

December Celestial Calendar

All times, unless otherwise noted, are UT (subtract five hours and, when appropriate, one calendar day for EST)

12/1 Asteroid 349 Dembowska (magnitude +9.6) is at opposition at 13:00

12/2 The Moon is 9.0 degrees south-southeast of the bright open cluster M45 (the Pleiades or Subaru) in Taurus at 22:00

12/3 Mercury is stationary in right ascension at 8:00; Neptune is at eastern quadrature at 12:00; the Moon is 0.8 degree north of the first-magnitude star Aldebaran (Alpha Tauri), with an occultation taking place in northwestern North America, northern Greenland, and central and northern Asia, at 13:00; Full Moon (known as the Before Yule, Cold, Long Nights, and Oak Moon), the largest of the year, occurs at 15:47

12/4 The earliest end of evening twilight at 40 degrees north takes place today; the Moon is at perigee, subtending 33' 26" from a distance of 357,492 kilometers (222,135 miles), at 8:46

12/5 The Moon is 4.5 degrees south of the bright open cluster M35 in Gemini at 1:00; the Moon is at its northernmost declination for 2017 at 12:00

12/6 The Moon is 1.1 degrees north of the asteroid 8 Flora at 2:00; the Moon is 8.7 degrees south of the first-magnitude star Pollux (Beta Geminorum) at 11:00

12/7 Mercury is 1.2 degrees south-southwest of Saturn at 2:00; the Moon is 2.1 degrees south of the bright open cluster M44 (the Beehive Cluster or Praesepe) in Cancer at 9:00; the earliest sunset at latitude 40 degrees north occurs at 16:35; Mercury is at the ascending node through the ecliptic plane at 20:00

12/8 The Moon is at the ascending node (longitude 136.9 degrees) at 0:39; the Moon is 0.7 degree north-northeast of the first-magnitude star Regulus (Alpha Leonis), with an occultation taking place in northern Micronesia, northern Asia, northern Greenland, and northeastern and central Europe, at 23:00

12/9 Venus is 5.0 degrees north of the bright first-magnitude star Antares (Alpha Scorpii) at 11:00

12/10 Last Quarter Moon occurs at 7:51

12/12 The Curtiss Cross, an X-shaped clair-obscure illumination effect located between the craters Parry and Gambart, is predicted to be at a midpoint at 2:00; Mercury is at perihelion (0.3075 astronomical units from the Sun) at 12:00

12/13 Mercury is in inferior conjunction (1.72 degrees north of the Sun) at 2:00; the Moon is 6.8 degrees north-northeast of the first-magnitude star Spica at 2:00; the Moon is 4.0 degrees north of Mars at 16:00

12/14 The peak of the Geminid meteor shower (100 to 120 per hour) occurs at 7:00; the Moon is 4.0 degrees north of Jupiter at 14:00; the Moon is 0.2 degree south of asteroid 4 Vesta, with an occultation occurring in parts of Chile and Argentina, and in central Polynesia, at 19:00

12/15 Mercury is 2.2 degrees north of Venus at 12:00

12/16 The Moon is 9.2 degrees north of Antares at 22:00

12/17 Asteroid 20 Massalia (magnitude +8.4) is at opposition at 8:00; the Moon is 1.7 degrees north of Mercury at 9:00; the Moon is 4.1 degrees north of Venus at 19:00

12/18 New Moon (lunation 1175) occurs at 6:30; the Sun enters Sagittarius (ecliptic longitude 266.59 degrees) at 8:00; the Moon is 2.8 degrees north of Saturn at 14:00

12/19 The Moon is at apogee, subtending 29' 23" from a distance of 406,603 kilometers (252,651 miles), at 1:26; the Moon is at its southernmost declination for 2017 at 10:00

12/20 Venus is at the descending node through the ecliptic plane at 0:00; the Moon displays minimum libration for 2017 at 15:00

12/21 Winter solstice in the northern hemisphere occurs at 16:28; Saturn is in conjunction with the Sun at 21:00; asteroid 1 Ceres is stationary in right ascension at 21:00

12/22 The Moon is at the descending node (longitude 315.7 degrees) at 10:08; the peak of the Ursid meteor shower (10 per hour) occurs at 15:00; Mercury is at its greatest latitude north of the ecliptic plane (7.0 degrees) at 17:00

