Sky Calendar Extra Content Page for December 2023, January 2024, & beyond, through July 2024

by Robert Victor. Graphics contributed by Robert D. Miller and Jeffrey L. Hunt.

In these pages you will find:

- detailed coverage of sky events from late December 2023 through the end of January 2024, with evening and morning twilight sky charts
- finder charts for Uranus and Neptune
- a graph of rising times of planets in relation to sunrise, enabling observers to estimate visibility of morning planets until June 2024
- monthly sky charts for February through July 2024, depicting positions of naked-eye planets and bright stars during evening and morning twilight

Sky events for December 2023

Only 37.6 years to go! **Halley's Comet,** according to calculations by NASA/JPL, was expected to reach its aphelion, or greatest distance from the Sun, at a location farther than the most distant planet Neptune, on the evening of December 8, 2023. Comet Halley then began its journey back toward the inner solar system. On July 28, 2061, the storied comet will reach its perihelion, or closest approach to the Sun, inside the orbit of Venus, and will reach its closest approach to Earth on the very next day. The comet will be visible to unaided eye in surrounding weeks of July-August 2061, shifting from morning to evening sky, and even be visible at both dawn and dusk for a few days. Urge your young friends and family to plan to see it.

Winter begins on December 21 at 10:27 p.m. EST/7:27 p.m. PST, as the Sun stands directly over the Tropic of Capricorn, giving northern hemisphere residents their lowest midday Sun and shortest day.

Evening sky in December 2023

[See evening twilight sky map N202312P.pdf.]

The three brightest "stars" at dusk in late December are brilliant Jupiter in SE; and two stars of zero magnitude, Vega in NW, and Capella ascending in NE. Other objects, all first magnitude or brighter, are Saturn in SW, with Fomalhaut, mouth of the Southern Fish, to its lower left; Altair and Deneb completing the Summer Triangle with Vega; and Aldebaran, eye of Taurus, rising north of east. On December 2, Aldebaran was at opposition as Earth passed between that star and the Sun, so the star was up all that night: low in eastern sky at dusk, high in south in middle of night, and low in western sky at dawn. Late in month, the stars Betelgeuse and Rigel of Orion (identified with the vertical line of three 2nd-mag. stars marking his belt in between) appear low in the eastern sky at dusk, with Castor and Pollux rising farther left, in the northeast.

Planets at dusk: Jupiter, currently the brightest evening "star", gleams at mag. –2.6 in ESE at dusk in late December. In Aries, Jupiter ends retrograde on Dec. 30. A telescope reveals its disk 44" (arcseconds) across, and four bright satellites discovered by Galileo in 1610. **Saturn** glows near mag. +1.0 in SSW at dusk in late December. Against stars of Aquarius, Saturn slowly progresses ENE, away from 4.3-mag. Iota in Aquarius. Telescopically at year's end, Saturn's rings appear 36" in east-west extent, while 9.2° from edge-on.

Faint solar system bodies in evening sky

[See finder charts for Uranus and Neptune.]

Uranus, of mag. 5.7 at the end of December, is 13° ENE of Jupiter, 12° WSW of the Pleiades, and 2.8° SW of the 4.3-mag. star Delta in Aries. **Neptune,** of mag. 7.9 and ending retrograde in Pisces on Dec. 6, ends month 22° ENE of Saturn, and 1.4° WSW of the 5.5-mag. star 20 in Pisces. Don't confuse Neptune with the 7.3-mag. star HIP 117112, located 57' (0.95°) WSW of 20 Psc. Fainter Neptune will pass 9' (arcminutes) NNW of the 7.3-mag. star on Jan. 22. **Finder charts for Uranus and Neptune** for binocular users are posted above. **Minor planet # 4 Vesta** reaches opposition at mag. 6.4 on Dec. 22. During the night of Dec. 14-15, find Vesta 12' (arcminutes) NE to 8' NNE of the 4.6-mag. star Chi-2 in Orion's club. Vesta is then moving west by 0.26° per day. The 4.4 mag. star Chi-1 in Orion's club is 2¼° west of Chi-2 and 13° north of Betelgeuse. On the evening of Dec. 23, Vesta passes 22' north of 4.4-mag. Chi-1 Ori, but in a bright moonlit sky.

Morning sky in December 2023

[See morning twilight sky map N202312A.pdf.]

