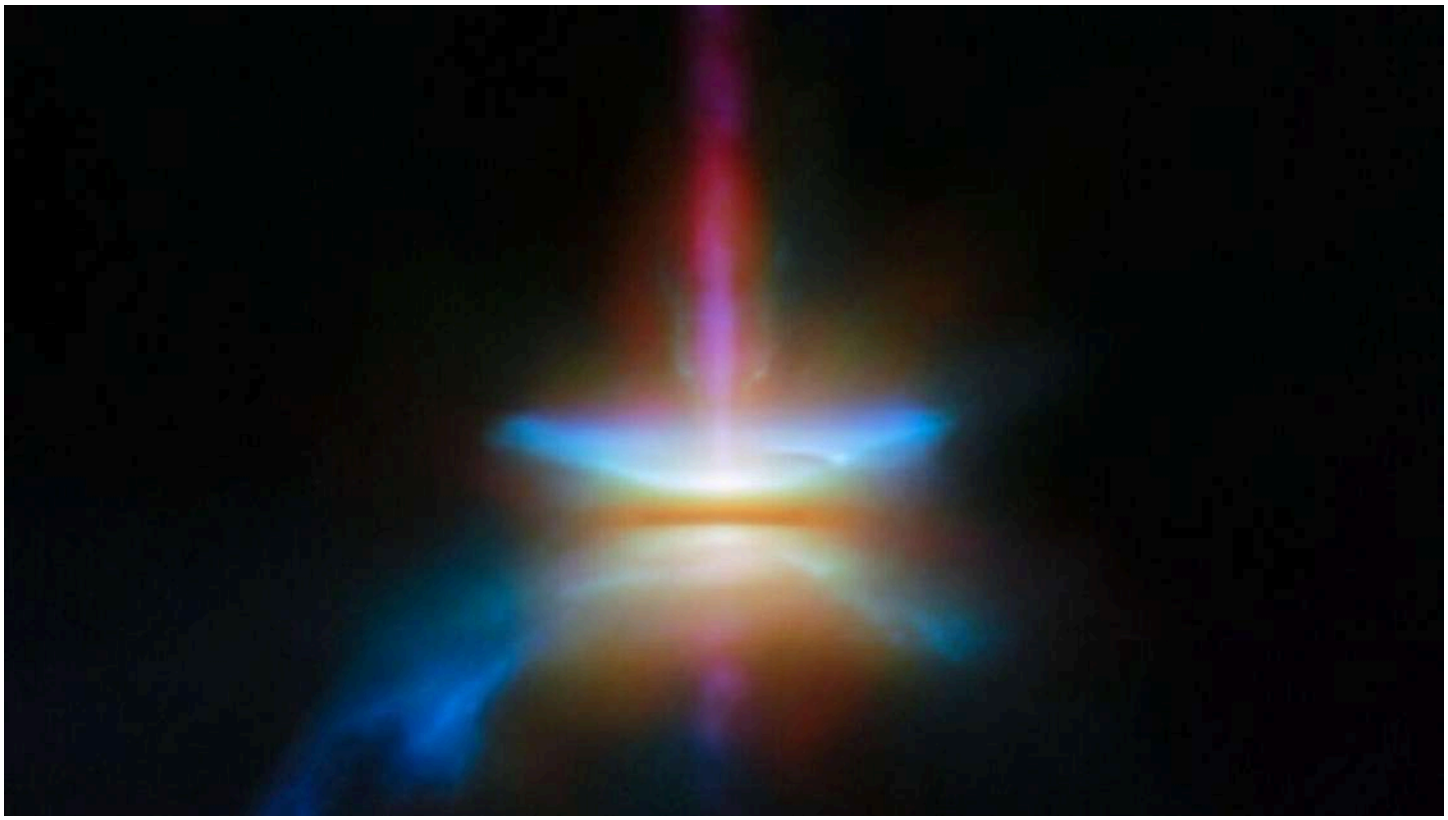
Keene Amateur Astronomers

The Newsletter for Keene Amateur Astronomers

Vol. 2025 No. 3 March 2025

James Webb Space Telescope, Herbig Haro 30



This latest image taken in the infrared by the JWST shows a protoplanetary disc edge-on that is surrounded by jets and a disc wind. Herbig-Haro objects, like HH 30, are luminous regions surrounding newborn stars (known as protostars). They form when stellar winds or jets of gas spewing from these newborn stars form shockwaves as they collide with nearby gas and dust at high speeds

Credit: NASA, ESA, and CSA

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Editor's Message

The view of the crescent Moon, Venus, and Mercury were spectacular. I was unable to see this on the 28th of February but had an opportunity to view it on March 1st. The Earthshine on the Moon was lovely and provided an opportunity to see the Moon in its entirety when it wasn't full. The Astronomical League has a featured page on Earthshine this month. Jupiter and Mars continue to dazzle high above in the early evening hours.

On the 14th, there will be a Lunar Eclipse. It will occur in the wee hours of the morning and will be visible throughout the United States. Be sure to check out NASA's What's Up Video for more information and check local information for exact times and remember to account for Daylight Savings.

Be sure to check out the article on Messier objects and consider tuning into the NSN Webinar on Transient Luminous Events which includes Sprites, to learn how you can be part of Spritacular, a citizen science project.

