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  Pluto is stationary at 21:00

10/3  Mercury is at aphelion today; Venus is 3 degrees north of the first-magnitude star Spica (Alpha Virginis) at 1:00; the Moon is 7.3 degrees north of Antares (Alpha Scorpii) at 7:00; the Moon is 1.9 degrees north of Jupiter at 20:00

10/5  First Quarter Moon occurs at 16:47; the Moon is at the descending node (longitude 283.2 degrees) at 19:00; the Moon is 0.3 degrees south of Saturn, with an occultation taking place in southern Africa, southern Georgia, southern South America, and Easter Island, at 21:00

10/6  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 be visible at 4:17; the Moon is 0.1 degree south of Pluto, with an occultation taking place in western Polynesia, southeastern Micronesia, Melanesia, and Australia, at 9:00

10/7  The Martian northern hemisphere summer solstice occurs at 9:00

10/8  The peak of the Draconid meteor shower (10 to 30 per hour) occurs at 21:00

10/10 A double Galilean shadow transit begins at 10:55; the Moon is at apogee, subtending 29' 26" from a distance of 405,899 kilometers (252,214 miles), at 18:29; the Moon is four degrees south of Neptune at 23:00

10/13 Asteroid 19 Amphitrite (magnitude +8.7) is at opposition in Pisces at 8:00; Full Moon, known as the Blood or Sanguine Moon, occurs at 21:08; a double Galilean shadow transit begins at 23:53

10/15 The Moon is 4 degrees south of Uranus at 0:00

10/17 The Moon is 7.4 degrees south of the bright open cluster M45 (the Pleiades or Subaru) in Taurus at 4:00

10/19 The Moon is 1.7 degrees south of the bright open cluster M35 in Gemini at 15:00

10/20 Mercury is at greatest eastern elongation (24.6 degrees) at 4:00; the Moon is at the ascending node (longitude 101.4 degrees) at 7:00; the Moon is 3.3 degrees north of the first-magnitude star Regulus (Alpha Leonis) at 20:00

10/21 Last Quarter Moon occurs at 12:39

10/22 The peak of the Orionid meteor shower (15 per hour) occurs at 0:00; the Moon is 0.7 degree north of M44 (the Beehive Cluster or Praesepe) in Cancer at 5:00; the Curtiss Cross, an X-shaped illumination effect located between the craters Parry and Gambart, is predicted to be visible at 5:16

10/23 Mercury is at greatest heliocentric latitude south today; the Sun is at longitude 210 degrees at 17:00

10/25 Venus is at the descending node through the ecliptic plane at 2:00; asteroid 9 Metis (magnitude
10/26 The Moon is at perigee, subtending 33' 04" from a distance of 361,311 kilometers (224,508 miles), at 10:39; the Moon is 5 degrees north of Mars at 17:00

10/27 The Moon is 7 degrees north of Spica at 12:00

10/28 New Moon occurs (lunation 1198) at 3:38; Uranus is at opposition (magnitude +5.7, apparent size 3.7") at 8:00

10/29 Venus is 4 degrees south of the Moon at 14:00

10/30 Mercury (magnitude +0.5) is 3 degrees south of Venus (magnitude -3.9) at 8:00; the Moon is 7.1 degrees north of Antares at 16:00

10/31 The Sun enters Libra, at longitude 217.8 degrees on the ecliptic, at 13:00; the Moon is 1.3 degrees north of Jupiter at 14:00; Mercury is stationary at 20:00

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. Maria 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 the night of October 8th/9th. 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. See page 50 of the October 2019 issue of Sky & Telescope for more on the Southern Taurids. The Orionid meteor shower peaks on the night of October 21st but is compromised by a waning crescent Moon. Orionid meteors are fragments of Comet 1P/Halley. Consult page 48 of the October 2019 issue of Sky & Telescope or 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 USAF’s X-37B, the HST, and other satellites can be found at http://www.heavens-above.com/

