



SOCIETY NEWS AND EVENTS

MONTHLY MEETINGS

Board Meeting – December 2 @ 7:00 p.m.

Members Meeting – December 2 @ 8:00 p.m.

Held at Schoonover Observatory

Program

WLIO Chief Meteorologist Adam Musyt will host a program on local weather patterns and the chances of clear skies in our area for the Total Solar Eclipse in April 2024.

ANNOUNCEMENTS & UPDATES



LIMA COMMUNITY
FOUNDATION

The Lima Astronomical Society is now a member of the Lima Community Foundation. The Foundation assists a wide range of organizations and individuals in meeting their charitable and financial goals, and is a trusted name throughout the region. We are proud to be a member of the Foundation.

Nominations for next year's officers will wrap up at the December meeting, and official voting will take place after the program. Several nominations have been made at meetings, and via write in to be presented at the December meeting.

A new operating agreement has been signed by Society officers and City of Lima officials. This new agreement will strengthen the relationship between the city and the club.

The city parks department has installed a new thermostat in the observatory meeting room to replace a non-functioning one. Just in time too, as cold weather is beginning to settle in area.

UNDER THE DOME

There has been no news of what has become of the Celestron C14 and accessories that were stolen from the observatory this summer; however, we do have some good news to announce:

The club has received a brand new set of Explore Scientific eyepieces, courtesy of Dan Higgins of [AstroWorld](#) and [Explore Scientific](#). President Michael Ritchie appeared with Dan and his team during an AstroWorld live broadcast online on November 16 to discuss the club, the burglary at the observatory, and to help raise funds. A big thank you to all those who donated, and the club members who tuned in to lend support.

We are thrilled to announce that the club was approved for grant funds totaling \$15,000 issued by The P&G Fund of the Greater Cincinnati Foundation. The funds have been received by the club, and will be used towards the purchase of a new telescope and equipment.

While there is still much work to do, replacement of the stolen equipment does not seem so far out of reach as it did a couple months ago. Thank you to all of the hard work our President and Lima Astro members have put in to help the club succeed, and thank you to our donors for making the future a bit brighter for Lima Astro and the many community members who visit the club and the observatory each year. The Lima Astronomical Society has been an active club for 70 years. Let's make sure it keeps going for another 70!