The brightest "stars" at dawn in early December are Venus in SE; Sirius, the Dog Star, in SW to WSW; Arcturus in E; Vega rising in NE; and Capella in NW. Spica was still within 5° of Venus on Dec. 1 and 2, otherwise, to find Spica, use the Big Dipper's handle to "follow the arc to Arcturus and drive a spike to Spica." Regulus, heart of Leo, was high in SSW at dawn as December began. In the western sky early in month, the entire Spring Arch was still visible at mid-twilight. Later in month, look for it earlier, before morning twilight gets underway. The Arch is topped by an eye-catching pair of stars 4.5° apart, Pollux and Castor of Gemini. To the Twins' lower right is Capella. To lower left of the Twins are Procyon and Sirius. Below the Arch are Aldebaran, eye of Taurus, and Orion's Betelgeuse and Rigel. Rigel is the first of all these bright stars to set. Look after Vega rises and before Rigel sets, and you can see eleven stars of first magnitude or brighter, not counting Castor of mag. +1.6, and the planet Venus. Late in December, after Rigel, Aldebaran, and Sirius have disappeared, watch for Antares rising in SE and Deneb rising in NE.

Morning planets: Venus, of mag. –4.2 to –4.0 in SE, rules the morning! Venus progresses east by 1.2° per day, going 4.2° N of first-mag. Spica on Nov. 29; 1.9° N of 3rd-mag. Alpha in Libra on Dec. 17; 1.0° N of 3rd-mag. Beta in the head of Scorpius on Jan. 1; and 6.3° N of first-mag. Antares on Jan. 7. Venus' gibbous phase fills out to 78% in December, while its disk shrinks to 14”. **Mercury,** brightening to mag. +1.0 by Dec. 30, appears lower left of Venus, by 22° on Dec. 30, and by 20° on Dec. 31. **Mars,** low in bright twilight and fainter at mag. +1.4, is 5° to 6° below Mercury those two mornings, requiring binoculars. Both improve visibility in January.

If you had a vantage point with unobstructed views you could have seen Venus and Jupiter very low above opposite horizons in early December, for example about three hours before sunrise on December 2. You would have been able to see both planets at once during the short time interval after Venus’ rising and before Jupiter’s setting. By December 10, the chance to see both at once slipped away. Your next chance to view these two brightest planets simultaneously will occur in evening sky, for 4½ months beginning on November 4, 2024, when Jupiter will rise in ENE just before Venus sets in WSW.

Moon in evening sky, December 2023

The first easy chance to catch the Moon in the early evening came on Thursday, Dec. 11, with the 2-percent crescent very low in southwest at dusk. On Sunday, Dec. 14, the 31-percent crescent waxing Moon appeared within 3° south of Saturn. On Dec. 19, the Moon is just past First Quarter phase, when it is 90° east of the Sun and appears half full. The Moon’s position against the stars of Pisces that night is close to where the Sun will appear three months later, near the beginning of spring. On Dec. 21, the 75-percent waxing gibbous Moon appears 6° upper right of bright Jupiter. On the following night, the 83-percent Moon will appear 8° to Jupiter’s lower left. On Dec. 23, binoculars will help spot the Pleiades in the glare of the 91-percent Moon. Look in the same field, 4° to Moon’s lower left. On Dec. 24, note Aldebaran, eye of Taurus and “follower” of the Pleiades, within 9° lower right of the 96-percent Moon. On Dec. 25, use binoculars to spot 1.7-mag. Elnath, or Beta in Taurus, 1°-2° upper left of the 99-percent Moon. The Moon is Full on Dec. 26 at 7:33 p.m. EST (4:33 p.m. PST). From a location with unobstructed views, try to see the Sun and Moon simultaneously shortly before sunset that evening and shortly after sunrise on Dec. 27.

Moon in morning sky in late December 2023

Of the five first-mag. stars within the zodiac, only **Pollux** can’t be hidden by the Moon, since the star is 6.7° north of the plane of Earth’s orbit. The Moon’s orbit is inclined about 5° to Earth’s, not enough to cover the star from anyplace on our planet. In 2023-24, the Moon comes close to Pollux at each pass, at intervals of about 27.3 days. (For example, on the morning of Dec. 28, the 97-percent Moon passes only 2° south of Pollux.) The Moon’s orbit slowly precesses, or wobbles, changing its orientation in a cycle of 18.6 years, so in 8-10 years (about half a cycle from now), the Moon each month will pass some 12° S of the star. So, enjoy the close passes of Moon to Pollux while you can! The four brightest stars the Moon can occult are Aldebaran, Regulus, Spica, and Antares.

On the morning of Dec. 31, the 81-percent waning gibbous Moon appears within 3° north of Regulus. No occultation this time! But the Moon will cover Antares before dawn from western states on Jan. 8. Some details and links to more information appear in the sky events summary for January.

Sky events for January 2024

Morning sky in January 2024

[See morning twilight sky map N202401A.pdf.]

