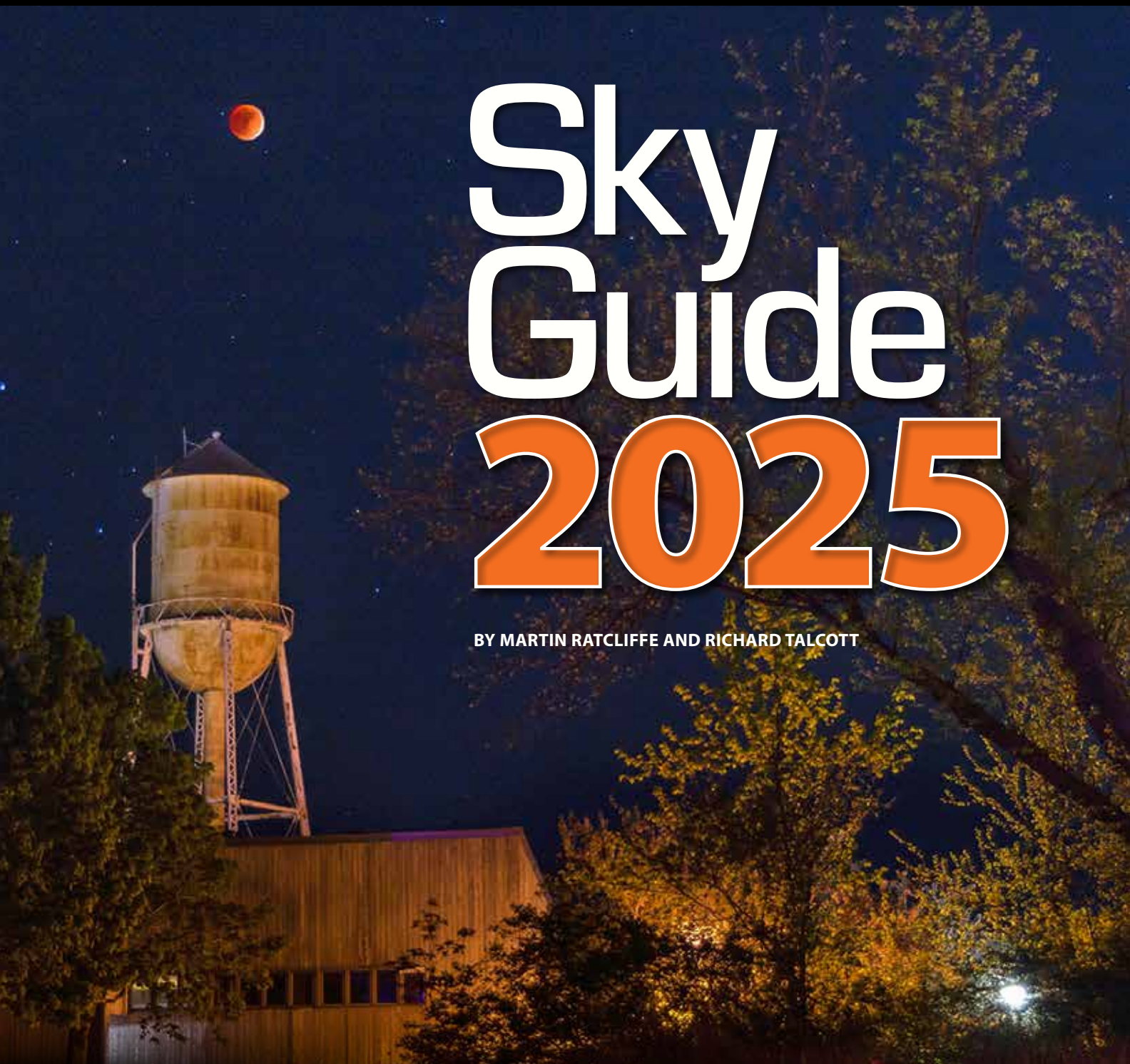
Astronomy magazine

Sky Guide 2025

BY MARTIN RATCLIFFE AND RICHARD TALCOTT



Viewers across the Americas witness a dramatic total lunar eclipse the night of March 13/14. GREGG ALLISS

Martin Ratcliffe *is a planetarium professional with Evans & Sutherland and enjoys observing from Salt Lake City.* **Richard Talcott** *is a contributing editor of* **Astronomy.**

A supplement to *Astronomy* magazine

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JANUARY 2025

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- **3** Asteroid Pallas is in conjunction with the Sun, 3 A.M. EST
- Quadrantid meteor shower peaks
- The Moon passes 1.4° south of Venus, 10 A.M. EST
- **4** The Moon passes 0.7° north of Saturn, noon EST
- **5** The Moon passes 1.1° north of Neptune, 10 A.M. EST
- **9** The Moon passes 4° north of Uranus, 11 A.M. EST
- Venus is at greatest eastern elongation (47°), midnight EST
- **10** The Moon passes 5° north of Jupiter, 6 P.M. EST
- **13** The Moon passes 0.2° north of Mars, 11 P.M. EST
- **15** Mars is at opposition, 10 P.M. EST
- **19** Venus passes 3° north of Saturn, midnight EST
- **21** Pluto is in conjunction with the Sun, 7 A.M. EST
- Mars passes 2° south of Pollux, noon EST
- **31** The Moon passes 1.1° north of Saturn, midnight EST

The Red Planet's return to excellence

Mars reaches opposition the night of Jan. 15/16, when it shines brighter and appears larger through a telescope than at any time since December 2022. The Red Planet dazzles at magnitude –1.4, matching the night sky's brightest star, Sirius.

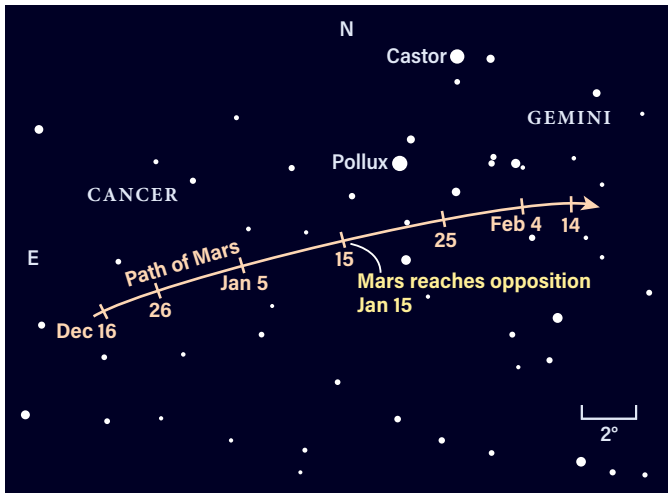
Mars begins the year set among the background stars of Cancer. Its westward motion carries it into Gemini on the 12th and, one night later, it encounters the Full Moon. Observers across North America can watch our satellite pass in front of the planet the evening of the 13th. The occultation starts shortly after 9 P.M. EST in the east and near 6 P.M. PST (during twilight) out west. The planet reappears about an hour later. The exact time and duration depend on your longitude and latitude.

Observers should get excellent views of Mars for several weeks on either side of opposition. With the planet situated well north of the celestial equator, it climbs high in the sky for Northern Hemisphere observers. Even small telescopes should deliver crisp views of the Red Planet because its light travels through less of Earth's atmosphere.

Mars' apparent diameter peaks at 14.6", large enough that the desert world's major surface features should be easy to see. The planet's bright white north polar cap remains on view throughout this period. Mars' darkest feature, the triangular-shaped Syrtis Major, stands out against its bright orange surroundings when it lies near the center of the planet's Earth-facing hemisphere. The best times come on evenings during January's final 10 days. Also look for the bright Hellas Basin that lies directly to its south.

