Volume 52 Number 1 January 2026

The Celestial Mechanic

The Official Newsletter of the Astronomy Associates of Lawrence

Coming Events

Monthly Meeting
January 25, 2025, 7:00PM
Baker Wetlands Discovery Center

Public Observing
January 25, 2025, 8:00PM
Baker Wetlands Discovery Center

Club Officers
President
Rick Heschmeyer email

NSN Coordinator
Howard Edin email

Faculty Advisor
Dr. Jennifer Delgado email.

Newsletter Editor
Chuck Wehner email

Inside This Issue

Report From the Officers

By Rick Heshmeyer

Our December meeting took place on Sunday, December 7. Dr. Shane Larson, Professor of Physics and Director of Integrated Engineering & Applied Science Projects at Clarkson University in Potsdam, New York gave a fantastic presentation named "A STORM OF STARS: Knowing the Milky Way from Star Counts to Gravitational Waves". Everyone enjoyed Dr. Larson's talk so much that we are planning on inviting him back to present to the club again in the future. Unfortunately, clouds made it impossible to observe following the meeting.

At our January 25th club meeting, I will be presenting "The Useful Stars: The Night Sky as Calendar, Navigational Aid, and Cultural Repository". The meeting will start at 7pm at the Baker Wetlands Discovery Center, and will be followed by public telescope observing, weather permitting.

On Sunday, February 22 Dr. Brian Thomas of Washburn University will be presenting "Terrestrial Effects of Nearby Supernovae and Gamma-Ray Bursts". The speaker and subject for our Sunday, March 29 meeting is yet to be finalized. On Sunday, April 26 KU Graduate Student Rachel Cionitti will be presenting "Looking for Time to Look Back in Time", a discussion of the process involved in applying for observing time on the James Webb Space Telescope. All meetings start at 7 PM at Baker Wetlands Discovery Center and will be followed by public telescope observing if the weather permits. As always, if you have any ideas for future events or meetings, reach out to me. I look forward to seeing everyone at our upcoming events.

The Spring 2026 dates for the KU Astronomy Public Nights have not yet been released. We will share once they have been published.

Bundle up and enjoy the long winter nights and the many holidays this time of year. See everyone in January!

Clear Skies!

Webb Captures a Stunning Cosmic Structure We've Never Seen Before

The aging pair of stars swing by one another once every 190 years, producing four spirals of dust.

BY Passant Rabie

GIZMODO, NOVEMBER 19, 2025

Webb's mid-infrared image shows four coiled shells of dust around a pair of Wolf-Rayet stars.

The Webb telescope has unlocked a mystery in an exotic star system located approximately 8,000 light-years from Earth. Using its mid-infrared observation capabilities, the space telescope captured the first image of four swirling spirals of dust encircling two aging stars locked together in an orbital dance.

NASA released the image on Wednesday, confirming the existence of the layered shells of dust surrounding two Wolf-Rayet stars in the Apep system. Previous observations had only detected one dust spiral, while Webb was not only able to see all four, but it also narrowed down how long the binary stars take to orbit one another.

"Looking at Webb's new observations was like walking into a dark room and switching on the light—everything came into view," Yinuo Han, a researcher at Caltech in Pasadena, California, and lead author of a new study published in the Astrophysical Journal, said in a statement. "There is dust everywhere in Webb's image, and the telescope shows that most of it was cast off in repetitive, predictable structures."

One of a kind

Wolf-Rayet stars are extremely rare, with only about a thousand of them believed to exist in the Milky Way galaxy. They are massive, bright stars in late stages of their stellar evolution. Stars that big don't last very long; Wolf-Rayets burn through their fuel rather quickly, expelling their mass into space through high-pressure winds.

The pair of stars in Apep, named after the Egyptian god of chaos, have been shedding their outer layers over the past 700 years. The two Wolf-Rayet stars are gravitationally bound to one another, along with a third companion, a massive supergiant star that carves a hole into the clouds of dust from its wider orbit.

Most Wolf-Rayet stars orbit one another within two to 10 years, with the longest recorded orbital period being 30 years. The Apep stars, however, swing by one another every 190 years. The team of researchers behind the new study was able to figure out the orbits of the stars by combining measurements of the location of the rings from Webb's image with the speed of the shells' expansion from observations taken by the European Southern Observatory's Very Large Telescope in Chile over a period of eight years.

With each long orbit, the two stars remain close for 25 years, forming the expanding dust shells. As the stars approach and pass one another, their stellar winds collide and mix, forming the spirals of dust for a period

that lasts a quarter of a century. The dust of other star systems lasts for a few months at a time.

Although the Webb image may inspire tranquility, there is nothing chill about the Apep stars. The two stars are emitting dust at 1,200 to 2,000 miles per second (2,000 to 3,000 kilometers per second) while speeding through the cosmos.

The Wolf-Rayet stars were initially more massive than their third companion but have shed most of their mass over the years. Scientists estimate that the two stars are between 10 and 20 times the mass of the Sun, while the supergiant is 40 or 50 times as massive as our host star.

Although scientists have known about the third star in the Apep system, Webb's observations confirmed that it is gravitationally bound to the system by revealing it slicing through the dust shells. "Webb gave us the 'smoking gun' to prove the third star is gravitationally bound to this system," Ryan White, a PhD student at Macquarie University in Sydney, Australia, and author of another paper published in the Astrophysical Journal, said in a statement.