LIMA COMMUNITY
FOUNDATION

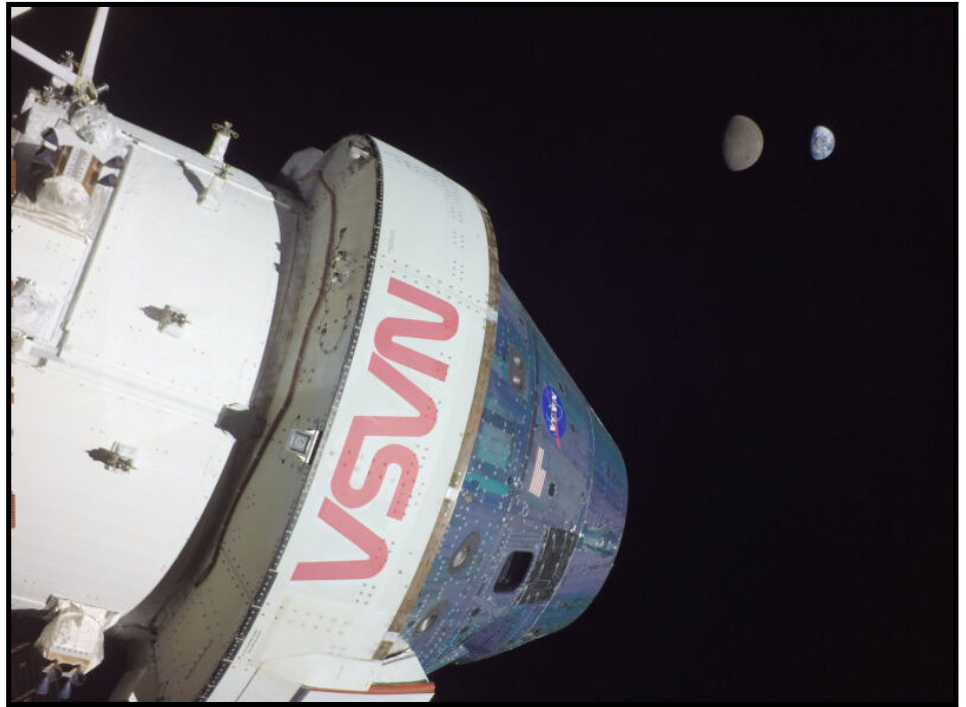
www.limacommunityfoundation.org

ARTEMIS I HAS FINALLY LAUNCHED!

After a long waiting period and a few delays, NASA's Space Launch System (SLS) lifted off early in the morning on November 16 with the Orion spacecraft on the first Artemis mission to the Moon.

As of this writing, Orion is still on its journey back to Earth, and is scheduled to return on December 11, splashing down in the Pacific Ocean near San Diego.

If the Artemis I mission is successful, the Artemis II mission is slated to be a manned mission that will take astronauts on a journey around the Moon and back, preparing the way for Artemis III; in which the first lunar landing in over 50 years is planned.



SNEAK PEEK AT TWO PROMISING COMETS

Two 10th magnitude comets are now visible in the evening sky. Both were discovered by Zwicky Transient Facility (ZTF), a systematic optical survey study of the night sky. The comets bear the names ZTF (C/2000 V2) and ZTF (C/2022 E3). The ZTF survey scans the northern sky every two nights using an extremely wide-field CCD camera connected to the 48-inch Samuel Oschin Telescope at Palomar Observatory.

Comet ZTF (C/2022 V2) heads almost straight north through mid-December, cutting a path between the Little Dipper's Bowl and the bright M81-M82 galaxy pair. While visible as early as nightfall, the later you're out, the higher the comet climbs, reaching peak altitude just before dawn. The comet will venture from Ursa Major to Sculptor between now and October 2023, slowly brightening to a peak magnitude of about 9.0–9.5 in late January and again in late August–early September during its closest approach to Earth on September 17, 2023. Along the way it will pass Polaris 3.7° to its southeast on December 22nd and 0.8° west of M103 in Cassiopeia on January 25th and 26th.



ZTF (C/2022 E3) (*pictured left*) should become an order of magnitude more spectacular than V2. This small, strongly condensed comet glows around magnitude 9.8, and is currently staying put in northern Serpens near the border of Corona Borealis. The comet is currently at magnitude 10, improved from magnitude 13.8 when it was first discovered. The coma has grown to about 1.5', and it appears to have a 3' tail pointing east.

BINOCULARS: A GREAT FIRST TELESCOPE

DAVID PROSPER - NIGHT SKY NETWORK

Do you want to peer deeper into the night sky? Are you feeling the urge to buy a telescope? There are so many options for budding astronomers that choosing one can be overwhelming. A first telescope should be easy to use and provide good quality views while being affordable. As it turns out, those requirements make the first telescope of choice for many stargazers something unexpected: a good pair of binoculars!

Binoculars are an excellent first instrument because they are generally easy to use and more versatile than most telescopes. Binoculars can be used for activities like stargazing and birdwatching, and work great in the field at a star party, along the hiking trail, and anywhere else where you can see the sky. Binoculars also travel well, since they easily fit into carry-on luggage – a difficult feat for most telescopes! A good pair of binoculars, ranging in specifications from 7x35 to 10x50, will give you great views of the Moon, large open star clusters like the Pleiades (M45), and, from dark skies, larger bright galaxies like the Andromeda Galaxy (M31) and large nebulae like the Orion Nebula (M42). While you likely won't be able to see Saturn's rings, as you practice your observing skills you may be able to spot Jupiter's moons, along with some globular clusters and fainter nebulae from dark sites, too.

