WHAT'S UP IN SEPTEMBER

By Bernie Reim

The month of September always marks the behttps://docs.google.com/document/d/1SqWCwdp1YDFOTOrFcuLL2vsgrOapW8hK/editginning of fall for us in the northern hemisphere. This year that will happen at exactly 2:50 a.m. EDT on Saturday the 23rd. The autumnal and the vernal equinoxes are the only two days each year that the sun will rise due east and set due west for everyone on Earth except for the poles. Within a few days of those dates the days will also be exactly 12 hours long for everyone on earth except for the poles. They are off by a few days since we orbit in ellipses and not perfect circles and we are tilted at 23.5 degrees on our axis.

Our famous flaming fall foliage will also begin in earnest this month and peak for us in southern Maine around the middle of October. A small percentage of our often unnoticed background of green foliage is already starting to stand out and differentiate itself in a wide array of brilliant reds, oranges, and yellows, which will only intensify as the month progresses.

Autumn tends to be our best season for viewing the heavens since there is less humidity and more clear days and it is not too cold yet to enjoy the ever-lengthening nights. There are several good highlights to see this month including Saturn still near its best for the year, Jupiter getting a little brighter and closer each night, Venus at its greatest brilliancy in the morning sky, the best morning apparition of Mercury for the year, a fairly bright telescopic comet, and the beginning of the zodiacal light becoming visible in the morning sky for several months.

Saturn was at its best and brightest and closest for the year at the end of last month. So it now rises just a few minutes earlier each night, but it is still visible almost all night long reaching its highest point in the sky around midnight. The ringed planet is getting slightly dimmer and farther away each evening, but you won't really notice that until near the end of this month.

Look for its soft golden glow in Aquarius the water bearer. Through a good telescope you may even see some of the white spots in its atmosphere which signal the beginning of another season of mega storms which occur every 25 to 30 years, or about the time it take for Saturn to orbit the sun once. They are caused by higher concentrations of ammonia falling as rain or hail from its upper atmosphere into its lower atmosphere. I have seen them several times.

A bright waxing gibbous moon will be near Saturn on the 26th. Notice that its rings are fairly narrow now at only 9 or 10 degrees. They can be tilted at a maximum angle of up to 27 degrees. They are on their way down to zero now, which it will reach in 2025. Then they will reach their maximum angle again by 2039, halfway back to its next 29 year cycle around the sun. Humans will most likely be walking around on Mars by the time Saturn's rings reach their maximum angle again.

Jupiter is not far behind since it now rises around 10 pm early this month and it will rise by 8 pm by the end of the month. The king of the planets begins its retrograde or westward motion against the fixed background of stars on Sept. 4 in the constellation of Aries the Ram, two constellations to the east of Saturn in Aquarius. Jupiter will reach its own opposition on November 3 of this year.

Remember that these two bright gas giants were less than one tenth of a degree apart in Capricorn on the winter solstice of 2021. That was their closest approach in 800 years, when the world was a very different place during the Dark Ages. They are getting a little farther apart

each night now. They get fairly close together from our perspective on Earth about every 20 years.

Venus will be at its greatest brilliancy for the year on the 19th at minus 4.8 magnitude, or almost 100 times brighter than Saturn and still 7 times brighter than Jupiter. Through a telescope you will notice that it is a thin crescent only 11% lit by the sun at the beginning of the month and it will grow all the way to 36% lit by the end of the month. It will slowly be getting dimmer again after the 19th, but it will continue to get more illuminated even as it is getting smaller and farther away from us.

Venus rises around 5 am and it will be just below a slender waning crescent moon on the 11th in Cancer the Crab. Look for M44, the Beehive open star cluster, just above Venus and then move up about another 10 degrees, or one fist at arm's length, and you will see Pollux and Castor in Gemini.

The Beehive, also known as M44 or Praesepe, which means the manger or crib in Latin, has about 1000 stars in it that are about 600 light years away. They are fairly young, about 600 million years old, which is only one seventh as old as our sun. That cluster is also related to the Hyades open cluster in Taurus based on a common origin for the stars and a similar speed that they are moving away.

Then watch for Mercury to pop back into the morning sky one week into this month after its inferior conjunction with the sun. Look for our first planet below Regulus in Leo the Lion by the middle of the month below and to the left of Venus and then it reaches its greatest western elongation from the sun at 18 degrees. It will be at its brightest on the 29th when it will reach 9 degrees high above the eastern horizon half an hour before sunrise.

There should be many brighter than tenth magnitude comets visible to us over the coming year. The one for this month should reach 8th magnitude and will be closest to us on Sept 25 and 26 in the constellation of Auriga which marks the top of the winter hexagon. It is named 103P/Hartley 2. It orbits the sun every 6.5 years and was discovered by Malcolm Hartley on March 15 of 1986. It will be just 5 degrees above the colorful California Nebula in Perseus during the middle of this month, which would be a great time to get a picture of this ancient and primordial cosmic interloper if you have the equipment. Otherwise, just look for it in a pair of binoculars around the middle of the month since it will be new moon on the 14th.

