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The Celestial Mechanic

The Official Newsletter of the Astronomy Associates of Lawrence

Coming Events

Monthly Meeting
September 27, 2026, 7:00PM
Baker Wetlands Discovery Center

Public Observing
September 27, 2026, 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

Welcome back! I hope everyone had a wonderful summer. Our first club meeting of the fall took place on Saturday, August 22nd. Rick Heschmeyer presented "Rocks from Space", a discussion of asteroids and meteorites, and their effect on the evolution of our planet. Also included was a hands-on display of numerous meteorites so everyone to enjoy. The meeting was followed by public telescope observing with the "stars" of the night were the Moon and Venus.

Our first event of the summer at the KU Field Station to observe the Perseid Meteor Shower was cancelled due to the forecast of cloudy skies, the second summer event at the Field Station, on Thursday, August 27, to observe the Partial Lunar Eclipse was a success.

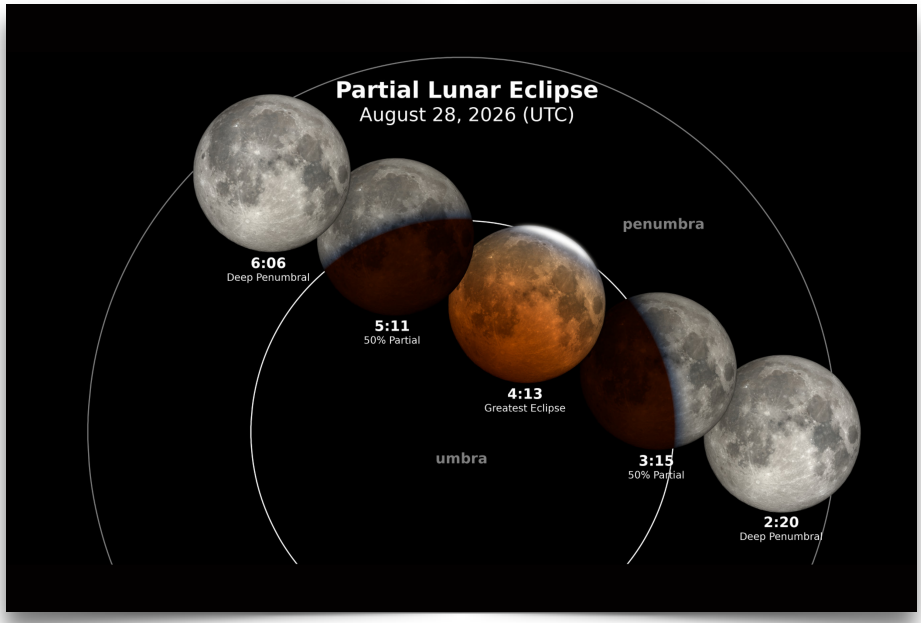
Our September club meeting will take place on Sunday, September 27. AAL member David Kolb will present "Mary Emma Byrd, Lawrence's Forgotten Astronomer."

The KU Telescope Nights events on campus have been released for the fall semester. They are listed below.

Thursday Sep 10, Thursday Oct 8, Thursday Nov 12, Thursday Dec10

Planetarium Shows start at 7:30, 8:00 and 8:30 pm in G174 Slawson. Stargazing and telescopes will take place after the shows as conditions allow.

Clear Skies!



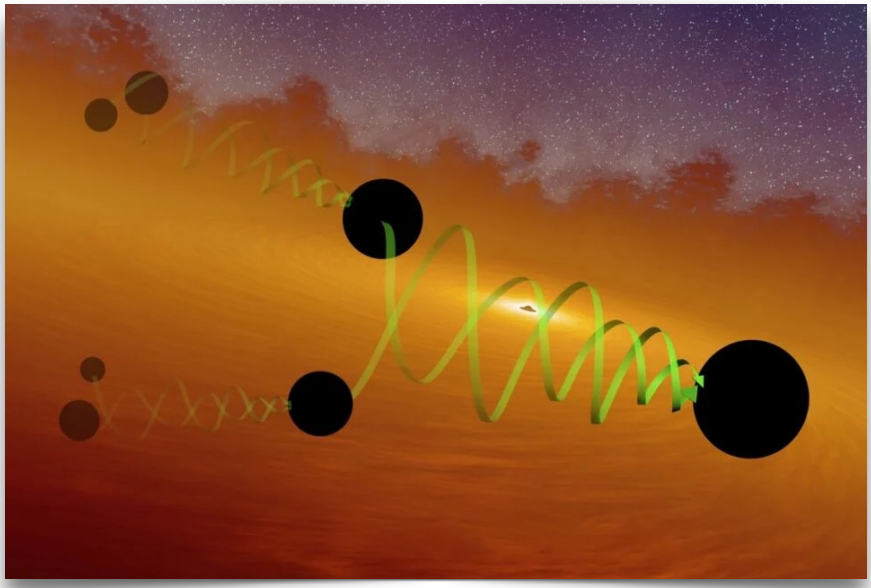
Scientists Say Some Black Holes Are Born From Other Black Holes

The universe keeps telling us that black holes exist in an "impossible" mass zone. That's leaving astronomers to find alternative origin stories for black holes.