What do the numbers on those binocular specs actually mean? The first number is the magnification, while the second number is the size in millimeters (mm) of the lenses. So, a 7x35 pair of binoculars means that they will magnify 7 times using lenses 35 mm in diameter. It can

be tempting to get the biggest binoculars you can find, but try not to get anything much more powerful than a 10x50 pair at first. Larger binoculars with more power often have narrower fields of vision and are heavier; while technically more powerful, they are also more difficult to hold steadily in your hands and "jiggle" quite a bit unless you buy much more expensive binoculars with image stabilization, or mount them to a tripod.

Would it surprise you that amazing views of some astronomical objects can be found not just from giant telescopes, but also from seemingly humble binoculars? Binoculars are able to show a much larger field of view of the sky compared to most telescopes. For example, most telescopes are unable to keep the entirety of the Pleiades or Andromeda Galaxy entirely inside the view of most eyepieces. Binoculars are also a great investment for more advanced observing, as later on they are useful for hunting down objects to then observe in more detail with a telescope.

If you are able to do so, real-world advice and experience is still the best for something you will be spending a lot of time with! Going to an in-person star party hosted by a local club is a great way to get familiar with telescopes and binoculars of all kinds – just ask permission before taking a closer look! You can find clubs and star parties near you on the Night Sky Network's Clubs & Events page at bit.ly/nsnclubsandevents, and inspire your binocular stargazing sessions with NASA's latest discoveries at nasa.gov.