In early January, we experience **our latest sunrises of the year** (except for late October and early November, when late sunrises result from the artifact of daylight-saving time). Dark skies within an hour before sunup allow stargazers in this first month of 2024 to conveniently enjoy **Venus,** the brilliant "morning star" shining at mag. –4 in the southeast; **Mercury** to its lower left; **eight to ten stars of first magnitude or brighter scattered across the sky;** and a **waning Moon** Jan. 1-9 (hiding one of those stars on Jan. 8, as described below), and returning for a second morning engagement Jan. 25-Feb. 7.

Ranking next after Venus before dawn are three stars of magnitude zero: **Arcturus** high in the southern sky, **Vega** low in the northeast, and **Capella** very low in the northwest. After January's first few days, although **Mercury** will exceed these stars in brilliance, binoculars will be handy to pick it up low in the glow of twilight.

The ***Big Dipper*** stands high in north to northwest as morning twilight brightens. Its curved handle, extended, leads to **Arcturus** and first-magnitude **Spica** well up in the southern sky. Low in the west-northwest is a pair of stars 4.5° apart, **Pollux** of mag. 1.1, and fainter **Castor** of mag. 1.6. As Earth passes between Sun and these "Twin" stars of Gemini late in January's second week, they're visible all night: Low in ENE at dusk, south of overhead in the middle of the night, and low in WNW at dawn.

On the morning of Jan. 14, Spaceship Earth is heading toward Spica, while Pollux is at opposition to the Sun.

Following Pollux by five weeks, the star **Regulus,** heart of Leo, the Lion, will take its turn at all-night visibility, on night of Feb. 18-19. On January mornings, find 1.4-mag. Regulus in the western sky, 37° upper left of Pollux. You can also find Regulus by imagining the Big Dipper's bowl springing a leak! The watery contents would pour onto Leo and Regulus. On New Year's morning, a 73-percent **waning gibbous Moon** stands 13° upper left of Regulus.

The Moon shifts eastward through the zodiac constellations at an average rate of 13° per day. On mornings of Jan. 4 and 5, about ten days before Earth takes direct aim at Spica, a fat, crescent Moon appears near that same star.

On Jan. 7, the southeast sky hosts a beautiful display: Venus 15° lower left of an 18-percent crescent **Moon,** with the red supergiant star **Antares, heart of the Scorpion,** just 6° lower right of Venus. Binoculars give a striking view of stars in the head of the Scorpion to Moon's lower left, and two third-magnitude stars, the "outworks of the heart", closely flanking Antares. Look 13°-14° lower left of Venus for zero-mag. **Mercury.** Using binoculars, can you spot 1.4-mag. **Mars** very low in twilight, within 9° to Mercury's lower left?

On the next morning, Monday Jan. 8, the Moon and Antares are both 6° to the lower right of Venus, but you may or may not spot Antares very close to the Moon, depending on your exact location and what time you look. That is because **the 11-percent crescent Moon actually occults, or covers Antares, before sunrise from parts of western U.S.!**

Here are two examples: As seen from Palm Springs, the star will be covered by the leading sunlit bright edge of the Moon in a dark sky shortly before 5:39 a.m. PST and reappear along the dark edge of the Moon just before 6:33 a.m., with the Moons dark edge invisible in very bright twilight. Antares will be easily seen in binoculars until a few minutes before immersion, but a telescope will be needed to observe the star at either of the two contact times.

As seen from the vicinity of Reno, Nevada, the star will be covered by the leading sunlit bright edge of the Moon in a dark sky shortly after 5:35 a.m. PST and reappear along the dimly earth lit edge of the Moon just after 6:34 a.m., around the middle of twilight. With an unobstructed view toward the southeast Antares can be seen in binoculars before and just after the occultation, but a telescope will be needed to observe the star at either of the two contact times.

For predictions for other locations, follow these links:

http://lunar-occultations.com/iota/iotandx.htm

http://lunar-occultations.com/iota/bstar/bstar.htm

http://lunar-occultations.com/iota/bstar/0108zc2366.htm

The last link gives times for the disappearance and reappearance of the Jan. 8 occultation of Antares for many locations. Scroll down for U.S. cities. Convert the Universal Times provided in the tables to your own time zone. For example, subtract 8 hours to get Pacific Standard Time; subtract 5 hours to get times for the Eastern Standard Time zone, where the event occurs in the daytime. A blank in the column for Sun's altitude means that the event occurs in a dark sky, with the Sun more than 12° below the horizon. A positive number in that column indicates the event occurs in the daytime.

