Volume 52 Number 7 July 2026

The Celestial Mechanic

The Official Newsletter of the Astronomy Associates of Lawrence

Coming Events

Monthly Meeting
No Meeting This Month
Baker Wetlands Discovery Center

Public Observing
No Public Observing
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

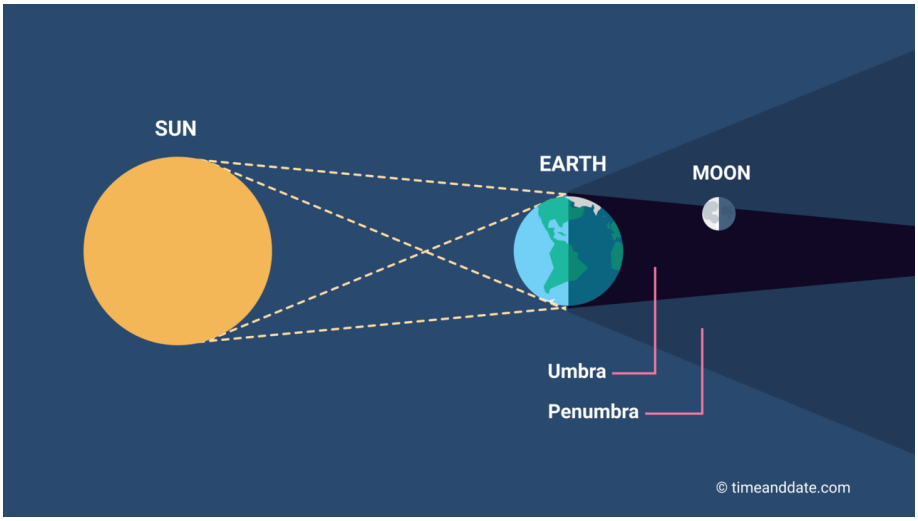
Report From the Officers

By Rick Heschmeyer

On Saturday, June 6, AAL participated in the 2026 How-To Festival at the Lawrence Public Library. Safe solar observation was our theme, but mostly cloudy skies impeded our views of Sol. A few lucky attendees were able to grab quick looks in between clouds, so it was not a complete loss.

We also have two events scheduled at KU Field Station in August.The first is scheduled for Wednesday, August 12 and will coincide with the peak of the Perseid Meteor Shower. The second will take place on Thursday, August 27 for the Partial Lunar Eclipse. Both events are scheduled to start at 9pm. More information will be sent out as we get closer to the dates. As always anyone wishing to help out with either of these events please contact me. Hope to see everyone at these events.

Clear Skies!



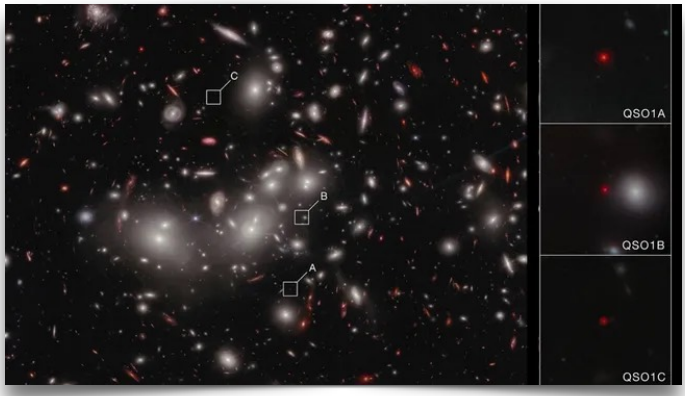
An illustration of a Partial Lunar Eclipse.

James Webb Space Telescope discovers a black hole that formed before its host galaxy. Scientists aren't sure how

"It's a paradigm shift, a total revisiting of the classical scenarios of how black holes form and grow."

By Robert Lea

SPACE.COM, MAY 28, 2026



An image from NIRCam on NASA's James Webb Space Telescope shows Little Red Dot Abell2744-QSO1, magnified and triply imaged by galaxy cluster Abell 2744 (Pandora's Cluster).

Observations of ancient galaxies called "Little Red Dots" by the James Webb Space Telescope (JWST) could finally answer the question: which comes first, the black hole or its galaxy? It turns out that the answer isn't what scientists expected and could thus represent a complete paradigm shift in our understanding of how black holes grow.

Little Red Dots were first spotted in 2022 by the JWST, immediately presenting themselves to astronomers as something completely new, perhaps a type of galaxy never seen before. The mystery of these objects deepened when scientists discovered that they are remarkably common in the infant universe but seem to disappear around 1.5 billion years after the Big Bang. But Little Red Dots are far from the only cosmic mystery that the JWST has dropped into the lap of scientists.