The two massive stars are on a path to destruction and will eventually explode as supernovas. It's possible that either of the stars may emit a gamma ray burst before becoming a black hole. ☀

Star trails over telescope in Chile | Space photo of the day for Nov. 25, 2025

By Kenna Hughes-Castleberry

SPACE.COM, NOVEMBER 25, 2025

Chilean astrophotographer Osvaldo Castillo captured this breathtaking view.

For Chilean astrophotographer Osvaldo Castillo, the night sky above the European Southern Observatory's (ESO) Paranal Observatory held a breathtaking sight.

"I couldn't believe I was photographing a circumpolar startrail in Paranal; without a doubt, one of the most incredible experiences I've had as a photographer," said Castillo in a recent ESO article.

The photograph reveals a hypnotic circular ballet of starlight turning slowly across the night sky.

What is it?

Star trails are the visible imprint of Earth's rotation. As our planet spins around its axis, the stars appear to sweep across the sky in long, circular arcs. When a camera takes repeated long-exposure images over hours and the frames are later stacked together, these arcs become luminous trails revealing the circular (apparent) path of the stars.

The exact pattern depends on where the photographer is located on Earth. In the Southern Hemisphere, the stars appear to circle the south celestial pole, an extension of Earth's south rotational axis into the sky. In Castillo's photograph, that pole forms the central point around which every trail curves.

Where is it?

This image was taken at the Paranal facility in the Atacama Desert in Chile.

Why is it amazing?

Producing such an image requires extraordinary patience, precision and technical skill. Long-exposure star trail photography demands hundreds of individual frames, each taken over minutes or hours. A small mistake in alignment can distort the final result, and motion in the foreground can complicate the stacking process.

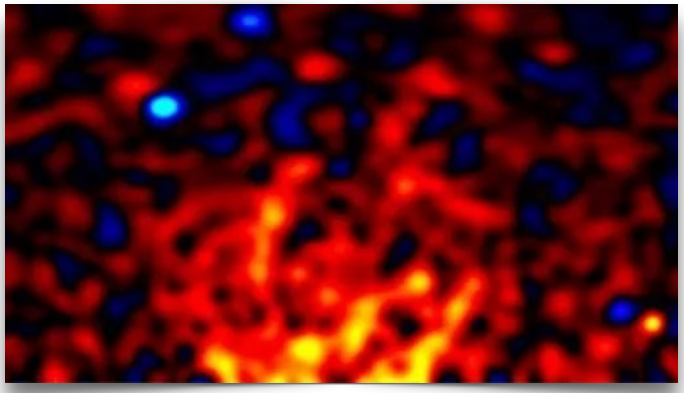
These challenges are heightened at observatories, where telescopes constantly reposition to track celestial objects. To overcome this, Castillo needed to photograph the foreground and background separately, ensuring the telescope remained crisp while the star trails formed perfect arcs behind it.

In total, he captured almost 300 images. "You can't see the result immediately," he explained in a statement. "Fortunately, the calculation and orientation to the South were accurate." The payoff is evident: a gorgeously composed starwheel set against one of the world's premier astronomical sites. ☀

Scientists may have finally 'seen' dark matter for the 1st time

By Robert Lea published
SPACE.COM, NOVEMBER 25, 2025

"This signifies a major development in astronomy and physics."



A gamma-ray intensity map of the region of the galactic plane isolating the dark matter halo.

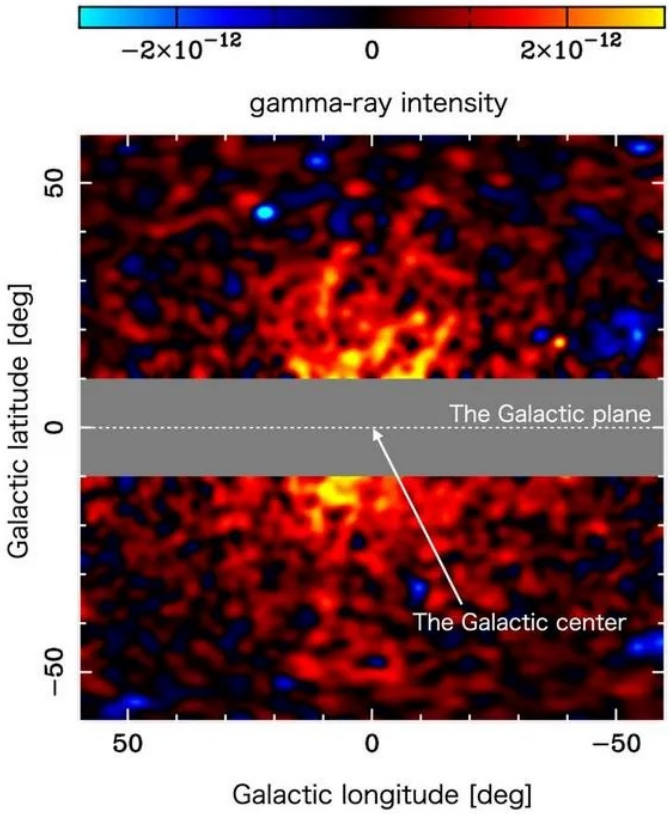
Scientists may have "seen" dark matter for the first time, thanks to NASA's Fermi gamma-ray space telescope. If so, this would mark the first direct detection of the universe's most mysterious substance.