The second link shows there will be other occultations of interest in parts of U.S. in 2024. Check especially the circumstances for the occultations of Antares visible in U.S., on morning of March 3, and on the night of May 23-24.

On Tuesday morning, Jan. 9, the 5-percent old crescent Moon with Mercury 7° to its upper left appear within 13° lower left of Venus. Antares is now in the clear, 7° to Venus' lower right.

Three planets at dawn: Venus shines at mag. –4 in SE as twilight brightens. Approaching superior conjunction on far side of Sun to be reached on June 4, Venus narrows its distance west (upper right) of rising Sun from 37° to 31° during January. Combined with the Sun-to-Venus line making an ever-smaller angle with horizon this season, Venus drops noticeably lower each month. As Venus recedes from Earth, its phase becomes less impressive, from 78% lit and 14" (arcseconds) across on Jan. 1, to 86%, 12" on Jan. 31. **Follow Venus going 1.2° east per day against background:** 1.0° N of Beta in head of Scorpius on Jan. 1; 6.3° N of Antares on Jan. 7; 3.0° N of Lambda Sagittarii, top of Teapot, on Jan. 28; and 4.0° N of Sigma Sgr in handle, on Feb. 2. Look for **Mercury** in twilight, to lower left of Venus, by 22° on Dec. 30; by 19° on Jan. 1; 15° on Jan. 5; by 13° on Jan. 8; by 11° on Jan. 14-22; and back up to 13° on Jan. 31. Mercury brightens from mag. +1.0 on Dec. 30, to +0.4 on Jan. 1; to mag. 0.0 on Jan. 4; then slowly to mag. –0.3 by Jan. 31. Mercury climbs highest in twilight around Jan. 8 and reaches greatest elongation, 23.5° W of Sun, on Jan. 12. **Use binoculars to locate faint, gradually emerging Mars** (mag. +1.4), 5.0° below Mercury on Dec. 30, and then to Mercury's lower left through Jan. 26. Mars reaches max. dist. 8.6° lower left of Mercury on Jan. 7-8. On Jan. 27, Mars appears only ¼° to lower right of Mercury. Thereafter Mars appears to Mercury's upper right as our solar system's innermost planet drops away toward superior conjunction on far side of Sun in late February.

The graph below, plotting the planets' rising times in relation to sunrise during Venus' morning apparition in 2023-24, makes it easy to know when to look for the planets. For example, Venus quickly emerged into the eastern morning sky in late August 2023, put on a spectacular predawn show in following months, and will sink deep into morning twilight in March 2024. Mercury has a fine apparition in late December through most of January. Mars very slowly emerges into the morning sky beginning in January 2024, finally rising before the start of twilight in May. Saturn becomes easy to see in April, and Jupiter in June.

[See illustration: VenusAsMorningStar2023-24JeffHunt.pdf]

Evening sky (planets, Moon, and stars) in January 2024:

[See evening twilight sky map N202401P.pdf.]

At dusk, **Jupiter** shines at mag. –2.6 to –2.4, in Aries, high in SE to SSW. **Saturn,** at mag. +0.9 to +1.0 in Aquarius, sinks through SW toward WSW horizon. **Saturn's rings** look "skinny" now, only 9.1° to 7.7° from edge-on. In the morning sky during spring 2025, they'll be presented edgewise in turn to Earth and Sun and will disappear. **New Moon** occurs on Jan. 11 at 3:57 a.m. PST, setting up an easy view of a 4-percent young crescent Moon within 38 hours later, low in SW to WSW at dusk on Jan. 12. The **waxing Moon** skips past Saturn Jan. 13-14, and past Jupiter Jan. 17-18. On Feb. 20, the gibbous Moon passes a wide 9° N of **Aldebaran,** eye of Taurus and follower of the Pleiades. Approaching Full, the Moon skips past **Castor** and **Pollux** Jan. 23-24.

Evening stars: The ***Summer Triangle*** of **Vega, Deneb** and **Altair** is visible at dusk through midmonth. Before Altair, its southernmost member, sets just north of west, check the east-southeast for the rising of **Sirius,** the Dog Star. (You'll need unobstructed views in both directions.) To find Sirius, extend Orion's belt downward toward the horizon. To the left of Sirius and a little higher, look for **Procyon,** the "before the dog" or "little dog" star, and **Betelgeuse,** Orion's shoulder, forming the nearly equilateral ***Winter Triangle*** with the two dog stars. After Sirius rises and before Altair sets, the six stars of the Summer and Winter Triangles, plus five additional stars of first magnitude or brighter (totaling 11) are visible simultaneously.