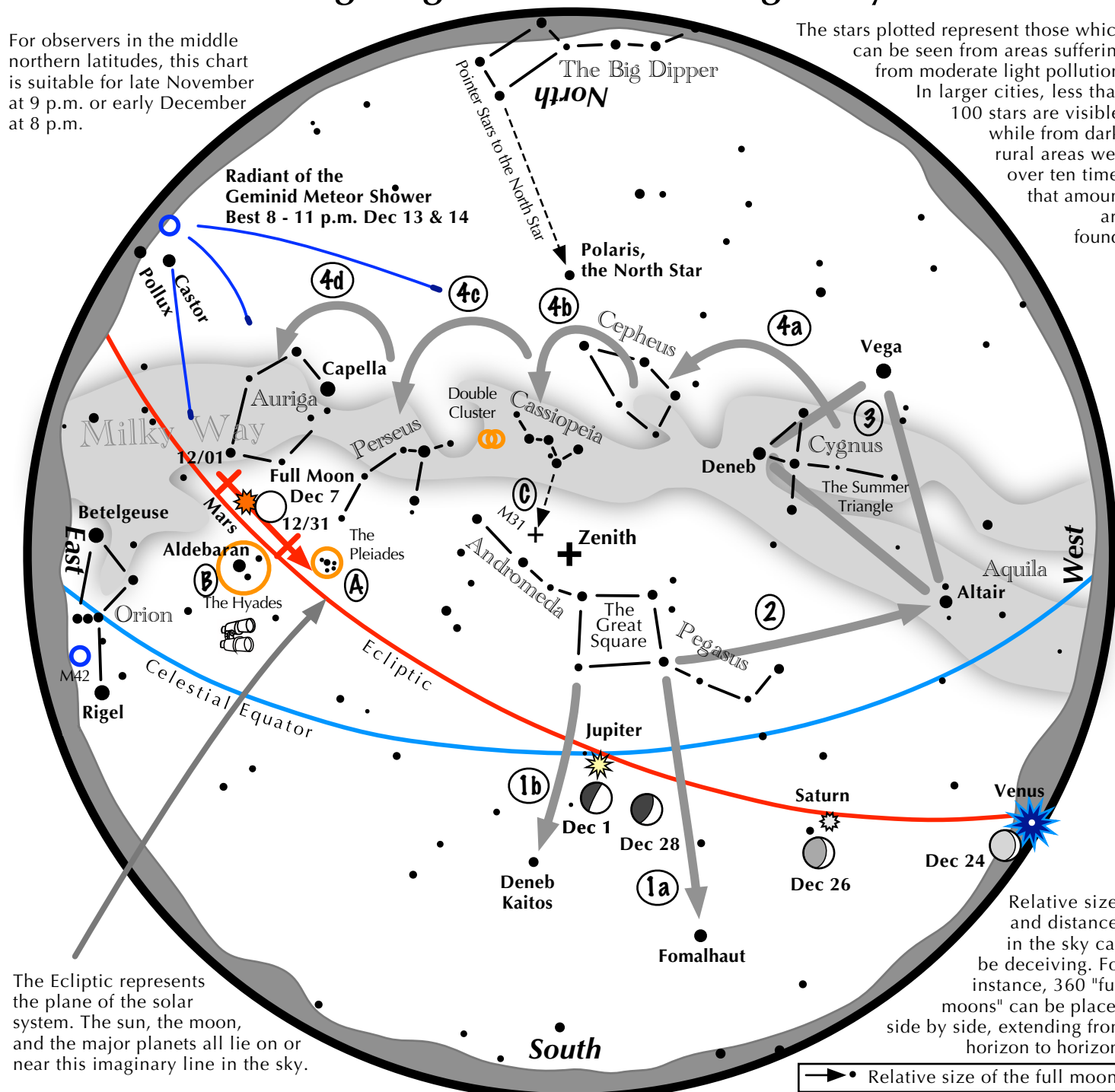


The two most popular types of binocular designs are shown here: roof-prism binoculars (left) and porro-prism binoculars (right). Roof prisms tend to be more compact, lighter, and a bit more portable, while porro-prisms tend to be heavier but often offer wider views and greater magnification. What should you choose? Many birders and frequent fliers often choose roof-prism models for their portability. Many observers who prefer to observe fainter deep-sky objects or who use a tripod with their observing choose larger porro-prism designs. There is no right answer, so if you can, try out both designs and see which works better for you.

Navigating the December Night Sky

For observers in the middle northern latitudes, this chart is suitable for late November at 9 p.m. or early December at 8 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 December night sky: Simply start with what you know or with what you can easily find.

- 1 Face south. Almost overhead is the "Great Square" with four stars about the same brightness as those of the Big Dipper. Extend an imaginary line southward following the Square's two westernmost stars. The line strikes Fomalhaut, the brightest star in the southwest. A line extending southward from the two easternmost stars, passes Deneb Kaitos, the second bright star in the south.
- 2 Draw another line, this time westward following the southern edge of the Square. It strikes Altair, part of the "Summer Triangle."
- 3 Locate Vega and Deneb, the other two stars of the "Summer Triangle." Vega is its brightest member while Deneb sits in the middle of the Milky Way.
- 4 Jump along the Milky Way from Deneb to Cepheus, which resembles the outline of a house. Continue jumping to the "W" of Cassiopeia, to Perseus, and finally to Auriga with its bright star Capella.

