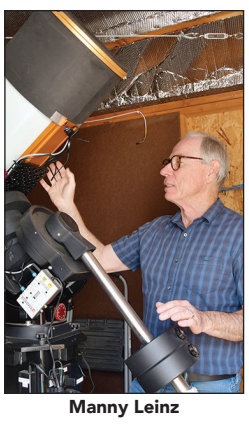
CELESTIAL MARIPOSA

Twinkle, twinkle colorful star

By MANNY LEINZ

If you've been out under the night sky for any length of time enjoying the twinkling starlight, you may have noticed that the brightest stars are not all a uniform white color.

Many stars do appear white, of course, but there are also shades of red, orange, yellow and blue. The differences are subtle, but once you start paying attention to the different hues, as the saying goes, you can't "unsee" them.



Manny Leinz

So why do stars appear in different colors, and how can you best see these celestial shades? For the answer to these and other questions, read on!

Star colors 101

If you've ever placed an iron poker into a fire and allowed it to heat up over time, you should have a clue as to the reason for star colors: it's the temperature. Just as the color of the poker changes as it heats, the color of a star gives a good indication of its temperature.

Betelgeuse, in this month's featured constellation, Orion, is among the coolest stars, shining orange-red at about 6,000 degrees Fahrenheit. The star Pollux — at about 8,000°F in Gemini — glows orange, whereas 9,000°F Capella, in Auriga, glows yellow. Rigel, in the foot of Orion, blazes blue-white at 21,000°F while Alnitak in Orion's belt, one of the hottest stars, shines blue at over 60,000°F!

The best and nearest example of a white star is our own Sun. But wait — every kid knows that the Sun is yellow, right? Yes, while it's true that the Sun appears yellow — or even orange or red when it's near the horizon — this is the result of our atmosphere scattering the sun's light.

Shorter wavelength blue light "bounces off" the oxygen and nitrogen in our atmosphere, illuminating the sky in all directions, but longer wavelength red and yellow light is able to pass more directly through to our eyes.

This deficit in blue light makes the Sun look yellow, while the scattered blue light makes the sky look, you guessed it, blue! The Sun really is white; take a sheet of white paper out near noon, when the Sun is highest in the sky, and it will appear nearly pure white. Take that same sheet of paper out in the late afternoon, and it looks yellow, or orange.

More than meets the eye

The colors of stars tell us much more about them than just their temperature, however.

Stars are mostly hydrogen, and in the prime of life they burn their hydrogen via nuclear fusion, converting it into helium. Among these main sequence stars there is a direct relationship between a star's color and its size, mass and luminosity.

In addition to being the coolest, the reddest stars are also the smallest, least massive and dimmest, while the bluest stars are the largest, most massive and brightest.

The reddest stars also live the longest: potentially up to trillions of years — much longer that the current age of the universe at an estimated 13.8 billion years — whereas the brightest, hottest, blue stars may live only 10 million years or so.

Our Sun, an average sized star, is currently "middle aged" and astronomers estimate it to be about 4.6 billion years old.

So are all red stars small, dim and destined to live nearly forever? No.

A good example is our friend Betelgeuse — pronounced "Beetle Juice" like in the old Michael Keaton movie. When aging stars like Betelgeuse run out of their hydrogen fuel, they leave the main sequence, becoming red giants or supergiants.

Their surface then cools and expands dramatically — in the case of Betelgeuse to up to 900 times the diameter of our Sun. They begin to fuse helium into heavier elements: carbon, oxygen, neon, silicon and iron.

The energy released at each of these stages keeps the star from collapsing under the force of its own gravity. The process stops at iron, however, which cannot release energy under fusion. Now the star can no longer resist gravity, and so violently collapses.

Depending on its mass, the star either shrinks to a city-sized white dwarf, or rebounds in a spectacular supernova explosion.

Betelgeuse is a massive supergiant, and so its destiny is to go out in a blaze of glory as a supernova. It is also a variable star, brightening and dimming somewhat in an approximately 400 day cycle.

From late 2019 into 2020, Betelgeuse dimmed more than usual, and there was wide speculation in the news media, and especially on social media, that it was about to explode in a supernova. However, later observations by ground and space-based telescopes confirmed that it was a stellar "burp," which ejected a large amount of relatively cool gas, that caused the dimming.