If you observe at the same time every evening, Mars' features appear to move backward thanks to the planet's 24.6-hour rotation period. And as any given evening progresses, surface markings rotate toward the sunset limb.

After opposition, Mars continues to slide westward. It passes 2° south of Pollux, Gemini's brightest star, on the 21st. It manages to reach central Gemini during the second half of February before reversing course and heading back east. It passes Pollux once again April 2, this time 4° to the star's south. It returns to Cancer in mid-April and makes a beeline toward the Beehive star cluster (M44). Mars, now a ruddy 1st-magnitude gem, passes less than 1° north of the cluster from May 3–5. A First Quarter Moon appears 2° from the pair on the 3rd.



ABOVE: The Red Planet shines brightly and climbs high in the sky against the background stars of Gemini the Twins at its January peak. ALL ILLUSTRATIONS: *ASTRONOMY*: ROEN KELLY

BELOW: Hubble captured Mars on Oct. 28, 2005, revealing clouds, dark surface markings, and a regional dust storm. NASA/ESA/THE HUBBLE HERITAGE TEAM (STSCI/AURA)

The Seven Sisters' disappearing act

Night owls are in for a treat the evening of Feb. 5 into the wee hours of the 6th. The Moon, just one day past its First Quarter phase, passes in front of the glittering stars of the Pleiades Cluster (M45). Luna occults each of the Seven Sisters' stars in turn over a period of two hours or so. Observers across the western third of North America can witness the entire event, while those farther east will see the Moon poised in front of the cluster as the pair sets.

In addition to the Pleiades, the Moon can occult four 1st-magnitude stars: Aldebaran, Antares, Regulus, and Spica. Such events don't occur every month or every year because the Moon's orbit tilts with respect to the ecliptic — the Sun's apparent path across our sky — causing it to wander from 5° north of the ecliptic to 5° south during a cycle that lasts 18.6 years.

The Pleiades stands 4° north of the ecliptic. The Moon occults these stars each month in a series that began in September 2023 and will continue until July 2029. However, many of these events occur in daylight or when the Moon is blazingly bright. The good ones, like that on Feb. 5/6, are rare.

After sunset on the 5th, you'll find the Moon a few degrees west of M45. It takes a couple of hours to creep up to the Pleiades. Luna occults the cluster's first bright star, magnitude 3.7 Electra, soon after 2 A.M. EST and right around 11 P.M. PST. While the view with naked eyes is impressive, binoculars deliver a more satisfying spectacle.

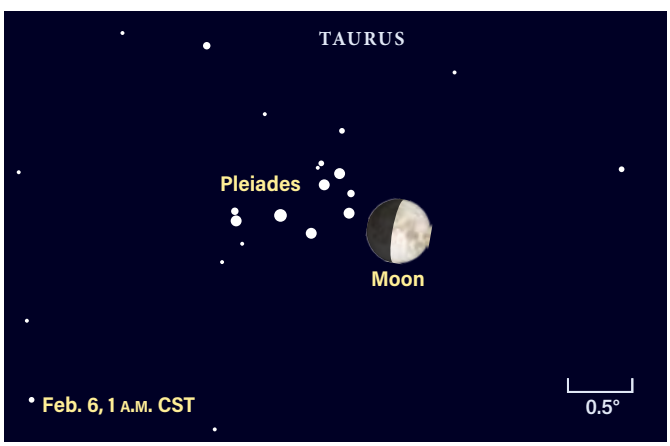
A telescope provides a more detailed view, of course. You can watch a dozen or more individual occultations and, using high magnification, you can see Luna's faint dark edge approaching each star and also move much of the Moon's lit part out of the field.

The cluster spans 58' from east to west and the Moon measures 32' across this night. Because our satellite moves its own width every hour, all of M45's stars get occulted within a two-hour time period.

After Electra disappears, the next bright star to go is magnitude 3.9 Maia. The Moon occults the cluster's brightest star, magnitude 2.9 Alcyone, around 12:15 A.M. PST. Last but not least, magnitude 3.6 Atlas vanishes near 12:50 A.M. PST. Remember that these times vary depending on longitude and latitude, as they always do with occultations.

Each occulted star reappears from behind the Moon's bright limb up to an hour or so after it disappears. Keep in mind that it's much harder to see a star re-emerge at the sunlit limb.

A slender crescent Moon crossed the southern half of the Pleiades star cluster April 11, 2024, as seen from Gandhinagar, India. PRUTHU VANARAT



The night of Feb. 5/6 finds a slightly gibbous Moon passing in front of the Pleiades (M45). This view shows the pair just before the event starts.

FEBRUARY 2025

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16	17	18	19	◑	21	22
23	24	25	26	○	28	

1 The Moon passes 2° south of Venus, 3 P.M. EST

3 Venus passes 4° north of Neptune, 3 P.M. EST

5 The Moon passes 5° north of Uranus, 4 P.M. EST

6 The Moon passes 5° north of Jupiter, 11 P.M. EST

9 Mercury is in superior conjunction, 7 A.M. EST

The Moon passes 0.8° north of Mars, 3 P.M. EST

14 Dwarf planet Ceres is in conjunction with the Sun, 5 P.M. EST

Venus is at greatest brilliancy, 6 P.M. EST

28 The Moon passes 0.4° south of Mercury, 11 P.M. EST

Moon Phases

- ◑ **First Quarter**
- ● **Full Moon**
- ◐ **Last Quarter**
- ○ **New Moon**

Events that can be viewed with **the naked eye**

Events that can be viewed with **binoculars**

Events that can be viewed with a **telescope**

MARCH 2025

S	M	T	W	T	F	S
						1
2	3	4	5	◑	7	8
9	10	11	12	13	●	15
16	17	18	19	20	21	◐
23	24	25	26	27	28	○
30	31					

1 The Moon passes 1.6° north of Neptune, 4 A.M. EST

The Moon passes 6° south of Venus, 6 P.M. EST

4 The Moon passes 5° north of Uranus, 11 P.M. EST

6 The Moon passes 6° north of Jupiter, 7 A.M. EST

8 Mercury is at greatest eastern elongation (18°), 1 A.M. EST

The Moon passes 1.7° north of Mars, 7 P.M. EST

9 Mercury passes 6° south of Venus, 7 A.M. EDT

12 Saturn is in conjunction with the Sun, 6 A.M. EDT

14 Total lunar eclipse, 3 A.M. EDT

19 Neptune is in conjunction with the Sun, 7 P.M. EDT

20 Equinox (northern spring/southern autumn begins), 5 A.M. EDT

22 Venus is in inferior conjunction, 9 P.M. EDT

24 Mercury is in inferior conjunction, 4 P.M. EDT

28 The Moon passes 9° south of Venus, 10 A.M. EDT

29 Partial solar eclipse, 7 A.M. EDT

30 Venus passes 10° north of Saturn, 2 A.M. EDT

Earth shadows the Moon

The Full Moon appears almost totally immersed in Earth's umbral shadow in this scene from the partial eclipse of Nov. 19, 2021. GEORGE KONKOV

Skywatchers across North and South America can see the first total lunar eclipse since November 2022 the night of March 13/14. Meanwhile, people living in Western Europe can view the eclipse's early stages before dawn and those in New Zealand and eastern Australia can watch the end at dusk.

Lunar eclipses occur when a Full Moon passes through Earth's shadow. Eclipses don't happen every month because the Moon's orbit tilts 5° with respect to Earth's orbit around the Sun (the ecliptic). We get a lunar eclipse whenever a Full Moon occurs near the point where the two orbits intersect.