By Gayoung Lee

GIZMODO, JULY 10, 2026

Since LIGO's Nobel-winning discovery of gravitational waves—ripples in spacetime—the U.S.-based detector has been picking up on hundreds of signals from black hole mergers. And, after a decade of studying gravitational waves, researchers believe a significant fraction of black holes may come from cosmic chain reactions.



An artist's concept of the hierarchical formation of black holes.

A recent paper published in Physical Review Letters describes an analysis of 155 pairs of binary black holes, identified by LIGO and its sisters, Virgo and KAGRA, in Italy and Japan, respectively. According to the study, about 14% of merging black holes may be what's called "second-generation black holes," or black holes that form from previous mergers of two smaller black holes. This "hierarchical" backstory is vastly different from the textbook version of how black holes emerge from the explosive death of a star.

"Overall in the universe, black holes are merging all the time," Cailin Plunkett, the study's first author and a graduate student at the Massachusetts Institute of Technology, told MIT News. "Now we're seeing a relatively consistent picture where there's a decent percentage of black holes that are coming from this repeated pathway."

Tracking the invisible

Gravitational waves that reach Earth's detectors typically come from extremely intense events. Over the years, LIGO has picked up some truly perplexing signals. For example, last summer it found the most colossal black hole merger ever—and if that wasn't wild enough, the black holes that took part in the merger lie within a cosmic "dead zone" for black holes.

This zone refers to a range of black hole masses in which, physically speaking, black holes can't form through ordinary stellar collapse. From these discoveries, astronomers realized just how little we knew about black holes, which are challenging to investigate directly. In that sense, it was a no-brainer that the ever-growing catalog of LIGO's gravitational signals would turn up entirely new insights about black holes.

"It is increasingly clear, both from individual events and population analyses, that massive black holes exist in [this] range," the researchers wrote in the latest paper. "These observations have spurred further investigation into mechanisms that can populate this gap."

A wobbly imprint

The latest research represents one such investigation. During mergers, the two black holes spiral toward each other along an orbital plane. When one or both black hole spins are misaligned, the orbital plane can wobble, or "precess," the researchers explained to MIT News. The degree to which the disk wobbles acts as a parameter from which researchers can measure the masses and spins of the merging black holes.

One telling sign of hierarchical mergers is that they're "lopsided," meaning one of the pair has a much higher spin and mass than the other. For the study, the team created an analytic model to capture the kind of

wobble that would have emerged from second-generation black holes. Around 14% of merging black holes followed this pattern, and the second-generation black holes identified had a very specific range of masses, at around 20 solar masses or 40 solar masses and above.

Of mysterious origins

To be fair, that might not sound like a whole lot. But it demonstrates that a sizeable portion of known black holes indeed follow this pattern. As for why, the team suspects hierarchical mergers emerge from dense stellar environments. Simply, when multiple neighboring stars die and collapse into black holes, the dense environment can make it easier for those black holes to find each other and merge. That could further lead to the formation of second-generation black holes. Theoretically, this could "repeat potentially ad infinitum, by virtue of the fact that you have a ton of stars and black holes in this really dense environment," Plunkett said

But an ensuing mystery concerns those black holes in the 40-and-above regime, which coincides with the aforementioned "death zones" for black hole masses. According to stellar evolution theory, black holes born of supernovas shouldn't leave any black holes above roughly 45 solar masses, explained Plunkett.

"Yet we have seen black holes that are that massive," she mused. "And the question is: Where did they come from?"

For now, it's hard to say when we'll get an answer to that question, if ever. But one thing seems to be clear: black holes are a lot weirder than we could ever imagine. ☀

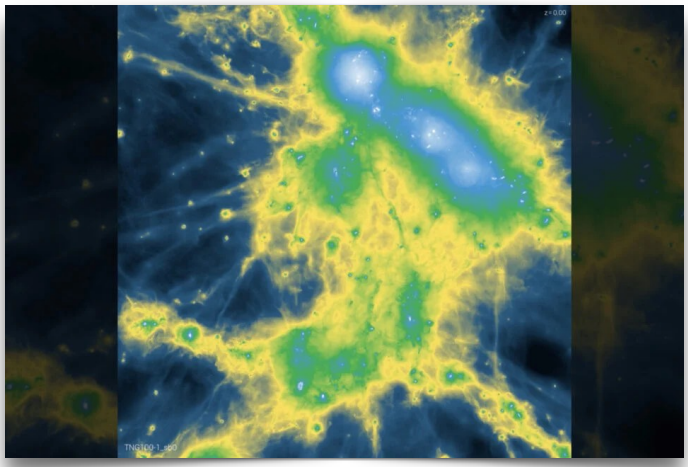
Scientists Finally Found the Universe's Missing 'Ordinary' Matter

Two mysteries come together to address a decades-long puzzle.

By Gayoung Lee

GIZMODO, JULY 22, 2026

A huge missing chunk of our universe has been found at last, but I'm not talking about dark matter.



Simulated gas distribution (blue, green, and yellow colors) around galaxies (white dots on the image).

For decades, there's been a discrepancy between the amount of ordinary—neither invisible nor dark—matter that we should see and that which we actually observe. A new study published today in Physical Review Letters suggests that, fortunately, this conflict does not reflect poorly upon leading astrophysical models. By studying "smears" in fast radio bursts, researchers successfully mapped the distribution of this missing ordinary matter, which turned out to be diffuse clouds of baryonic gas surrounding galaxy clusters. These diffuse clouds may be flung outside galaxies through black hole jets, according to the researchers.