As October ends, the zodiacal light may be visible in the pre-dawn eastern sky from a dark site. 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 2.5 days old, subtends 32.7 arc minutes, is illuminated 7.2%, and is located in Libra on October 1st at 0:00 UT. The Moon reaches its greatest northern declination (+22.9 degrees) on October
20th and its greatest southern declination (-22.7 degrees) on October 6th. Longitudinal libration is at a maximum of +7.9 degrees on October 4th and a minimum of -6.1 degrees on October 20th. Latitudinal libration is at a maximum of +6.6 degrees on October 13th and a minimum of -6.5 degrees on October 27th. The smallest Full Moon of the year occurs on October 13th. New Moon occurs on October 28th. The Moon is at apogee (a distance of 63.64 Earth-radii) on October 10th and at perigee (a distance of 56.65 Earth-radii) on October 26th. The Moon occults Saturn from some parts of the world on October 5th and Pluto from some parts of the world on October 6th. Consult http://www.lunar-occultations.com/iota/planets/planets.htm and http://www.lunar-occultations.com/iota/bstar/bstar.htm for further information on lunar occultation 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. Click on https://www.calendar-12.com/moon_calendar/2019/october for a lunar phase calendar for this month. Times and dates for the lunar crater light rays predicted to occur in September 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 13:00 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 -0.2, 5.3", 86%, 1.28 a.u., Virgo), Venus (magnitude -3.9, 10.0", 98%, 1.66 a.u., Virgo), Mars (magnitude +1.8, 3.5", 100%, 2.64 a.u., Virgo), Jupiter (magnitude -2.0, 35.8", 99%, 5.51 a.u., Ophiuchus), Saturn (magnitude +0.5, 16.8", 100%, 9.88 a.u., Sagittarius), Uranus (magnitude +5.7, 3.7", 100%, 18.85 a.u. on October 16th, Aries), Neptune (magnitude +7.8, 2.3", 100%, 29.12 a.u. on October 16th, Aquarius), and Pluto (magnitude +14.3, 0.1", 100%, 33.92 a.u. on October 16th, Sagittarius).

This month Mercury, Venus, and Jupiter are located in the southwest, Saturn in the south, Uranus in the east, and Neptune in the southeast during the evening. At midnight, Uranus and Neptune can be found in the southwest. Mars is in the east and Uranus is in the west in the morning sky.

Mercury, Venus, Mars, and the Sun are all located in Virgo as October begins.

Mercury is at aphelion on October 3rd. The speediest planet reaches greatest eastern elongation on October 20th and greatest heliocentric latitude south on October 23rd. Mercury is three degrees south of Venus on October 30th. It is visible low in the south at twilight. Southern hemisphere observers will have a more favorable view.

The separation of Venus from the Sun increases from 13 degrees on October 1st to 21 degrees by October 31st but the planet remains low in the sky at sunset. Venus and Mercury grow closer to one another as October progresses. On October 29th, Mercury is positioned three degrees to the lower left of Venus and six degrees directly below the two-day-old crescent Moon, while Venus is five degrees to the lower right of the Moon. Once again observers in the southern hemisphere are favored.

Mars increases very slightly in apparent size this month but remains constant in brightness at magnitude +1.8. The Red Planet crosses southward over the celestial equator on October 7th.

Jupiter fades slightly to magnitude -1.9 and decreases in apparent size by 2.3 arc seconds this month. It sets about 2.5 hours after the Sun sets by the end of October. The waxing crescent Moon passes less than two degrees north of Jupiter on October 3rd and October 31st.

Saturn is almost 30 degrees in altitude at dusk in early October and sets around midnight. By the end of the month, it sets shortly after 10:00 p.m. local time. Saturn reaches eastern quadrature on October 7th. The Ringed Planet’s disk is some 16 arc seconds in angular diameter in mid-October. Its rings measure
37 arc seconds and are inclined 25.2 degrees. Titan is north of Saturn on October 1st and October 17th and south of it on October 9th and October 25th. Iapetus lies 8.5 arc minutes from Saturn and shines at tenth magnitude when it reaches greatest western elongation on the night of October 1st. It dims to eleventh magnitude on October 22nd when it passes 1.3 arc minutes north of Saturn. For further information on Saturn’s satellites, browse [http://www.skyandtelescope.com/observing/interactive-sky-watching-tools/](http://www.skyandtelescope.com/observing/interactive-sky-watching-tools/)

Uranus lies three degrees southwest of the sixth-magnitude star 19 Arietis this month. The waning gibbous Moon passes four degrees south of the ice giant on September 15th. When Uranus reaches opposition on October 28th, it is 2.6 light hours from the Earth and shines at magnitude +5.7, which is bright enough to be visible from a dark site. Uranus will be 63 degrees above the southern horizon, the highest it’s been since February 1962, just before 1:00 a.m. local time on the night of opposition. Visit [http://www.bluewaterastronomy.info/resources/Maps/Charts-2019/09uranus_2019_1.pdf](http://www.bluewaterastronomy.info/resources/Maps/Charts-2019/09uranus_2019_1.pdf) and [http://www.nakedeyeplanets.com/uranus.htm](http://www.nakedeyeplanets.com/uranus.htm) for finder charts.