12/23 Mercury is stationary in right ascension at 3:00

12/24 Mercury (magnitude +0.2) is 8.1 degrees north-northeast of Antares at 1:00; asteroid 2 Pallas is stationary at 6:00; the Moon is 1.4 degrees south-southeast of Neptune at 14:00
12/25 The equation of time equals 0 at 4:00; the Lunar X (the Purbach or Werner Cross), an X-shaped clair-obscur illumination effect involving various rims and ridges between the craters La Caille, Blanchinus, and Purbach, is predicted to occur at 14:50; Venus is 1.1 degrees south of Saturn at 17:00
12/26 First Quarter Moon occurs at 9:20
12/27 The Moon displays maximum libration for 2017 at 19:00; the Moon is 4.3 degrees south-southeast of Uranus at 21:00
12/28 Venus is at its greatest southern declination (-23.7 degrees) for 2017 at 11:00
12/30 The Moon is 9.1 degrees south-southeast of M45 at 9:00
12/31 The Moon is 0.74 degree north-northwest of Aldebaran, with an occultation taking place in western Russia, most of Europe, Greenland, and most of North America, at 1:00

Tycho Brahe, Johannes Kepler, Isaac Newton, E. E. Barnard, and Arthur Eddington were born in December.

Giovanni Cassini discovered the Saturnian satellite Rhea on December 23, 1672. The bright galaxies M81 and M82 in Ursa Major were discovered by Johann Bode on December 31, 1774. Caroline Herschel discovered Comet 35P/Herschel-Rigoliet on December 21, 1788. 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.

The peak of Geminid meteor shower occurs on the morning of December 14th and is not adversely affected by moonlight from a slim waning crescent Moon. The Geminids, which are associated with the Palladian asteroid, or possible cometary nucleus, 3200 Phaethon, have become the most reliable meteor shower of the year. Geminid meteors appear to originate from a radiant that's just northwest of Castor (Alpha Geminorum). That radiant lies almost at the zenith at 2:00 a.m. local time. Geminid meteors travel at a relatively slow speed of 35 kilometers per second (22 miles per second). The Ursids, a normally minor meteor shower, peak on the morning of December 22nd. The radiant is located close to Kochab (Beta Ursa Minoris), some 15 degrees from the north celestial pole. See <http://earthsky.org/astronomy-essentials/earthskys-meteor-shower-guide#geminids> and <https://www.imo.net/resources/calendar/> for additional information on the Geminids and http://www.popastro.com/meteor/activity/activity.php?id_pag=386 and <https://www.imo.net/resources/calendar/> for more on the Ursids.

Information on Iridium satellite flares and passes of the ISS, the Tiangong-1, the X-37B, the HST, and other satellites can be found at <http://www.heavens-above.com/>

The Moon is 12.5 days old, is illuminated 90.0%, subtends 32.9 arc minutes, and is located in Cetus on December 1st at 0:00 UT. Large tides will take place following Full Moon on December 3rd. Due to the position of the ecliptic, the Moon reaches its highest point in the sky for the year in December. It attains its greatest northern declination (+19.5 degrees) for the month on December 5th and its greatest southern declination (-19.6 degrees) on December 19th. Longitudinal libration is at a maximum of +7.4 degrees on December 11th and a minimum of -7.9 degrees on December 27th. Latitudinal libration is at a maximum of +6.6 degrees on December 2nd and +6.7 degrees on December 29th and a minimum of -6.7 degrees on December 15th. The largest Full Moon of the year (apparent size 33' 05"), a perigean Full Moon or so-called supermoon, occurs on December 3rd. New Moon occurs on December 18th. From certain parts of the world, the Moon occults Aldebaran on December 3rd, Regulus on December 8th, Vesta on December 14th, and Aldebaran once again on December 31st. Consult <http://www.lunar-occultations.com/iota/iotandx.htm> for more on these events. Visit

<http://saberdoesthestars.wordpress.com/2011/07/05/saber-does-the-stars/> for tips on spotting extreme crescent Moons and <http://www.curtrenz.com/moon.html> for Full Moon data. Browse http://www.cambridge.org/features/turnleft/the_moon.htm and <http://www.shallowsky.com/moon/> for information on various lunar features. Times and dates for the lunar crater light rays predicted to occur this month are available at <http://www.lunar-occultations.com/rlo/rays/rays.htm>

The Sun is located in Ophiuchus, a non-traditional constellation of the zodiac, on December 1st. Sol enters Sagittarius on December 18th. Winter solstice for the northern hemisphere occurs when the Sun is farthest south for the year on December 21st. It is the shortest "day" of the year (9 hours and 20 minutes) at latitude 40 degrees north.