Dark matter was theorized in 1933 by astronomer Fritz Zwicky, who found that the visible galaxies of the Coma Cluster lacked the necessary gravitational influence to prevent this cluster from flying apart. Then, in the 1970s, astronomer Vera Rubin and colleagues found the outer edges of spiral galaxies were spinning at the same rate as their centers, something that would only be possible if the major amount of mass in these galaxies wasn't concentrated at their centers, but rather more widely dispersed. These aren't direct observations of dark matter, of course, but inferences made using dark matter's interactions with gravity as well as the influence gravity then has on ordinary matter and light. Still, because of these findings, s astronomers have since calculated that all large galaxies are embedded within vast haloes of dark matter that expand way beyond the limits of visible matter in galaxies (such as galactic haloes of stars).

The particles of this mysterious substance are now estimated to outweigh the particles that make up everyday matter by a ratio of five to one. That means everything we see around us on a day-to-day basis — stars, planets, moons, our bodies, next door's cat, and so on — all account for just 15% of the matter in the universe, with dark matter accounting for the other 85%. Adding to the mystery of dark matter is the fact that, because it interacts with electromagnetic radiation so weakly, or not at all, it doesn't emit, absorb, or reflect light. Thus, it is effectively invisible in all wavelengths of light — or at least, we thought it was.

There is one possibility that would result in dark matter producing light. If dark matter particles "annihilate" when they meet each other and interact, much as matter and its counterpart antimatter do, then it should produce a shower of particles, including photons of gamma-rays that, while invisible to our eyes, could be "seen" by sensitive gamma-ray space telescopes. One of the suggested "self-annihilating" particles theorized to comprise dark matter are so-called "Weakly Interacting Massive Particles" or "WIMPS."

A team of researchers, led by Tomonori Totani from the Department of Astronomy at the University of Tokyo, trained the Fermi spacecraft on the regions of the Milky Way where dark matter should congregate, namely at the center of our galaxy, and hunted for this telltale gamma-ray signature.



Well, Totani thinks we finally found that signature.

Gamma-ray intensity map on previous page excluding components other than the halo, spanning approximately 100 degrees in the direction of the Galactic Center. The horizontal gray bar in the central region corresponds to the galactic plane area, which was excluded from the analysis to avoid strong astrophysical radiation.

"We detected gamma rays with a photon energy of 20 gigaelectronvolts (or 20 billion electronvolts, an extremely large amount of energy) extending in a halolike structure toward the center of the Milky Way galaxy," Totani said. "The gamma-ray emission component closely matches the shape expected from the dark matter halo."

And this isn't the only close match. The energy signature of these gamma-rays closely matches those predicted to emerge from the annihilation of colliding WIMPs, which are predicted to have a mass around 500 times that of a proton, the ordinary matter particles found at the heart of atoms. Totani suggests there aren't any other astronomical phenomena that easily explain the gamma-rays observed by Fermi.

"If this is correct, to the extent of my knowledge, it would mark the first time humanity has 'seen' dark matter. And it turns out that dark matter is a new particle not included in the current standard model of particle physics," Totani said. "This signifies a major development in astronomy and physics."

While Totani is confident that what he and his colleagues have detected is the signature of dark matter WIMPs annihilating each other at the heart of the Milky Way, the scientific community in general will require more hard evidence before the book is closed on this nearly century-old mystery.

"This may be achieved once more data is accumulated, and if so, it would provide even stronger evidence that the gamma rays originate from dark matter," Totani added. ☀

Mind-Bending 'Einstein Cross' Reveals Ultrabright Supernova From an Unthinkable Distance

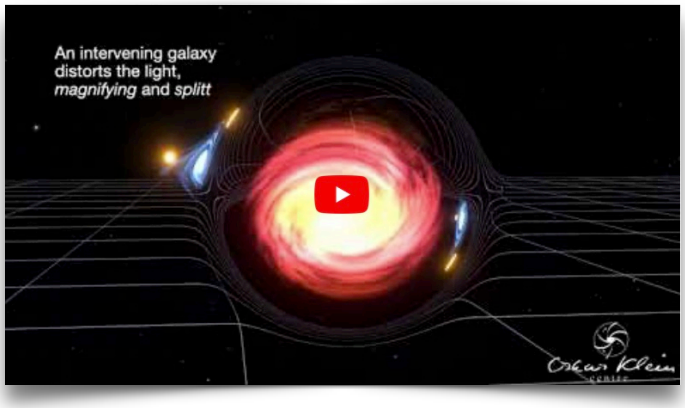
For the first time, astronomers have captured the brilliance of a superluminous supernova via gravitational lensing.

By Gayoung Lee
GIZMODO, DECEMBER 12, 2025

The supernova SN 2025wny is hopelessly far, lying approximately 10 billion light-years from Earth. Normally, this would make it impossible for astronomers to detect. But one team got lucky.

While scanning the sky for cosmic transients, an international team of astronomers noticed two galaxies in the foreground of a giant blob of light. Further analysis with other telescopes revealed that the blur was a supernova—a superluminous one at that. Remarkably, the two galaxies were acting as a "cosmic magnifying glass," boosting the brightness of the energetic, rare type of supernova by a factor of 50.