- Susan Rolke

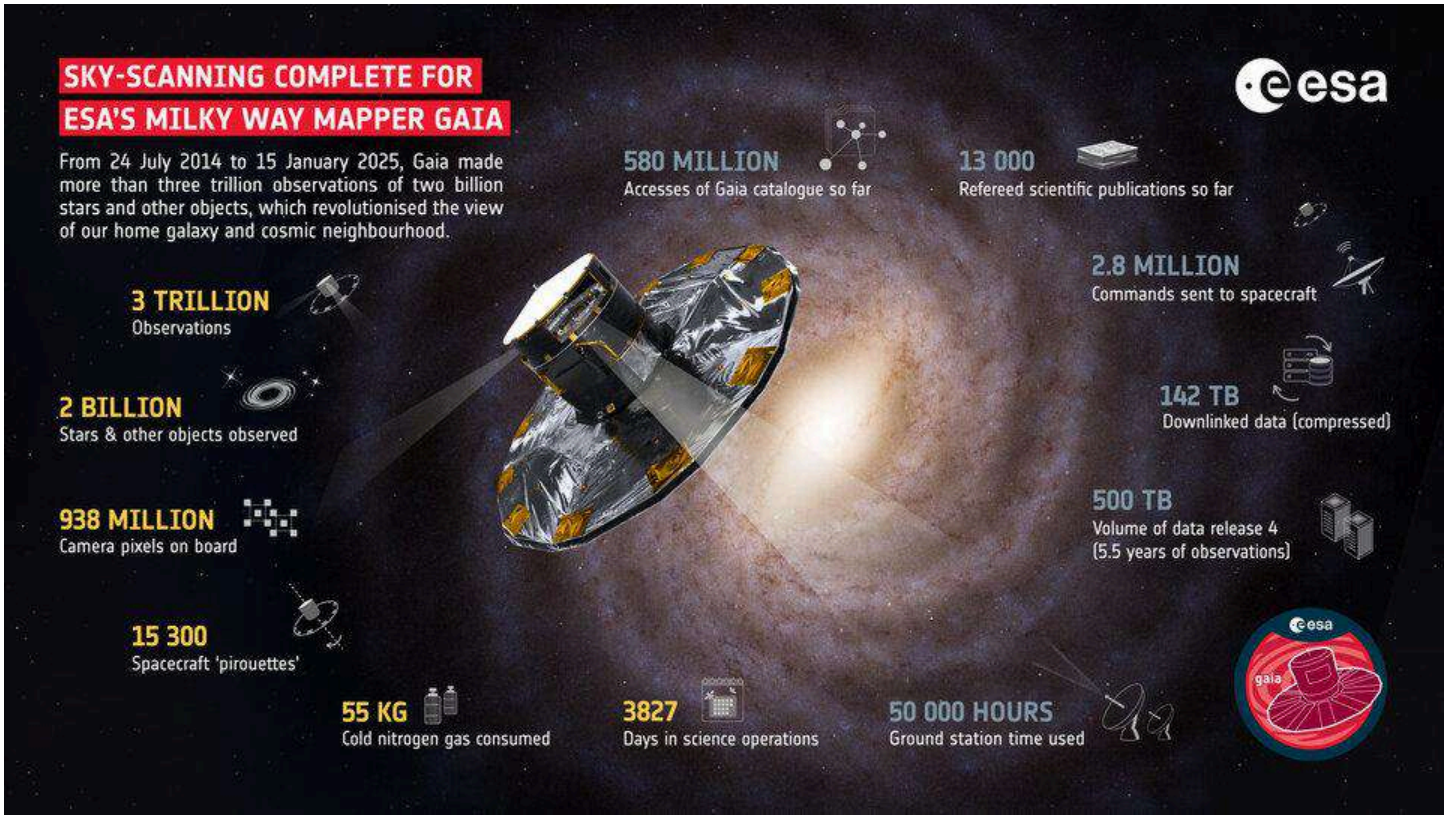
Monthly Business Meeting

Our next meeting will take place on March 14th at 7 pm via Zoom. Members will receive an emailed link.

Gaia's Billion Star Survey

By Susan Rolke

After 11 years in orbit, the ESA's Gaia space telescope is being decommissioned. Originally expected to operate for five years, Gaia far exceeded its mission lifespan. Despite facing challenges such as micrometeorites, solar storms, a failed transponder, and other technical issues, it has earned its place as one of the most successful space telescopes. The decision to shut it down now is due to the depletion of its fuel supply.



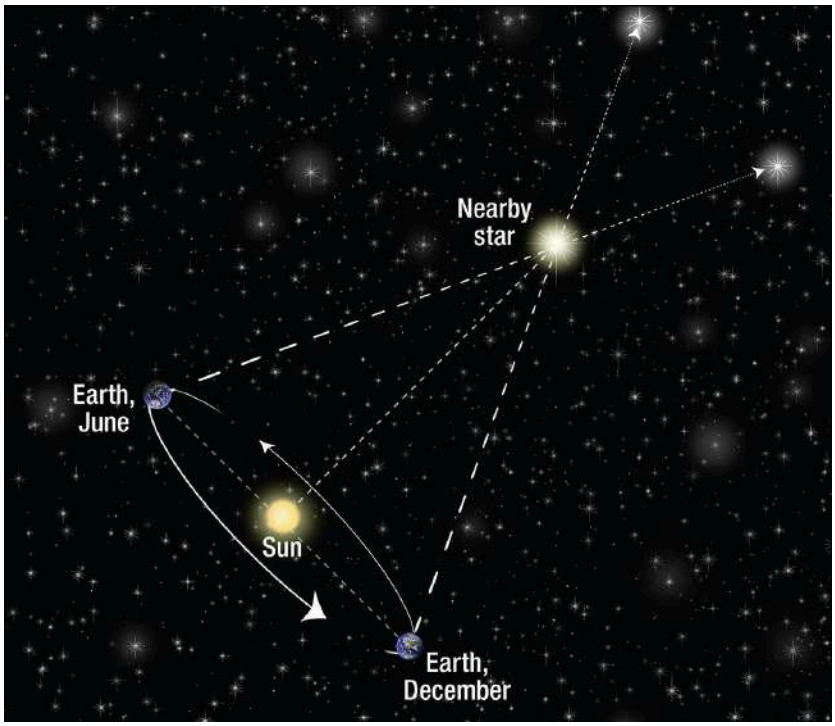
Credit: ESA

In 2014, Gaia began scanning the sky in order to create the largest three-dimensional map of the Milky Way. Over the course of its operation, it has made precise measurements of the location, motion, brightness, and color of more than 2 billion stars and performed over 3 trillion observations. Unlike other telescopes that focus on a specific target to observe, Gaia scanned the entire sky through a rotation of the telescope's field of view. All objects were observed repeatedly in this manner, some as many as 200 times. Additionally, Gaia's data has