The $10 billion space telescope has also discovered a wealth of supermassive black holes with masses millions to billions of times that of the sun prior to the universe being 1 billion years old. That is problematic because the feeding and merging processes that allow black holes to grow to supermassive status had always been thought to take longer than 1 billion years.

This new study of Little Red Dots by the JWST indicates that maybe supermassive black holes were born directly without needing a massive star to live for millions of years before collapsing to birth a stellar-mass black hole. It also means that these early supermassive black holes would not need to gorge on copious amounts of gas and dust from their host galaxies to grow. That means these black holes could form before the galaxies that will eventually host them come together.

"This is a remarkable finding," team member Roberto Maiolino of the University of Cambridge in the United Kingdom, said in a statement. "It's a paradigm shift, a total revisiting of the classical scenarios of how black holes form and grow." The team's research was published on Wednesday (May 27) in the journals Nature and the Monthly Notices of the Royal Astronomical Society

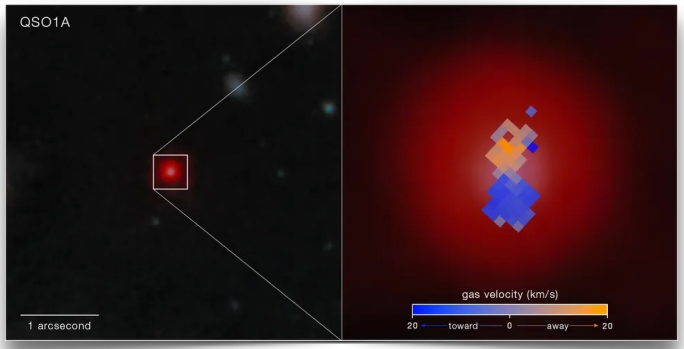
Little Red Dots put black holes on the spot with help from Einstein

To reach their conclusion, scientists focused on the Little Red Dot designated Abell2744-QSO1 (QSO1), which existed 700 million years after the Big Bang. This means that the light from this ancient galaxy, which is just 1,300 light-years wide, has been travelling to Earth for just over 13 billion years.

QSO1 is easier to study than other Little Red Dots because of a phenomenon called gravitational lensing.

First suggested by Einstein in 1915, gravitational lensing occurs when an object of great mass sits between a more distant background object and Earth. As light passes this middle or "lensing" object, its path is curved by the warp in spacetime the lensing body causes; the closer to the object the light passes, the more curved its path is. This means light from the background objects can arrive at our telescopes at different times, thus magnifying the background object.

In the case of QSO1, this Little Red Dot is being gravitationally lensed by the galaxy cluster Abell 2744, also known as Pandora's Cluster.



An image detail from NIRCam on NASA's James Webb Space Telescope shows the Little Red Dot Abell2744-QSO

Researchers had initially thought that QSO1 is actually just a supermassive black hole with a mass 40 million times greater than the sun, surrounded by a cloud of hydrogen and helium gas. However, scientists couldn't be entirely sure about the mass of this black hole.

"Before now, all of the mass measurements of black holes in the early universe have been indirect, based on assumptions from what we know about them in the local universe," team member Francesco D'Eugenio, also of the University of Cambridge, said. "We didn't know if those assumptions really apply to the distant universe."

This team reasoned that if the black hole heart of QSO1 is as massive as initially thought, then its mass should be observable in the motion of the gas swirling around it. They therefore used the JWST's NIRSpec (Near Infrared Spectrograph) instrument to map the motion of this gas, finding it orbits a central point similar to how the planets of the solar system orbit the sun, a phenomenon called Keplerian motion.

"This is important because it tells us that most of the mass of QSO1 is concentrated in the black hole at the center," team co-leader Ignas Juodžbalis of Cambridge University said. "If the mass were more distributed, as it would be if there were a lot of stars, the gas would not have this perfect Keplerian rotation."

This allowed the team to directly measure the mass of QSO1's central black hole for the first time.

"This is a phenomenal result," Maiolino added. "It is the first direct measurement of a black hole mass within the first billion years after the Big Bang, and it is consistent with the previous measurements."

This revealed that at 50 million solar masses, the supermassive black hole accounts for an incredible 66% of the total mass of this Little Red Dot. That is a ratio that is thousands of times greater than the ratio of supermassive black hole mass to galaxy mass found in the local universe.

An illustration shows a supermassive black hole surrounded by nothing but gas and dust.

That ratio indicates that this black hole can't have been born from a collapsing star and gradual feeding from the surrounding galaxy, indicating it was born "big" and now has what will eventually grow to be a galaxy taking shape around it.