Neptune is positioned 0.7 degree west-southwest of the fourth-magnitude star Phi Aquarii on the first day of October. As the month ends, Neptune is located 1.3 degrees west-southwest of the star. The waxing gibbous Moon passes four degrees south of Neptune on September 10th. Browse [http://www.bluewaterastronomy.info/resources/Maps/Charts-2019/10neptune_2019_1.pdf](http://www.bluewaterastronomy.info/resources/Maps/Charts-2019/10neptune_2019_1.pdf) and [http://www.nakedeyeplanets.com/neptune.htm](http://www.nakedeyeplanets.com/neptune.htm) for finder charts.


For more on the planets and how to locate them, see [http://www.nakedeyeplanets.com/](http://www.nakedeyeplanets.com/)


Asteroid 29 Amphitrite travels southeastward through Pisces this month. It shines at magnitude 8.7 when it reaches opposition on October 13th. Asteroid 9 Metis (magnitude +8.6) is at opposition in Cetus on October 25th. Other asteroids brighter than magnitude +11.0 coming to opposition this month include 33 Polyhymnia (magnitude +10.2) on October 16th and 14 Irene (magnitude +10.6) on October 17th. Data on asteroid occultations taking place this month is available at [http://www.asteroidoccultation.com/2019_10_si.htm](http://www.asteroidoccultation.com/2019_10_si.htm) and [http://www.poyntssource.com/New/Global.htm](http://www.poyntssource.com/New/Global.htm)


Various events taking place within our solar system are discussed at [http:/](http://)
Information on the celestial events transpiring each week can be found at [http://astronomy.com/skythisweek](http://astronomy.com/skythisweek) and [http://www.skyandtelescope.com/observing/sky-at-a-glance/](http://www.skyandtelescope.com/observing/sky-at-a-glance/)

Online data generators for various astronomical events are available at [https://astronomynow.com/almanac/](https://astronomynow.com/almanac/) and [https://calsky.com/](https://calsky.com/)

The famous eclipsing variable star Algol (Beta Persei) is at a minimum, decreasing in brightness from magnitude +2.1 to magnitude +3.4, on October 3rd, 5th, 8th, 11th, 14th, 17th, 20th, 23rd, 25th, 28th, and 31st. Consult page 50 of the October 2019 issue of *Sky & Telescope* for the minima times. On the night of October 2nd, Algol shines at minimum brightness (magnitude +3.4) for approximately two hours centered at 9:23 p.m. EDT (1:23 UT October 3rd). It does the same at 11:04 p.m. EDT (3:04 UT October 23rd) on the night of October 22nd and 7:53 p.m. EDT (23:53 UT) on the night of October 25th. For more on Algol, see [http://stars.astro.illinois.edu/sow/Algol.html](http://stars.astro.illinois.edu/sow/Algol.html) and [http://www.solstation.com/stars2/algol3.htm](http://www.solstation.com/stars2/algol3.htm)


Data on current supernovae can be found at [http://www.rochesterastronomy.org/snimages/](http://www.rochesterastronomy.org/snimages/)

Finder charts for the Messier objects and other deep-sky objects are posted at [https://freestarcharts.com/messier](https://freestarcharts.com/messier) and [https://freestarcharts.com/ngc-ic](https://freestarcharts.com/ngc-ic) and [http://www.cambridge.org/features/turnleft/seasonal_skies_october-december.htm](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](http://www.astro-tom.com/messier/messier_finder_charts/map1.pdf) and [http://sao64.free.fr/observations/catalogues/cataloguesac.pdf](http://sao64.free.fr/observations/catalogues/cataloguesac.pdf) respectively.


Author Phil Harrington offers an excellent freeware planetarium program for binocular observers known as TUBA (Touring the Universe through Binoculars Atlas), which also includes information on purchasing binoculars, at [http://www.philharrington.net/tuba.htm](http://www.philharrington.net/tuba.htm)

Stellarium and Cartes du Ciel are useful freeware planetarium programs that are available at [http://stellarium.org/](http://stellarium.org/) and [https://www.ap-i.net/skychart/en/start](https://www.ap-i.net/skychart/en/start)


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 2909, Xi Pegasi, Struve 2910, Otto Struve 504, Struve 3044 (Pegasus); Struve 3009, Otto Struve 482, Struve 3023, 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.