

WHAT'S UP IN FEBRUARY

By Bernie Reim

The month of February is named after the Latin word "februum" which means purification. Groundhog Day is on the second of this month, which also marks the half way point between the winter solstice and the spring equinox. Just like there are 4 seasons, there are also 4 cross quarter days marking the half way points of our four seasons. The one this month is also known as Candlemas in the Christian tradition and as Imbolc in the Celtic tradition that dates farther back.

This January was one of the warmest on record, almost a permanent January thaw, so it should get much colder this month. The days continue to get longer by 3 minutes each day all month long, leading to the day length being over 11 hours long by the end of this month. They were under 10 hours long to start February.

There will be many great highlights this month that will be well worth braving any cold that we may get to go outside and enjoy them and learn more about how our amazing solar system and universe really work from a first-hand perspective once you better understand what is happening. These include one last chance to see all 7 of our planets in the sky on the first of this month, 6 of them in the evening and Mercury in the morning. Just like Venus passed very close to Saturn last month, it will pass very close to Jupiter on the last day of this month. Then Jupiter will continue to sink even as Venus continues to climb higher until summer starts.

Watch for an even closer conjunction of Venus and Neptune in Aquarius on Valentine's Day. The pair will be only half a degree apart, which is the width of the full moon. You will need a good pair of binoculars to see Neptune, since it is nearly 12 magnitudes or about 40,000 times fainter than brilliant Venus. At a distance of 30.8 A.U., it takes light 4 hours to reach us from this lonely last outpost for a planet in our solar system. The light from Venus will reach us in just 12 minutes. Then there will be two asteroids at their best, Ceres and Pallas. There will be not one, but three comets visible this month with binoculars, the brightest of which, Comet C/2022 E3 (ZTF) will pass very close to Mars in Taurus on the 10th, and it may even become visible without binoculars. The other two comets are another ZTF comet (C/2020V2), passing through Cassiopeia and Perseus not far from the first ZTF comet, and then Comet 96P/Machholz low in the morning sky just below the Summer Triangle and Aquila the Eagle. After that we can expect 5 more fairly good comets, magnitude 10 or better, for the rest of this year.

The last remaining highlight this month, other than some more close conjunctions of the moon with some of our planets, will be the zodiacal light. Look for it starting around the middle of this month with no moonlight to interfere with its subtle glow. Look for a cone-shaped glow aligned with the ecliptic low on the western horizon about an hour after sunset. This faint light is caused by sunlight reflecting off solar system debris left by ancient comets in the ecliptic plane of our solar system. So even though there will be no more meteor showers until the April 22 Lyrids, which always fall on Earth Day, you can now see the combined effect of trillions of tiny pieces of all of the comets that have ever passed near the earth, at least within the last few thousand years. You can also look for the zodiacal light about an hour before dawn in October and November. The key is that the angle of our horizon to the ecliptic has to be at its steepest for us to see this subtle pyramid of light. This debris forms a permanent torus in the ecliptic plane of our solar system, but you can only see it when the angle is at its steepest. I have seen it 3 or 4 times and it is quite haunting and inspiring at the same time.

Watch Venus and Jupiter carefully all month as the much faster moving Venus is rapidly catching up with the king of the planets at a rate of exactly one degree per day. They begin 29 degrees apart and they will be just one degree apart in Pisces the Fish on the last day of this month low in the western evening sky about an hour after sunset.

Moving from west to east, Venus, Jupiter, and Mars will all be strung across our evening sky like a celestial necklace of planetary pearls all month long. Notice that Mars is moving in its normal prograde or eastward motion in Taurus again and that is getting a little fainter and smaller and less orange each evening. It is about zero magnitude now and the same distance from us as our sun, just over 8 minutes away at the speed of light.

We will lose Saturn in our evening sky after the first of this month. Then the ringed planet will reappear in our morning sky next month.

The largest asteroid Ceres will be at its best on the 8th and the second largest asteroid, Pallas, will be at its best in Canis Major on the 12th. Pallas will reach 7.7 magnitude and will pass close to Sirius, the brightest star in our sky at minus 1.4 magnitude on the 25th. That is about 9 magnitudes or 4000 times brighter than Pallas, which is about 325 miles across. The German astronomer Heinrich Olbers discovered Pallas in 1802 by carefully comparing the sky against the current star charts of his time. Olbers is better known for his conjecture about why it is dark at night, called Olber's paradox. Edmund Halley and Johannes Kepler also seriously considered this paradox before Olbers did.