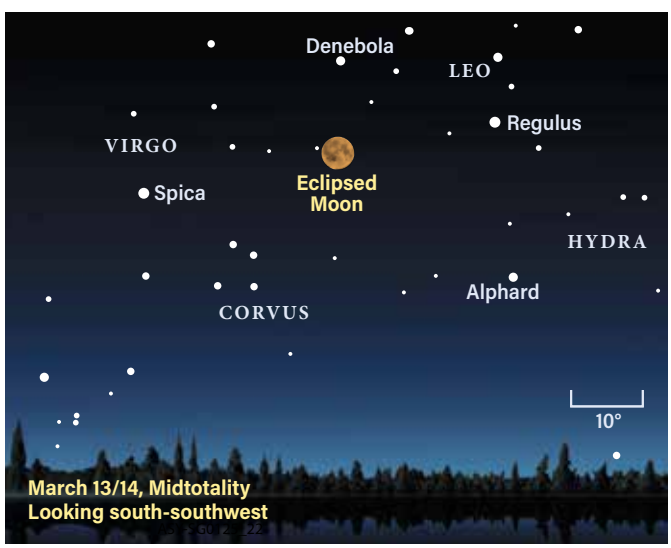
The initial penumbral phase begins at 11:56 P.M. EDT. This part of our planet's shadow is quite light, so the penumbral stage isn't conspicuous. The Moon's southwestern limb gradually becomes dusky until Luna enters the dark umbral shadow at 1:09 A.M. EDT. Watch Luna's character change as the shadow creeps across its surface. Once the umbra covers more than half the Moon, you may start to notice a colorful shift. Sunlight streaming through Earth's atmosphere gets refracted into the shadow, turning it an orange-red color. This distinctive shade, which varies from eclipse to eclipse, shows up best through a telescope.

Totality commences at 2:26 A.M. EDT and runs until 3:32 A.M. EDT. Spend time during the 66 minutes of totality checking out the rest of the sky. The Moon straddles the border between Leo the Lion and Virgo the Maiden at mid-eclipse. You'll find Mars glowing at magnitude 0.1 in the western sky with the stars of Gemini and Jupiter blazing at magnitude –2.2 nearer the horizon in central Taurus.

After totality ends, the concluding partial phases progress until 4:48 A.M. EDT. The final trace of the penumbral shadow leaves the Moon's disk unnoticed at 6:02 A.M. EDT.

Few people can resist the urge to photograph a lunar eclipse. Choose a wide-angle lens, place your camera on a tripod, and set it to manual mode. Use digital zoom to accurately focus on the stars. Then take a range of exposures to capture the Moon and star field. Most importantly, find a location with some interesting foreground objects, such as trees or a dramatic landscape, to serve as a silhouette.

Two weeks after the lunar eclipse, on March 29, observers in northeastern North America, Western Europe, and northwestern Africa experience a partial solar eclipse.



The night of March 13/14 brings the first total lunar eclipse since November 2022. Luna then lies near the border between Leo and Virgo.

Venus blazes in the morning sky

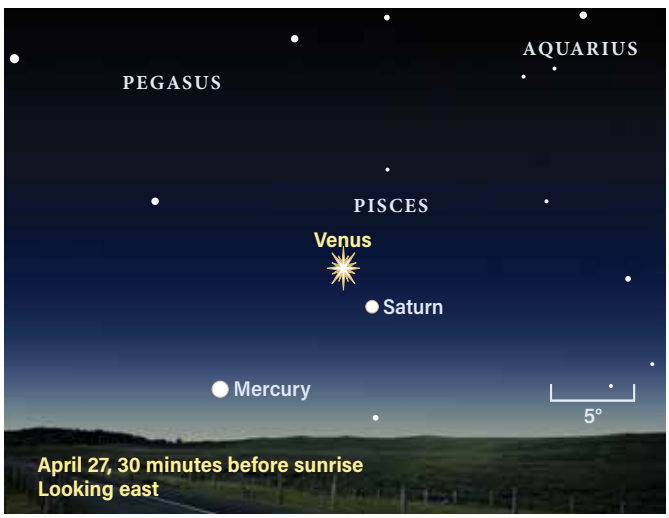
Venus rules evenings in early 2025 before shifting into the morning sky in April. It brightens throughout this month until achieving greatest brilliancy on the 27th, when it dazzles at magnitude –4.8. The inner planet's brilliance arises from a combination of its proximity to Earth, a highly reflective cloud cover, and its changing phase.

As April opens, look for Venus low in the east before sunrise. It appears 7° high a half-hour before sunrise, shining at magnitude –4.3 and piercing the bright twilight like a plane's landing light. A telescope or steadily held binoculars reveals the planet's disk, which spans 57" and appears just 4 percent lit.

Venus' angular distance from the Sun steadily increases during April, so it rises earlier and climbs higher with each passing day. At greatest brilliancy on the 27th, the inner world lies 39° west of the Sun and rises 100 minutes before our star. You can find it 13° above the eastern horizon 30 minutes before sunup. A telescope shows the planet's 39"-diameter disk and one-quarter-lit phase.

Venus resides among the background stars of Pisces the Fish, a collection of dim stars that won't show up in twilight. Still, the world is not alone during April's last week. On the morning of the 25th, a slender crescent Moon appears 5° to the planet's lower left and Mercury an equal distance to Luna's lower left. Meanwhile, Saturn sits 4° to Venus' lower right. Mercury glows at magnitude 0.2 and Saturn at magnitude 1.2, so you'll need binoculars to spot these planets. A clear sky and an unobstructed horizon are also necessary. Venus stands 4° north of Saturn on the 29th.

Venus' solar elongation continues to increase during May until it reaches greatest elongation the night of May 31/June 1. It then rises two hours before the Sun. It remains a brilliant morning "star" through November.



Venus dazzles in late April when it reaches a peak brightness of magnitude –4.8. The inner world then lies among the dim stars of Pisces the Fish.

Venus stands out to the left of an even brighter Moon as dawn approaches Feb. 27, 2022. The two hug the horizon below the Milky Way in Sagittarius.
MATT DIETERICH

APRIL 2025

S	M	T	W	T	F	S
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6	7	8	9	10	11	●
13	14	15	16	17	18	19
◐	21	22	23	24	25	26
○	28	29	30			

1	The Moon passes 5° north of Uranus, 10 A.M. EDT	🔭
2	The Moon passes 6° north of Jupiter, 8 P.M. EDT	👁 🔭
	Mars passes 4° south of Pollux, 11 P.M. EDT	👁 🔭
5	The Moon passes 2° north of Mars, 3 P.M. EDT	👁 🔭
16	Mercury passes 0.7° south of Neptune, 3 P.M. EDT	🔭
21	Mercury is at greatest western elongation (27°), 3 P.M. EDT	👁 🔭
22	Lyrid meteor shower peaks	👁
24	The Moon passes 2° south of Venus, 9 P.M. EDT	👁 🔭
	The Moon passes 2° north of Saturn, midnight EDT	👁 🔭
25	The Moon passes 1.9° north of Neptune, 6 A.M. EDT	🔭
	The Moon passes 4° north of Mercury, 9 P.M. EDT	👁 🔭
27	Venus is at greatest brilliancy, 6 A.M. EDT	👁 🔭
28	The Moon passes 5° north of Uranus, 10 P.M. EDT	🔭
	Venus passes 4° north of Saturn, 10 P.M. EDT	👁 🔭
30	The Moon passes 5° north of Jupiter, 2 P.M. EDT	👁 🔭

MAY 2025

S	M	T	W	T	F	S
				1	2	3
◑	5	6	7	8	9	10
11	●	13	14	15	16	17
18	19	◐	21	22	23	24
25	○	27	28	29	30	31

- **2** Asteroid Vesta is at opposition, 2 P.M. EDT
- **3** The Moon passes 2° north of Mars, 7 P.M. EDT
- Venus passes 2° north of Neptune, 11 P.M. EDT
- **5** Eta Aquariid meteor shower peaks
- **14** Asteroid Juno is at opposition, 2 P.M. EDT
- **17** Uranus is in conjunction with the Sun, 8 P.M. EDT
- **22** The Moon passes 3° north of Saturn, 2 P.M. EDT
- The Moon passes 2° north of Neptune, 5 P.M. EDT
- **23** The Moon passes 4° north of Venus, 8 P.M. EDT
- **28** The Moon passes 5° north of Jupiter, 9 A.M. EDT
- **29** Mercury is in superior conjunction, midnight EDT
- **31** Venus is at greatest western elongation (46°), midnight EDT

View an asteroid with naked eyes

Imagine setting out to discover new objects in the space between the orbits of Mars and Jupiter — and finding one. Such was Heinrich Olbers' reward March 29, 1807, when he spotted an object that eventually would be called Vesta. It was the fourth such body, now termed asteroids, found in this orbital gap.