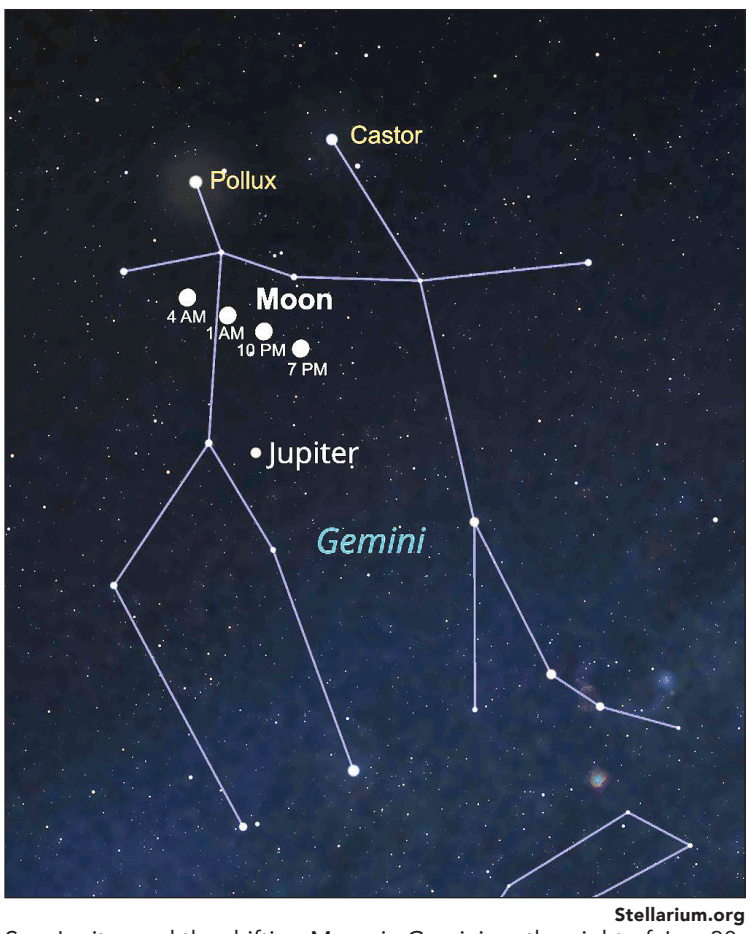
Nevertheless, Betelgeuse's time is running out; a supernova is expected within 100,000 years, which is the blink of an eye for an ancient star.

Fun fact: It's a good thing Betelgeuse isn't our sun. It is so large that the planets Mercury, Venus, Earth and Mars would actually be inside the star!

Orion in living color

This month is a great time to get acquainted with the celestial hunter, the constellation Orion. He rises in the east in the early evening, with his sword at his side and brandishing his club and shield.

Look for three bright stars in a row — Orion's belt — to help you locate him. Orion will be highest in the southern sky before midnight, an excellent time to checkout the contrasting colors of the bright stars Betelgeuse, Alnitak and Rigel.



Stellarium.org

See Jupiter and the drifting Moon in Gemini on the night of Jan. 30-31

If you can, go someplace away from bright lights and allow your eyes some time to acclimate to the night. You should be able to see a difference in color between rusty Betelgeuse in Orion's shoulder, blue Alnitak in his belt and blue-white Rigel at his foot.

If you have binoculars, use them to observe the stars. To better see colors, try defocusing slightly to spread the starlight out a bit.

As you observe Orion's stars — or any stars for that matter — you will probably notice their brightness rapidly changing; they twinkle. This is caused by scintillation, the bending and distortion of pinpoint starlight by the turbulence in the Earth's atmosphere.

This turbulence, which is more pronounced near the horizon — more atmosphere to look through — also causes rapid apparent changes in a star's color. This is because pockets in our atmosphere act as chaotic prisms, bending different colors of starlight in different directions.

Planets, by contrast, appear as tiny disks. They are not affected by the atmosphere as much, and so twinkle much less than stars. Now you know.

While you are admiring Orion's stars, be sure to checkout the Great Orion Nebula. Sharp observers will detect it with the naked eye as a fuzzy patch in the sword hanging from his belt.

The nebula will be obvious in binoculars, and show yet more detail in a small telescope. The nebula is about 1,300 light-years from Earth, and is one of the closest "stellar nurseries," an area where new stars are actively forming.

What's else is up this month ...

The King of Planets, Jupiter, remains a prime target for viewing all month. It's visible all night in the constellation Gemini; rising before it's completely dark in the evening and setting after the sky begins to brighten in the morning.

Use binoculars or a small telescope to spot Jupiter's four largest Moons: Io, Europa, Ganymede and Callisto. Catch the gas giant keeping company with the Moon on Jan. 30 and watch the Moon move with respect to the stars Castor and Pollux over the course of a few hours.

This month is also the last opportunity to view Saturn until the ringed planet reappears in the morning sky in May. See it early in the evening in the south at the beginning of January, and low in the west by month's end. Even a small telescope will reveal Saturn's nearly edge-on rings and perhaps its largest moon, Titan.

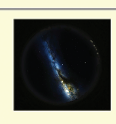
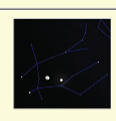
I hope you enjoyed this article and that it may inspire you to get out explore the wonders of the night sky. If you would like to get a chart to help you find planets, stars and constellations, checkout https://skyandtelescope.org/interactive-sky-chart/ or https://theskylive.com/ for starters. There are also some great free smartphone apps, including Stellarium, SkySafari and SkyView.