The zodiacal light will become visible again in the morning sky starting late this month into November. This faintly glowing pyramid of ghostly light is caused by sunlight bouncing off trillions of tiny dust particles in the ecliptic plane of our solar system. This dust ring is always there, but is best visible to us when the angle of the ecliptic to our horizon is at its steepest, which is about one hour before sunrise in the fall and one hour after sunset in the spring.

There will not be any major meteor showers this month, so instead of watching a few grains of comet dust getting vaporized at the edge of space 60 miles high, you can now see a little of this permanent ring that is made up of all the comet dust caught in our ecliptic plane along with other interplanetary dust and debris.

Sept.1. The moon passes 1.4 degrees south of Neptune at 3 in the morning.

Sept. 2 Venus is stationary at midnight. It started its retrograde or westward motion against the fixed background of stars on July 22 this summer. Venus retrogrades every 18 months, spending about 40 days seeming to move backwards.

Sept. 3. On this day in 1976 Viking 2 landed on Mars. Viking 1 landed there a few weeks earlier.

Sept. 4. The moon passes 3 degrees north of Jupiter this afternoon. Jupiter is stationary and then begins its retrograde motion at 5 pm EDT.
Sept. 6. Mercury is in inferior conjunction with the sun today at 7 am.
Sept. 7. James van Allen was born on this day in 1914. He discovered the van Allen radiation belts in 1958, a zone of energetic charged particles caused by the solar wind and captured by the earth's magnetic field. The inner belt forms at about 1000 to 8000 miles above the earth and the much wider outer belt can be found from 12,000 to 25,000 miles high. Our GPS satellites orbit at 12,500 miles and our geosynchronous satellites orbit at 22,300 miles high so that they always remain above the same spot on Earth. I interviewed his son and grandson for my radio show on WMPG 90.9 FM called Scientifically Speaking that is on live every Friday morning from 11:30 to noon that I co host with Sarah Chang.
Sept. 11. The moon passes 11 degrees north of Venus this morning. On this day in 1985 the ICE satellite (International Cometary Explorer) flew by Comet 21P/Giacobini-Zinner. This was the first satellite to orbit in the L1 Lagrange point located about 1 million miles away between the sun and the earth. The L2 point is about that distance beyond the earth away from the sun. There are five Lagrange points in the sun-earth system where the gravitational forces of this two body system perfectly balance. There are 3 very important satellites orbiting the L2 point right now, the JWST, GAIA, which is mapping over a billion stars in our galaxy with great accuracy, and the newly arrived EUCLID mission that will look for dark matter and dark energy. The WMAP and PLANCK satellites orbited there recently. They carefully mapped the cosmic microwave background and helped narrow down the age of the universe. At least 7 more great space telescopes and missions are scheduled to orbit there in the near future. These include the Nancy Grace Roman telescope, PLATO, LiteBird, ARIEL, the Comet Interceptor, LUVOIR, and ATHENA. They will study everything from biosignatures in planetary atmospheres to looking for footprints of gravitational waves in the cosmic microwave background.
Sept. 14. Mercury is stationary, ending its latest retrograde that lasted from August 23 to now. It goes into retrograde for about a month at a time about 3 times each year. New moon is at 9:40 p.m. EDT. The new moon next month will create an annular solar eclipse visible from Oregon to Texas on Saturday, October 14. It will be a partial solar eclipse for the rest of the country and we will only see about 5% here in Maine. Use it as a warm-up eclipse for the big total solar eclipse over northern Maine on Monday, April 8 of next year. Make sure you get some good solar filters or eclipse glasses before then and practice so that you will be ready to capture a little of its great beauty. I will write much more about them next month.
Sept. 16. The moon passes 0.7 degrees north of Mars this afternoon.
Sept. 17. On this day in 1789 William Herschel discovered Mimas, the 7th largest moon of Saturn at 250 miles in diameter. Saturn has at least 145 moons now. Mimas is a very strange moon that has a huge crater covering one third of its surface that is 4 miles high.
Sept. 19. Venus is at greatest brilliancy at magnitude minus 4.8.
Sept. 21. The moon passes near Antares in Scorpius this morning.
Sept. 22. Mercury is at greatest western elongation from the sun at 18 degrees this morning. First quarter moon is at 3:32 p.m.
Sept. 23. The autumnal equinox is at 2:50 a.m. EDT.
Sept. 26. The moon passes 3 degrees south of Saturn tonight.

Sept. 29. Full moon is at 5:58 a.m. This is the famous Harvest moon since it is close to the equinox. The Harvest moon only rises about half an hour later each night instead of the usual 55 minutes later because the angle of the ecliptic to the horizon is very shallow now.