

October Celestial Calendar by Dave Mitsky

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

- 10/2 The Moon is at the descending node (longitude 323.4 degrees) at 2:06
- 10/3 Venus is at perihelion (0.7184 astronomical units from the Sun) at 5:00
- 10/5 Full Moon, known as the Blood Moon and this year's Harvest Moon, occurs at 18:46
- 10/6 Uranus is 4.0 degrees north-northwest of the Moon at 19:00
- 10/7 Mars is at aphelion (1.6661 astronomical units from the Sun) at 22:00
- 10/8 The peak of the Draconid meteor shower (10 to 30 per hour) occurs at 9:00; Mercury is in superior conjunction with the Sun at 21:00
- 10/9 The Moon is 9.1 degrees south-southeast of the bright open cluster M45 (the Pleiades or Subaru) in Taurus at 2:00; the Moon is at perigee, subtending 32' 34" from a distance of 366,856 kilometers (227,954 miles), at 5:33; the Moon is 0.6 degree north of the first-magnitude star Aldebaran (Alpha Tauri), with an occultation taking place in northwestern Canada, Alaska, and central and northeastern Asia, at 19:00
- 10/11 The Moon is 4.8 degrees south of the bright open cluster M35 in Gemini at 8:00
- 10/12 The Moon is 1.5 degrees north of asteroid 8 Flora at 0:00; Last Quarter Moon occurs at 12:25; the Moon is 9.2 degrees south of the first-magnitude star Pollux (Beta Geminorum) at 21:00
- 10/13 Mercury is 2.7 degrees north-northeast of the first-magnitude star Spica (Alpha Virginis) at 20:00; the Moon is 2.6 degrees south of the bright open cluster M44 (the Beehive Cluster or Praesepe) in Cancer at 20:00; the Curtiss Cross, an X-shaped illumination effect located between the craters Parry and Gambart, is predicted to be at a midpoint at 22:14
- 10/14 The Moon is at the ascending node (longitude 142.6 degrees) at 22:11
- 10/15 The Moon is 0.2 degree north of the first-magnitude star Regulus (Alpha Leonis), with an occultation taking place in western Africa, Cape Verde, most of the Caribbean, and most of North America, at 11:00
- 10/17 Mars is 1.7 degrees south-southwest of the Moon at 11:00
- 10/18 Venus is 1.9 degrees south-southwest of the Moon at 2:00; Mercury is 0.93 degree south-southwest of Jupiter at 8:00
- 10/19 Mercury is at the descending node through the ecliptic plane at 3:00; the Moon is 6.5 degrees north-northeast of Spica at 14:00; Uranus (magnitude +5.7, apparent size 3.7") is at opposition at 18:00; New Moon (lunation 1173) occurs at 19:12
- 10/20 Jupiter is 3.7 degrees south-southwest of the Moon at 5:00; Mercury is 5.0 degrees south-southwest of the Moon at 11:00
- 10/21 The peak of the Orionid meteor shower (15 per hour) occurs at 12:00
- 10/23 The Moon is 9.3 degrees north of the first-magnitude star Antares (Alpha Scorpii) at 8:00; Mars (heliocentric longitude 163.1 degrees) and Neptune (heliocentric longitude 343.1 degrees) are at heliocentric opposition at 10:00
- 10/24 Saturn is 3.2 degrees south of the Moon at 12:00; Venus is at its greatest latitude north of the ecliptic plane (3.4 degrees) at 23:00
- 10/25 The Moon is at apogee, subtending 29' 29" from a distance of 405,152 kilometers (251,750 miles), at 2:00
- 10/26 Jupiter is in conjunction with the Sun at 18:00; Mars crosses the celestial equator and enters the southern celestial hemisphere at 23:00
- 10/27 The Lunar X, also known as the Purbach or Werner Cross, an X-shaped illumination effect involving various rims and ridges between the craters La Caille, Blanchinus, and Purbach, is predicted to occur at 10:51; First Quarter Moon occurs at 22:22; Comet 96P/Machholz is at perihelion (0.1239 astronomical units from the Sun) at 23:00
- 10/28 Asteroid 2 Pallas (magnitude +8.3) is at opposition at 16:00

10/29 The Moon is at the descending node (longitude 321.1 degrees) at 6:43; Mercury is at aphelion (0.4667 astronomical units from the Sun) at 12:00; asteroid 7 Iris (magnitude +6.9) is at opposition at 14:00

10/30 Neptune is 0.84 degree north-northwest of the Moon, with an occultation taking place in far southern Africa and most of Antarctica, at 21:00

10/31 The Sun enters Libra (longitude 217.78 degrees on the ecliptic)

Ejnar Hertzsprung and Henry Norris Russell were born this month.