The researchers describe their findings in a recent paper for The Astrophysical Journal Letters.



"This is nature's own telescope," Joel Johansson, study lead author and an astrophysicist at Stockholm University in Sweden, said in a statement. "The magnification lets us study a supernova at a distance where detailed observations would otherwise be impossible."

Distortions in spacetime

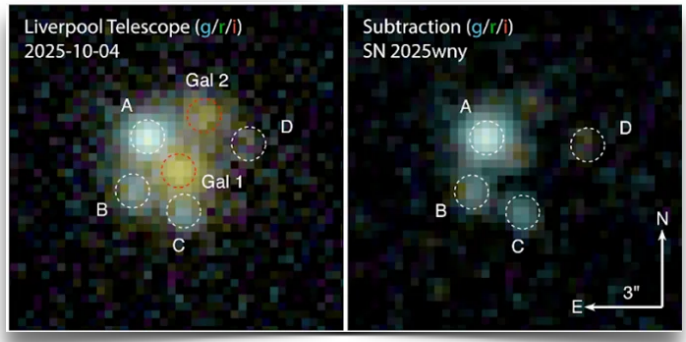
Astronomical observations are limited to the speed of light—that is, the things we "see" from the universe

are a product of how far they are in terms of light. So if light bumps into anything along the way, that also shows up in our observations. Many times, that appears as unfortunate noise in the data.

But other times, these obstructions are large enough to bend spacetime with their gravitational pull, subsequently making light travel alongside the newly bent path. From this distortion—a gravitational lens—astronomers can extract valuable information about that section of the universe.

Not a bad signal

In the case of SN 2025wny, the two intervening galaxies magnify and split the light from the supernova. The separated light signals each enter the view of Earthbound telescopes at different times, making the supernova manifest as a weird, spotty image.



Liverpool Telescope images from October 4, 2025 (left panel) and the four lensed images of SN 2025wny (right panel) after subtracting the lens and host galaxy light from archival images.

"I couldn't believe my eyes when I saw the data; I thought that it must have been an artifact from the camera," admitted Jacob Wise, study co-author and a PhD student at Stockholm University, in the release. "However, when I carefully looked at our data from previous nights, I could still clearly see the multiple lensed images of the supernova."

Wise and his advisor, Dan Perley, quickly sent their observations to the Keck Observatory in Hawaii, which collected and confirmed the spectra of the strange signal. Indeed, the team was looking at an extremely bright supernova sitting impossibly far away.

New explosions, new questions

SN 2025wny is the first superluminous supernova to be observed by gravitational lensing. That has some important implications. For one, the time differences between the lensed images represent a novel way to determine the universe's expansion rate, known as the Hubble constant. This constant is at odds with real-life observations, a mismatch referred to as the Hubble tension.

Gravitational lensing of faraway objects could help point to "whether the tension reflects new physics or limitations in existing methods," the researchers explained in the statement. The team is already conducting follow-up observations with the Hubble and James Webb Space Telescopes, they added.

The discovery is yet another neat example of multi-messenger astronomy, which applies multiple techniques to study a single source. In that sense, the paper concluded, SN 2025wny represents "not only an individual milestone but also a glimpse into a rapidly unfolding era" for astronomy pursuits. ☀

The Backyard Observer, January 2026

By Rick Heschmeyer

Cetus

This month's constellation, Cetus is Latinized for Greek "Ketos", the name of a sea monster. In Greek mythology Cetus was sent by Poseidon to terrorize the coasts of Ethiopia after feeling insulted by the queen Cassiopeia who declared that she was more beautiful than his water nymphs. The king, on the instruction of an oracle, intended to sacrifice the princess Andromeda in order to stop the beast, but the hero Perseus slew it before it could get to her.

One of Ptolemy's original 48 constellations, Cetus is the 4th largest constellation by size in the night sky, but befitting with its monstrous heritage, it contains no particularly bright stars.

Beta Ceti, more commonly called Diphda, is the constellation's brightest beacon. It was once called Deneb Kaitos, meaning the end of the southern tail.

The most striking star in Cetus is Omicron Ceti. You may know this star by its proper name of Mira. Its name means wonderful, and that is due to its changing brightness. Mira is the prototype of the Mira class of variable stars. Mira is a pulsating red giant star whose brightness variations are caused by changes in the star's size. Mira is also a double star,

with a white dwarf companion. While there is circumstantial evidence that Mira's variability was know in ancient, Greece, Babylon, and China, that variability was not confirmed until 1638 when Frisian astronomer Johannes Holwarda first calculated its period. Mira is located about 300 light years from Earth.