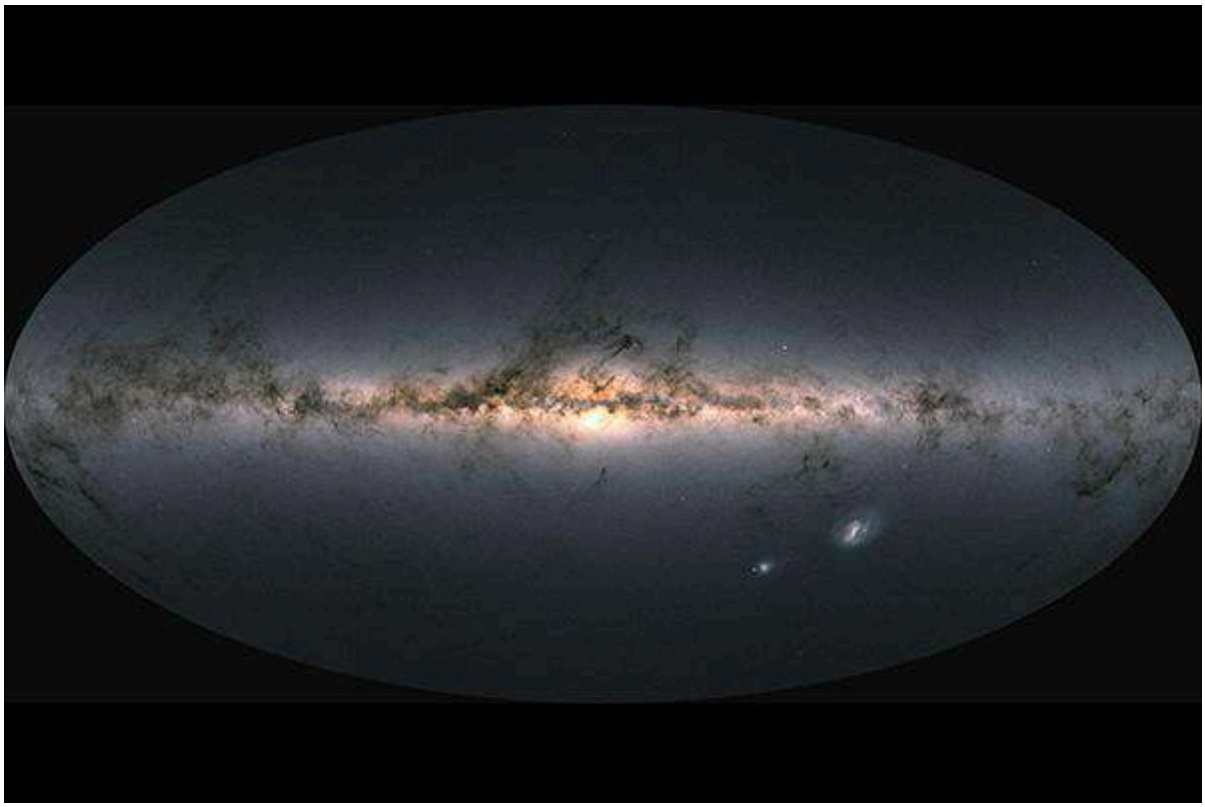
been essential for observations made by the James Webb Space Telescope and will greatly improve our ability to predict occultations.

A conceptual image of the Milky Way as seen from above the galactic plane. Credit: ESA/Gaia/DPAC, Stefan Payne-Wardenaar

Gaia trails the Earth in its orbit around the Sun in a location known as the L2 Lagrange Point. From this position, it uses a technique called parallax to calculate the distance to stars by taking multiple measurements from different points in its orbit. By measuring this shift and knowing the Earth's distance from the Sun, Gaia can determine the star's distance. Although the parallax of the closest stars is incredibly small, Gaia's instruments have achieved micro-arcsecond precision in measuring the distances to billions of stars. (An arcsecond is 1/3600 of a degree, and one degree is about twice the size of the full Moon in the sky.) Over 99.9% of the objects Gaia has observed have never had their distance measured accurately.



Courtesy: NASA, ESA



The Milky Way seen edge on. The Large and Small Magellanic Clouds are also shown. Credit: ESA / Gaia / DPAC

An interactive map of the Milky Way in greater detail can be found here. The brighter regions correspond to greater concentration of stars while the dark regions are due to dust blocking our view as we peer edge on toward the center of our galaxy.

The success of the Gaia mission has not only contributed to the creation of the largest star catalog, but it will also continue to shape our understanding of both our solar system and the Milky Way galaxy. Currently, there are an average of five peer-reviewed publications per day based on Gaia data. With two future data releases scheduled in the coming years, the legacy of this space telescope will continue to drive new research for many years to come.

The data collected will help us continue to revise our understanding of our own galaxy's history, shape, and motion. Gaia has played a key role in rewriting our understanding of the evolution of the Milky Way. Researchers analyzing the first data release uncovered the odd motion of a collection of 30,000 stars in the Milky Way. These stars share a common elongated trajectory and move in the opposite direction compared to most stars in the Milky Way. Using computer models, the research team concluded that our young and less massive galaxy had once merged with a dwarf galaxy, slightly more massive than the Small Magellanic Cloud. This dwarf galaxy has been named Gaia-Enceladus. The stars from this merger now make up the majority of the Milky Way's inner halo and are primarily older stars that predate the collision. Additionally, the models provided evidence that this merger played a key role in the formation of the Milky Way's thick disc.