Brightness, apparent size, illumination, distance from the Earth in astronomical units (a.u.), and location data for the planets and Pluto on December 1st: Mercury (magnitude -0.1, 7.8", 40% illuminated, 0.86 a.u., Sagittarius), Venus (magnitude -3.9, 9.9", 99% illuminated, 1.68 a.u., Libra), Mars (magnitude +1.7, 4.2", 95% illuminated, 2.21 a.u., Virgo), Jupiter (magnitude -1.7, 31.4", 100% illuminated, 6.29 a.u., Libra), Saturn (magnitude +0.5, 15.1", 100% illuminated, 10.99 a.u., Sagittarius), Uranus (magnitude +5.7, 3.6", 100% illuminated, 19.39 a.u. on December 16th, Pisces), Neptune (magnitude +7.9, 2.3", 100% illuminated, 30.14 a.u. on December 16th, Aquarius), and Pluto (magnitude +14.3, 0.1", 100% illuminated, 34.37 a.u. on December 16th, Sagittarius).

During the evening, Mercury and Saturn can be found in the southwest, Uranus in the southeast, and Neptune in the south. Uranus is in the west at midnight. In the morning, Mercury, Venus, Mars, and Jupiter are located in the southeast.

During the first week of December, Mercury can be found very low in the southwestern sky. By the end of the month, it will be visible in the southeast at dawn. The speediest planet is stationary and begins retrograde (westward) motion on December 3rd. It is at the ascending node on December 7th, enters Ophiuchus on December 8th, reaches perihelion on December 12th, is in inferior conjunction on December 13th, and is at its greatest heliocentric latitude north on December 22nd.

Venus can be seen in the southeast during bright morning twilight in early December and then disappears into the glare of the Sun. The brightest planet is at descending node on December 19th.

Mars is four degrees south of the Moon on December 13th. It departs Virgo and enters Libra on December 21st. Mars and Jupiter are situated approximately 1.5 degrees to either side of the third-magnitude binary star Alpha Librae (Zubenelgenubi) on the morning of December 31st. The Red Planet grows to 4.8 arc seconds in apparent size and brightens to magnitude +1.5 by the end of the month.

Jupiter rises at approximately 4:30 a.m. local time on December 1st. It increases in apparent size from 31.4 arc seconds to 33.0 arc seconds this month. The gas giant lies 4.0 degrees south of the waning crescent Moon on December 14th. Jupiter passes less than one degree north of Zubenelgenubi on December 20th. Click on <http://www.skyandtelescope.com/observing/interactive-sky-watching-tools/> to determine transit times of the central meridian by the Great Red Spot. Data on Galilean satellite positions and events is available online at <http://www.skyandtelescope.com/observing/interactive-sky-watching-tools/> and <http://www.nakedeyeplanets.com/jupiter.htm#jupmoons> and on page 51 of the December 2017 issue of *Sky & Telescope*.

Saturn lies about five degrees above the southwestern horizon just after sunset on December 1st. Mercury and Saturn are situated within three degrees of each other on that date. The Ringed Planet is in conjunction with the Sun on December 21st and will reappear in the morning sky in January.

Uranus sets after midnight local time. During December, Uranus (magnitude +5.8) is positioned one degree northwest of a trapezoid-shaped asterism consisting of sixth and seventh-magnitude stars which is located half-way between Omicron Piscium (magnitude +4.3) and Mu Piscium (magnitude +4.8). Uranus is 4.3 degrees north-northwest of the Moon on December 27th. Browse <http://bluewaterastronomy.info/resources/uranus-finder-chart-2017.png> for a finder chart.

Neptune sets by midnight local time in early December. During the first half of the month, it's positioned 0.6 degree south of the fourth-magnitude star Lambda Aquarii. By month's end, Neptune has moved to a location 0.5 degree southeast of Lambda Aquarii. The ice giant is at eastern quadrature on December 3rd. The Moon passes 1.4 degrees south-southeast of Neptune on December 24th. A finder chart is posted at <http://bluewaterastronomy.info/resources/neptune-finder-chart-2017.png>

Additional online finder charts for Uranus and Neptune can be found at <http://www.nakedeyepanets.com/uranus.htm> and <http://www.nakedeyepanets.com/neptune.htm> and also at http://www.cdn.skyandtelescope.com/wp-content/uploads/WEB_Uranus_Neptune17.pdf

Click on <http://www.skyandtelescope.com/observing/interactive-sky-watching-tools/> for JavaScript utilities that will illustrate the positions of the five brightest satellites of Uranus and the position of Triton, Neptune's brightest satellite.