There are still mysteries to solve surrounding the black hole of QSO1, particularly questions of how it formed. The team thinks that the black hole could have grown from a "heavy seed" born from a collapsing cloud of gas and dust. Or alternatively, it could have been birthed directly during the initial moments of the Big Bang through an as-yet unknown process

What the team is relatively sure of is that QSO1 cannot be rare among Little Red Dots in the early universe. They are now assessing other Little Red Dots to determine if these also harbor supermassive black holes with galaxies in the process of forming around them. ☀

Hubble Spies Faint Irregular Galaxy

HUBBLESITE, MAY 27, 2026

This NASA Hubble Space Telescope image captures the faint glow of the dwarf irregular galaxy ESO 490-017.

This NASA Hubble Space Telescope image features the dwarf irregular galaxy ESO 490-017, roughly 12,000 light-years in diameter and some 23 million light-years away in the constellation Canis Major. The galaxy's low surface brightness makes it appear as a faint, starry swarm behind brighter foreground stars that are easily recognized by their diffraction spikes. Numerous red, orange, and beige dots are distant galaxies peppering the black background, many exhibiting distinct spiral structure.

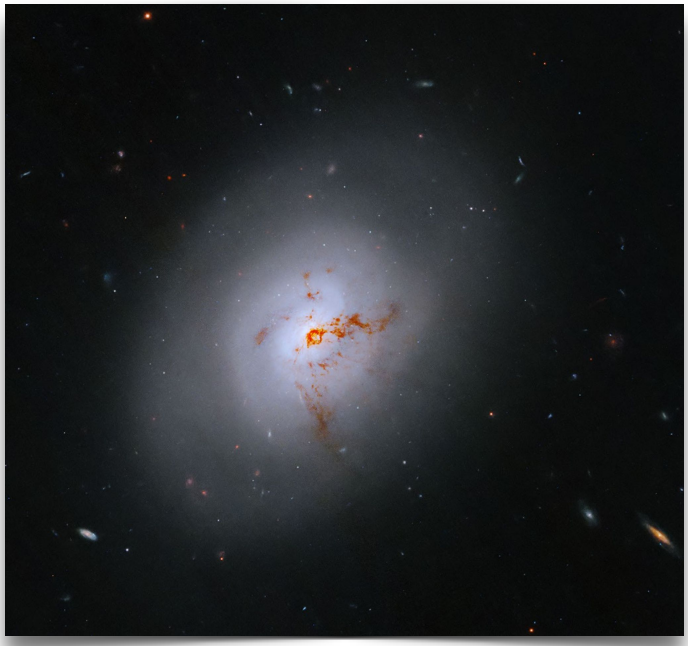
The data in this image of ESO 490-017 was part of a Hubble observing program that looked at the movement of galaxies and galaxy clusters through space. Matter in the universe is distributed unevenly, and the gravitational influence of that matter drives the "cosmic flow" or movement of large-scale structures in the universe.

Hubble is uniquely capable of providing distances to nearby galaxies like ESO 490-017 by measuring the luminosities of low-mass red giant stars as "standard candles". The observing program also provided a legacy archive of the types of stars in local galaxies.
☀

Hubble Sights Galaxy in Transition

HUBBLESITE, MAY 15, 2026

This NASA Hubble Space Telescope image reveals an enigmatic galaxy with a bright center and a face that hints at spiral structure, yet it holds no obvious spiral arms. Reddish-brown clumps and filaments of dust partially obscure the galaxy's full face, while red, blue, and orange light from distant galaxies shines through its diffuse outer regions and dots the inky-black background.



This NASA Hubble Space Telescope images reveals the lenticular galaxy, NGC 1266. This enigmatic post-starburst galaxy has a bright center and a face that hints at spiral structure, yet it holds no discernable spiral arms.

NGC 1266 is a lenticular galaxy located some 100 million light-years away in the constellation Eridanus (the Celestial River). Astronomers classify lenticulars as transitional galaxies that represent an evolutionary bridge between spirals and ellipticals. Lenticulars are "lens-shaped" and have a bright central bulge and flattened disk like spirals, but they have no spiral arms and little to no star formation like ellipticals.

As interesting as this galaxy's structure and lenticular classification are, those traits aren't its most intriguing features. NGC 1266 is a rare post-starburst galaxy that is in transition between a galaxy that experienced

a major burst of star formation and a quieter elliptical galaxy. Post-starburst galaxies have a young population of stars but few star-forming regions. Roughly one percent of the local galaxy population is a post-starburst galaxy.

Astronomers think that NGC 1266 had a minor merger with another galaxy some 500 million years ago. The merger spurred the formation of new stars and increased the mass of the galaxy's central bulge while funneling gas into its supermassive black hole. The additional matter made the black hole much more active, creating an active galactic nucleus or AGN. The black hole's increased activity would have generated powerful winds and jets of gas along its axis of rotation. Over time, the burst of new stars and the black hole's powerful jets would deplete the galaxy's reservoir of star-forming gas, while the turbulence generated in these processes suppressed new stars from forming in the gas that remained.