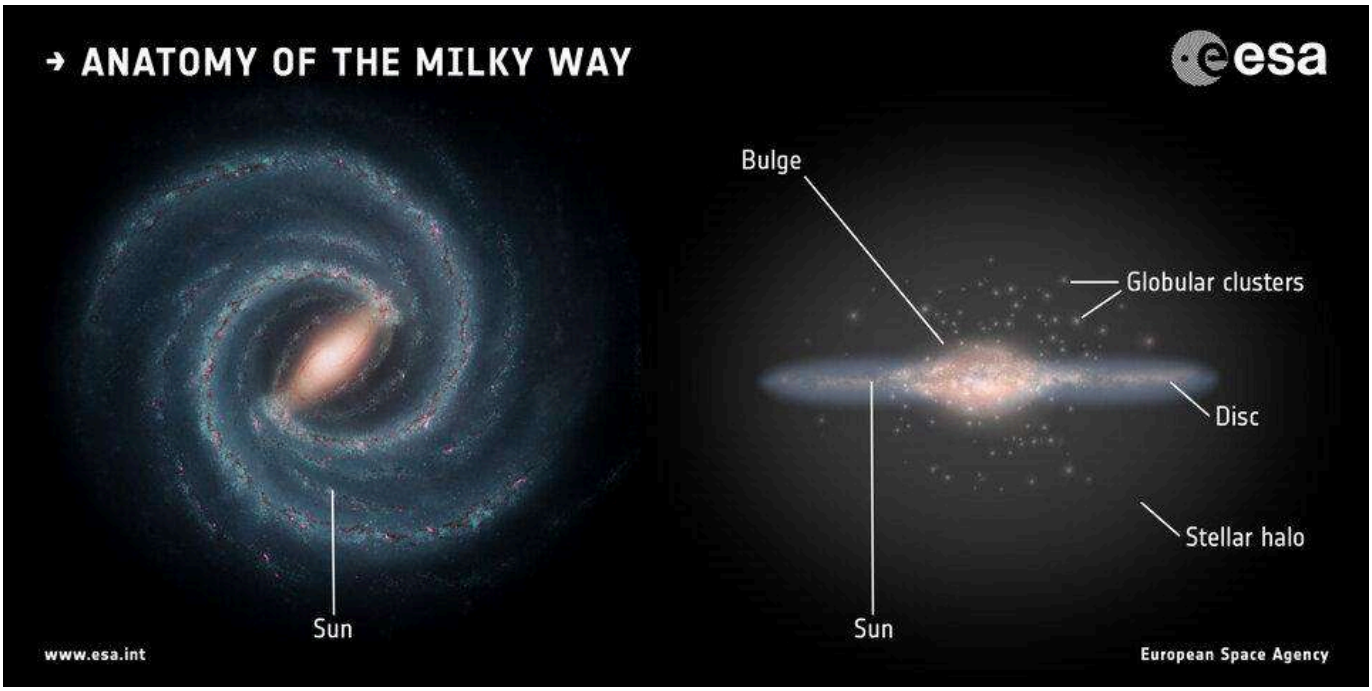
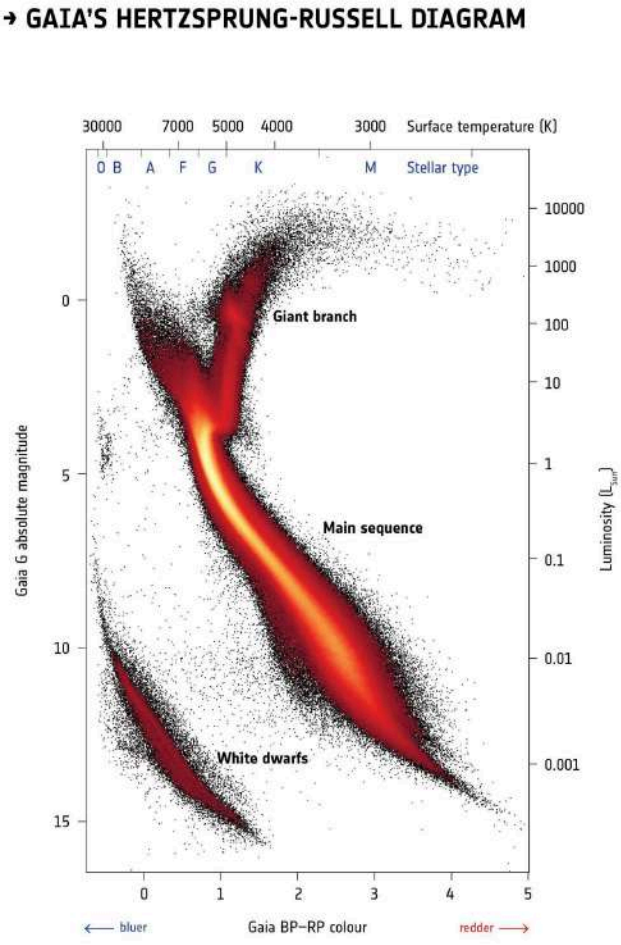


Image Courtesy of ESA A video of the merger can be seen here.