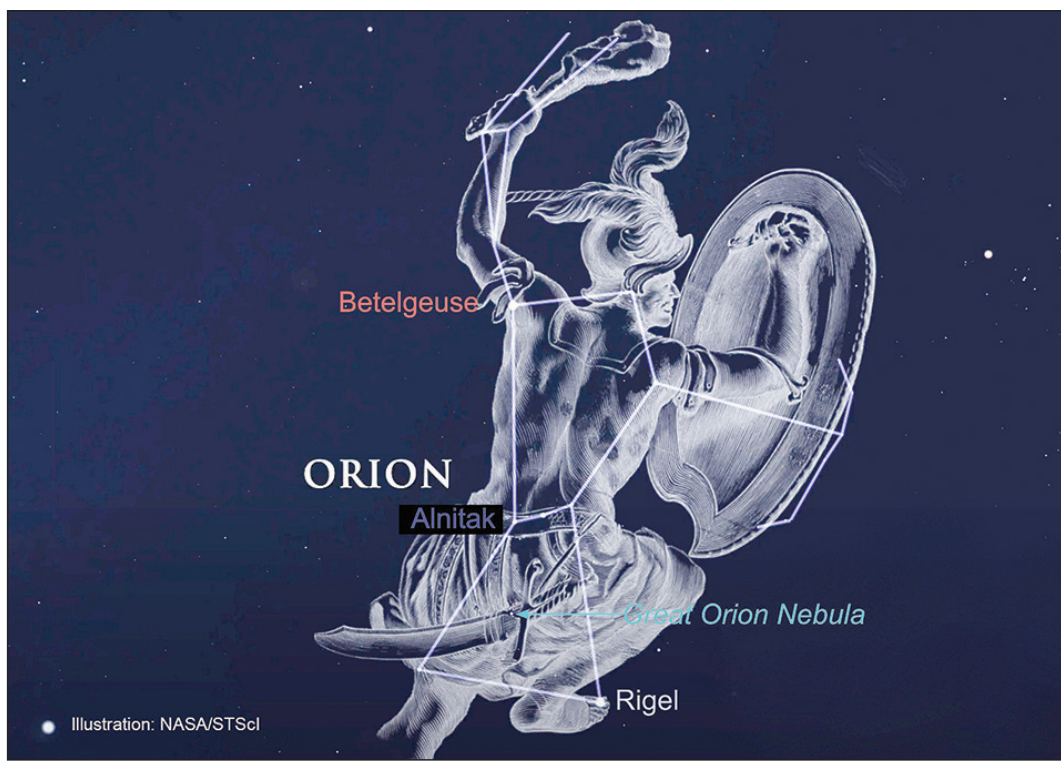
As always, if you have questions, comments or suggestions for future articles, you can get in touch with me by email at: celestialdeep55@gmail.com. You can find my prior *Gazette* articles on my website at https://celestialdeep.space/mariposa-gazette/.

If you have a question of general interest, I'll try to answer it in my next article.

Manny Leinz is a long-time amateur astronomer and night sky photographer. He and his wife live part time in Bootjack where they also have an observatory.

Celestial Highlights for January, 2026

Jan 3		The Full Moon rises at 5:21 PM on January 3rd alongside Jupiter. It reaches its highest point in the sky (transit) at 12:01 AM on the 4th, sets at 7:50 AM and will be visible all night in the constellation *Gemini*. Earth also passes through Perihelion on this date – its closest point to the Sun (see my Nov. 27th article for more info).
Jan 10		The Last Quarter Moon rises in the Constellation *Virgo* at 12:06 AM on January 10th, transits at 5:46 AM and sets at 11:18 AM. Jupiter is also at *opposition* – directly opposite the Sun from our vantage point – on this date.
Jan 18		Our Milky Way Galaxy is easiest to see around this date of the New Moon. It will be fully dark by 6:40 PM. Bright Jupiter will be visible in the east after sunset will be visible all night in the constellation *Gemini*. Catch Saturn in the early evening in the constellation *Pisces*. It will be visible in the southwest and then later in the west before 9:30 PM
Jan 25		The First Quarter Moon rises in the constellation *Pisces* at 10:38 AM on January 25th, transits at 5:41 PM and sets at 12:55 AM on the 26th. Saturn will be visible in the west until around 9:00 PM. Jupiter will rise in the afternoon and be visible all night in the constellation *Gemini*.
Jan 30		As they did at the beginning of the month, the Moon and Jupiter meet up once again, this time near the bright stars Castor and Pollux in the constellation Gemini. Look carefully and you can see the Moon's position change with respect to these stars over the course of a few hours.



NASA/STScI

Look for Orion in the east early evening, and later in the south to observe his colorful stars

Photo by Manny Leinz

The author took this image of the Great Orion Nebula in 2021 from his Celestial Deep Observatory in Bootjack — Don't expect to see this much color or detail through even a large telescope!