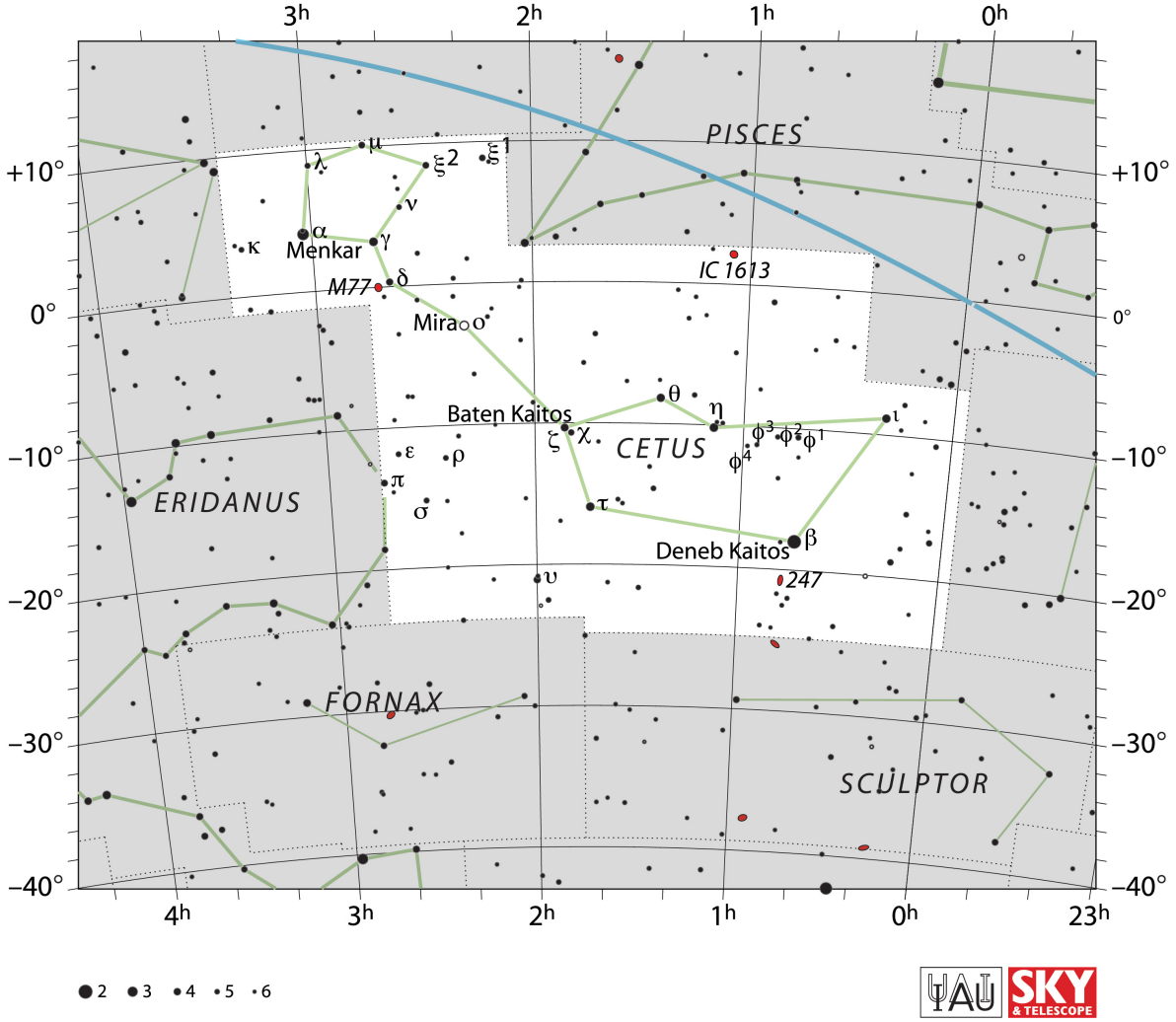
One more interesting star lies within Cetus, although it is not visible with any telescope on Earth. Earendel (WHL0137-LS) is the earliest and most distant star discovered to date. It lies at a distance of 28 billion light-years from Earth, almost twice as distant as the previous record holder, Icarus (MACS J1149 Lensed Star 1). It was discovered by the Hubble Space Telescope through a gravitational lens. The discovery was reported on March 20, 2022.

One Messier object lies in Cetus, the spiral galaxy Messier 77. M77 is also known as Cetus A, and lies at a distance of 47 million light years away. The bright core of the galaxy can be spotted is binoculars from a dark location. 4-inch or larger telescopes will show the oval glow of the spiral arms. M 77 is a type of active galaxy, called a Seyfert galaxy. Named after the American astronomer Carl Seyfert, who was the first to identify the class in 1943, Seyfert galaxies are characterized by hot, highly ionized gas around an extremely active center. M77 serves as the prototype for the class.

Another Cetus galaxy is NGC 247. It is a spiral galaxy situated near the celestial equator. It is fainter than M77, but still visible in small telescopes.

Our final stop in Cetus is the irregular dwarf galaxy IC 1613, also designated Caldwell 51. This galaxy is a member of our Local Group of Galaxies and lies a mere 2.3 million light years distant. Fainter even than NGC 247, IC 1613 is difficult to spot and will require mid-to-large telescopes to observe.

Enjoy looking up at this "whale" of a constellation.