Gaia has also significantly advanced our understanding of stellar life cycles. By analyzing data from over 4 million stars, scientists were able to create a more detailed Hertzsprung-Russell diagram, which plots stars based on their color, brightness, and distance. This diagram is a valuable tool for determining a star's age, mass, and stellar life cycle. A prominent feature of the diagram is the Main Sequence, a diagonal band where stars spend the majority of their lives, fusing hydrogen into helium. As stars age, they move off the Main Sequence. Our Sun, for example, will eventually shift upward and to the right as it evolves into a red giant, ultimately becoming a white dwarf once fusion in its core ceases



The Gaia H-R diagram has provided new insights into stellar life cycles, particularly in the development of white dwarfs. White dwarfs are the final stage for stars with a mass similar to that of our Sun, and are primarily composed of carbon and oxygen. Data from Gaia sheds light on the behavior of the materials within these stellar remnants and how these hot gas objects will eventually cool and solidify into dense, solid spheres.

Image of Gaia's HR Diagram on prior page, Credit: ESA

For more information about Gaia, you might find it of interest to explore the ESA's webpage. Some of the discoveries made by Gaia include:

- moons orbiting asteroids in our solar system,
- black holes 30 times heavier than the sun,
- how our solar system moves around the center of the Milky Way,
- detailed information on the number of spiral arms the Milky Way has and shape of the central bar,
- detection of 'starquakes' – tiny motions on the surface of a star,
- the most accurate survey of asteroids,
- more accurate orbits of near Earth objects,
- discovery of rare stars, gaseous structures, and empty bubbles in space,
- new exoplanets

As the next two data sets are released, one in 2026 and the last in 2032, Gaia will continue to shape our understanding of our galaxy and the stars.

Night Sky Network Online Webinar

Join NASA Night Sky Network on Tuesday, March 11, at 9:00 PM Eastern along with Dr. Burcu Kosar to learn about Spritacular, a NASA citizen science project that gathers public observations of Transient Luminous Events (TLEs) above thunderstorms to advance research and connect citizen scientists with experts.

The goal of the talk will be to provide information about this citizen science project, discuss TLE science, and connect the public with scientists.

Dr. Burcu Kosar is affiliated with the ITM Physics Laboratory of NASA Goddard Space Flight Center. She is an atmospheric and space physics expert who has studied critical regions of the Earth's atmosphere through computational modeling and satellite data analysis. Dr. Kosar has a wide range of research interests, including plasma discharge physics and computational electromagnetics, lightning-related transient luminous events (TLEs), data science, and citizen science, just to name a few.

If you want a reminder of when this will be live, you can visit the website and set up a notification alert.

NASA Night Sky Notes, March 2025

March'sNight Sky Notes: Messier Madness

By Kat Troche

March is the start of spring in the Northern Hemisphere; with that, the hunt for Messier objects can begin!

Showing a large portion of M66, this Hubble photo is a composite of images obtained at visible and infrared wavelengths. The images have been combined to represent the real colors of the galaxy. Credit: NASA, ESA and the Hubble Heritage (STScI/AURA)-ESA/Hubble Collaboration; Acknowledgment: Davide De Martin and Robert Gendler

What Are Messier Objects?

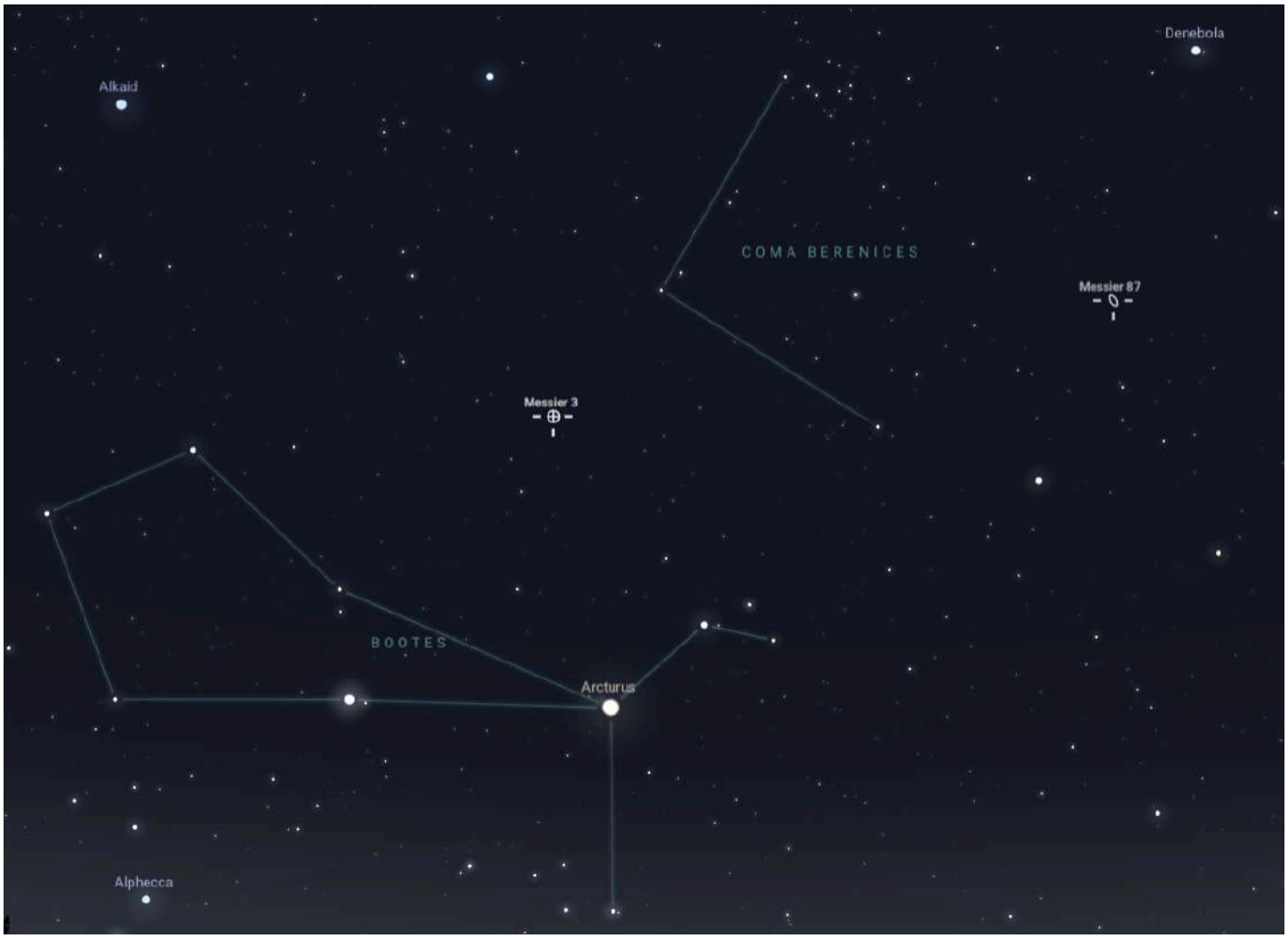
During the 18th century, astronomer and comet hunter Charles Messier wanted to distinguish the 'faint fuzzies' he observed from any potential new comets. As a result, Messier cataloged 110 objects in the night sky, ranging from star clusters to galaxies to nebulae. These items are designated by the letter **'M'** and a number. For