Yet Vesta stands out from the hundreds of thousands of now-known asteroids as the only one that's bright enough to see with the naked eye. It achieves this milestone in the weeks surrounding opposition the night of May 1/2.

Vesta contains 9 percent of the mass in the asteroid belt (only the dwarf planet Ceres surpasses it), and its diameter averages 326 miles (525 kilometers; again second to Ceres). But it reflects more light than Ceres and comes closer to Earth, giving it the boost it needs to be the main belt's brightest object.

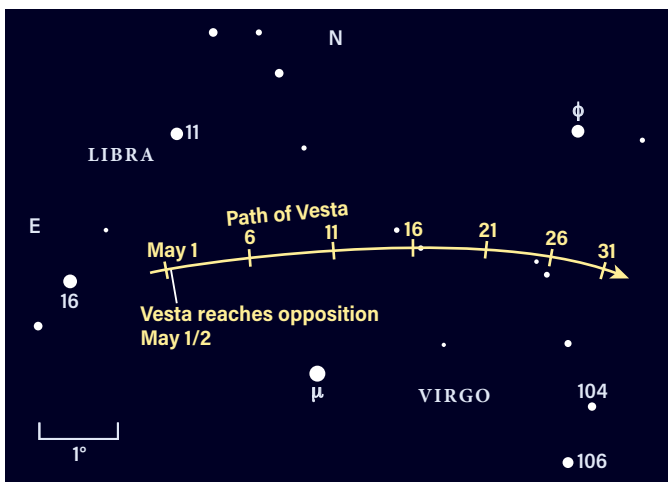
At opposition May 1/2, Vesta lies in northern Libra near that constellation's border with Virgo. It then shines at magnitude 5.6, though it stays above magnitude 6.0 from mid-April until late May. This is the best period to spot it without optical aid, though it helps to find it first with binoculars or a telescope. You'll need a clear, dark sky, and you should look for it when it climbs highest around midnight local time. Fortunately, the asteroid remains visible all night around opposition.

Begin your search with Libra's brightest star, magnitude 2.6 Zubeneschamali (Beta [β] Librae). Then head 7° northwest to magnitude 4.5 16 Lib. At opposition, Vesta lies 1° west of this star. (The asteroid passed 10' due south of the star the night of April 25/26.) With no other object brighter than these two in the immediate vicinity, it should be easy to identify Vesta.

After opposition, the asteroid continues moving westward at a rate of about 0.2° per day. You can find it 1.7° due north of magnitude 3.9 Mu (μ) Virginis on May 10. And during the second half of May, Vesta is the brightest object within a triangle defined by the stars Mu, magnitude 4.8 Phi (ϕ) Vir, and magnitude 5.4 106 Vir. On the night of May 28/29, the asteroid stands 40 percent of the way from Phi to 106.

With the nights growing warmer this spring, now is a great time to hunt down this bright and historic asteroid.

On July 24, 2011, NASA's Dawn spacecraft captured Vesta and the series of grooves that run parallel to its equator. NASA/JPL-CALTECH/UCLA/MPS/DLR/IDA



You can see Vesta without optical aid from a dark site in early May, when the asteroid reaches its peak among the stars of northern Libra.

Mercury shines brightly at dusk

Mercury pops into the evening sky in early June and climbs higher as the month progresses, as it makes one of its finest appearances of 2025. The innermost planet is notoriously difficult to spot because it never strays far from the Sun in our sky and thus appears in twilight before sunrise or after sunset.

Your first view could come June 9. Mercury then lies 13° east of the Sun and stands 5° high in the west-northwest 30 minutes after sundown. Glowing at magnitude –1.1, it should be visible through binoculars if you have a haze-free and unobstructed horizon. But what makes this evening special is the presence of a guide "star": magnitude –1.9 Jupiter lies 3° below its planetary companion.

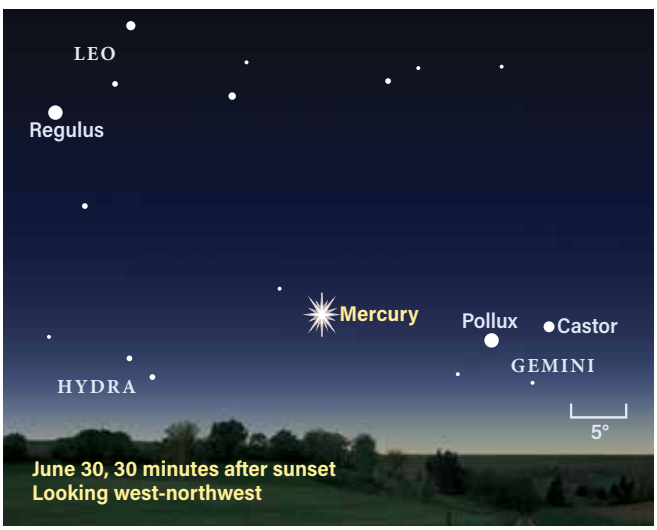
While Jupiter quickly disappears in the solar glare, Mercury continues to climb. On the evening of the 22nd, the inner planet appears 11° high a half-hour after sunset. It shines at magnitude –0.6, nearly two magnitudes brighter than Gemini's luminary, Pollux, which lies 5° to the north (upper right).

Four days later, on the 26th, a beautiful two-day-old waxing crescent Moon joins Mercury. The Moon lies 4° to the planet's right while Pollux and Castor (Gemini's second-brightest star) appear farther to the right. The four objects form a nearly parallel line that lies 11° above the horizon, and they don't set until an hour later.

As the month closes, Mercury maintains its 11° altitude a half-hour after the Sun sets. Castor and Pollux remain companions to the right while the Moon now stands much higher in the west. The planet has faded a bit to magnitude 0.4 but should still be easy to spot against the twilight background. If you point a telescope at Mercury on the 30th, you'll find a disk that spans 8" and appears slightly less than half-lit. Although the planet doesn't reach greatest elongation until July 3/4, it then lies a bit lower in the sky and will be harder to see.

Mercury orbits the Sun every 88 days, so it puts on several other shows during 2025. The best of the bunch comes in early March, when the inner world climbs a couple of degrees higher after sunset than it does in June. For viewers who prefer the quieter hours before dawn, Mercury's best morning appearances arrive in the second half of August and in early December.

A crescent Moon stands to Mercury's left in evening twilight May 2, 2022. The Pleiades glows faintly to the planet's lower right. GIANNI TUMINO



Late June offers a nice opportunity to spot the innermost planet near the bright stars Castor and Pollux.