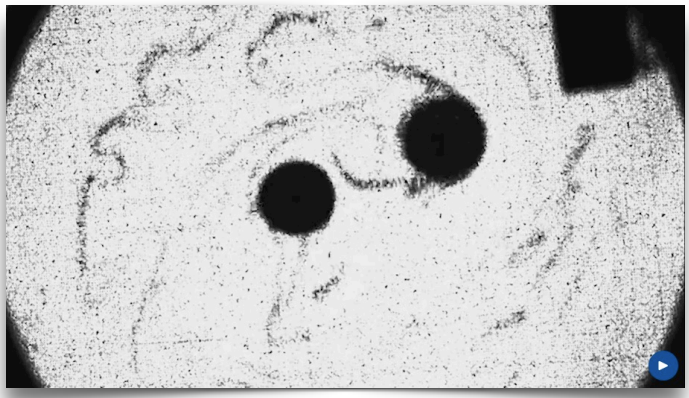
Observations by Hubble and other observatories reveal a strong outflow of gas from the galaxy and that the space between its stars is shocked or highly disturbed. Researchers found that any remaining stellar nurseries are in the core of the galaxy, and that very little to no star formation happens beyond that core. These observations suggest the supermassive black hole in the galaxy's heart may be suppressing star birth by stripping or ejecting star-forming gas from the galaxy. The shockwaves from this process would create turbulence that disturbs the gas and dust between stars enough to stop any remaining matter from gravitationally condensing into infant stars.

Post-starburst galaxies like NGC 1266 are ideal subjects for astronomers to study the complex physical processes that suppress star formation. They help us better understand the evolution of galaxies and how supermassive black holes interact with their hosts. ☀

Water drops on soap bubble films act like merging galaxies

By Emily Conover

Sciencenews, MAY 14, 2026



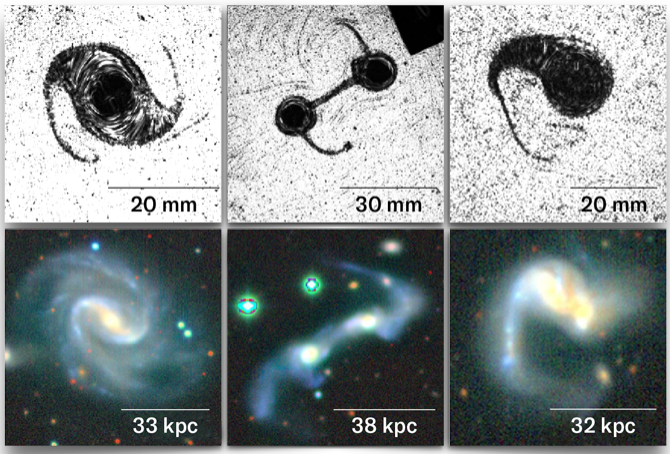
Like colliding galaxies, water droplets (dark circles) on a soap film orbit before coalescing.

The physics of merging galaxies has popped up in an unexpected place: the stuff of soap bubbles.

Water droplets placed on a flat soap film act like galaxies that orbit one another before coalescing. As they merge, the water droplets take on shapes reminiscent of those that appear in astronomical images of colliding galaxies, physicist Jean-Paul Martischang and colleagues report in the April PNAS Nexus. The water droplets might eventually be useful for studying gravitational attraction in a laboratory, to better understand how galaxies collide and coalesce.

When plopped on a horizontal soap film — in the laboratory equivalent of a bubble wand — a water droplet takes on a hammocklike shape, about a centimeter wide. That disrupts the shape of the soap film, pulling it downward. That sagging causes drops to attract one another, orbit and coalesce.

To visualize the translucent water droplets, the researchers took advantage of the fact that each droplet acts like a lens that causes blurring. They placed a randomized pattern of dots below the film. Mapping out where that pattern was blurred revealed the drops' locations and shapes.



Similar structures appear in water droplets coalescing on a soap film (top; dark shapes show where blurring caused by the droplets occurs) and in merging galaxies (bottom). That's despite vast differences in scale: tens of millimeters for the soap bubbles versus tens of kiloparsecs for the galaxies. (A kiloparsec is about 3,260 light-years.)

The unexpected effect appeared while the researchers were studying other features of soap films, says Martischang, who performed the research at the University of Lille in France. "Once we tried putting water on it and we saw those lenses, we just thought 'Let's go with that.'"

Mathematical study of the effect revealed that the attraction of the two orbiting water drops was analogous to the attraction two objects experience due to gravity, but in two dimensions instead of three. The researchers don't yet know if the merging of water droplets also follows gravity's rules, but they did see structures in the merging drops that are commonly seen in colliding galaxies, such as bridges and spiral arms.