The first recorded solar eclipse took place on October 22, 2136 BCE. Supernova SN 1604 (Kepler's Supernova) became visible to the naked-eye on October 9, 1604. Giovanni Cassini discovered Saturn's odd satellite Iapetus on October 25, 1671. M51a (the Whirlpool Galaxy) was discovered by Charles Messier on October 13, 1773. William Lassell discovered Triton, Neptune's brightest satellite, on October 10, 1846. Marie Mitchell discovered Comet C/1847 T1 (Miss Mitchell's Comet) on October 1, 1847. Asteroid 8 Flora was discovered by John Russell Hind on October 18, 1847. Two of the satellites of Uranus, Ariel and Umbriel, were discovered by William Lassell on October 24, 1851. Edwin Hubble discovered Cepheid variable stars in M31 (the Andromeda Galaxy) on October 5, 1923. Charles Kowal discovered 2060 Chiron, the first Centaur asteroid, on October 18, 1977. Michel Mayor and Didier Queloz announced the discovery of the exoplanet 51 Pegasi b (Dimidium) on October 6, 1995.

The Draconid (formerly the Giacobinid) meteor shower peaks on October 8th. The Draconids are quite variable and have produced meteor storms in 1933 and 1946. Comet 21P/Giacobini-Zimmer is the parent comet of the Draconids. Consult <http://earthsky.org/astronomy-essentials/everything-you-need-to-know-draconid-meteor-shower> for additional information on the Draconid meteor shower. The Southern Taurid shower, debris from Comet 2P/Encke, may produce five meteors per hour when it peaks on October 10th. The Orionid meteor shower peaks on the night of October 21st. Orionid meteors are fragments of Comet 1P/Halley. Browse <http://www.timeanddate.com/astronomy/meteor-shower/orionid.html> or <http://earthsky.org/astronomy-essentials/everything-you-need-to-know-orionid-meteor-shower> for more on the Orionids.

Information on Iridium flares and passes of the ISS, the Tiangong-1, the Tiangong-2, the USAF's X-37B, the HST, and other satellites can be found at <http://www.heavens-above.com/>

The zodiacal light may be visible in the pre-dawn eastern sky from a dark site after October 15th. Articles on the zodiacal light appear at <http://www.atoptics.co.uk/highsky/zod1.htm> and <http://earthsky.org/astronomy-essentials/everything-you-need-to-know-zodiacal-light-or-false-dawn>

The Moon is 10.8 days old, subtends 30.4 arc minutes, is illuminated 76.4%, and is located in Virgo on October 1st at 0:00 UT. The Moon reaches its greatest northern declination (+19.6 degrees) on October 12th and its greatest southern declination (-19.7 degrees) on October 26th. Longitudinal libration is at a maximum of +5.2 degrees on October 17th and a minimum of -5.5 degrees on October 4th and -6.7 degrees on October 31st. Latitudinal libration is at a maximum of +6.6 degrees on October 9th and a minimum of -6.6 degrees on October 22nd. The waxing gibbous Moon occults Neptune from certain parts of the world on October 3rd. The waning gibbous Moon occults Aldebaran from certain parts of the world on October 9th. The waning crescent Moon occults Regulus from most of North America on the morning of October 15th. The waxing gibbous Moon occults Neptune again from certain parts of the world on October 30th. Consult <http://www.lunar-occultations.com/iota/planets/planets.htm> and <http://www.lunar-occultations.com/iota/bstar/bstar.htm> for further information 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/moon06.html> for Full Moon data. Times and dates for the

lunar light rays predicted to occur in October are available at <http://www.lunar-occultations.com/rlo/rays/rays.htm>

The Sun is located in Virgo on October 1st at 0:00 UT. It enters Libra at 0:00 UT on October 31st.