JUNE 2025

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8	9	10	●	12	13	14
15	16	17	◐	19	20	21
22	23	24	○	26	27	28
29	30					

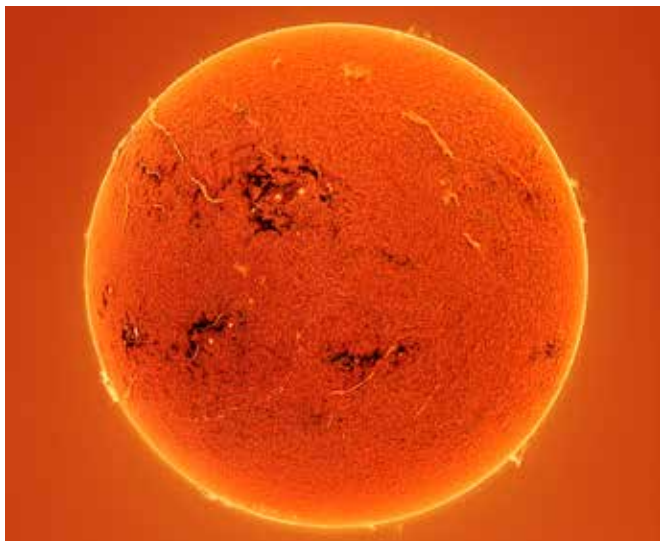
1	The Moon passes 1.4° north of Mars, 6 A.M. EDT	👁 🔭
8	Mercury passes 2° north of Jupiter, 4 P.M. EDT	👁 🔭
16	Mars passes 0.8° north of Regulus, midnight EDT	👁 🔭
18	The Moon passes 3° north of Saturn, midnight EDT	👁 🔭
	The Moon passes 2° north of Neptune, midnight EDT	🔭
20	Solstice (northern summer/southern winter begins), 11 P.M. EDT	👁
22	The Moon passes 7° north of Venus, 5 A.M. EDT	👁 🔭
	Mercury passes 5° south of Pollux, 4 P.M. EDT	👁 🔭
	The Moon passes 5° north of Uranus, midnight EDT	🔭
24	Jupiter is in conjunction with the Sun, 11 A.M. EDT	
27	The Moon passes 3° north of Mercury, 2 A.M. EDT	👁 🔭
29	Saturn passes 1.0° south of Neptune, 4 A.M. EDT	🔭
	The Moon passes 0.2° north of Mars, 9 P.M. EDT	👁 🔭

JULY 2025

S	M	T	W	T	F	S
		1	◑	3	4	5
6	7	8	9	●	11	12
13	14	15	16	◐	18	19
20	21	22	23	○	25	26
27	28	29	30	31		

- **3** Venus passes 2° south of Uranus, 9 P.M. EDT
- **4** Mercury is at greatest eastern elongation (26°), 1 A.M. EDT
- **13** Venus passes 3° north of Aldebaran, midnight EDT
- **16** The Moon passes 3° north of Neptune, 6 A.M. EDT
- The Moon passes 4° north of Saturn, 7 A.M. EDT
- **20** The Moon passes 5° north of Uranus, 9 A.M. EDT
- **21** The Moon passes 7° north of Venus, 3 P.M. EDT
- **22** The Moon passes 5° north of Jupiter, midnight EDT
- **25** Pluto is at opposition, 3 A.M. EDT
- **28** The Moon passes 1.3° south of Mars, 4 P.M. EDT
- **31** Mercury is in inferior conjunction, 8 P.M. EDT

Solar activity stays near its peak



Sunspots, filaments, and prominences reached a crescendo around solar maximum in 2024. Activity should remain high this year. ARTURO BUENROSTRO

The Sun seems to be in a big hurry. Astronomers anticipated the current solar cycle to peak in mid-2025, but it looks like it beat those expectations by several months. In any case, activity should be high this year, giving observers great views of solar features and a chance to see more aurorae.

Small telescopes are perfect for observing the Sun — if you take precautions. The Sun's brilliance can damage your eyes instantly if you don't use a filter specifically designed for solar viewing. Make sure that the filter fits snugly over the front end of your scope, and cap the finder to keep anyone from accidentally taking a peek.

The first solar features you'll notice are sunspots. These dark blemishes arise when strong magnetic fields near the Sun's surface, or photosphere, restrict heat flowing from the interior. The surface cools by a few thousand degrees and thus the area doesn't radiate as much light as its surroundings. A sunspot near the solar equator takes 27 days to return to the same location, a combination of the Sun's 25-day rotation rate and Earth's orbital motion during that time. Also keep an eye out for granulation, the rice-grain pattern of convection cells in the photosphere.

The Sun's limb appears slightly dimmer than the rest of the disk because that's where we view higher, cooler layers in the solar atmosphere. This makes the limb the best region to spot faculae, a bright filamentary network often seen around sunspots.

The Sun's upper atmosphere, or chromosphere, stands out in views through a Hydrogen-alpha (Hα) filter. These filters block all sunlight except in a narrow band centered on 656.3 nanometers. Hα filters reveal the fiery tongues of gas called prominences that arc above the solar limb. When viewed against the Sun's brilliant disk, a bright prominence transforms into a dark filament.

Although the April 8 total solar eclipse probably ranked as 2024's top highlight, several spectacular aurorae, particularly in May and October, ranked a close second. With solar activity remaining high this year, expect the Sun to keep pouring charged particles into Earth's magnetic field and sparking more auroral displays.

Spectacular aurorae were the norm in 2024. On Feb. 11, these greenish curtains hung above the Lofoten Islands near Ramberg, Norway. MARTY WEINTRAUB

A brilliant duo meets before dawn

The two brightest planets dominate the early morning sky in August. Skygazers will want to target the month's second week, however, when Venus and Jupiter converge in a spectacular conjunction.

Venus starts the month in far western Gemini the Twins, having crossed the border from Orion the Hunter the previous day. Meanwhile, Jupiter awaits its future companion 10° to the east in central Gemini. The constellation stands clear of the eastern horizon by 5 A.M. local daylight time.

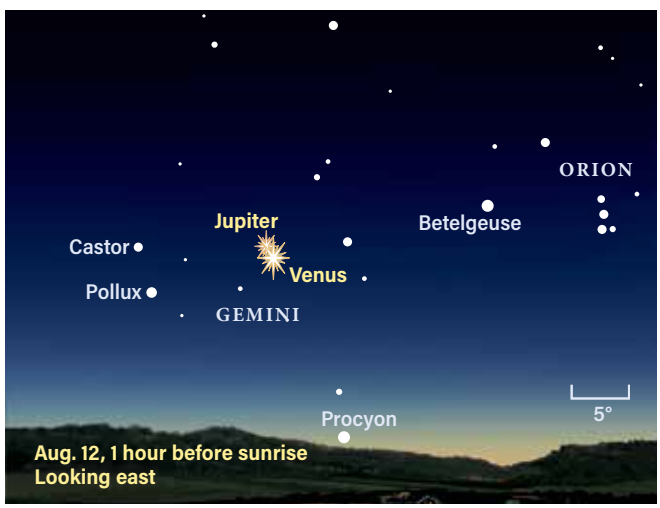
The gap closes by nearly 1° each day, though Venus does most of the moving. The two worlds lie within 1.5° of each other for three days centered on Aug. 12, which happens to coincide with the peak of the Perseid meteor shower. Unfortunately, a waning gibbous Moon in Pisces dampens the shower, but you'll want to keep an eye out for any fireballs.

The morning of Aug. 12 finds Jupiter and Venus at their closest, just 0.9° apart. The pair rises together in a dark sky by 3:30 A.M. It seems appropriate that the two planets lie a dozen degrees from Gemini's twin stars, Castor and Pollux.

Jupiter stands north of (above) Venus and shines at magnitude –1.9. Venus appears seven times brighter, at magnitude –4.0. Also keep an eye out for Sirius, the night sky's brightest star at magnitude –1.4, when it rises in the east-southeast as twilight brightens.

When viewed through a telescope at low power, the two planets look stunning. Jupiter's disk spans 33", and its equatorial belts show up nicely. All four of the planet's Galilean moons also are on display. Io, Europa, and Ganymede stand west of the gas giant while Callisto lies to the east. Although Venus has no moons, it still dazzles. The inner planet measures 13" across and appears 79 percent lit.

