WHAT'S UP IN OCTOBER

By Bernie Reim

The leaves have started to turn and soon much of new England will be ablaze with its famous flaming fall foliage. October always marks the first full month of autumn for us in the northern hemisphere. Just as our terrestrial landscape is transforming itself now so our celestial landscape above us is also undergoing its gradual annual change from our familiar summer constellations like the summer triangle and Sagittarius and Scorpius to the more brilliant stars of Orion and the winter hexagon.

Since any given star will rise 4 minutes earlier each night, this is a gradual transformation, but it is quite noticeable over a week or two. The sky will look the same at 10 pm tonight as it will look at 8 pm next month on the same date. It changes by 120 minutes or 2 hours each month and completes its cycle of 24 hours each year.

The nights have already been cooler and crisper and fall is usually the best time of year to get some consistently good skies for viewing before it gets too cold to stay out for long periods of time. It is always well worth going outside and looking up to enjoy and learn more about the many wonders that the cosmos is always offering us, but this is a particularly good month for that even as the nights are getting a few minutes longer each night.

The highlights this month include Mars getting a little closer and brighter each night as we are catching up with it in our respective orbits, Venus getting higher and brighter in our evening sky as it catches up with Earth in its faster orbit around the sun, Saturn still close to its best as an evening planet, some nice conjunctions of the moon and planets, the annual Orionid meteor shower which peaks on the 21st, and a potentially brilliant comet that could light up our evening skies early this month if it survives its always perilous journey around the sun. Along with all of that we are still waiting for the BLAZE STAR, T Corona Borealis, to erupt as a recurrent nova and suddenly become about 1,000 times brighter in our evening sky.

Mars now rises around midnight to begin this month and it will rise by 11 pm by the end of October. It is moving in its normal eastward or prograde motion through Gemini now and it will enter the constellation of Cancer the Crab on the 29th. The red planet will start its retrograde or westward motion on December 6 and it will reach opposition on January 16 and then it will end its retrograde about a month after that, on February 23 of next year.

Mars only reaches opposition every 26 months, so we only have about 4 months in every 26 months when Mars is close enough to Earth to spot some of its very interesting features in average amateur telescopes. That time will start near the end of this month. We have sent 39 missions to Mars, and only 15 of them have been successful. Mars and even the moon still present some serious challenges to land on, even without any humans on board.

Right now, we still have the Perseverance rover, nicknamed Percy, operating well and giving us new information almost daily. It landed on Mars on February 18 of 2021. It discovered many kinds of igneous rocks in Jezero crater along with "leopard spots" on a reddish rock that could indicate that microbial life was living on that rock and many others billions of yeas ago. It will dig up and leave some samples of Mars for a future mission to pick up and return to earth, which would be the first time we ever returned any sample of Mars to earth.

The only other way that we have found rocks from Mars on Earth was as meteorites from asteroids that hit Mars long ago and sent some material beyond the orbit of Mars that eventually encountered Earth as it partially burned up while entering our atmosphere as a

brilliant meteor. We know all this by analyzing the rocks and matching them with what we know is on Mars right now, including having captured a little of its unique atmosphere inside the rock. Rare isotopes of neon, argon, xenon, and krypton trapped in this meteorite and others exactly matched the composition of the Martian atmosphere. We found a Martian meteorite near the South Pole in 1984 which we thought at one time even contained the remains of a once-living microbe on Mars, but that has not been proven beyond the shadow of a doubt.

Another first from the Perseverance Rover was the launching of a little helicopter named Ingenuity on Mars. It performed much better than expected, but its 72nd flight on January 18 of this year was its last one since it damaged its blades upon landing. I am sure we will fly around on Mars with much more sophisticated drones in the not- too -distant future as our technology improves. It was similar to flying a helicopter near the top of Mt. Everest on Earth since the atmosphere on Mars is only about 1 percent as dense as ours on our surface.

Venus is finally getting higher and brighter in our evening sky. It now sets fully 80 minutes after the sun in the western sky in the constellation of Libra the scales. Through a telescope you will see that Venus is 84 percent lit by the sun but it is getting less illuminated even as it is getting brighter since it is getting closer to us and larger in our sky as our sister planet is catching up with us. Notice that a slender waxing crescent moon will pass very close to Venus on Saturday evening the 5th and Mercury will join Venus by the 24th, but it will remain very low in the sky and you may need binoculars to spot our first planet.

Since Saturn is just past opposition now, it will already be up in our eastern sky as soon as it gets dark enough to spot it. It is still in Aquarius. Since it takes nearly 30 years to orbit the sun, the ringed planet will spend over 2 years in each of our 12 zodiac constellations. I saw a great view of Saturn through one of the telescopes at our club's observatory in Kennebunk the other night with the shadow of the planet clearly visible on its rings along with 3 of its 146 moons. Its famous rings are now very thin, tilted open at only 5 degrees instead of its maximum of 27 degrees. The tilt will increase a little more and then it will decrease to zero in March of next year before they open up again. This whole cycle happens twice every 29 years. Saturn is slowly getting smaller and dimmer again as it gets farther away from Earth. It is currently almost 100 times fainter than Venus, which now shines at minus 3.9 magnitude while Saturn is 0.7 magnitude.