"We are finding that the activity in galaxies is messier than we thought," Haochen Wang, the study's first author and a graduate student at the Massachusetts Institute of Technology (MIT), told MIT News. "They're more like fountains and really push out gas to very large distances."

Ordinarily elusive

More formally, "ordinary" matter in this context refers to matter consisting of baryons, a family of particles that include protons and neutrons. Estimates posit that about 17% of the early universe consisted of baryonic matter, some of which evolved to become planets, stars, galaxies, and more. However, the total mass of all visible objects in the universe adds up to a measly 10% of that 17%, according to the paper.

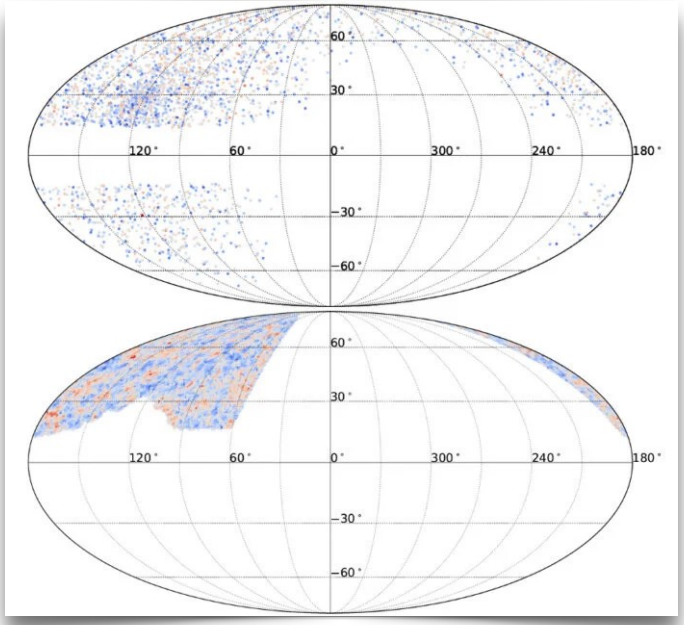
That led scientists to hypothesize that the remaining 90% resided elsewhere in the universe—but where? If we're not seeing these baryons in stars or galaxies, there should be a good chance that we could find them in the cooler, widely dispersed gas surrounding galaxies, according to the study. And to trace the

whereabouts of this elusive gas, the researchers employed an equally puzzling cosmic phenomenon: fast radio bursts.

An uncanny pair

First detected in 2007, fast radio bursts are fleeting flashes of radiation that can "outshine an entire galaxy," often with cryptic origins, according to NASA. For the latest study, the team harnessed the extreme energy of fast radio bursts to search for signs of missing ordinary matter. The researchers analyzed thousands of past fast radio burst measurements and paid close attention to how the signal shifted on its way to Earthbound laboratories.

Fast radio bursts "start out as a very quick flash, and as they pass through matter, they smear out in time," Wang explained. "And we can measure that smearing very precisely, which is directly proportional to how much missing matter the FRB passed through."



The spatial distribution of fast radio burst signal across the sky (above), compared against the galaxy distributions (below).

Specifically, the team compared these "smears" to the amount of baryonic matter that the fast radio burst must have traveled through to experience this distortion. Then, the researchers examined the relationship between these measurements and the locations of over 6 million galaxies.

Concealed in the open

According to the analysis, there was indeed a pattern of "missing" baryonic matter widely dispersed across galaxies and galaxy clusters. However, the team was slightly surprised at its sheer range. Overall, this missing matter was scattered like a "diffuse puff" millions of light years away from galaxies.

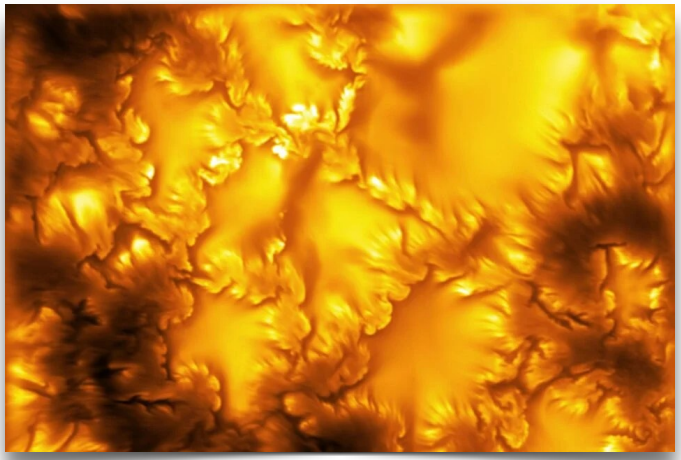
"A galaxy is maybe a few 100,000 light years across, and we found missing matter out to about 4 million light years," Kiyoshi Masui, the study's co-author and a physicist at MIT, told MIT News. "That's further than the simulations predict, by quite a bit."

What this could mean is that highly energetic processes such as black hole jets or exploding stars are flinging baryonic matter far, far across the universe. The energy levels involved in these processes appear to be much stronger and more violent than we thought, Masui added.