The two brightest planets came together at dusk in early March 2023. Brilliant Venus stands above Jupiter. FABRIZIO MELANDRI



Venus and Jupiter pass within 1° of each other Aug. 12. Venus then appears seven times brighter than its companion.

AUGUST 2025

S	M	T	W	T	F	S
					◑	2
3	4	5	6	7	8	●
10	11	12	13	14	15	◐
17	18	19	20	21	22	○
24	25	26	27	28	29	30
◑						

6	Saturn passes 1.1° south of Neptune, 6 A.M. EDT	🔭
7	Asteroid Pallas is at opposition, 5 P.M. EDT	🔭
12	Venus passes 0.9° south of Jupiter, 4 A.M. EDT	👁 🔭
	The Moon passes 4° north of Saturn, 11 A.M. EDT	👁
	The Moon passes 3° north of Neptune, noon EDT	
	Perseid meteor shower peaks	👁
16	The Moon passes 5° north of Uranus, 4 P.M. EDT	
19	Mercury is at greatest western elongation (19°), 6 A.M. EDT	👁 🔭
	The Moon passes 5° north of Jupiter, 5 P.M. EDT	👁
20	The Moon passes 5° north of Venus, 7 A.M. EDT	👁
21	Venus passes 7° south of Pollux, 5 A.M. EDT	👁
	The Moon passes 4° north of Mercury, noon EDT	👁
26	The Moon passes 3° south of Mars, 1 P.M. EDT	👁

SEPTEMBER 2025

S	M	T	W	T	F	S
	1	2	3	4	5	6
●	8	9	10	11	12	13
◐	15	16	17	18	19	20
○	22	23	24	25	26	27
28	◑	30				

- 2 Mercury passes 1.2° north of Regulus, 6 A.M. EDT
- 7 Total lunar eclipse, 2 P.M. EDT
- 8 The Moon passes 4° north of Saturn, 4 P.M. EDT
- The Moon passes 3° north of Neptune, 6 P.M. EDT
- 12 Mars passes 2° north of Spica, 4 A.M. EDT
- The Moon passes 5° north of Uranus, 10 P.M. EDT
- 13 Mercury is in superior conjunction, 7 A.M. EDT
- 16 The Moon passes 5° north of Jupiter, 7 A.M. EDT
- 19 The Moon passes 0.8° north of Venus, 8 A.M. EDT
- Venus passes 0.5° north of Regulus, 9 A.M. EDT
- 21 Saturn is at opposition, 2 A.M. EDT
- Partial solar eclipse, 4 P.M. EDT
- 22 Equinox (northern autumn/southern spring begins), 2 P.M. EDT
- 23 Neptune is at opposition, 9 A.M. EDT
- 24 The Moon passes 4° south of Mars, 11 A.M. EDT

Spy a ringed world on edge

Saturn reaches its peak the night of Sept. 20/21. The ringed world then shines brightest, looms largest through a telescope, and remains visible all night. Although opposition is the best time to observe the planet, its appearance changes so slowly that good views last for several months.

One thing you're bound to notice when you target Saturn is its rather lackluster rings. In fact, they don't appear as much more than a thin line because they turned edge-on to Earth early this year. The planet circles the Sun once every 29.4 years, and its axis tilts 27° to its orbital plane. During half of its orbit, the northern side of the planet and rings tip toward us. The other half finds the southern side inclined toward us. And twice each saturnian year, the rings tilt edge-on to Earth.

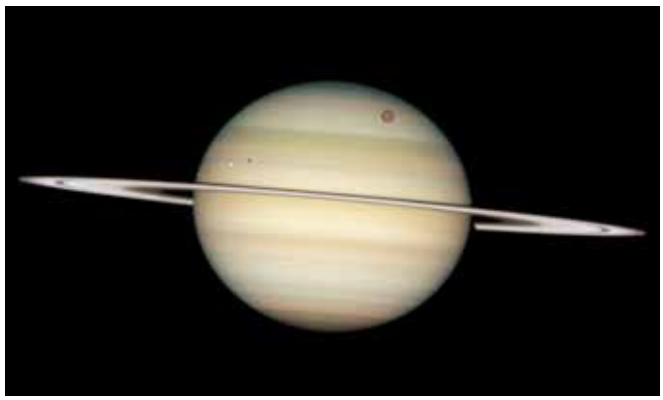
March 23 brings one of those rare ring-plane crossings. Earthbound observers would have seen the rings edge-on — if the planet were visible. Unfortunately, Saturn reached solar conjunction less than two weeks earlier, and it was lost in the Sun's glare.

You can start looking for Saturn before dawn in late April. Use Venus as a guide on the 29th, when the inner planet passes 4° north (upper left) of Saturn. A close look at Saturn reveals the rings to be backlit by the Sun, which doesn't pass through the ring plane until May 6.

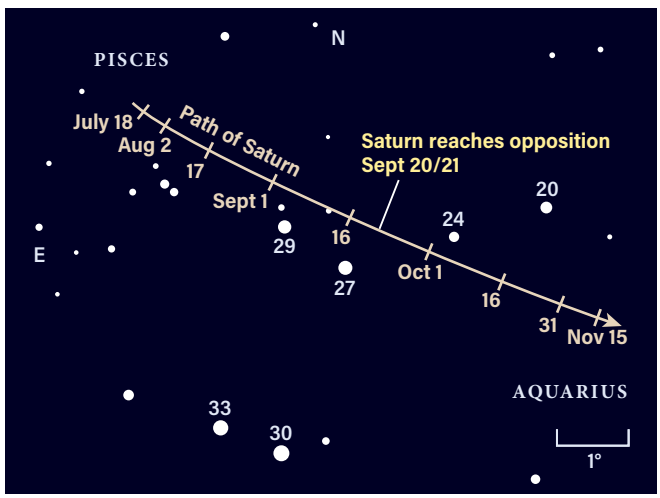
Saturn rises earlier and climbs higher throughout the spring and summer. Because its host constellation, Pisces, holds no bright stars, the 1st-magnitude planet appears conspicuous. The rings reach their maximum tilt (3.6°) for this apparition in early July.

When Saturn peaks Sept. 20/21, it shines at magnitude 0.6. The planet measures 19" across while the rings span 44" and tilt 1.8° to our line of sight. The world remains in Pisces just 0.3° from the northeastern corner of Aquarius. (Saturn crosses into Aquarius at the end of September.)

Although the planet may look less impressive with the rings not open wide, the reduced glare creates better opportunities for spotting two faint satellites near the rings' edge. Enceladus, which shines at 12th magnitude, circles the planet in 1.4 days and never strays farther than 38" from Saturn's center. Mimas presents an even greater challenge. This 13th-magnitude object orbits the planet every 23 hours and stays within 30" of the ringed world's center.



Hubble took this Saturn portrait in February 2009. The rings then tilted 2° to our line of sight, as they will at this year's opposition. NASA/ESA/THE HUBBLE HERITAGE TEAM (STSCI/AURA)



The ringed planet stands on the border between Aquarius and Pisces at its peak in late September, when it shines at magnitude 0.6.

Halley's debris lights up the night

Although many comets have put on more impressive displays than 1P/Halley, none better captures the public imagination. This famed periodic comet started its latest journey toward the inner solar system in December 2023, and 36 years from now it will light up our sky again.

Each time Halley returns, the Sun boils off some of its surface ices. The cloud of dusty debris this releases continues to orbit the Sun roughly along Halley's path. Earth intersects this path twice each year, producing the Eta Aquariid meteor shower in May and the Orionid shower in October.

Our planet runs into the thickest part of this debris trail Oct. 21. Observers under a clear dark sky could see up to 20 meteors per hour as the dust particles burn up in our atmosphere that morning. And the best thing about this year's shower is that its peak coincides with New Moon.