Binocular Highlights

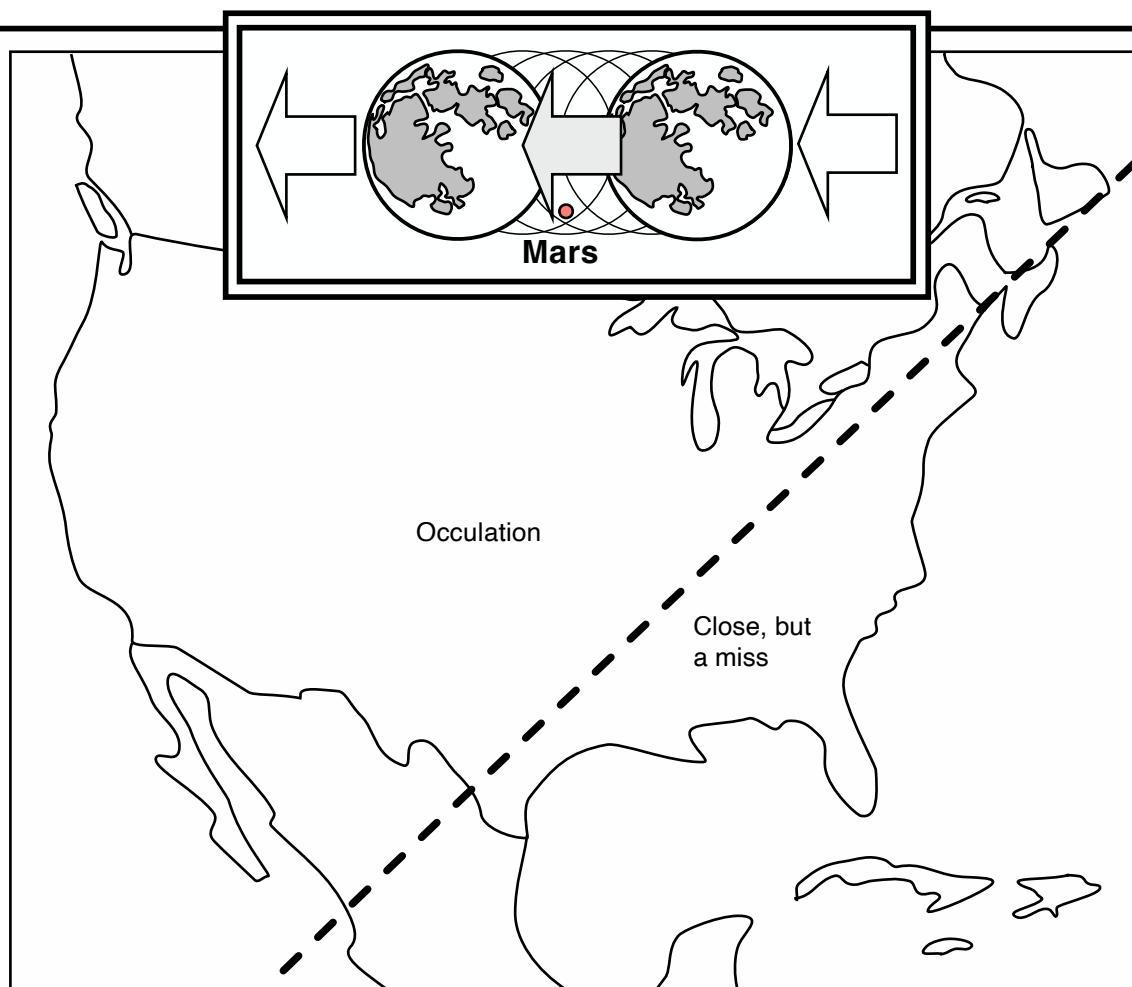
A and B: Examine the stars of the Pleiades and Hyades, two naked eye star clusters.

C: The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval.

D: Sweep along the Milky Way from Altair, past Deneb, through Cepheus, Cassiopeia and Perseus, then to Auriga for many intriguing star clusters and nebulous areas.



If you can see only one celestial event this December, see this one.



Occultation of Mars occurs northwest of a line drawn from August, ME through Columbus, OH through Little Rock, AR, and through San Antonio, TX

Full Moon occults Bright Mars

In the evening hours of **Dec. 7**, the brilliant full moon passes in front of bright Mars, which is at opposition, for viewers west of a line drawn from August, ME through San Antonio, TX. It may not be easy to see because of the moon's bright glare!

Approximate local times of disappearance and reappearance. Begin viewing a few minutes before listed disappearance time. Mars' time and position of reappearance is hard to judge since the planet lies concealed behind the moon beforehand.

City	Disappearance	Reappearance
Augusta	10:57	11:25
Austin	8:58	9:12
Buffalo	10:32	11:13
Chicago	9:10	10:04
Columbus	10:26	10:56
Denver	7:45	8:47
Indianapolis	10:16	10:56
Kansas City	8:57	9:51
Little Rock	9:06	9:32
Los Angeles	6:31	7:30
Phoenix	7:32	8:30
Salt Lake City	7:42	8:45
San Antonio	8:59	9:07
San Francisco	6:36	7:35
Seattle	6:53	7:50



Occultations demonstrate the moon's eastward orbital motion as Earth's rotation causes it to move in a westward arc across the night sky.