Once the math of merging droplets is fully understood, it could allow researchers to study phenomena that take eons in nature, but just moments in the lab. One second for the water droplets is equivalent to 460 million years in the lives of merging galaxies. ☀

Tiny X-ray telescope could unlock the Moon's hidden chemistry

Sciencedaily, June 6, 2026

Researchers at Tokyo Metropolitan University have used simulations to show that a small, newly developed X-ray telescope could help create a chemical map of the entire lunar surface. Such a map would be a major step toward understanding how the Moon formed, changed, and evolved over time.

A new compact X-ray telescope could help scientists produce the first-ever complete map of the Moon's chemical makeup.

Their detailed modeling, which included both the telescope detector and a realistic Moon orbiting satellite mission, suggests that one telescope could map five important elements in about two years. A larger five by five array of detectors could produce sharper maps and complete the work more quickly.

Mapping the Moon's Chemistry

The Moon's geological history is still not fully understood. One major reason is that scientists do not yet have a complete geochemical map of the lunar surface. Because researchers cannot simply collect samples from every part of the Moon, they must rely on remote sensing methods.

One of these methods is X-ray fluorescence imaging. In this approach, detectors are pointed at the Moon to capture X-rays emitted by specific elements after they are struck by solar radiation. Those signals can help reveal which elements are present across different regions of the surface.

Why Complete Lunar Maps Are Difficult

Earlier observations from the Apollo and Chandrayaan missions produced useful partial maps, but a full global map is still missing. Creating one is technically

difficult for several reasons. Missions have limited time to gather enough sunlight driven X-ray signals, and detectors can degrade during long periods in space.

The problem is especially difficult near the Moon's poles. In these regions, solar X-rays are weaker, which makes it harder to collect the signals needed to identify surface elements.

A Compact X-Ray Telescope for Lunar Orbit

To address these obstacles, a team led by Airi Toida and Prof. Yuichiro Ezoe of Tokyo Metropolitan University has proposed using a compact X-ray telescope on a satellite orbiting the Moon. The telescope would allow wide area observations of the lunar surface during strong solar flares, when the Sun provides more intense X-ray illumination.

Traditional X-ray telescopes are often too large and heavy for this type of mission. By contrast, the team's compact telescope was originally designed for studying Earth's magnetosphere and weighs less than ten kilograms. Its small size could make it practical for long term lunar satellite observations.

The detector has also been tested in radiation conditions far harsher than those expected in lunar orbit. That durability could support robust, wide area, high resolution imaging over an extended mission.

Simulations Show a Path to a Full Moon Map

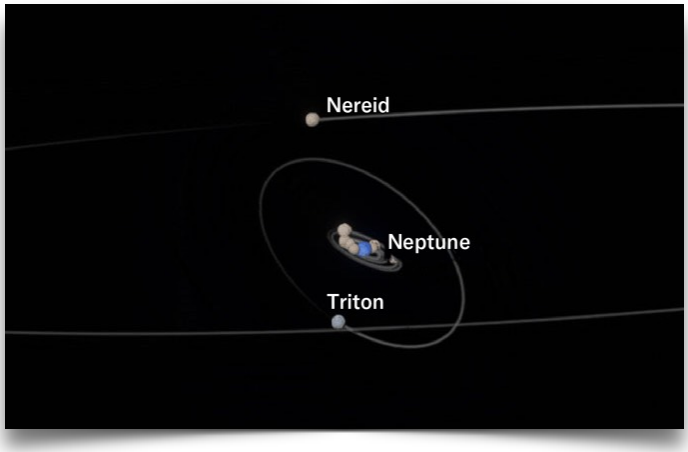
The researchers then added the telescope's specifications into a numerical simulation to test whether a satellite mission could successfully map the Moon. Assuming 300 solar flares per year and a single telescope aboard a Moon orbiting satellite, the simulation showed that the whole lunar surface could be mapped for five elements (oxygen, iron, magnesium, aluminum, silicon) in two years, using a grid size of 70 x 70 kilometers.

Because the telescope is so compact, the team also examined a satellite carrying a five by five array of telescopes. According to the simulations, this 25 telescope system could reduce the mission time to one year. With two years of operation, it could also map sodium, while improving the grid size to 30 x 30 kilometers.

A New Window Into Lunar Geology

If either mission concept becomes reality, it would produce the first complete map of elemental abundance across the entire Moon. That achievement would give scientists a powerful new tool for studying lunar geology and reconstructing the Moon's long and complex history. ☀

An ancient moonpocalypse may explain Neptune's odd moon Nereid



By Lisa Grossman

Sciencenews, MAY 20, 2026

A new study suggests that the strange satellite was born in a steady, circular orbit around Neptune, then tossed into its current elongated orbit during a chaotic encounter with a Pluto-sized body that ejected or pulverized all its sibling moons. This idea counters the assumption that Nereid formed in the Kuiper Belt, the cold reservoir of space rocks in the outer solar system, and was pitched into its present orbit later, researchers argue May 20 in Science Advances.