Orionid meteors appear to radiate from northern Orion, a region that rises before midnight local daylight time and climbs highest just before twilight begins. The hour or two before dawn should deliver the most "shooting stars." Dress warmly for these cool autumn nights and find a location well away from city lights with a clear view of the whole sky. And be sure to let your eyes dark adapt for at least 15 minutes.

The end of the year includes two other meteor showers that avoid strong moonlight. The Leonids in mid-November and the Geminids in mid-December both reach maximum under a waning crescent Moon. Although the Geminids are significantly more prolific, the Leonids have their own cachet. Their parent comet, 55P/Tempel-Tuttle, will pass closest to the Sun in 2031. Astronomers predict that this year's shower could produce a few more meteors than usual, as well as brighter ones.

Abundant Quadrantid meteors should streak the sky in early January because a waxing crescent Moon offers little competition. Alas, a waning gibbous Moon shares the sky with August's Perseid shower, which peaks Aug. 12. Still, you'll want to be out that morning to catch the conjunction of Venus and Jupiter.

Dozens of shooting stars radiate from Orion the Hunter in this composite image of the 2023 Orionid meteor shower, taken from Egypt's Black Desert. OSAMA FATHI

Meteor showers in 2025

Name	Peak date	Moon's phase	Prospects
Quadrantids	Jan. 3	Waxing crescent	Excellent
Lyrids	April 22	Waning crescent	Excellent
Eta Aquariids	May 5	Waxing gibbous	Fair
Perseids	Aug. 12	Waning gibbous	Poor
Orionids	Oct. 21	New Moon	Excellent
Leonids	Nov. 17	Waning crescent	Excellent
Geminids	Dec. 14	Waning crescent	Excellent

OCTOBER 2025

S	M	T	W	T	F	S
			1	2	3	4
5	●	7	8	9	10	11
12	◐	14	15	16	17	18
19	20	○	22	23	24	25
26	27	28	◑	30	31	

2 Mercury passes 1.9° north of Spica, 7 A.M. EDT

Dwarf planet Ceres is at opposition, 9 A.M. EDT

5 The Moon passes 4° north of Saturn, 11 P.M. EDT

6 The Moon passes 3° north of Neptune, 3 A.M. EDT

10 The Moon passes 5° north of Uranus, 5 A.M. EDT

13 The Moon passes 4° north of Jupiter, 6 P.M. EDT

19 The Moon passes 4° south of Venus, 6 P.M. EDT

21 Mercury passes 2° south of Mars, 2 A.M. EDT

Orionid meteor shower peaks

23 The Moon passes 5° south of Mars, 9 A.M. EDT

The Moon passes 2° south of Mercury, noon EDT

27 Jupiter passes 7° south of Pollux, 11 A.M. EDT

29 Mercury is at greatest eastern elongation (24°), 6 P.M. EDT

31 Venus passes 4° north of Spica, midnight EDT

NOVEMBER 2025

S	M	T	W	T	F	S
						1
2	3	4	●	6	7	8
9	10	11	◐	13	14	15
16	17	18	19	○	21	22
23	24	25	26	27	◑	29
30						

- **2** The Moon passes 4° north of Saturn, 6 A.M. EST
- The Moon passes 3° north of Neptune, noon EST
- **6** The Moon passes 5° north of Uranus, noon EST
- **10** The Moon passes 4° north of Jupiter, 3 A.M. EST
- **12** Mercury passes 1.3° south of Mars, 2 P.M. EST
- **17** Leonid meteor shower peaks
- **19** The Moon passes 6° south of Venus, 4 A.M. EST
- **20** Mercury is in inferior conjunction, 4 A.M. EST
- **21** Uranus is at opposition, 7 A.M. EST
- **24** Mercury passes 1.1° north of Venus, midnight EST
- **26** Jupiter passes 7° south of Pollux, 2 P.M. EST
- **29** The Moon passes 4° north of Saturn, 2 P.M. EST
- The Moon passes 3° north of Neptune, 9 P.M. EST

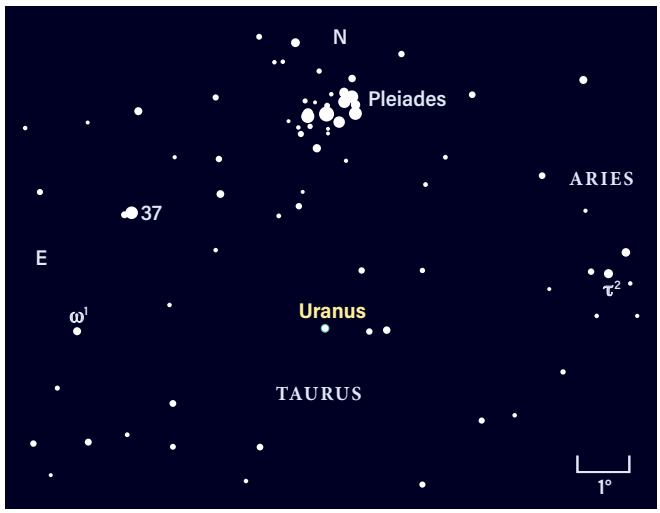
An ice giant climbs high

The stars align nicely this month, pointing the way to Uranus. The seventh planet from the Sun and the first one to be discovered since antiquity, this ice giant world reaches opposition Nov. 21. Ideally located 4° south of the Pleiades star cluster (M45), Uranus climbs higher in the sky for Northern Hemisphere observers than at any time since 1956. This is a great opportunity to discover the distant planet for yourself.

German-born William Herschel first spotted Uranus on March 13, 1781. A musician by trade, Herschel developed an interest in astronomy and building telescopes after he moved to England as a teen. On that fateful night, he hauled his 6-inch telescope into the backyard of his home in Bath. He was continuing a survey of the sky. Having completed a catalog of stars to 4th magnitude, he was now extending it to 8th magnitude.

While charting stars in Gemini, Herschel came across a curious nonstellar object. He first thought it was a comet, but subsequent observations showed it moved in a circular orbit around the Sun and thus was a new planet. He named the object *Georgium Sidus* (George's Star) after King George III, but cooler heads ultimately prevailed and it became Uranus.

To find Uranus this month, grab binoculars or a small telescope with a low-power eyepiece and center the Pleaides. Take a few minutes to enjoy this beautiful cluster, then sweep south. If you wait until the cluster and planet climb highest around midnight local time, south is directly below.



Magnitude 5.6 Uranus lies 4° south of the Pleiades star cluster (M45) when it reaches opposition and peak visibility in late November.

On the night of opposition, Uranus lies 4.4° due south of magnitude 2.9 Alcyone (Eta [η] Tauri), M45's brightest star. The planet moves slowly from night to night, so these directions hold pretty closely for a week either side of opposition.

Several storm clouds dot Uranus' atmosphere while multiple rings circle the planet in this infrared view. LAWRENCE SROMOVSKY (UNIVERSITY OF WISCONSIN)/W.M. KECK OBSERVATORY

Uranus glows at magnitude 5.6; no other object in the vicinity shines brighter.

A pair of nearby stars could give you pause, however. Uranus forms a straight east-west line with these two, which both lie to the planet's west. The nearer star shines at magnitude 6.1 and the more distant one at magnitude 5.7. They stand 21' apart (two-thirds the Full Moon's diameter), while Uranus lies 53' east of the fainter one.

The three show a nice color contrast. The brighter star appears white and the dimmer one yellow. Uranus stands out with a distinctive blue-green hue because methane in its atmosphere absorbs red light. The colors become more pronounced with larger optics.

Although Uranus is bright enough to see with the naked eye, it's tough under less than ideal conditions. (Fortunately, New Moon arrives a day before the planet's opposition.) Find it with binoculars first and then set them aside to see if the seventh planet tickles your retinas.

