

September Celestial Calendar by Dave Mitsky

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

9/1 The peak of the Aurigid meteor shower (zenithal hourly rate of 6 per hour) occurs at 2:00; the equation of time equals 0 at 8:00; Venus is 1.2 degrees south-southwest of the bright open cluster M44 (the Beehive Cluster or Praesepe) in Cancer at 13:00

9/4 Mercury is stationary in right ascension at 16:00; the Moon is at the descending node (longitude 324.2 degrees) at 18:41

9/5 Mercury, Mars, and the first-magnitude star Regulus (Alpha Leonis) lie within a circle with a diameter of 3.19 degrees at 0:00; Neptune (magnitude +7.8, apparent size 2.4") is at opposition at 5:00

9/6 Neptune is 0.8 degree north of the Moon, with an occultation taking place in southern Georgia, southeastern South America, and most of Antarctica at 5:00; Full Moon (known as the Barley, Corn, or Fruit Moon) occurs at 7:03

9/8 The north pole of the Sun is most inclined (7.25 degrees) towards the Earth today; asteroid 89 Julia (magnitude +9.0) is at opposition at 21:00

9/9 Uranus is 4.1 degrees south-southeast of the Moon at 13:00

9/10 Mercury (magnitude 0.0) is 0.6 degree south of Regulus (magnitude +1.4) at 12:00; Mercury is at the ascending node through the ecliptic plane at 20:00

9/11 The Moon is 9.3 degrees south-southeast of the bright open cluster M45 (the Pleiades or Subaru) at 20:00

9/12 Jupiter is 3.1 degrees north-northeast of the first-magnitude star Spica (Alpha Virginis) at 1:00; Mercury is at greatest western elongation (17.9 degrees) at 10:00; the Moon is 0.4 degree north of the first-magnitude star Aldebaran (Alpha Tauri), with an occultation taking place in the Azores, Central and North America, and Hawaii, at 13:00

9/13 Last Quarter Moon occurs at 6:25; the Moon is at perigee, subtending 32' 19" from a distance of 369,860 kilometers (229,820 miles), at 16:06

9/14 The Moon is 0.73 degree north of asteroid 8 Flora at 1:00; the Moon is 5.0 degrees south of the bright open cluster M35 in Gemini at 2:00; Saturn is at eastern quadrature at 3:00; the Curtiss Cross, an X-shaped illumination effect located between the craters Parry and Gambart, is predicted to be at a mid-point at 9:46; Mercury (magnitude -0.6) is 10.9 degrees east-southeast of Venus (magnitude -3.9) at 12:00

9/15 Mercury is at perihelion (0.3075 astronomical units from the Sun) at 12:00; the Moon is 9.3 degrees south of the first-magnitude star Pollux (Beta Geminorum) at 15:00

9/16 The Moon is 2.8 degrees south of M44 at 15:00; Mercury (magnitude -0.8) is 0.06 degree north of Mars (magnitude +1.8) at 18:00; the Sun enters Virgo (ecliptic longitude 174.14 degrees) at 20:00

9/17 The Moon is at the ascending node (longitude 144.0 degrees) at 18:28

9/18 Venus is 0.53 degree north-northeast of the Moon, with an occultation taking place in New Zealand, Australia, and southeastern Asia, at 1:00; the Moon is 0.14 degree northwest of Regulus, with an occultation taking place in northern Australia, southeastern Asia, the Middle East, and northeastern Africa, at 5:00; the Moon, Venus, and Regulus lie within a circle with a diameter of 2.36 degrees at 5:00; Mars is 0.17 degree southwest of the Moon, with an occultation taking place in northwestern South America, the Galapagos Islands, Hawaii, and northeastern Micronesia, at 20:00; the Moon, Mercury, and Mars lie within a circle with a diameter of 1.83 degrees at 21:00; Mercury is 0.05 degree northwest of the Moon, with an occultation taking place in northern Polynesia, Micronesia, and far eastern Asia, at 23:00

9/20 Venus (magnitude -3.9) is 0.46 degree north-northeast of Regulus (magnitude +1.4) at 2:00; New Moon (lunation 1172) occurs at 5:30