example, the Orion Nebula is **Messier 42** or **M42**, and the Pleiades are **Messier 45** or **M45**. These are among the brightest 'faint fuzzies' we can see with modest backyard telescopes and some even with our eyes.

Stargazers can catalog these items on evenings closest to the new moon. Some even go as far as having "Messier Marathons," setting up their telescopes and binoculars in the darkest skies available to them, from sundown to sunrise, to catch as many as possible. Here are some items to look for this season:

M44 in Cancer and M65 and 66 in Leo can be seen high in the evening sky 60 minutes after sunset. Credit: Stellarium Web

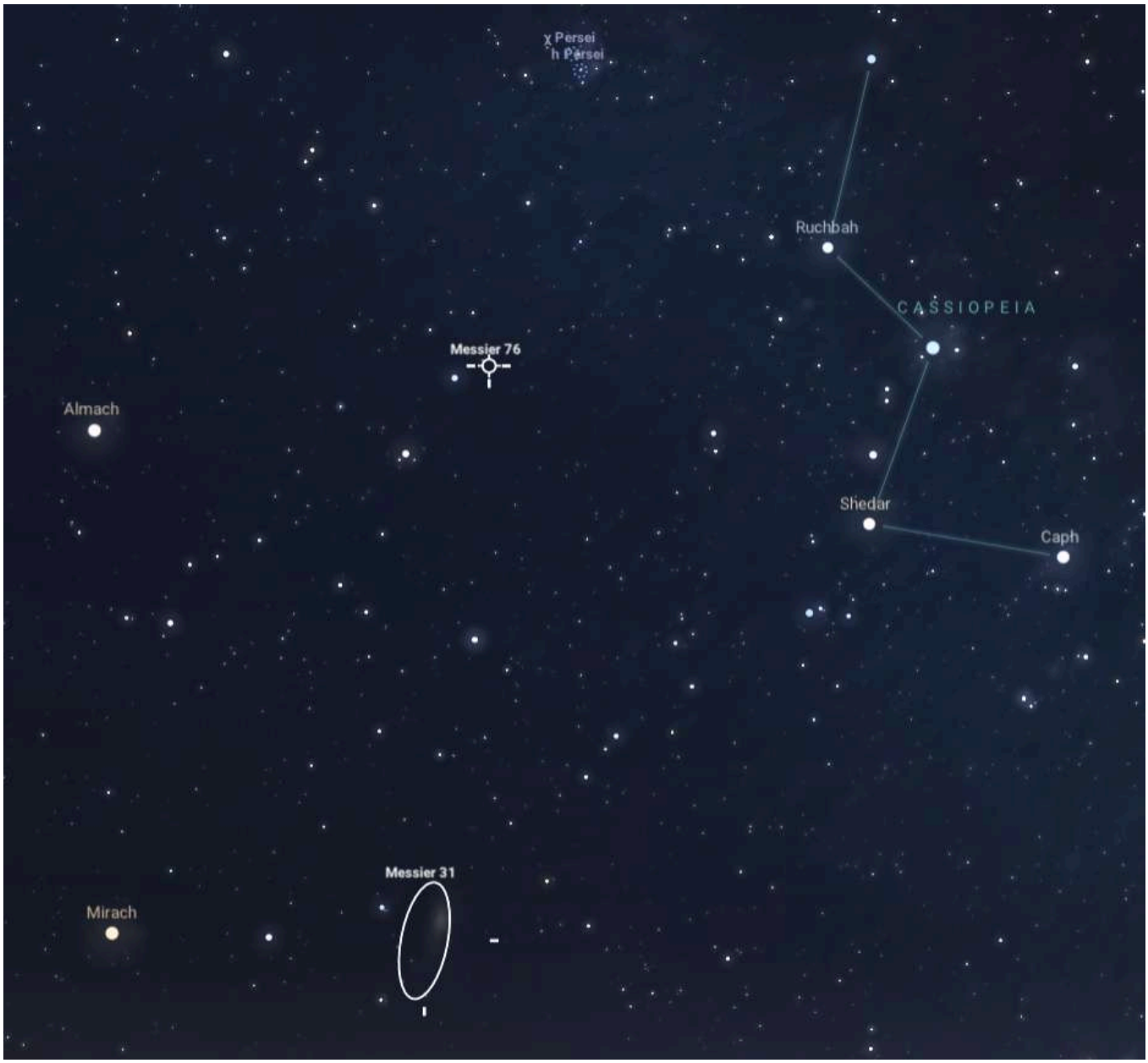
Messier 44 in Cancer: The Beehive Cluster, also known as Praesepe, is an open star cluster in the heart of the Cancer constellation. Use Pollux in Gemini and Regulus in Leo as guide stars. A pair of binoculars is enough to view this and other open star clusters. If you have a telescope handy, pay a visit two of the three galaxies that form the Leo Triplet - **M65** and **M66**. These items can be seen one hour after sunset in dark skies.