The dwarf planet Pluto will not be visible again until next year.

For more on the planets and how to locate them, see <http://www.nakedeyepanets.com/>

C/2016 R2 (PanSTARRS) may reach eleventh magnitude as it travels northwestward through Orion. This Oort Cloud comet lies within one degree of the fourth-magnitude star Pi2 Orionis as it crosses the orbital plane of the Earth on December 12th and December 13th. On December 15th and December 16th, it passes about two degrees southwest of the open cluster NGC 1662. Visit <http://cometchasing.skyhound.com/> and <http://www.aerith.net/comet/future-n.html> for information on comets that are potentially visible this month.

Asteroid 7 Iris dims from magnitude +7.7 to magnitude +8.5 as it glides southeastward through Aries this month. It lies less than one degree southeast of the sixth-magnitude star 4 Arietis on December 1st. Asteroid 349 Dembowska (magnitude +9.6) is at opposition in Taurus on December 1st. Asteroid 20 Massalia (magnitude +8.4) is at opposition, the fourth brightest asteroidal opposition of 2017, in Taurus on December 17th. The so-called rock comet 3200 Phaethon, the source of the Geminid meteor shower, will pass exceptionally close to the Earth, about 10,312,000 kilometers (6,407,000 miles), on December 16th. The asteroid will shine at approximately eleventh-magnitude on closest approach and will be in the vicinity of the second-magnitude star Alpheratz (Alpha Andromedae) in Pegasus. Browse <https://www.virtualtelescope.eu/2017/11/21/unique-asteroid-3200-phaethon-bright-2017-apparition/> for more on this event. For information on this year's bright asteroids and upcoming asteroid occultation events, consult <http://www.curtrenz.com/asteroids.html> and <http://asteroidoccultation.com/> respectively.

A wealth of information on solar system celestial bodies is posted at <http://www.curtrenz.com/astronomy.html> and <http://nineplanets.org/>

Free star maps for this month can be downloaded at <http://www.skymaps.com/downloads.html> and <http://www.telescope.com/content.jsp?pageName=Monthly-Star-Chart>

The famous eclipsing variable star Algol (Beta Persei) is at a minimum, decreasing in magnitude from +2.1 to +3.4, on December 1st, 3rd, 6th, 9th, 12th, 15th, 18th, 21st, 24th, 26th, and 29th. On December 17th (December 18th UT) and December 20th (December 21st UT), Algol is at minimum brightness for approximately two hours and is well-placed for observers in North America. Consult page 49 of the December 2017 issue of *Sky & Telescope* for the times of the eclipses. For more on Algol, see <http://stars.astro.illinois.edu/sow/Algol.html> and <http://www.solstation.com/stars2/algol3.htm>

Data on current supernovae can be found at <http://www.rochesterastronomy.org/snimages/>

Information on observing some of the more prominent Messier galaxies is available at <http://www.cloudynights.com/topic/358295-how-to-locate-some-of-the-major-messier-galaxies-and-helpful-advice-for-novice-amateur-astronomers/>

Finder charts for the Messier objects and other deep-sky objects are posted at <https://freestarcharts.com/messier> and <https://freestarcharts.com/ngc-7023> and http://www.cambridge.org/features/turnleft/seasonal_skies_october-december.htm

Telrad finder charts for the Messier Catalog and the SAC's 110 Best of the NGC are posted at http://www.astro-tom.com/messier/messier_finder_charts/map1.pdf and <http://www.saguaroastro.org/content/db/Book110BestNGC.pdf> respectively.