Brightness, apparent size, illumination, distance from the Earth in astronomical units, and location data for the planets and Pluto on October 1st: Mercury (magnitude -1.4, 5.0", 98%, 1.34 a.u., Virgo), Venus (magnitude -3.9, 11.2", 91%, 1.50 a.u., Leo), Mars (magnitude +1.8, 3.7", 99%, 2.55 a.u., Leo), Jupiter (magnitude -1.7, 30.9", 100%, 6.37 a.u., Virgo), Saturn (magnitude +0.5, 16.2", 100%, 10.29 a.u., Ophiuchus), Uranus (magnitude +5.7, 3.7", 100%, 18.92 a.u. on October 16th, Pisces), Neptune (magnitude +7.8, 2.3", 100%, 29.19 a.u. on October 16th, Aquarius), and Pluto (magnitude +14.2, 0.1", 100%, 33.51 a.u. on October 16th, Sagittarius).

Mercury is in superior conjunction with the Sun on October 7th. It reenters the evening sky in late October and reaches perihelion on October 29th. Mercury decreases in apparent size and magnitude this month.

During October, Venus grows a bit less prominent in the morning sky as it heads sunward. On October 5th, Venus and Mars enter into a close conjunction. Venus lies about two degrees south of the Moon on October 18th.

Mars is visible at dawn. It reaches aphelion on October 7th. The Red Planet exits Virgo and enters Leo on October 12th. Mars and Neptune are at heliocentric opposition on October 23rd.

Jupiter lies very low in the southwestern sky in early October. Jupiter is in conjunction with the Sun on October 26th.

Saturn is low in the southwest in early evening. It lies south of the waxing crescent Moon on October 23rd.

Uranus reaches opposition on October 19th. At that time, the seventh planet is located at a declination of +9.6 degrees, shines at magnitude +5.7, subtends 3.7 arc seconds, and is 2.6 light-hours (2.9 billion kilometers or 1.8 billion miles) from the Earth. At the time of opposition, it is located about two degrees west-northwest of the fourth-magnitude star Omicron Piscium. Browse <http://bluewaterastronomy.info/resources/uranus-finder-chart-2017.png> for a finder chart.

Neptune is occulted by the waxing gibbous Moon from certain parts of the world on October 3rd and October 30th. The eighth planet continues its retrograde motion through Aquarius this month. It's positioned less than a degree to the southeast of the fourth-magnitude star Lambda Aquarii. 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.nakedeyeplanets.com/uranus.htm> and <http://www.nakedeyeplanets.com/neptune.htm> and also at http://wwwcdn.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 is located in northeastern Sagittarius near the Teaspoon asterism. Articles on observing Pluto are available on pages 48 and 49 of the July issue of *Sky & Telescope* and pages 64 and

65 of the July issue of *Astronomy*. See page 243 of the RASC *Observer's Handbook 2017* for a paper finder chart. A detailed finder chart is posted at http://www.wcdn.skyandtelescope.com/wp-content/uploads/Pluto_2017.pdf

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

For information on comets visible in October, browse <http://cometchasing.skyhound.com/> and <http://www.aerith.net/comet/future-n.html>

Asteroid 2 Pallas (magnitude +8.3) is at opposition on October 28th. Asteroid 7 Iris (magnitude +6.9) is at opposition on October 29th. Browse <https://in-the-sky.org/findercharts.php?objtxt=A2&duration=5> and <https://in-the-sky.org/findercharts.php?objtxt=A7&duration=5> respectively for finder charts. For information on this year's bright asteroids and upcoming asteroid occultation events respectively, consult <http://www.curtrenz.com/asteroids.html> and <http://asteroidoccultation.com/>

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

Free star maps for October 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 October 1st, 4th, 7th, 10th, 13th, 16th, 19th, 21st, 24th, 27th, and 30th. Consult <http://www.skyandtelescope.com/observing/interactive-sky-watching-tools/> and page 51 of the October 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>