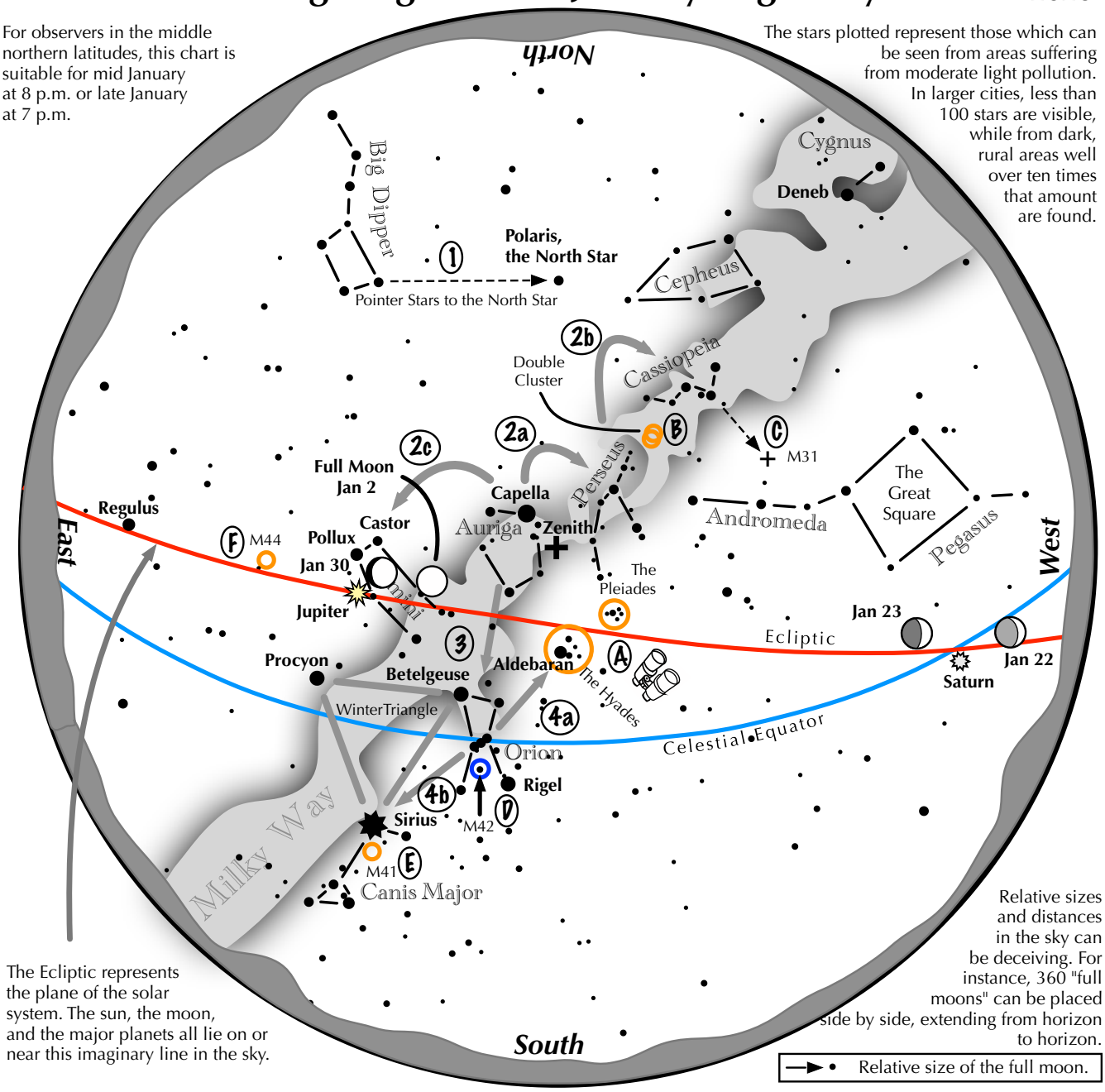


Navigating the mid January Night Sky

2026

For observers in the middle northern latitudes, this chart is suitable for mid January at 8 p.m. or late January at 7 p.m.

The stars plotted represent those which can be seen from areas suffering from moderate light pollution. In larger cities, less than 100 stars are visible, while from dark, rural areas well over ten times that amount are found.



The Ecliptic represents the plane of the solar system. The sun, the moon, and the major planets all lie on or near this imaginary line in the sky.

Relative sizes and distances in the sky can be deceiving. For instance, 360 "full moons" can be placed side by side, extending from horizon to horizon.

Relative size of the full moon.