That said, there's much we've yet to understand about missing baryonic matter and, in fact, fast radio bursts. While the latest work demonstrates that the latter can give some clues to the former, we'll surely see some more discoveries as we continue to detect more radio bursts, the team concluded in the paper.

"We got it to work for the first time and will get it to work even more precisely as data gets better," Masui said. ☀

These Are the Sharpest Images Ever Taken of the Sun, and They Might Solve a Decades-Old Mystery



The highest-resolution image of the Sun's surface (photosphere) ever captured, taken at 416 nm by the Inouye Solar Telescope. It reveals deformed boundaries of magnetic elements and ultra-fine scale stripes, both associated with Kelvin-Helmholtz instability.

By Ellyn Lapointe
GIZMODO, AUGUST 5, 2026

You've never seen the Sun like this before.

In a study published today in the journal Nature, researchers present the highest-resolution images of the Sun's visible surface, or photosphere, ever obtained. The images are more than beautiful—they're packed with critical information about the fundamental physics of our home star, including the first experimental confirmation of a long-theorized phenomenon that only the high spatial resolution of the Inouye Solar Telescope could reveal.

"It is very important to understand what is going on at the Sun at the microscopic level," first author David Kuridze, an astronomer at the National Solar Observatory, told Gizmodo. "This is very important if we want to understand the Sun, its magnetism, its global dynamics. We need to understand those small-scale microscopic fields."

Zooming in on the Sun

The National Science Foundation Daniel K. Inouye Solar Telescope, seated near the summit of the Haleakalā shield volcano in Maui, is the world's most powerful solar telescope. With an unmatched mirror size of 13 feet (4 meters) across, it collects seven times more sunlight than any other, allowing it to produce exceptionally clear, detailed images of the photosphere.

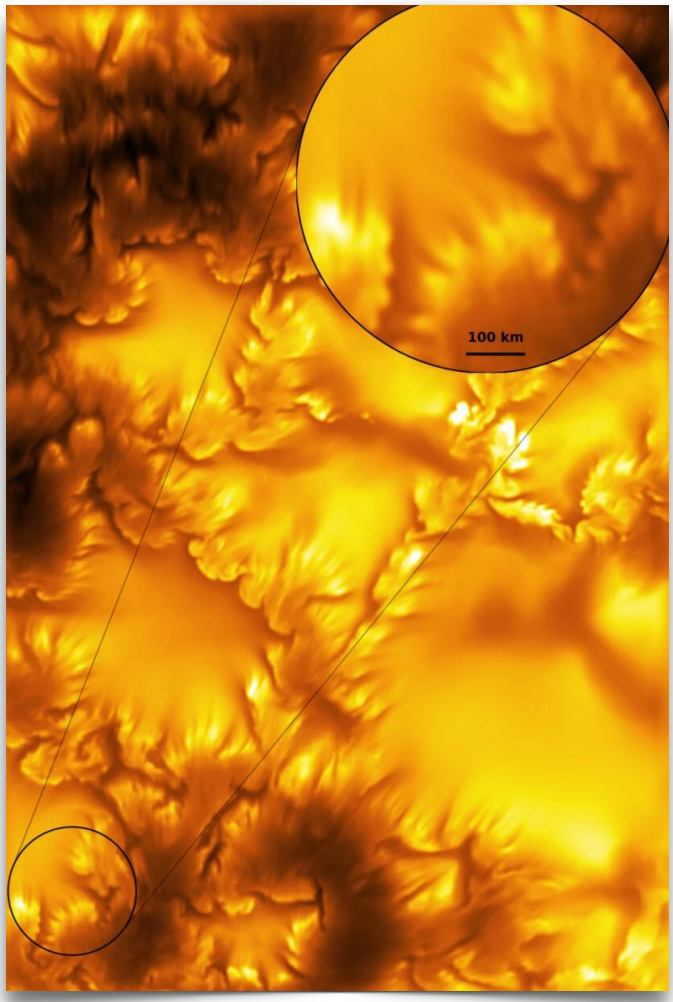
Kuridze was part of an international team of scientists who originally set out to find the best way to fully realize the Inouye Solar Telescope's capabilities. Developing and testing different techniques to improve image quality ultimately led to the striking solar close-ups unveiled today.

"When I was sitting there with my colleagues and we looked at these images for the first time, we immediately recognized these Kelvin-Helmholtz patterns, and we were super excited right away," co-author Friedrich Wöger, a senior scientist at the National Solar Observatory acting as the Inouye Solar Telescope's instrument program scientist, told Gizmodo.

Kelvin-Helmholtz instability (KHI) occurs when two fluids slide past each other at different speeds, creating a "shear" at the interface that causes small disturbances to grow into wave-like or spiraling vortices. KHI on the Sun's photosphere has long been predicted by theory, but until now, researchers had never directly observed the signatures of this phenomenon.

Answering big questions in solar physics

This discovery could help solve some scientific mysteries, such as the coronal-heating problem, according to the researchers. While the Sun's surface



A close-up view of a selected region from the Inouye Solar Telescope image reveals the extraordinary spatial resolution of the observations. The inset highlights deformed magnetic boundaries and ultra-fine dark striations (signatures of the Kelvin-Helmholtz instability) at a scale of tens of kilometers.

temperature measures around 10,000 degrees Fahrenheit (5,500 degrees Celsius), its outer atmosphere—the corona—measures closer to 2 million degrees F, according to the Princeton Plasma Physics Laboratory. That's about 200 times hotter.