"Maybe it got perturbed outward, rather than kicked inward," says planetary scientist Matthew Belyakov of Caltech. "Nereid is that last remaining signature of the original satellite system."

Neptune's largest moon, Triton, orbits backward and makes up more than 99 percent of the mass of all the planet's moons combined. Most of Neptune's other moons orbit the planet from a shorter distance and are small and rubbly, suggesting they've been through a lot of collisions. Planetary scientists think Triton came from the Kuiper Belt and wreaked havoc on the rest of the moons when Neptune captured it billions of years ago.

Nereid stands alone. It orbits in a wide ellipse far from Neptune. That puts it in a family of moons from across the solar system called irregular satellites, many of which are also thought to be captured Kuiper Belt objects. But it's brighter, larger, more eccentric and closer to its host planet than other irregular satellites

in the solar system. “Nereid always is an outlier,” Belyakov says. Maybe its origin story was an outlier, too.

Belyakov and colleagues compared James Webb Space Telescope observations of Nereid’s makeup with those of other Kuiper Belt objects. Nereid wasn’t a good match for any of them.

That left the possibility that Nereid formed locally. Belyakov and colleagues ran computer simulations of Triton’s known chaotic arrival at hundreds of different masses and orbits for Neptune’s original moons, including the destroyed ones.

None reproduced Nereid’s exact present-day orbit. And some ended with Triton leaving the system or crashing into Neptune. But about 20 percent produced a moon on a Nereid-like orbit, without destroying Triton. That’s enough to make the story believable, Belyakov says.

Nereid itself is still largely mysterious. The best picture we have of it is about five pixels across, from the Voyager 2 mission in 1989. Belyakov is holding out for a spacecraft flyby someday. “That’s the next frontier, missions to the ice giants,” he says. ☀

The Backyard Observer, July 2026

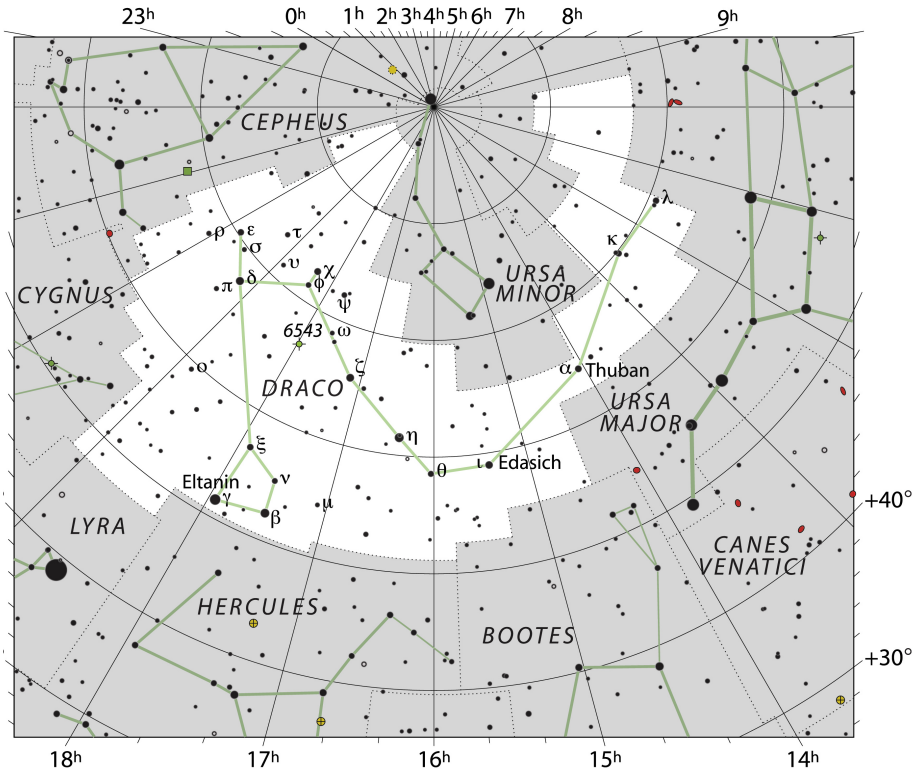
Draco

Draco is a long, winding constellation easily visible to northern hemisphere observers. It's one of those star patterns that actually does look somewhat like its name, tracing out the long body of an exotic dragon across the sky. Locating Draco is pretty easy in clear, dark skies. The best way is to first locate the north star Polaris, then find the Big Dipper and the Little Dipper. The two dippers are on either side of the long body of the celestial dragon. Its head is at one end, near the constellation Hercules and its tail is up near the bowl of the Big Dipper. To observers in mid-northern latitudes Draco is a circumpolar constellation, meaning that its star never set, but circle endlessly around the north celestial pole.