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

Eighty-five binary and multiple stars for October: Struve 2973, Struve 2985, Struve 2992, Struve 3004, Struve 3028, Otto Struve 501, Struve 3034, Otto Struve 513, Struve 3050 (Andromeda); 29 Aquarii, 41 Aquarii, 51 Aquarii, 53 Aquarii, Zeta Aquarii, Struve 2913, Struve 2935, Tau-1 Aquarii, Struve 2944, Struve 2988, Psi-1 Aquarii, 94 Aquarii, 96 Aquarii, h3184, Omega-2 Aquarii, 107 Aquarii (Aquarius); Otto Struve 485, Struve 3037, 6 Cassiopeiae, Otto Struve 512, Sigma Cassiopeiae (Cassiopeia); Xi Cephei, Struve 2883, Struve 2893, Struve 2903, Krueger 60, Delta Cephei, Struve 2923, Otto Struve 482, Struve 2947, Struve 2948, Struve 2950, Struve 2984, Omicron Cephei, Otto Struve 502 (Cepheus); Otto Struve 459, h1735, Struve 2876, Otto Struve 465, Struve 2886, Struve 2894, h1756, Struve 2902, Struve 2906, 8 Lacertae, Otto Struve 475, 13 Lacertae, h1828, 16 Lacertae (Lacerta); Struve 2857, Struve 2877, 34 Pegasi, Struve 2908, Xi Pegasi, Struve 2958, Struve 2978, 57 Pegasi, Struve 2991, h1859, Struve 3007, Struve 3021, Otto Struve 504, Struve 3044 (Pegasus); Struve 3009, Struve 3019, Struve 3033 (Pisces); Eta Piscis Austrini, Beta Piscis Austrini, Dunlop 241, h5356, Gamma Piscis Austrini, Delta Piscis Austrini, h5371 (Piscis Austrinus); h5417, Delta Sculptoris, h5429 (Sculptor)

Notable carbon star for October: RZ Pegasi

Seventy-five deep-sky objects for October: NGC 7640, NGC 7662, NGC 7686 (Andromeda); NGC 7180, NGC 7183, NGC 7184, NGC 7293, NGC 7392, NGC 7585, NGC 7606, NGC 7721, NGC 7723, NGC 7727 (Aquarius); Cz43, K12, M52, NGC 7635, NGC 7788, NGC 7789, NGC 7790, St12 (Cassiopeia); B171, B173-4, IC 1454, IC 1470, K10, Mrk50, NGC 7235, NGC 7261, NGC 7354, NGC 7380, NGC 7419, NGC 7510 (Cepheus); IC 1434, IC 5217, NGC 7209, NGC 7223, NGC 7243, NGC 7245 (Lacerta);

NGC 7177, NGC 7217, NGC 7320 (the brightest galaxy in Stephan's Quintet), NGC 7331, NGC 7332, NGC 7339, NGC 7448, NGC 7454, NGC 7479, NGC 7619 (the brightest member of Pegasus I), NGC 7626, NGC 7678, NGC 7742, NGC 7769 (Pegasus); NGC 7541, NGC 7562, NGC 7611 (Pisces); IC 5156, IC 5269, IC 5271, NGC 7172, NGC 7173, NGC 7174, NGC 7176, NGC 7201, NGC 7203, NGC 7214, NGC 7221, NGC 7229, NGC 7314, NGC 7361 (Piscis Austrinus); NGC 7507, NGC 7513, NGC 7713, NGC 7755, NGC 7793 (Sculptor)

Top ten binocular deep-sky objects for October: M52, NGC 7209, NGC 7235, NGC 7243, NGC 7293, NGC 7510, NGC 7686, NGC 7789, NGC 7790, St12

Top ten deep-sky objects for October: K12, M52, NGC 7209, NGC 7293, NGC 7331, NGC 7332, NGC 7339, NGC 7640, NGC 7662, NGC 7789

Challenge deep-sky object for October: Jones 1 (PK104-29.1) (Pegasus)

The objects listed above are located between 22:00 and 24:00 hours of right ascension.