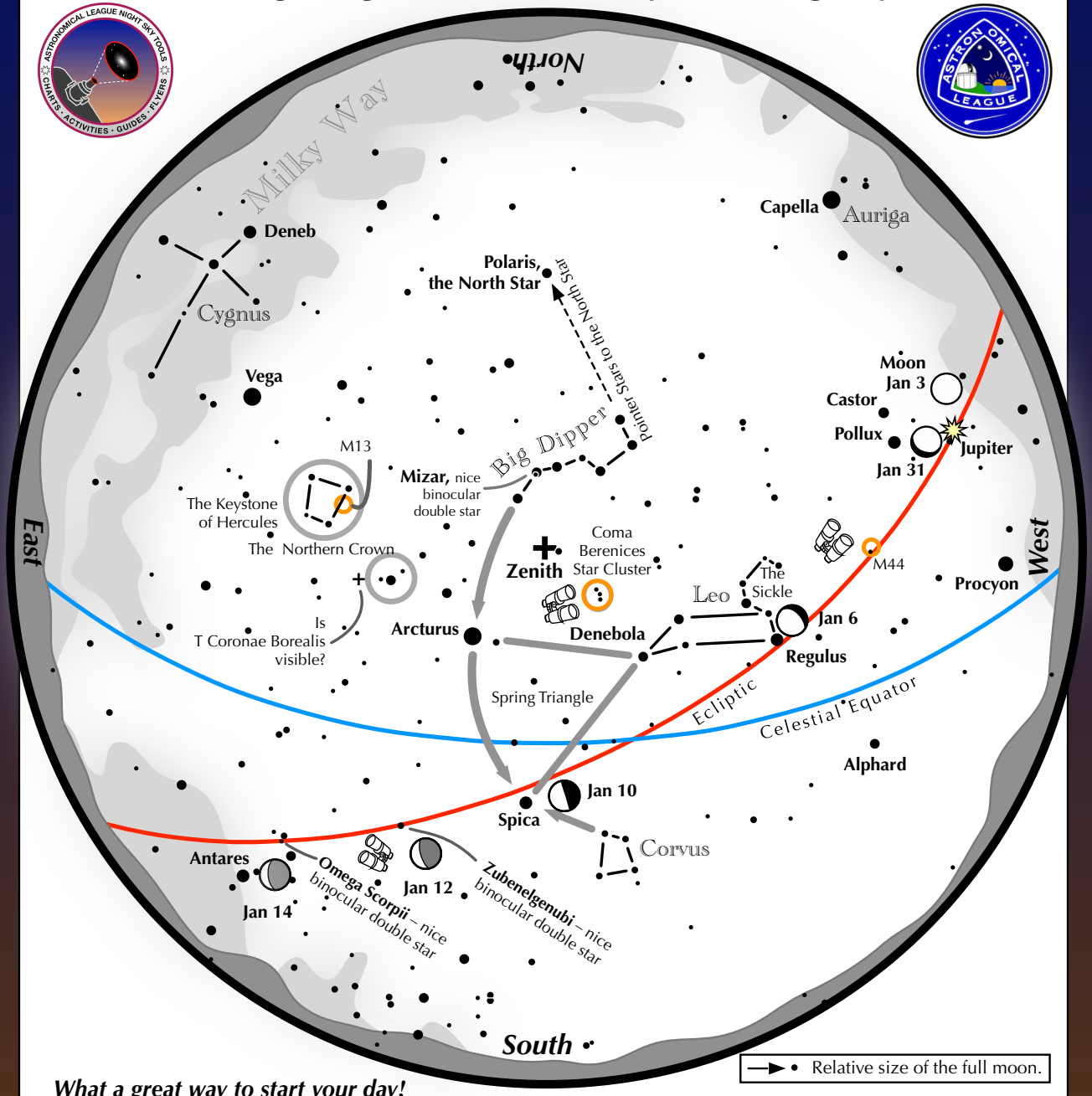
Navigating the winter night sky: Simply start with what you know or with what you can easily find.

1. Above the northeast horizon rises the Big Dipper. Draw a line from its two end bowl stars upwards to the North Star.
2. Face south. Overhead twinkles the bright star Capella in Auriga. Jump northwestward along the Milky Way first to Perseus, then to the "W" of Cassiopeia. Next Jump southeastward from Capella to the twin stars Castor and Pollux of Gemini.
3. Directly south of Capella stands the constellation of Orion with its three Belt Stars, its bright red star Betelgeuse, and its bright blue-white star, Rigel.
4. Use Orion's three Belt stars to point to the red star Aldebaran, then to the Hyades, and the Pleiades star clusters. Travel southeast from the Belt stars to the brightest star in the night sky, Sirius.

Binocular Highlights

A: Examine the stars of the Pleiades and Hyades, two naked eye star clusters. **B:** Between the "W" of Cassiopeia and Perseus lies the Double Cluster. **C:** The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval. **D:** M42 in Orion is a star forming nebula. **E:** Look south of Sirius for the star cluster M41. **F:** M44, a star cluster barely visible to the naked eye, lies to the southeast of Pollux.

Navigating the mid January Morning Sky 2026



What a great way to start your day!