Observing Lists

Top ten deep-sky objects for December

M 34	NGC 891
M 45	NGC 1023
M 77	NGC 1232
NGC 869	NGC 1332
NGC 884	NGC 1360

Top ten binocular objects for December

M 34	NGC 884
M 45	NGC 1027
Mel 15	NGC 1232
Mel 20	St 2
NGC 869	St 23

Challenge deep-sky object for December

vdB 14
vdB 14 is a small reflection nebulae illuminated by the blue variable supergiant HD 21291, part of the Cam OB1 group in the constellation Camelopardalis.

The Planets in December

Mercury: Emerges into the evening sky in the second week of the month. Reaches maximum eastern elongation (its fourth of 2022) on the 21st, when it shines at mag. -0.6 some 20° east of the Sun, and some 5° east of brilliant Venus. The two inner planets achieve conjunction 1.4° apart on the 28-29, by which time Mercury will have faded nearly a full magnitude. Binoculars will be a must to enjoy this pairing.

Venus: Slowly emerging into early evening twilight, low in the southwest after sunset. Joins fading Mercury late in the month, with the one-day-old waxing crescent Moon entering the frame on the 24th. The two inner planets achieve conjunction 1.4° apart on the 29th (see above).

Mars: Above the horizon throughout the hours of darkness all month long, its declination of 25° N among the stars of Taurus makes it extremely accessible to Northern Hemisphere observers. Begins December at its closest point to Earth of the current apparition, gleaming at mag. -1.8 with a 17.2" disk, just 4.5 light-minutes (0.544 AU) away. Opposition doesn't occur until a full week later on the 8th, the lag time due to the asymmetric nature of the Red Planet's orbit. Extraordinarily, **Mars is occulted by the full Moon** when both objects are exactly opposite the Sun (although far enough north of the ecliptic that no lunar eclipse occurs) and 100% illuminated. This event favors observers in the Northern Hemisphere including most of North America (evening hours of the 7th for most of the continent). *See previous page for additional details on this event.*

Jupiter: Gradually resuming its prograde motion in southern Pisces, where it is prominent throughout the evening hours. The Moon passes to its south twice in December, in waxing gibbous phase on the 1st and as a thick, waxing crescent on the 29th. By month-end, Jupiter is setting around midnight local standard time.

Saturn: Ends the year some 10° east of where it began, still among the stars of Capricornus. Now exclusively in the evening sky, its viewing window is closing rapidly; the Ringed Planet's elongation from the Sun is reduced from 70° to 42° during December. The waxing crescent Moon passes 4° to the south on the 25-26th.

Uranus: Now well past opposition, Uranus is well placed in the evening sky at the onset of darkness. It will have yet another close encounter with the now-waxing gibbous Moon on the 5th, with an occultation not visible in North America.

Neptune: In the SW evening sky in extreme northeastern Aquarius, setting before midnight local standard time. Reaches its second stationary point on the 4th, and gradually resumes prograde motion thereafter.

Historical Astronomical Events This Month

- Giovanni Cassini discovered the Saturnian satellite Rhea on December 23, 1672.
- Nicolas Louis de Lacaille discovered NGC 2070 (the Tarantula Nebula) on December 5, 1751.
- The bright spiral galaxies M81 and M82 in Ursa Major were discovered by Johann Bode on December 31, 1774.
- William Herschel discovered the galaxy pair NGC 3166 and NGC 3169 in Sextans on December 19, 1783.
- Caroline Herschel discovered Comet 35P/Herschel-Rigoliet on December 21, 1788.
- Caroline Herschel discovered Comet C/1791 X1 (Herschel) on December 15, 1791.
- The Jovian satellite Himalia was discovered by Charles Perrine on December 3, 1905.
- Audouin Dolfus discovered the Saturnian satellite Janus on December 15, 1966.
- The Saturnian satellite Epimetheus was discovered by Richard Walker on December 18, 1966.