Deep-sky object list generators can be found at <https://dso-browser.com/> and <http://www.virtualcolony.com/sac/> and <http://tonightssky.com/MainPage.php>

Freeware sky atlases can be downloaded at <http://www.deepskywatch.com/files/deepsky-atlas/Deep-Sky-Hunter-atlas-full.pdf> and <https://www.uv.es/jrtorres/triatlas.html>

One hundred and five binary and multiple stars for December: Gamma Andromedae, 59 Andromedae, Struve 245 (Andromeda); Struve 362, Struve 374, Struve 384, Struve 390, Struve 396, Struve 400, Struve 19, Otto Struve 67 (Camelopardalis); Struve 191, Struve Iota Cassiopeiae, Struve 263, Otto Struve 50, Struve 283, Struve 284 (Cassiopeia); 61 Ceti, Struve 218, Omicron Ceti, Struve 274, Nu Ceti, h3511, 84 Ceti, h3524, Lambda Ceti, Struve 330 (Cetus); h3527, h3533, Theta Eridani, Rho Eridani, Struve 341, h3548, h3565, Tau-4 Eridani, Struve 408, Struve 411, h3589, h3601, 30 Eridani, 32 Eridani (Eridanus); h3478, h3504, Omega Fornacis, Eta-2 Fornacis, Alpha Fornacis, See 25, Xi-3 Fornacis, h3596 (Fornax); Struve 268, Struve 270, h1123, Otto Struve 44, h2155, Nu Persei, Struve 297, Struve 301, Struve 304, Eta Persei, Struve 314, Otto Struve 48, Tau Persei, Struve 331, Struve 336, Es588, Struve 352, Struve 360, Struve 369, Struve 382, Struve 388, Struve 392, Struve 410, Struve 413, Struve 425, Otto Struve 59, Struve 426, 40 Persei, Struve 434, Struve 448, Es277, Zeta Persei, Struve 469, Epsilon Persei, Es878 (Perseus); Struve 399, Struve 406, Struve 401, Struve 422, Struve 430, Struve 427, Struve 435, 30 Tauri (Taurus); Epsilon Trianguli, Struve 219, Iota Trianguli, Struve 232, Struve 239, Struve 246, 10 Trianguli, Struve 269, h653, 15 Trianguli, Struve 285, Struve 286, Struve 310 (Triangulum)

Notable carbon star for December: U Camelopardalis

One hundred deep-sky objects for December: NGC 891 (Andromeda); IC 342, K6, St23, Tom 5 (Camelopardalis); Be65, IC 1848, K4, Mel15, NGC 896, NGC 1027, St2, Tr3 (Cassiopeia); M77, NGC 788, NGC 835, NGC 864, NGC 908, NGC 936, NGC 955, NGC 958, NGC 1015, NGC 1016, NGC 1022, NGC 1042, NGC 1052, NGC 1055, NGC 1087, NGC 1094 (Cetus); IC 2006, NGC 1084, NGC 1140, NGC 1187, NGC 1199, NGC 1209, NGC 1232, NGC 1291, NGC 1300, NGC 1309, NGC 1332, NGC 1337, NGC 1353, NGC 1357, NGC 1395, NGC 1400, NGC 1407, NGC 1421, NGC 1426, NGC 1440, NGC 1452, NGC 1453, NGC 1461 (Eridanus); NGC 1079, NGC 1097, NGC 1201, NGC 1292, NGC

1316 (Fornax I Galaxy Cluster), NGC 1317, NGC 1326, NGC 1344, NGC 1350, NGC 1360, NGC 1365, NGC 1371, NGC 1374, NGC 1379, NGC 1380, NGC 1381, NGC 1387, NGC 1398, NGC 1404, NGC 1406, NGC 1425 (Fornax); Bas10, Cz8, IC 351, IC 2003, K5, Mel 20, M34, NGC 869, NGC 884, NGC 957, NGC 1023, NGC 1058, NGC 1161, NGC 1245, NGC 1275 (Perseus I Galaxy Cluster), NGC 1333, NGC 1342, NGC 1444, Tr2 (Perseus); M45 (Taurus); NGC 777, NGC 784, NGC 890, NGC 925, NGC 949, NGC 959, NGC 978A/B (Triangulum)

Top ten binocular deep-sky objects for December: M34, M45, Mel15, Mel20, NGC 869, NGC 884, NGC 1027, NGC 1232, St2, St23

Top ten deep-sky objects for December: M34, M45, M77, NGC 869, NGC 884, NGC 891, NGC 1023, NGC 1232, NGC 1332, NGC 1360

Challenge deep-sky object for December: vdB14 (Camelopardalis)

The objects listed above are located between 2:00 and 4:00 hours of right ascension.