This is puzzling because the temperature should decrease as distance from the hot surface increases. Researchers have hypothesized that KHI contributes

to coronal heating, and these new, detailed observations could help them investigate this more thoroughly.

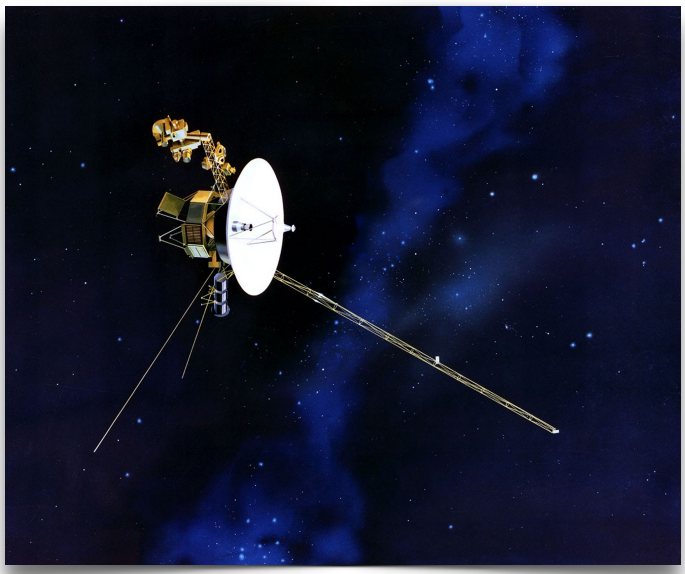
They could also help explain why the solar magnetic cycle is so short. The Sun's magnetic poles flip every 11 years or so, which is very quick compared to cosmic timescales. For this rapid cycle to work, the Sun's magnetic fields must be able to dissipate and reorganize with great efficiency, but current models struggle to explain how that happens. KHI could be a missing piece of the puzzle because it is very effective at dissipating magnetic fields.

Equipped with the high-resolution data from the Inouye Solar Telescope, the researchers now plan to use computer programs to automatically spot and study the swirling signatures of KHI. This will help them determine the prevalence of this phenomenon in the photosphere, how much energy KHIs can carry up into the Sun's corona, and how much they affect they way magnetic fields spread out in the Sun's lower atmosphere.

"This discovery opens up whole new avenues of how to tackle some of the biggest problems and mysteries we have in solar physics at this moment," Kuridze said. ☀

NASA Engineers Help Prolong Voyager 2's Science Mission

NASA, AUGUST 4, 2026



NASA's Voyager 2 spacecraft, depicted in this artist's concept, has enough power to continue operating three science instruments in interstellar space longer than anticipated thanks to some clever engineering by the mission team.

Engineers at NASA's Jet Propulsion Laboratory have successfully freed up power on Voyager 2, extending how long the spacecraft can continue to do science.

Nicknamed the "Big Bang," the effort involved simultaneously turning off certain powered devices and substituting them with lower-power alternatives while ensuring the spacecraft remains warm enough to operate.

The Voyagers get their power from radioisotope thermoelectric generators, devices that convert heat from decaying plutonium into electricity. Due to the plutonium supply continually depleting, both probes lose about 4 watts of power each year. After almost a half-century since launch, the spacecraft power margins have grown razor thin, requiring the team to conserve energy by shutting off non-essential devices and systems.

Since 2024, the dwindling power supply has forced the mission to turn off two science instruments on each of the Voyager spacecraft (each spacecraft has 10 instruments; others had been turned off previously because they were only used for the mission's planetary encounters). Without the Big Bang activity, the mission would have had to turn off another instrument on Voyager 2 before the end of 2026. The savings should provide power to keep its three instruments operating for at least an extra year.

The mission team plans to perform the same swap on Voyager 1, which is farther from Earth than Voyager 2, and to complete the effort in the coming months. ☀

Astronomers discover a new kind of cosmic object – a black hole 'star'

By Ian Sample

THE GUARDIAN, AUGUST 12, 2026

The body is the size of the entire solar system and glows with a brilliant red light billions of light years from Earth

Astronomers claim to have discovered a new kind of cosmic object, a black hole "star", which is the size of the entire solar system and glows with a brilliant red light.

The international team made the breakthrough after focusing their attention on a mysterious red spot in images of the early universe captured by Nasa's James Webb space telescope.

The black hole star, calculated to be more than 100,000 times larger than our sun.

Astronomers claim to have discovered a new kind of cosmic object, a black hole "star", which is the size of the entire solar system and glows with a brilliant red light.

The international team made the breakthrough after focusing their attention on a mysterious red spot in images of the early universe captured by Nasa's James Webb space telescope.

The object was lurking in the constellation of Cetus, the Whale, billions of light years from Earth. It is thought to have formed 660m years after the big bang, astronomers' leading theory as to how the universe began.

Measurements of the exotic body found that while it resembles an immense star, it releases 100bn times more energy than any known star can produce. The energy output is far closer to that observed from black holes than stars.

"We have found a new type of astrophysical object, a black hole star," said Dr Rohan Naidu who performed the work at the Kavli Institute for Astrophysics and Space Research, part of the Massachusetts Institute of Technology. He is now at the University of Hawaii.