Due to the precession of Earth’s rotational axis, different stars in the northern regions of the night sky take turns as the north star. Polaris currently holds that title but Thuban, or Alpha Draconis, held that position from 4000 BC until 1800 BC, meaning it was the closest star to the north celestial pole for the ancient Egyptians when they were building the pyramids. And there’s evidence that Thuban helped guide the ancient pyramid-builders. Some features inside the pyramids do align with the stars.

The star Beta Draconis, better known as Rastaban, would seem to be the second brightest star in Draco, Bayer on its Bayer designation, but in fact it is the third brightest. Thuban is the second brightest star, and Gamma Draconis, named Eltanin, is actually the brightest star, almost four times the brightness of Thuban.

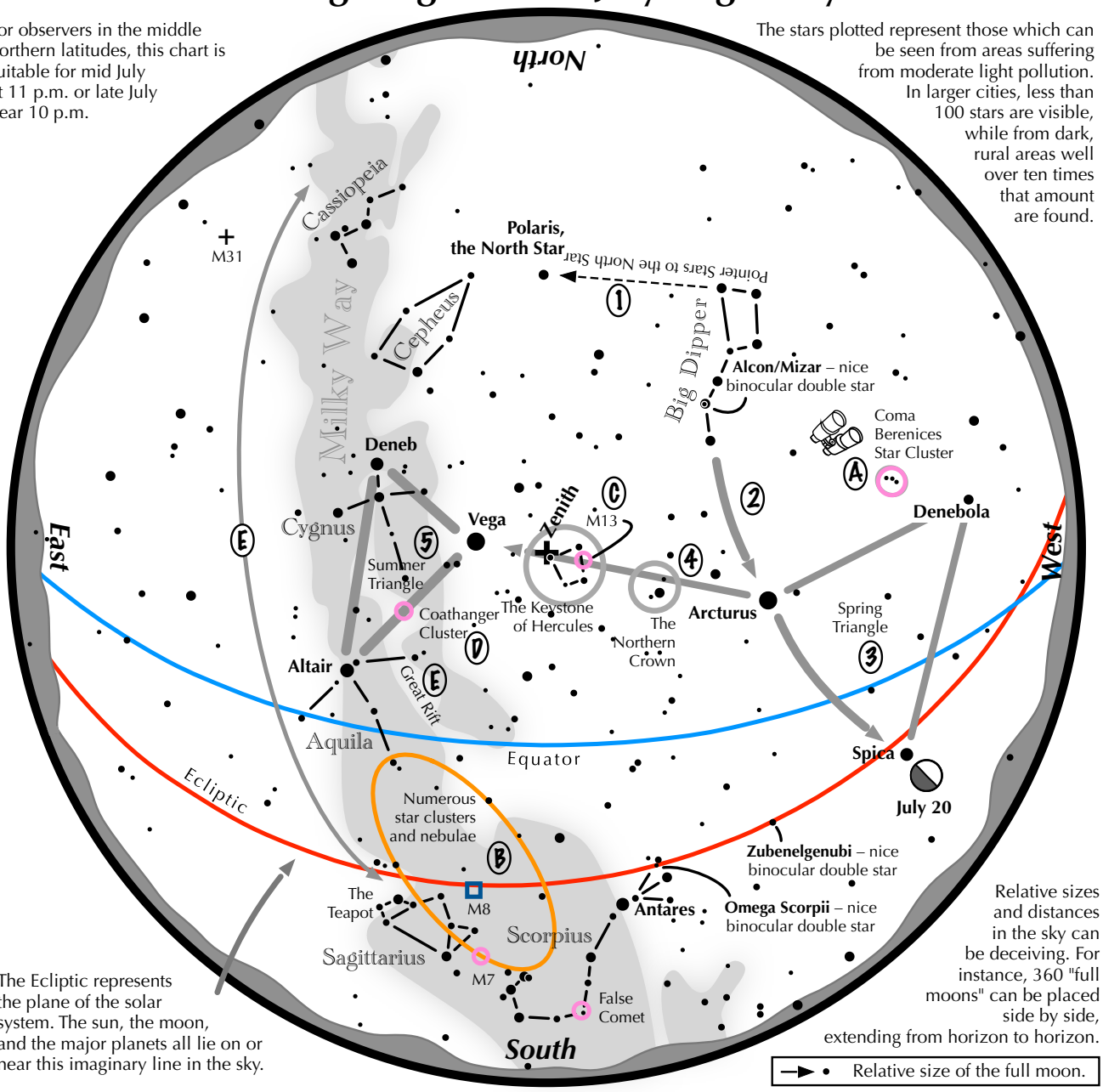
One of the brightest deep-sky objects in Draco is the planetary nebula NGC 6543, the Cat’s Eye Nebula, created by clouds of expanding gas given off by an aging star during its slow death. It is also listed in Sir Patrick Moore’s Caldwell Catalog as Caldwell 6. Fantastic and complex filaments of gas can been seen in images by the Hubble Space Telescope, but in backyard telescopes, it can be challenging to see. In spite if its relatively high surface brightness, NGC 6543 is small in size. Try averted vision to capture its beauty.



