3200 Phaethon, these meteors tend to be brighter than any of the other showers since the tiny sand grain-sized particles that we see burning up about 70 miles above us at the edge of space are denser than the comet dust that we see from all of the other meteor showers except for one more which is also caused by an asteroid, the January 3rd Quadrantids.

The other meteor shower this month is much less impressive, only producing about 15 meteors per hour at its best, which it will not be this year since they will peak on the 22nd, the day after the solstice and just 4 days after full moon this month. The Ursids are caused by Comet 8P/Tuttle and all seem to originate near Kochab, a star in Ursa Minor, commonly known as the Little Dipper.

Unfortunately it was cloudy and rainy for us in this area for the near total lunar eclipse last month, but a solar eclipse always follows or precedes a lunar eclipse so we will have a total solar eclipse on Saturday the 4th, but it will only be visible over western Antarctica and the South Orkney Islands including Coronation Island, just past where the tip of the lunar shadow cone will first brush across the earth over the Southern Ocean right at sunrise. Try to catch a live feed of this event on the NASA channel or slooh.com.

Everything will look much more dramatic and extreme during a total solar eclipse over such a unique and alien landscape as Antarctica. It will be a truly unforgettable experience for the lucky few that can get down there for this great event, which will be far fewer than the 60 or 70 million people that got to see the American total solar eclipse back on August 21 of 2017 that I had the chance to see over Idaho near Yellowstone National Park. The last total solar eclipse near the South Pole happened on November 23 of 2003 and the next one will not happen until December 15 of 2039. You don't need to wait until then since there will be a hybrid solar eclipse, which means it will be partly total and partly annular on April 20 of 2023 over the very western part of Australia. That will be closely followed by one right over Maine less than a year after that on April 8 of 2024.

Perhaps the greatest highlight of this month and maybe even the whole 21st century so far will be the long-awaited launch of the James Webb Space Telescope on Saturday the 18th. Since

it is all folded up at launch to fit into the Arianne 5 rocket, it has to execute nearly 400 distinct unfolding maneuvers flawlessly over the next 2 weeks. Then it will take another 2 weeks to get to its destination at the L2 point over 1 million miles out in space and then it will take another 5 months or so to be fully calibrated and start discovering amazing new things about our universe that will definitely rewrite our textbooks. I will write much more about its progress as that whole process unfolds.
Dec.4. New moon is at 2:43 a.m. EST. Total solar eclipse today over Antarctica. Venus is at its greatest brilliancy today for the year.
Dec.6. The moon passes less than 2 degrees south of Venus tonight.
Dec.7. Gerard Kuiper was born on this day in 1905. The belt of around 35,000 objects larger than 100 km including Pluto was named after him. There may be as many as 100 million objects down to 20 km across also residing in this belt in space starting at 40 a.u. away. The moon passes near Saturn tonight.
Dec. 9. The moon passes near Jupiter tonight.
Dec. 10. First quarter moon is at 8:36 p.m.
Dec.14. The Geminid meteor shower peaks.
Dec. 17. The Wright Brothers flew the world's first successful motor-operated airplane 255 meters for 59 seconds on this day in 1903. Just 66 years later we flew all the way to the moon.
Dec. 18. Full moon is at 11:35 p.m. This is also called the Cold moon or the Moon before Yule.
Dec.21. Winter solstice is at 10:59 a.m.
Dec.22. The Ursid meteor shower peaks.
Dec.25. Isaac Newton was born on this day in 1642.
Dec. 27. Johannes Kepler was born on this day in 1571.
Dec.28. Arthur Eddington was born on this day in 1882. He took a photograph during a total solar eclipse in May of 1919 that proved Einstein's general relativity correct. Mercury passes 4 degrees south of Venus this evening.
Dec.31. The moon passes near Mars this morning which will be close to Antares in Scorpius, which means "rival of Mars".