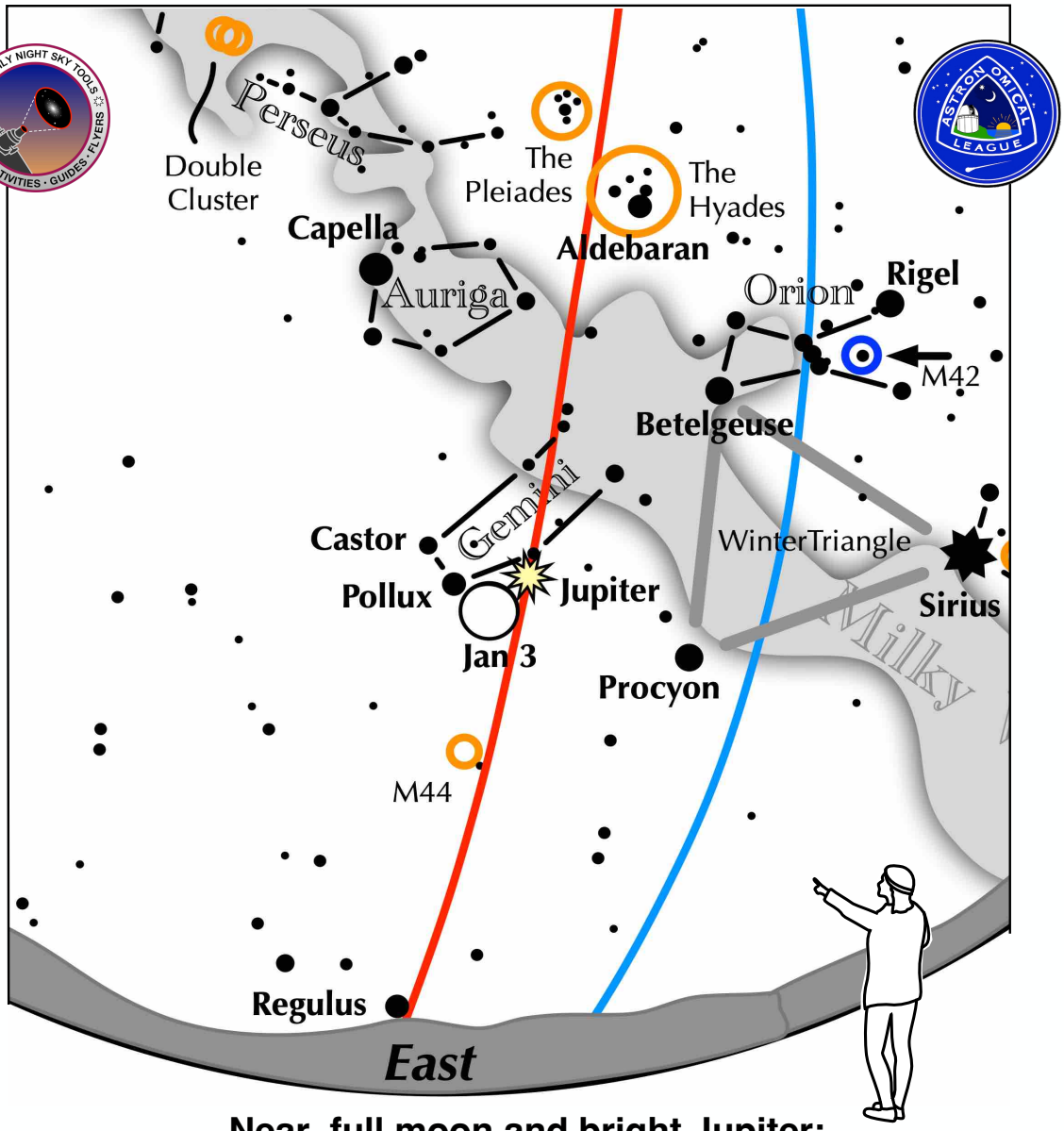
For observers in the middle northern latitudes, this chart is suitable for mid January at 5:30 a.m.

Late sunrises in January provide opportunities for early morning skywatching.

- Bright Jupiter shines in the west-northwest and moves below Pollux in Gemini.
- The third quarter moon floats near Spica on January 10.
- The waning crescent moon glows near Antares on January 14.
- Continue watching for a sudden and rapid brightening of T Coronae Borealis. When will it explode?
- A great time for viewing the Big Dipper, Leo, and Hercules. And it is time for galaxy viewing!

Astronomical League *www.astroleague.org/; duplication is allowed and encouraged for all free distribution.*

An observing activity for this January 3.



Near–full moon and bright Jupiter: What can you see in the moon glow?

In the evening of January 3, look for Jupiter to the upper right of the moon.

• How well can you see -2.7 magnitude Jupiter just 4° away from the moon? Look at stars further from the moon.

• Can you spot these luminaries?

1.1 mag. Pollux, 3° away followed by 1.6 mag. Castor 7° away,
0.4 magnitude Procyon 20° away,
1.7 mag. Alnilam, Orion's middle Belt Star, 40° away,
and the much dimmer Pleiades, 55° away.

www.astroleague.org

Astronomy Associates of Lawrence - Annual Dues

Membership includes the AAL monthly club newsletter, membership in the national organization,

the Astronomical League and their quarterly newsletter, the Reflector.
AAL is also affiliated with the Night Sky Network

Name_____

Address_____

City_____State_____Zip_____

Email_____Phone_____

Annual Dues Regular/Family Membership $**12.00** Student Membership $ **6.00**

Checks should be made out to **KUEA**

For more info, check out the club Web site https://astronaal.ku.edu/aboutaal

Please fill out the form above and return it with your dues to:

Astronomy Associates of Lawrence

Rm. 1082, Malott Hall

1251 Wescoe Hall Dr.

Lawrence, Kansas 66045

About Astronomy Associates

The club is open to all people interested in sharing their love for astronomy. Monthly meetings are typically on the last Sunday of each month and often feature guest speakers, presentations by club members, and a chance to exchange amateur astronomy tips. These meetings and the public observing sessions that follow are scheduled at the Baker Wetlands Discovery Center, south of Lawrence. All events and meetings are free and open to the public. Periodic star parties are scheduled as well.

Because of the flexibility of the schedule due to holidays and alternate events, it is always best to check the Web site for the exact Sundays when events are scheduled.

Copies of the Celestial Mechanic can also be found on the web at newsletter.
Annual Dues for the club are: $12 for regular members; $6 for students Membership forms can be accessed at the club website form.