Navigating the mid July Night Sky 2026

For observers in the middle northern latitudes, this chart is suitable for mid July at 11 p.m. or late July near 10 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 July 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 first intersects Arcturus, the brightest star in the July evening sky, then continues to Spica.
3. Arcturus, Spica, and Denebola form the Spring Triangle, a large equilateral triangle.
4. To the northeast of Arcturus shines another star of similar brightness, 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.
5. High in the East lies the Summer Triangle stars of Vega, Altair, and Deneb.

Binocular Highlights

A: Between Denebola and the tip of the Big Dipper's handle, lie the stars of the Coma Berenices Star Cluster.
B: Between the bright stars Antares and Altair, hides an area containing many star clusters and nebulae.
C: On the western side of the Keystone glows the Great Hercules Cluster, containing nearly 1 million stars.
D: 40% of the way between Altair and Vega, twinkles the "Coathanger," a group of stars outlining a coathanger.
E: Sweep along the Milky Way for an astounding number of faint glows and dark bays, including the Great Rift.

The Astronomical League
OC
Open Cluster Program

M6 & M7

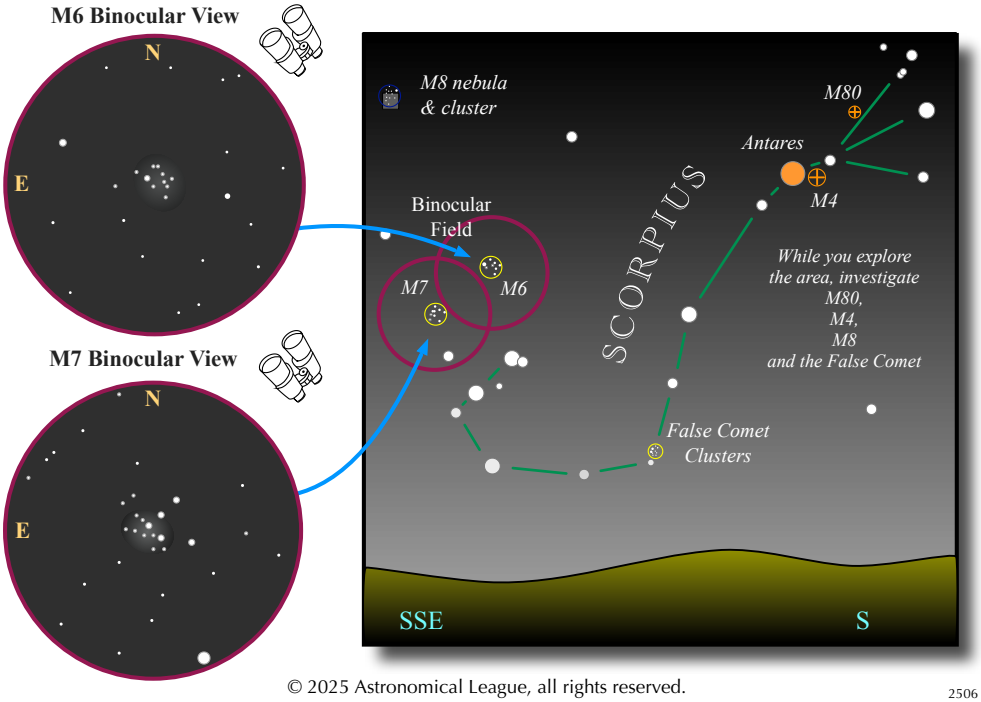
When these two big, bright, and beautiful open star clusters appear in the early evening in early July, summer is upon us.

If you have recently begun your journey under the stars, why not whet your appetite by exploring southeastern Scorpius and its two wonderful open star clusters, M6 & M7. You will return to them year after year!

While they are visible to the unaided eye from a dark location, binoculars help greatly.
1. Identify Scorpius standing low in the south-southeast on an early summer evening. As summer progresses, it is ascends low in the south, then swings low in the southwest in the early fall.
2. From red Antares, direct your gaze southward down the scorpion's back, then turn eastward.
3. When its tail hooks northward, continue the length of that hook.
4. M6 and M7 should be plainly visible in the binocular field.

M6:
A faint hazy glow is seen by the unaided eye from a dark, clear site. Two dozen stellar lights can be discerned with 10x50 binoculars.
• Integrated Magnitude: 4.2
• Size: 33 minutes

M7:
A glittery glow is easily spotted off the scorpion's tail by the unaided eye. Binoculars reveal many faint stars.
• Integrated Magnitude: 3.3
• Size: 80 minutes



2506

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.