Giant Jupiter greets the Twins

The solar system's largest planet remains visible nearly all night in December as it approaches opposition during January's second week. Jupiter puts on a magnificent show as 2025 winds down, reaching a brilliant magnitude –2.7 by month's end. With Venus lost in the Sun's glare, it outshines every other star and planet now visible.

Jupiter resides among the background stars of Gemini the Twins. As December begins, it lies 7° south of Gemini's brightest star, 1st-magnitude Pollux. It maintains this separation all month as it slides slowly westward against the starry backdrop.

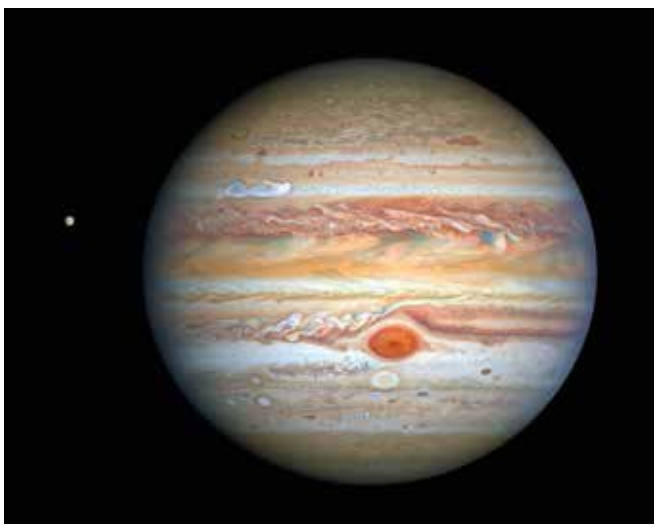
The giant planet rises by 8 P.M. local time in early December and some two hours earlier (during twilight) late in the month. From mid-northern latitudes, it stands 70° above the horizon shortly after midnight and remains at least halfway to the zenith for more than six hours. The high altitude promises superb views through telescopes of all sizes.

Jupiter's apparent equatorial diameter grows from 44" to 46" during December. Its polar diameter is 3" less, a difference easy to spot when you know to look for it. This polar flattening arises from the planet's rapid rotation and gaseous nature.

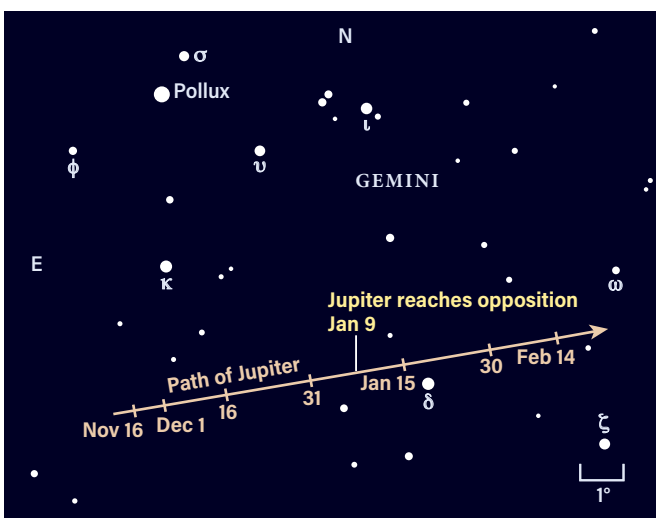
Jupiter's disk offers a rich variety of cloud belts. The most prominent are two dark belts that straddle the equator. Winds blow at hundreds of miles per hour along the boundaries of these belts, generating majestic swirls in the jovian cloud tops.

Also keep an eye out for the Great Red Spot. This massive storm lies on the southern edge of the South Equatorial Belt. If you don't see it right away, be patient. Jupiter spins on its axis in less than 10 hours and remains visible for more than 10 hours each December night, so if the Red Spot lies on the planet's far side during the evening, it will rotate into view before dawn.

A telescope also reveals the gas giant's four bright Galilean moons. Io, Europa, Ganymede, and Callisto change relative positions from day to day. And on these long winter nights, the inner moons (Io and Europa) shift positions noticeably from evening to morning.



Jupiter's colorful clouds and Great Red Spot highlight this Hubble portrait from August 2020. NASA/ESA/A. SIMON (GSFC)/M.H. WONG (UC, BERKELEY)/THE OPAL TEAM



Although Jupiter won't reach opposition until January 2026, it shines brilliantly against the backdrop of Gemini the Twins in December.

DECEMBER 2025

S	M	T	W	T	F	S
	1	2	3	●	5	6
7	8	9	10	◐	12	13
14	15	16	17	18	○	20
21	22	23	24	25	26	◑
28	29	30	31			

3	The Moon passes 5° north of Uranus, 10 P.M. EST	🔭
7	The Moon passes 4° north of Jupiter, 11 A.M. EST	👁 🔭
	Mercury is at greatest western elongation (21°), 4 P.M. EST	👁 🔭
14	Geminid meteor shower peaks	👁
17	Asteroid Juno is in conjunction with the Sun, 1 A.M. EST	
18	The Moon passes 6° south of Mercury, 7 A.M. EST	👁 🔭
	Mercury passes 6° north of Antares, 4 P.M. EST	👁 🔭
21	Solstice (northern winter/southern summer begins), 10 A.M. EST	👁
26	The Moon passes 4° north of Saturn, 11 P.M. EST	👁 🔭
27	The Moon passes 3° north of Neptune, 4 A.M. EST	🔭
31	The Moon passes 5° north of Uranus, 7 A.M. EST	🔭

2026 Preview

Looking ahead to next year . . .

Eclipse chasers have high hopes for the total solar eclipse that crosses parts of Iceland and Spain Aug. 12, 2026. PHILIPPE MOUSSETTE

ECLIPSES USUALLY DRAW THE MOST ATTENTION from amateur astronomers. But each of the two previous years provided only one kind of totality — 2024 offered a spectacular total solar eclipse for North Americans, while 2025 provided two total lunar eclipses.

This year brings the best of both worlds. On Aug. 12, the Moon's umbral shadow cuts a narrow path across Greenland, Iceland, and Spain. At maximum off Iceland's west coast, totality lasts 2 minutes 18 seconds. The morning of March 3 offers a total lunar eclipse to those across most of North America, though the Moon sets during totality in the east. Luna will lie completely in Earth's umbral shadow for 59 minutes. A second, nearly total, lunar eclipse graces our sky the night of Aug. 27/28.

For those who prefer viewing planets, 2026 promises to be a stellar year. Venus reappears in the evening sky during February on its way toward greatest elongation in mid-August. Don't miss its conjunction with Jupiter on June 9. After it disappears for a few weeks in October, the inner planet returns to view before dawn in November and December. Although Mars remains inconspicuous for much of the year, it brightens to magnitude –0.1 by late December among the background stars of Leo the Lion.

Both gas giant planets look great in 2026. Jupiter reaches opposition Jan. 10, when it shines brightest and rides high in the south against the backdrop of Gemini the Twins. Saturn comes to opposition in the non-zodiacal constellation Cetus the Whale Oct. 4. The good news for Saturn watchers is that the planet's rings then tilt a healthy 7.5° to our line of sight.

Meteor observers also have a lot to look forward to in 2026. After a down year in 2025, the Perseids peak with perfect conditions at New Moon. And the equally fine Geminid shower reaches its maximum under a thin crescent Moon that sets by 10 P.M. local time.

A waning gibbous Moon marred the 2025 Perseids, but 2026 will offer Moon-free skies. The photographer captured a 2024 Perseid above Sicily's Mount Etna. GIANNI TUMINO

After 2025 delivered two total lunar eclipses, a third such event arrives the morning of March 3, 2026. BARRY MIDDLETON

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