It "shines with the energy typically associated with black holes, but at the same time bears signatures classically associated with stars", he added.

The scientists were using the James Webb space telescope to search for the most distant galaxies in the known universe. After succeeding with a galaxy named Mom-z14, which formed a mere 280m years after the big bang, they turned their attention to other cosmic objects.

Writing in Nature, the astronomers describe how they focused on an extremely bright red spot known as MoM-BH*-1, the reddest object in the telescope's image archive.

"The way its light is almost entirely red, and abruptly disappears below a certain wavelength, is so dramatic that there is no comparison among any known class of objects," Naidu said.

Computer simulations showed that rather than being an enormous star powered by nuclear fusion, the object is a black hole so swaddled in shrouds of dense gas that it radiates like a star.

If the astronomers are correct, it suggests that scores of other mysterious Little Red Dots, or LRDs, that appear in nearly every deep space image from the James Webb space telescope are also black hole stars.

Naidu suspects that black hole stars play a major role in the evolution of galaxies. They might be the seeds of present-day supermassive black holes, such as the one at the centre of the Milky Way.

"For decades we have anticipated something spectacular must be afoot in the very early universe. Black hole stars may be the 'something spectacular'. They may be the nascent, swaddled phase that marks the beginning of almost every supermassive black hole's journey," he said.

Supermassive black holes are found at the centres of almost all galaxies such as the Milky Way and are thought to shape the fate of those galaxies.

"They may govern when stars are able to form and when they cease forming, setting the course for everything that follows from star formation: the birth of planets, the rise of life, the emergence of species that may one day piece together this entire history," Naidu said.

The Backyard Observer, September 2026

By Rick Heshmeyer

Triangulum

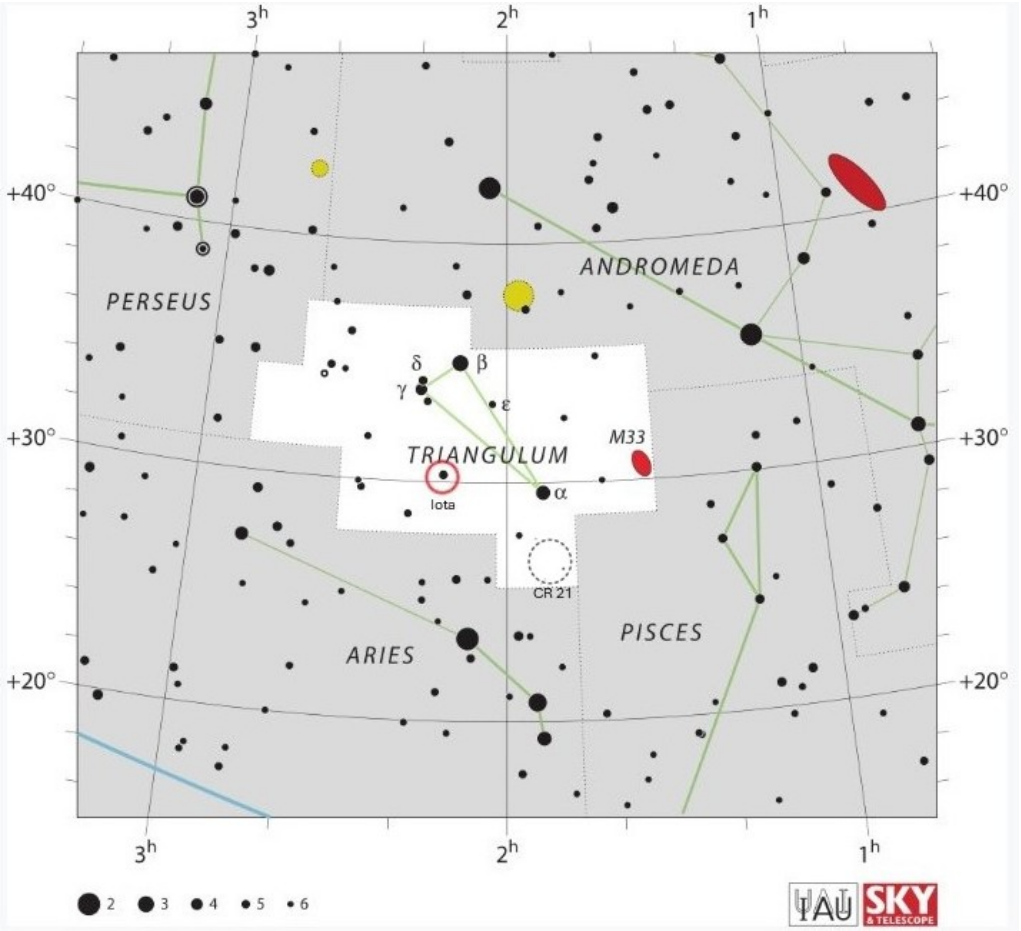
This month's constellation, Triangulum, the Triangle, is one of the smaller constellations, but contains one of the best galaxies in the night sky. Unfortunately, Triangulum is not only small but sparsely populated by objects for the backyard observer. What objects there are we will visit in this month's installment.

The key stars are the three that mark the corners of the triangle. The star Alpha Trianguli shines at magnitude 3.42 and lies 64 light-years from Earth. The Alpha stars are not always the brightest in constellations, and this is true for Triangulum. Alpha is only the second brightest star in this constellation.