If the universe is static and infinite and eternal, your line of sight from Earth at night would always land on a star or galaxy, similar to seeing just trees as you look deeper into any forest that isn't planted in straight rows. So the simple fact that it is dark at night leads to a profound realization that the whole universe must be expanding and that the speed of light is limited. This was not proven until 1929 when Edwin Hubble measured the redshift of galaxies to show the rate of expansion of our universe.

Actually, all of this light from the Big Bang is still there, but it was shifted into the infrared part of our electromagnetic spectrum as the universe is expanding so that we can't see it with just our human eyes anymore. That is the main reason that the new James Webb Space Telescope is so effective, it can see much farther into the space and time of our expanding universe than any other telescopes ever could. We have now seen all the way back to about 200 million years after the Big Bang which happened 13.8 billion years ago. One great mystery is that we have discovered fully formed galaxies at that distance containing second generation stars like our own sun that is 4.6 billion years old.

You can see and hear some of this very cold 3 degree Kelvin cosmic microwave background radiation that has been so greatly red shifted over time for yourself without a million dollar radio telescope like the one Penzias and Wilson used to discover this in 1965 and for which they won the Nobel Prize in 1978. All you need is an old analog T.V. or radio. About one percent of the white noise and random static between channels comes directly from the very origin of our universe, this all pervading light that is still present. The rest of the static comes from other electromagnetic interferences including energy from the sun and lightning and other radio and T.V. stations.

Comet C/2022 E3 (ZTF) will zip right along at 6 degrees per night early this month in Cassiopeia. Then it slows down to 3 degrees per night as it enters Auriga and Taurus and passes close to Mars on the 10th and then it slows down to just one degree per night at the end of this

month. It could still become visible without binoculars and will most likely be the best comet of this year, so try to see it for yourself. From the perspective of our latest rover on Mars, Perseverance, this comet is visible at 6th magnitude and appears just two degrees away from Earth at minus second magnitude in the pink Martian sky.

Feb.3. The waxing gibbous moon forms a neat line with Castor and Pollux in Gemini tonight.

Feb.4. Clyde Tombaugh was born on this day in 1906. He would discover Pluto on February 18 of 1930. It was known as a full-fledged planet for 76 years until it was reclassified as an icy dwarf in 2006.

Feb.5. Full moon is at 1:29 p.m. EST. This is also known as the Snow, Ice, or Hunger moon. This will also be a micro moon, since it is just one day past its apogee, or farthest distance from Earth for the month. A super moon occurs when the full moon is within one day of perigee, or closest to Earth. The full moon always looks much larger on the horizon anyway due to the moon illusion, so you will probably not notice that it will be a little smaller than usual. The smallest micro moon is only 14% smaller than the largest super moon.

Feb. 8. Dwarf planet Ceres is stationary. Jules Verne was born on this day in 1828.

Feb. 10. Comet C/2022 E3 (ZTF) passes close to Mars in Taurus tonight.

Feb. 13. Last quarter moon is at 11:01 a.m.

Feb.14. Venus and Neptune will be only half a degree apart in Aquarius tonight.

Feb.15. Galileo was born on this day in 1564. He would improve the telescope in 1609 and he soon proved that the earth is not the center of our solar system or the universe.

Feb. 19. Nicolaus Copernicus was born on this day in 1473. He developed the heliocentric model of the solar system which was later proven by Galileo.

Feb. 20. New moon is at 2:06 a.m.

Feb. 21. The slender waxing crescent moon will pass close to Venus and Jupiter tonight and the next night.

Feb. 23. Supernova 1987a was discovered by Ian Shelton on this day in 1987. This was a massive star in the Tarantula nebula in the Large Magellanic Cloud, one of two satellites to the Milky Way Galaxy. It actually exploded 160,000 years ago, but was just seen in our sky in 1987.

Pioneer 10 left our solar system on this day in 1990. That boundary is at about 120 A.U. or 3 times as far away as the average distance to Pluto.

Feb. 26. The moon passes between the Pleiades and the Hyades in Taurus tonight. Jupiter and Venus are less than 3 degrees apart low in the western sky this tonight.

Feb. 27. First quarter moon is at 3:06 am. The moon passes one degree north of Mars tonight.

Feb. 28. Jupiter and Venus are only one degree apart shortly after sunset in the western evening sky.