9/22 The Moon is 6.5 degrees north-northeast of Spica at 6:00; Jupiter is 4.0 degrees south of the Moon at 8:00; the autumnal equinox occurs in the northern hemisphere at 20:02

9/25 Asteroid 2 Pallas is stationary at 11:00; Mercury is at its greatest heliocentric latitude north (7 degrees north of the ecliptic plane) at 18:00

9/26 The Moon is 9.5 degrees north of the first-magnitude star Antares (Alpha Scorpii) at 1:00

9/27 Saturn is 3.5 degrees south of the Moon at 1:00; the Moon is at apogee, subtending 29' 33" from a distance of 404,347 kilometers (251,250 miles), at 6:50; asteroid 4 Vesta is in conjunction with the Sun at 14:00; Pluto is stationary in right ascension at 21:00; the Lunar X (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 21:25

9/28 First Quarter Moon occurs at 2:54

9/30 Fall Astronomy Day; Comet 41P/Tuttle-Giacobini-Kresak is 0.95 degree north of Pluto at 9:00

Jean-Dominique Maraldi discovered the globular cluster M15 on September 7, 1746. On September 11, 1746, Jean-Dominique Maraldi discovered the globular cluster M2. Nicolas-Louis de Lacaille discovered NGC 104 (47 Tucanae), the second largest and brightest globular cluster, on September 14th, 1751. Comet C/1793 S2 (Messier) was discovered by Charles Messier on September 24th, 1793. Karl Harding discovered asteroid 3 Juno on September 1, 1804. Neptune

was discovered by Johann Gottfried Galle on September 23, 1846, using Urbain Le Verrier's calculations of its position. On September 19, 1848, William Bond discovered Saturn's fourteenth-magnitude satellite Hyperion, the first irregular moon to be discovered. On September 13, 1850, John Russell Hind discovered the asteroid 12 Victoria. E. E. Barnard discovered Jupiter's fifth satellite, fourteenth-magnitude Amalthea, using the 36-inch refractor at the Lick Observatory, on September 9, 1892.

The minor meteor shower known as the Aurigids, which has a maximum hourly rate of just 6 per hour, peaks on the evening of September 1st. A waxing gibbous Moon sets before the radiant is high in the sky. For more on the Aurigids and the September Epsilon Perseids, another minor shower that peaks on September 9th, see <https://www.amsmeteors.org/meteor-showers/2017-meteor-shower-list/>

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, or the false dawn, is visible about two hours before sunrise from a dark site during the latter part of September. Articles on the zodiacal light appear at <http://www.atoptics.co.uk/highsky/zod1.htm> and <http://oneminuteastronomer.com/6645/zodiacal-light/>

The Moon is 10.2 days old, subtends 29.9 arc minutes, is illuminated 74.4%, and is located in Sagittarius on September 1st at 0:00 UT. The Moon is at its greatest northern declination (+19.3 degrees) on September 15th and its greatest southern declination (-19.4 degrees) on September 1st and September 28th. Longitudinal libration is at a maximum of +5.0 degrees on September 21st and a minimum of -4.9 degrees on September 6th. Latitudinal libration is at a maximum of +6.7 degrees on September 11th and a minimum of -6.7 degrees on September 25th. The Full Moon occults Neptune from certain parts of the world on September 6th. The waning gibbous Moon occults Aldebaran, the brightest star that it ever can occult, from certain parts of the world on September 12th. The occultation occurs during daylight for the eastern and central portions of North America. The waning crescent Moon occults Venus, Regulus, Mars, and Mercury from certain parts of the world on September 18th. Consult <http://www.lunar-occultations.com/iota/iotandx.htm> for further information. 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 June are available at <http://www.lunar-occultations.com/rlo/rays/rays.htm>

The Sun is located in Leo on September 1st. On September 16th, the Sun enters Virgo. The Sun crosses the celestial equator from north to south at 20:02 UT on September 22nd, the date of the autumnal equinox.