December 2022 Astronomy Events Calendar

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
				1 Juno 1.2° S of Moon, occultation Mars at closest approach Neptune 3° N of Moon	2 LAS Meeting @ 8pm Jupiter 3° N of Moon	3
4 Neptune stationary	5 Uranus 0.7° S of Moon, occultation	6	7	8 Full Moon Mars 0.5° S of Moon, occultation Mars at opposition	9	10 Mercury at greatest heliocentric lat. S
11 Pollux 1.8° N of Moon	12 Jupiter at greatest heliocentric lat. S Moon at apogee	13	14 Geminid meteors peak	15	16 Last quarter Moon	17
18	19	20	21 Mercury greatest elongation E (20°) Solstice	22 Ursid meteors peak	23 New Moon	24 Moon at perigee Large tides Venus 3° N of Moon Mercury 4° N of Moon
25	26 Venus at aphelion Saturn 4° N of Moon	27	28 Neptune 3° N of Moon	29 Mercury at ascending node Mercury stationary Mercury 1.4° N of Venus Jupiter 2° N of Moon	30 First quarter Moon Double shadow transit on Jupiter	31

ASTRONOMY CALENDAR TERMINOLOGY

Aphelion – The point in the orbit of a planet, asteroid, or comet at which it is furthest from the Sun.

Apogee – The point in the orbit of the Moon, planet, or satellite at which it is furthest from the Earth.

Ascending Node – The point along a planet's orbit where it crosses the ecliptic (Earth's orbital plane) from S to N.

Conjunction – When the Moon or a planet appears especially close to another planet or bright star.

Descending Node – The point along a planet's orbit where it crosses the ecliptic (Earth's orbital plane) from N to S.

Elongation – The angular distance the Moon or a planet is from the Sun. Mercury and Venus are best seen when at "greatest" elongation, and will appear at their highest position above the horizon before sunrise or sunset.

Heliocentric Latitude – The longitude of a heavenly body, as seen from the Sun's center (the Sun is at the center in the heliocentric model of the solar system). Essentially, if you could stand in the center of the Sun and draw a plane straight out in front of you (this would be 0.0°), heliocentric latitude is the number of degrees above or below that plane where the planet appears.

Inferior Conjunction – When a planet (Mercury or Venus) passes between the Earth and the Sun.

Occultation – When the Moon or a planet passes directly in front of a more distant planet or star. (*Occult, as a verb, means to obscure the view of an object*).

Opposition – When a planet or asteroid is directly *opposite* the Sun in the sky. Just like the Full Moon, a planet will appear brighter and fully lit during this time.

Perigee – the point in the orbit of the Moon, planet, or satellite at which it is nearest to the Earth.

Perihelion – the point in the orbit of a planet, asteroid, or comet at which it is closest to the Sun.

Superior Conjunction – When a planet (Mercury or Venus) passes behind the Sun, out of our view.

Transit – When a smaller object passes in front of a larger object. Such as when Mercury or Venus pass in front of the Sun, silhouetting them against the disc; or when one of Jupiter's Galilean moons pass in front of the planet.

Zodiacal Light – Sunlight that is reflected off celestial dust that is concentrated in the plane of the Solar System. It appears as a faint glow in the sky extending from the horizon in late winter/early spring, and requires the darkest skies to be observed. In the darkest sky conditions, zodiacal light can cast very faint shadows.

Examples

Mars 1.1° S of Moon, occultation

On this night, Mars would appear in the sky very close to the Moon - only 1.1 degrees away from it. At a point during this night the Moon would pass in front of Mars, hiding it from view.

Double shadow transit on Jupiter

On this night, two of Jupiter's Galilean moons will cast shadows on the surface of Jupiter simultaneously, appearing as two dark discs moving across the face of the planet. If you were standing on the surface of Jupiter as one of these shadows passed over, you would witness a solar eclipse.

Mercury greatest elongation E

On this night, Mercury will be at a point in its orbit where it appears highest in the sky. From our point of view, this is the furthest apart Mercury and the Sun will appear from each other. E or W indicate which side of the Sun the planet appears on in its orbital cycle, and can also tell you when to look for Mercury. The planet can be found in the evening sky during the greatest elongation E, and in the morning sky in the greatest elongation W.