The next two stars in the corners of the triangle are close together. Beta and Gamma Trianguli lie two degrees apart. Beta Trianguli, known as Mizan, is the brightest star in Triangulum at magnitude 3.0.

Iota Trianguli is an exquisite double star, showing a beautiful color contrast. The two stars' colors are yellow/gold and blue. Because of this pair's distance, the light we see tonight left Iota Trianguli nearly 300 years ago! Iota can be observed with any telescope over two inches in aperture.

Messier 33 is a wonderful, face-on spiral galaxy is sometimes called the "Pinwheel Galaxy", sometimes the "Triangulum Galaxy". Whatever you want to call it, M33 can be glimpsed without optical aid under perfect sky conditions. It's great size (about the size of a Full Moon) and low surface brightness make binoculars or other instruments with wide fields-of-view the best for observing M33. This galaxy is a member of the "Local Group" of galaxies, of which our Milky Way is also a member. If you thought the light from Iota Trianguli had taken a long time to get here, think again. M33's faint photons have travelled 2.9 million light years to reach your retina!



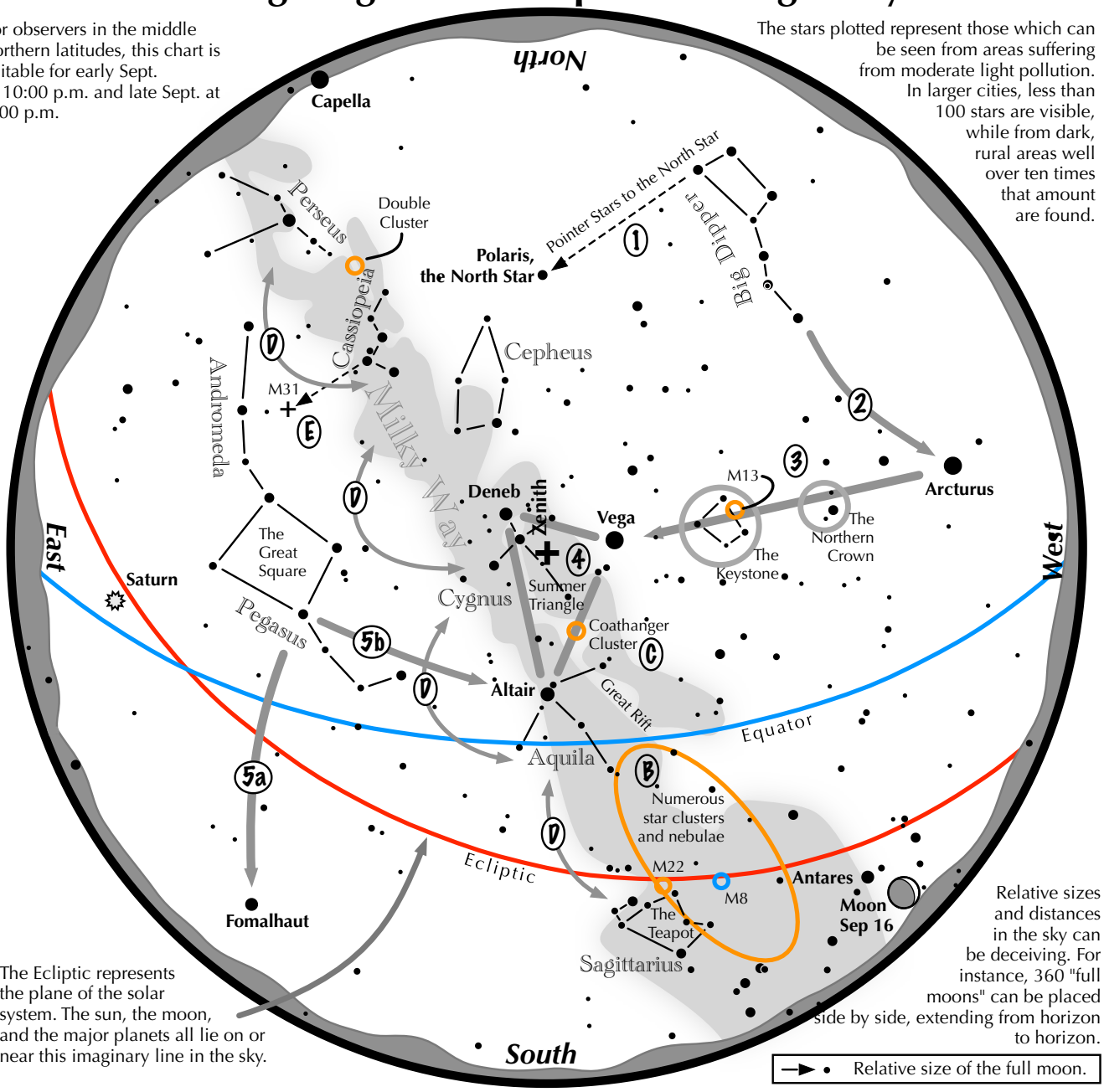
Collinder 21 is an open cluster nicknamed the "Putter Cluster" because of its resemblance to a golf putter. Binoculars or small telescopes will reveal its 20 or so members.