Brightness, apparent size, illumination, distance from the Earth in astronomical units, and location data for the planets and Pluto on September 1st: Mercury (magnitude +3.3, 10.0", 6% illuminated, 0.68 a.u., Leo), Venus (magnitude -3.9, 12.4", 84% illuminated, 1.34 a.u., Cancer), Mars (magnitude +1.8, 3.6", 100% illuminated, 2.64 a.u., Leo), Jupiter (magnitude -1.7, 32.1",

100% illuminated, 6.14 a.u., Virgo), Saturn (magnitude +0.4, 17.0", 100% illuminated, 9.80 a.u., Ophiuchus), Uranus (magnitude +5.7, 3.7", 100% illuminated, 19.08 a.u. on September 16th, Pisces), Neptune (magnitude +7.8, 2.4", 100% illuminated, 28.96 a.u. on September 16th, Aquarius), and Pluto (magnitude +14.2, 0.1", 100% illuminated, 32.99 a.u. on September 16th, Sagittarius).

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

Mercury, Mars, and Regulus lie within a circle with a diameter of 3.2 degrees on September 5th. The Moon, Venus, and Regulus lie within a circle with a diameter of 2.4 degrees on September 18th. Later that day, the Moon, Mercury, and Mars lie within a circle with a diameter of 1.8 degrees.

Mercury can be seen in the east before sunrise in early September. Northern hemisphere observers are favored for this predawn apparition of the planet, the best one of the year. On September 4th, Mercury is stationary in right ascension and then resumes direct (eastward) motion. It achieves greatest western elongation (17.9 degrees) on September 12th and perihelion on September 15th. The speediest planet has a very close conjunction with Mars on September 16th and is occulted by the Moon from certain parts of the world on September 18th. Mercury disappears from view as September draws to a close.

During September, Venus shrinks in apparent size from 12.4 to 11.2 arc seconds but increases in illumination from 84% to 91%. Venus is occulted by the Moon from some parts of the world on September 18th and passes very close to Regulus on the night of September 19th.

Mars enters the morning sky in Leo in mid-September. The Red Planet has a very close conjunction with Mercury on September 16th and is occulted by the Moon in some parts of the world on September 18th.

On September 5th, Jupiter is in conjunction with Spica for the second time in 2017. The gas giant passes three degrees north-northeast of the star, which is 12 times fainter than Jupiter. The Moon passes four degrees north of Jupiter on September 22nd. Jupiter is quite low in the sky this month, occupying an altitude of only ten degrees 45 minutes after the Sun sets in early September. It is only four degrees high as the month ends.

Saturn sets before midnight local daylight time before September ends. Its rings span 38 arc seconds and are tilted 26.9 degrees with respect to the Earth in mid-September. Eighth-magnitude Titan, Saturn's largest satellite, passes just north of Saturn on September 11th and September 27th and south of the planet on September 3rd and September 19th. Titan is a maximum of 2.9 arc minutes from Saturn, some two times farther than its northern and southern approaches, at greatest eastern and western elongation. Saturn's faint satellites Enceladus and Mimas both reach greatest western elongation on September 17th. The waxing crescent Moon passes some three degrees north of the Ringed Planet on the evening of September 26th. For

further information on Saturn's satellites, browse

<http://www.skyandtelescope.com/observing/interactive-sky-watching-tools/>

Uranus lies 1.0 degree north of the fourth-magnitude star Omicron Piscium on September 1st and 1.2 degrees northwest of Omicron Piscium on the last day of the month. Browse

<http://bluewaterastronomy.info/resources/uranus-finder-chart-2017.png> for a finder chart.

Neptune (magnitude +7.8, apparent size 2.3") reaches opposition on September 5th. The eighth planet is four light-hours distant and located eight degrees south of the celestial equator on that date. Neptune is situated 1.2 degrees east of the fourth-magnitude star Lambda Aquarii as the month begins. By the end of September, Neptune's westward motion takes it to a position 0.7 degree southeast of the star. 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://wwwcdn.skyandtelescope.com/wp-content/uploads/WEB_Uranus_Neptune17.pdf

Pluto is highest in altitude in the late evening. The dwarf planet is stationary in right ascension on September 27th and then resumes direct (eastward) motion. 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 basic finder chart is posted online at

<http://www.bluewaterastronomy.info/resources/Pluto-finder-2017.png> and a more detailed one at http://wwwcdn.skyandtelescope.com/wp-content/uploads/Pluto_2017.pdf

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

Comet C/2015 ER61 (PanSTARRS) passes southwestward through Taurus during September.