Jupiter continues to get higher and brighter and rises a little earlier each night as it is getting closer to Earth approaching its opposition on December 7 of this year. It now rises at 10 pm in Taurus and it will rise at 8 pm by the end of October. It will reach minus 2.7 magnitude, or only 3 times fainter than Venus. Notice that you can see all 4 of its large Galilean moons, Ganymede, Callisto, Io, and Europa with just a pair of binoculars.

The Orionid meteor shower peaks on Monday night the 21st. Unfortunately, the moon will be just 4 days past full, so it will interfere with the meteors when it rises around 9 pm and it will still be about 80 percent full in its waning gibbous phase. This shower will be active from October 2 through November 7. That is how long it takes the Earth to pass through all of the debris from Halley's comet.

The earth with all 8 billion of us aboard is always traveling through space around the sun at 18.6 miles per second or 67,000 miles per hour. The debris trail of Halley's comet that we are passing through right now is about 60 million miles wide, so it will take us 36 days to pass through all of it. We cover about 600 million miles of space each year as we are always orbiting

the sun at that great speed. Even without the moon, you could only expect about 20 meteors per hour from a dark sky site from this shower. You will get another chance to see tiny pieces of Halley's Comet burn up 60 miles high in our atmosphere on May 4 and 5 of next year as we once again pass through the other side of this same debris trail of this most famous of all comets.

The last major highlight this month is a good possibility of seeing a very bright comet in our evening sky passing through Virgo into Serpens and Ophiuchus shortly after sunset from the 13th to the 21st. This is Comet C/2023 A3 (Tsuchinshan-ATLAS). Tsuchinshan means Purple Mountain in Chinese after the observatory that first discovered it in 2023.

Many comets do not survive their journey around the sun if they pass too close to its powerful gravitational field and huge mass in relation to the tiny mass of the comet whose nucleus is usually only about 5 miles across. Many comets actually hit the sun on their perilous perihelion passes and others get torn up or greatly diminished which just happened recently to a comet that we had great hopes for but did not make it around. I call all comets the great imposters of the solar system since they look so impressive with their tails spanning up to 100 million miles and their comas, caused by the sublimation of their material due to their heating up and their proximity to the sun, reaching about the diameter of the earth while their nucleuses are only a few miles across.

This comet could become the brightest since one since NEOWISE which became very bright and easily visible below the Big Dipper a few years ago during the peak of the pandemic.

Oct.1. The Yerkes 40 -inch refracting telescope was dedicated on this day in 1897. It was the largest telescope in the world at the time and it is still the largest refractor in the world now. It was designed by George Ellery Hale, who also designed and built the next 3 consecutive largest telescopes in the world culminating with the 200-inch Mt. Palomar reflector dedicated in 1948.

Oct. 2. New moon is at 2:49 pm. Since we are still in an eclipse season, there will be an annular solar eclipse in South America today. The moon is at apogee, or farthest from Earth today at 252,597 miles.

Oct. 4. The first satellite, Sputnik, was launched on this day in 1957, beginning the Space Age.

Oct. 5. Neil deGrasse Tyson was born on this day in 1958. The moon passes 3 degrees south of Venus this evening.

Oct.7. Niels Bohr was born on this day in 1885. He was one of the pioneers of the quantum mechanics revolution that gave us the knowledge to make most of our modern technology possible. The moon passes 0.2 degrees south of Antares this evening. The word Antares means "rival of Mars".

Oct. 9. Jupiter is stationary this morning, which marks the beginning of its retrograde motion. Kepler's Supernova was discovered by him on this day in 1604. It is a Type 1A supernova 20,000 light years away in the constellation of Ophiuchus near where the current comet will be visible soon.

Oct. 10. First quarter moon is at 2:55 p.m. EDT.

Oct. 14. The moon passes less than a degree north of Saturn this evening.

Oct. 15. Asaph Hall was born on this day in 1829. He was an American astronomer who discovered Phobos and Deimos, the two tiny moons of Mars on this day in 1877. Thomas Bopp was born on this day in 1949. He was one of the two astronomers, along with Alan Hale, that discovered Comet Hale-Bopp which in 1995 in Arizona. This became the brightest comet in

nearly a century. Another once-in-a-life comet, Hyakutake was visible in March of 1996, the year before Hale-Bopp dominated the entire sky in March of 1997.
Oct. 17. Full moon is at 7:26 a.m. This is also known as the Hunter's Moon.
Oct.19. The Indian-American astronomer, Subrahmanyan Chandrasekhar, was born on this day in 1910. He discovered the Chandrasekhar limit of 1.44 solar masses that a red giant-white dwarf system will explode causing a Type 1A supernova which can used to determine distances to near the edge of the observable universe.
Oct. 21. The Orionid Meteor shower peaks tonight.
Oct. 22. Karl Jansky was born on this day in 1905. He invented the radio telescope and discovered radio waves from the center of our galaxy in August of 1931.
Oct. 23. The moon passes 3 degrees north of Mars this morning.
Oct. 24. Last quarter moon is at 4:03 p.m.
Oct. 25. Henry Norris Russell was born on this day in 1877. He created the Hertzsprung-Russell diagram to classify all stars in 1910.