After passing Full on Jan. 25, the Moon rises later in evening and returns to the morning sky. Find the waning gibbous Moon at dawn, near Regulus on Jan. 27 and near Spica on Feb. 1.

Sky Maps for Observing Planets and Bright Stars During Twilight,
February through July 2024

When organizing a first sky watching session for students, we suggest that you begin your outdoor session during evening twilight, so students can experience the joy of discovering and identifying the brighter stars as they first appear. Begin your session no later than one-half hour after sunset, or even earlier when the Moon or bright planets are visible and continue until you have enough dark-sky time to observe the deep sky objects on your list.

If you also schedule a predawn session, allow time to observe a selection of deep sky objects before twilight begins. Start the session at least 1-3/4 to 2 hours before sunrise and continue long enough into twilight to watch some of the brighter stars disappear.

My friend and former colleague at Michigan State University, Mr. Robert D. Miller, has kindly created computer programs and provided us with monthly sky charts tracking daily locations of the five naked-eye planets and the 15 stars of first magnitude or brighter visible from latitude 40° north. The star Castor, of mag. +1.6, is also plotted, to help identify his brighter Gemini Twin, 1.1-mag. Pollux, just 4.5° away.

Positions of the stars and planets are plotted each day at the moment the Sun is 9° below the horizon, which we have called "mid-twilight". Positions of the stars and planets are plotted each day at the moment the Sun is 9° below the horizon, which we have called "mid-twilight". Locations of the planets are plotted as a separate dot for each day, with larger dots plotted weekly on the 1st, 8th, 15th, 22nd, and 29th day of the month. Star positions during the course of the month are plotted as continuous tracks, with all stars drifting westward (left to right on the charts) in the course of the month, owing to the Earth's revolution around the Sun.

For latitude 40° N, the moment of evening mid-twilight during the course of the year occurs 43 to 53 minutes after sunset, and morning mid-twilight occurs a similar interval ahead of sunrise. For locations south of lat. 40° N, the same stage of twilight occurs closer to sunset and sunrise, and for locations farther north, twilights are longer.

Sometimes a star is below the horizon at the start of a month but might appear above the eastern horizon before month's end. For example, Regulus first appears above the ENE horizon in evening mid-twilight in early February and climbs higher for the rest of the month. On the same chart, Saturn appears in the western sky at mid-twilight until about mid-month.

Here are the maps, two for each month. You might enjoy inspecting the pair of maps for each month, or viewing all the monthly evening maps in order, and then all the monthly morning maps in order.

During the first four months of 2024, several conjunctions of planets will occur low in twilight, and binoculars will be very useful to observe them. Inspect the morning maps, looking for these pairings: Mercury-Mars within 0.3° on Jan. 27; Venus-Mars 0.6° apart on Feb. 22; Venus-Saturn within 0.6° apart on Mar. 21 (on horizon, or just below it, at morning mid-twilight); and Mars-Saturn 0.5° apart on Apr. 20.

The most impressive naked-eye planet pair in 2024 will be Mars-Jupiter 0.3° apart, high in the southern sky as morning twilight begins on August 14.

Month	Evening Twilight	Morning Twilight
February 2024	N202402P.pdf	N202402A.pdf
March 2024	N202403P.pdf	N202403A.pdf
April 2024	N202404P.pdf	N202404A.pdf
May 2024	N202405P.pdf	N202405A.pdf
June 2024	N202406P.pdf	N202406A.pdf
July 2024	N202407P.pdf	N202407A.pdf

The Abrams Planetarium *Sky Calendar* is available by subscription from www.abramsplanetarium.org/skycalendar/ Each monthly issue consists of a calendar page illustrating events such as mentioned in this article, and an evening sky map. For $12 per year, subscribers receive quarterly mailings, each containing three monthly issues. **Please consider purchasing gift subscriptions for your sky-watching friends.**

Robert C. Victor originated the Abrams Planetarium monthly *Sky Calendar* in October 1968 and still helps to produce an occasional issue. He enjoys being outdoors sharing the beauty of the night sky and other wonders of nature.

Robert D. Miller, who provided the evening and morning twilight charts, did graduate work in Planetarium Science, and later astronomy and computer science at Michigan State University, and remains active in research and public outreach in astronomy.

Dr. Jeffrey L. Hunt, who provided the graph of planet rising and setting times for the Venus morning apparition from August 2023 into Spring 2024, is a retired planetarium director now living in the Chicago area. He has taught astronomy and sky watching to people of all ages. He studied astronomy education at Abrams Planetarium at Michigan State University. Jeffrey writes an astronomy blog at jeffreylhunt.wordpress.com and can be followed on Twitter at @jeff_hunt.