The tenth-magnitude comet lies within three degrees of the bright open cluster M45 (the Pleiades) this month. For further information on comets visible in September, browse

<http://cometchasing.skyhound.com/> and <http://www.aerith.net/comet/future-n.html>

During the early part of September, asteroid 3122 Florence heads rapidly northwestward through eastern Delphinus and Cygnus. It brightens to ninth magnitude as it passes within 4,400,000 miles of the Earth on September 1st and dims to tenth magnitude by September 4th. The Amor asteroid will be traveling at about nine degrees per day at its closest approach. Asteroid 3122 Florence glides one degree west of the second-magnitude star Gamma Cygni on September 5th. Asteroid 89 Julia shines at magnitude +9.0 when it reaches opposition in Pegasus on September 8th. Consult <http://heavens-above.com/MinorPlanet.aspx?desig=89&> to generate a finder chart. Data on asteroid occultations taking place this month is available at

<http://www.poyntsource.com/New/Global.htm> and

http://www.asteroidoccultation.com/2017_09_si.htm

A wealth of current 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 brightness from magnitude +2.1 to magnitude +3.4, on September 3rd, 6th, 8th, 11th, 14th, 17th, 20th, 23rd, 26th, and 29th. For more on Algol, see <http://stars.astro.illinois.edu/sow/Algol.html> and <http://www.solstation.com/stars2/algol3.htm>

Eighty binary and multiple stars for September: 12 Aquarii, Struve 2809, Struve 2838 (Aquarius); Alpha Capricorni, Sigma Capricorni, Nu Capricorni, Beta Capricorni, Pi Capricorni, Rho Capricorni, Omicron Capricorni, h2973, h2975, Struve 2699, h2995, 24 Capricorni, Xi Capricorni, Epsilon Capricorni, 41 Capricorni, h3065 (Capricornus); Kappa Cephei, Struve 2751, Beta Cephei, Struve 2816, Struve 2819, Struve 2836, Otto Struve 451, Struve 2840, Struve 2873 (Cepheus); Otto Struve 394, 26 Cygni, h1470, h1471, Omicron Cygni, Struve 2657, 29 Cygni, 49 Cygni, 52 Cygni, 59 Cygni, 60 Cygni, 61 Cygni, Struve 2762 (Cygnus); Struve 2665, Struve 2673, Struve 2679, Kappa Delphini, Struve 2715, Struve 2718, Struve 2721, Struve 2722, Struve 2725 (in the same field as Gamma Delphini), Gamma Delphini, 13 Delphini, Struve 2730, 16 Delphini, Struve 2735, Struve 2736, Struve 2738 (Delphinus); 65 Draconis, Struve 2640 (Draco); Epsilon Equulei, Lambda Equulei, Struve 2765, Struve 2786, Struve 2793 (Equuleus); 1 Pegasi, Struve 2797, h1647, Struve 2804, Struve 3112, 3 Pegasi, 4 Pegasi, Kappa Pegasi, h947, Struve 2841, Struve 2848 (Pegasus); h1462, Struve 2653, Burnham 441, Struve 2655, Struve 2769 (Vulpecula)

Notable carbon star for September: LW Cygni

Forty-five deep-sky objects for September: M2, M72, M73, NGC 7009 (Aquarius); M30, NGC 6903, NGC 6907 (Capricornus); B150, B169, B170, IC 1396, NGC 6939, NGC 4343, B361, Ba6, Be87, Cr 421, Do9, IC 1369, IC 4996, IC 1516, LDN 906, M29, M39, NGC 6866, NGC 6871, NGC 6888, NGC 6894, NGC 6910, NGC 6960, NGC 6992, NGC 7000, NGC 7008, NGC 7026, NGC 7027, NGC 7039, NGC 7063, NGC 7086 (Cygnus); NGC 6891, NGC 6905, NGC 6934, NGC 7006 (Delphinus); NGC 7015 (Equuleus); M15 (Pegasus); NGC 6940 (Vulpecula)

Top ten binocular deep-sky objects for September: IC 1396, LDN 906, M2, M15, M29, M30, M39, NGC 6939, NGC 6871, NGC 7000

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Challenge deep-sky object for September: Abell 78 (Cygnus)

The objects listed above are located between 20:00 and 22:00 hours of right ascension.