Locate M3 and M87 rising in the east after midnight. Credit: Stellarium Web

Messier 3 Canes Venatici: M3 is a globular cluster of 500,000 stars. Through a telescope, this object looks like a fuzzy sparkly ball. You can resolve this cluster in an 8-inch telescope in moderate dark skies. You can find this star cluster by using the star Arcturus in the Boötes constellation as a guide.

Messier 87 in Virgo: Located just outside of Markarian's Chain, M87 is an elliptical galaxy that can be spotted during the late evening hours. While it is not possible to view the supermassive black hole at the core of this galaxy, you can see M87 and several other Messier-labeled galaxies in the Virgo Cluster using a medium-sized telescope.



Locate M76 and M31 setting in the west, 60 minutes after sunset. Credit: Stellarium Web

Messier 76 in Perseus: For a challenge, spot the Little Dumbbell Nebula, a planetary nebula between the Perseus and Cassiopeia constellations. With an apparent magnitude of 12.0, you will need a large telescope and dark skies. You can find both M76 and the famous Andromeda Galaxy (M31) one hour after sunset, but only for a limited time, as these objects disappear after April. They will reappear in the late-night sky by September.

Plan Ahead

When gearing up for a long stargazing session, there are several things to remember, such as equipment, location, and provisions:

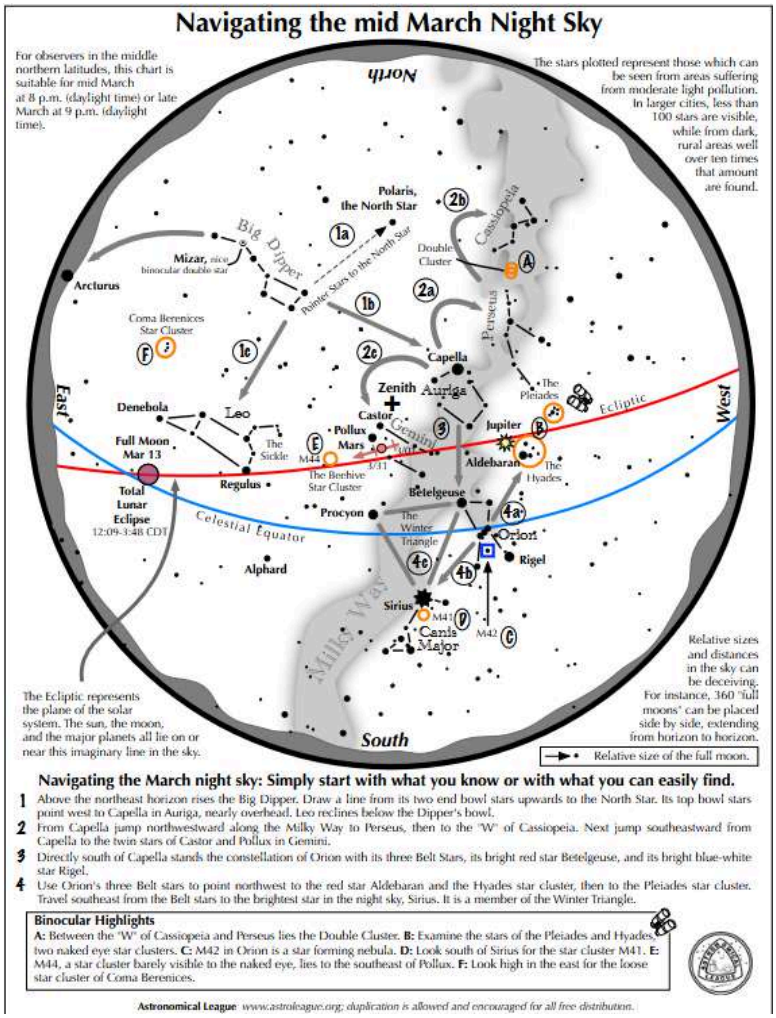
- **Do you have enough layers to be outdoors for several hours?** You would be surprised how cold it can get when sitting or standing still behind a telescope!
- **Are your batteries fully charged?** If your telescope runs on power, be sure to charge everything before you leave home and pack any additional batteries for your cell phone. Most people use their mobile devices for astronomy apps, so their batteries may deplete faster. Cold weather can also impact battery life.
- Determine the **apparent magnitude** of what you are trying to see and the **limiting magnitude** of your night sky. You can learn more about apparent and limiting magnitudes with our Check Your Sky Quality with Orion article.
- When choosing a location to observe from, select an area you are familiar with and bring some friends! You can also **connect with your local astronomy club** to see if they are hosting any Messier Marathons. It's always great to share the stars!

You can see all 110 items and their locations with NASA's Explore the Night Sky interactive map and the Hubble Messier Catalog, objects that have been imaged by the Hubble Space Telescope.

Observing

To find out skywatching tips for this month, click on the following links (in blue and underlined) to learn more.