Although few deep sky objects are available in Triangulum, the most important, the galaxy Messier 33 rewards those who stop here, even for a brief time, on their celestial tour of the heavens.

Navigating the mid September Night Sky 2026

For observers in the middle northern latitudes, this chart is suitable for early Sept. at 10:00 p.m. and late Sept. at 9:00 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.

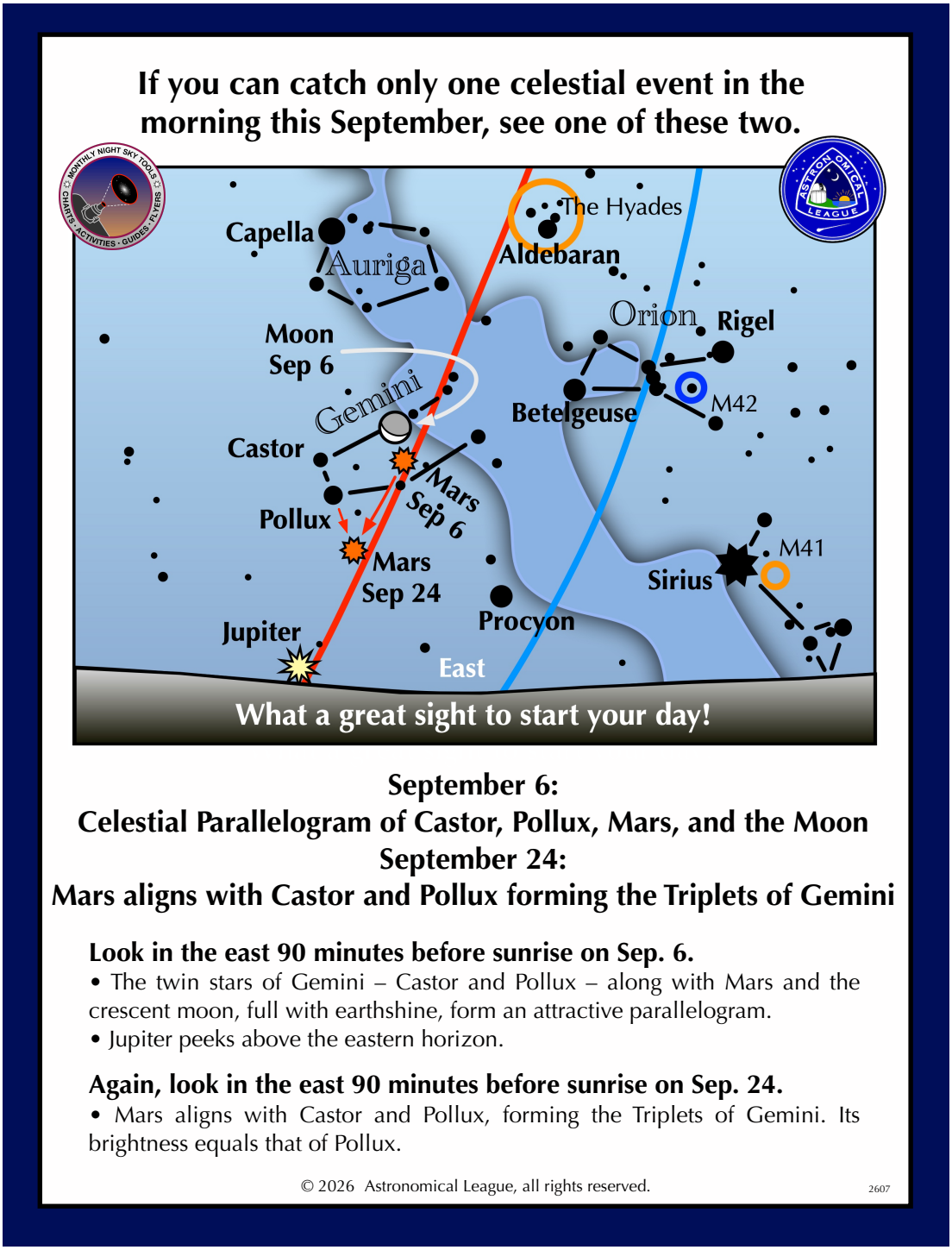
Relative size of the full moon.

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

1. Extend a line north from the two stars at the tip of the Big Dipper's bowl. It passes by Polaris, the North Star.
2. Follow the arc of the Dipper's handle. It intersects Arcturus, the brightest star in the September evening sky.
3. Nearly overhead shines a star of similar brightness as Arcturus, Vega. Draw a line from Arcturus to Vega. It first meets "The Northern Crown," then the "Keystone of Hercules." A dark sky is needed to see these two dim stellar configurations.
4. The stars of the summer triangle, Vega, Altair, and Deneb, shine overhead.
5. The westernmost two stars of the Great Square, which lies high in the east, point south to Fomalhaut. The southernmost two stars point west to Altair.

Binocular Highlights

A: On the western side of the Keystone glows the Great Hercules Cluster.
B: Between the bright stars Antares and Altair, hides an area containing many star clusters and nebulae.
C: 40% of the way between Altair and Vega, twinkles the "Coathanger," a group of stars outlining a coathanger.
D: Sweep along the Milky Way for an astounding number of faint glows and dark bays, including the Great Rift.
E: The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval.



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.