Video: [What's Up March 2025 Sky Watching Tips from NASA]



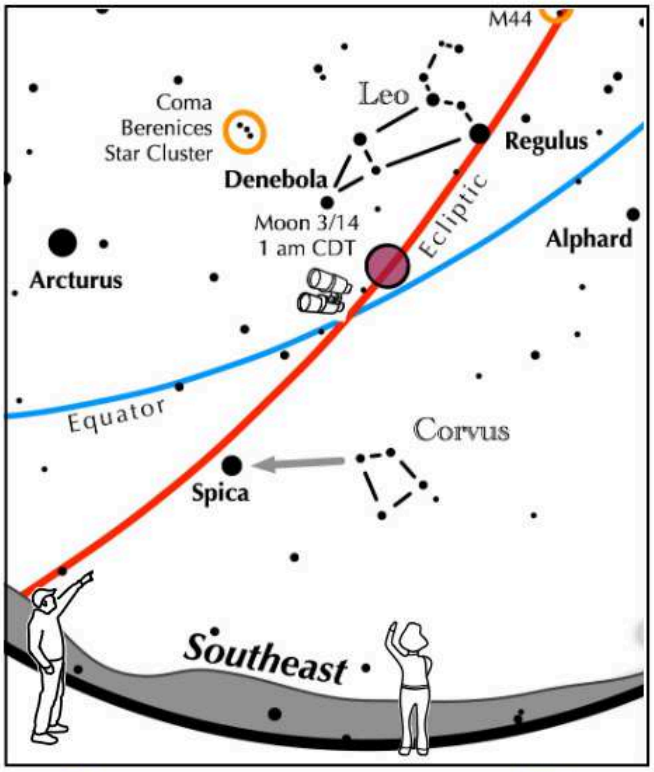
Click link for a larger image [March 2025]

You may find past issues of the Astronomical League charts **here.**

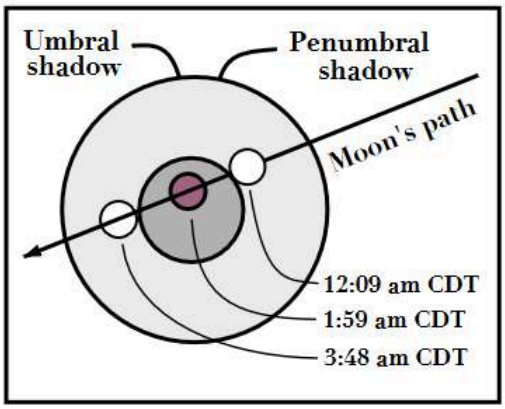
Astronomical League Observing this Month

This month be sure to see the Lunar Eclipse on the 14th.

If you can observe only one celestial event in the evening this March, see this one.



View to the southeast
on March 14
at 1 am CDT

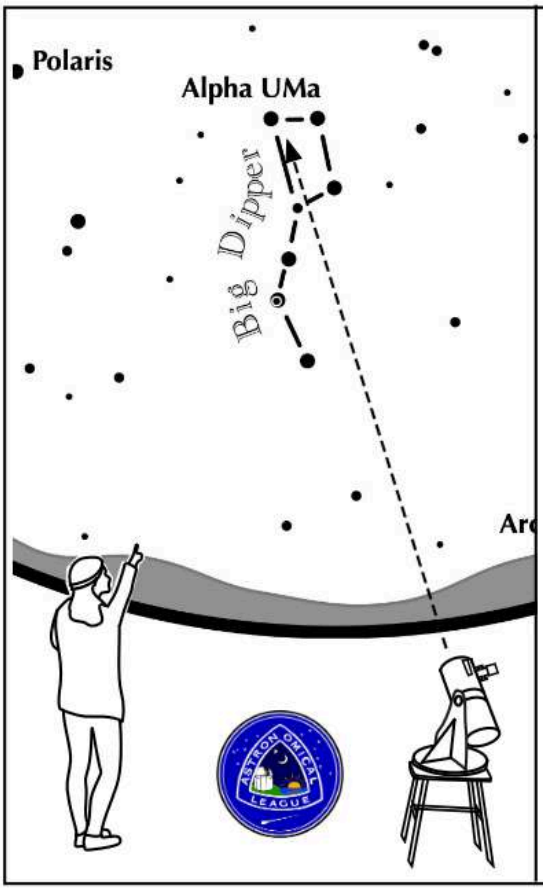


The Moon slides through a total eclipse

In the hours just after midnight on March 14, the brilliant full moon slides into Earth's shadow.

- Even though the partial umbral eclipse begins at 12:09 am CDT, darkening might not be noticed for another 5 minutes.
- When totality is reached, the full moon's brilliance is gone, allowing the stars to appear. Can you see that the moon lies mid-way between Regulus to the upper right and Spica to the lower left?
- At mid eclipse, what color is the moon? How red is it?
- During the partial phases, can you notice that the shadow's edge is not straight, but curved?

ASTRONOMICAL LEAGUE Double Star Activity



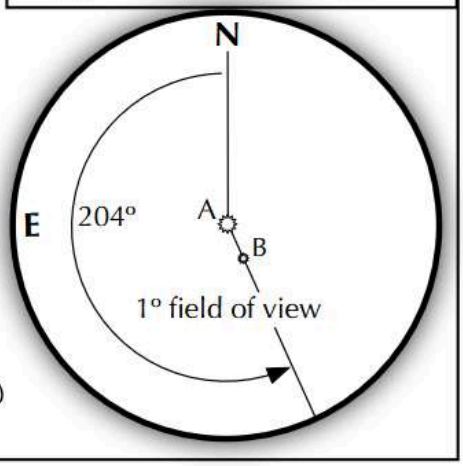
Other Suns: Alpha Ursae Majoris

How to find Alpha Ursae Majoris on a March evening

Face northeast. Look for the Big Dipper standing upright on its handle. Alpha is the star on the upper left corner of the bowl.

Suggested magnification: >20x
Suggested aperture: >3 inches

Alpha UMa
A-B separation: 381 sec
A magnitude: 2.0
B magnitude: 7.0
Position Angle: 204°
Colors:
orange
dark orange



Try binoculars!