

## November 2017 Astronomy Calendar by Dave Mitsky

Some information supplied and/or added by Tony Donnangelo

All times are Daylight Saving Time (-4 hrs. U.T.).

Events listed are based on a location of 40°N in the Eastern US and may not be visible in all areas.

Concerning moderate and minor meteor shower activity:

Do not have any high expectations. This general information is to account for why you might be seeing a few more than normal meteors during your observing session.

Lunar light rays may occur prior to or after the predicted time. Initial observations might have occurred after the ray's inception or continued after the observer's session. Rays may last a very short time or for many hours. Obtain further information; send reports (including non-occurrences and miss-calculations), photos, and observations of new rays to:

The Robinson Lunar Observatory: <http://www.lunar-occultations.com/rlo/rlondx.htm>.

- 10/30 Southern Taurids meteor shower (moderate activity) peaks from the 10/30 through 11/7. Duration is from 9/17 to 11/27. Observing and history: <http://meteorshoweronline.com/showers/taurids.html>
- 11/1 Comet 219P/LINEAR is at closest approach to Earth at 1.883 A.U.
- 11/1 Alpha Pegasids meteor shower (minor activity) peaks from the 1st through the 12th. Duration is from 10/29? to 11/17?. Observing and history: [http://meteorshoweronline.com/showers/alpha\\_pegasids.html](http://meteorshoweronline.com/showers/alpha_pegasids.html)
- 11/2 100th Anniversary (1917) of Mount Wilson 100-inch Telescope's first light.
- 11/2 Venus is 3.5° north-northeast of the first-magnitude star Spica (Alpha Virginis) at 2:00 p.m.
- 11/2 The equation of time is at a maximum (16.48 minutes) for 2017 at 11:00 p.m.
- 11/2 Uranus is 4.0° north-northwest of the Moon at 11:00 p.m.
- 11/3 60th Anniversary (1957) of Sputnik 2 launch with Laika the dog on board.
- 11/3 Asteroid (44) Nysa (magnitude +9.6) is at opposition at 2:00 a.m.
- 11/3 Northern Taurids meteor shower (moderate activity) peaks from the 3rd through the 7th. Duration is from 10/11 through 12/2. Dust from Comet Encke causes these meteors. Observing and history: <http://meteorshoweronline.com/showers/taurids.html>
- 11/4 Comet 31P/Schwassmann-Wachmann is at opposition at 3.104 A.U.
- 11/4 Full Moon, known as the Beaver or Frost Moon, occurs at 1:23 a.m.
- 11/5 Daylight saving time. Set clock back 1 hour at 2:00 a.m.
- 11/5 The Moon is 9.0° south-southeast of the bright open cluster M45 (the Pleiades) in Taurus at 6:00 a.m.
- 11/5 The peak of the Southern Taurid meteor shower (5 to 10 per hour) occurs at 7:00 a.m.
- 11/5 The Moon is at perigee subtending 33' 04" from a distance of 361,438 kilometers (224,587 miles), at 6:10 p.m.
- 11/5 The Moon is 0.8° north of the first-magnitude star Aldebaran (Alpha Tauri), with an occultation occurring in northwestern Asia, northern Europe, and most of North America, at 10:00 p.m.
- 11/7 The Moon is 4.6° south of the bright open cluster M35 in Gemini at 10:00 a.m.
- 11/8 Comet 87P/Bus is at opposition at 3.629 A.U.
- 11/8 Catherina (sunset) lunar light ray predicted to occur at 8:21:05 p.m.
- 11/9 Comet P/2016 G1 (PANSTARRS) is at opposition at 1.503 A.U.
- 11/9 Comet 31P/Schwassmann-Wachmann is at closest approach to Earth at 3.105 A.U.
- 11/9 The Moon is 2.4° south of the bright open cluster M44 (the Beehive Cluster or Praesepe) in Cancer at 9:00 p.m.
- 11/10 Royal Astronomical Society Ordinary Meeting held in London, United Kingdom.
- 11/10 Calippus (sunset) lunar light ray predicted to occur at 12:04:17 a.m.
- 11/10 Tempel (sunset) lunar light ray predicted to occur at 1:28:44 a.m.

11/10 Last Quarter Moon occurs at 3:36 p.m.  
11/10 The Moon is at the ascending node (longitude 139.8°) at 5:40 p.m.  
11/11 Comet 183P/Korlevic-Juric is at perihelion at 3.872 A.U.  
11/11 Keck Observatory Open House 2017 being held in Kamuela, Hawaii.  
11/11 35th anniversary (1982) of STS-5 launch of space shuttle Columbia.  
11/11 445th anniversary (1572) of Tycho Brahe's observation of SN1572.  
11/11 The Moon is 0.44° north-northeast of the first-magnitude star Regulus (Alpha Leonis), with an occultation occurring in Central America, southwestern North America, eastern Asia, and Japan, at 12:00 p.m.  
11/12 Comet C/2015 ER61 (PANSTARRS) is at opposition at 1.905 A.U.  
11/12 Comet 123P/West-Hartley is at closest approach to Earth at 2.717 A.U.  
11/12 Clavius (sunset) lunar light ray predicted to occur at 1:01:39 p.m. Moonrise 12:44 a.m.  
11/12 Pitatus (sunset) lunar light ray predicted to occur at 4:36:45 a.m.  
11/12 The Curtiss Cross, an X-shaped illumination effect located between the craters Parry and Gambart, is predicted to be at a midpoint at 6:43 a.m.  
11/12 The peak of the Northern Taurid meteor shower (5 to 10 per hour) is predicted to occur at 6:00 a.m.  
11/12 Mercury is 2.2° north of the first-magnitude star Antares (Alpha Scorpii) at 5:00 p.m.  
11/13 Comet 219P/LINEAR is at opposition at 1.902 A.U.  
11/13 Comet 86P/Wild is at opposition at 3.768 A.U.  
11/13 Venus is 0.26° north-northeast of Jupiter at 3:00 a.m.  
11/14 Andromedids meteor shower (minor activity) peaks 11/15. Duration is from 9/25 to 12/6. Observing and history: <http://meteorshowersonline.com/showers/andromedids.html>  
11/15 Comet 302P/Lemmon-PANSTARRS is at closest approach to Earth at 3.058 A.U.  
11/15 Comet 218P/LINEAR is at opposition at 4.021 A.U.  
11/15 The Moon is 6.6° north-northeast of Spica at 3:00 p.m.  
11/16 Comet 62P/Tsuchinshan is at perihelion at 1.384 A.U.  
11/16 Comet C/2017 E1 (Borisov) is at opposition at 2.399 A.U.  
11/16 40th anniversary (1977) of "Close Encounters of the Third Kind" released.  
11/16 165th anniversary (1852) of Hermann Goldschmidt's discovery of asteroid (21) Lutetia.  
11/16 Jean le Rond d'Alembert's 300th birthday (1717).  
11/16 Asteroid (4) Vesta is 0.41° north-northeast of the Moon, with an occultation occurring in the Kerguelen Islands, southwestern Africa, and eastern Brazil at 4:00 a.m.  
11/16 Comet 24P/Schaumasse is at perihelion (1.2063 astronomical units from the Sun) at 2.00 p.m.  
11/16 Jupiter is 4° north of the Moon at 4:00 p.m.  
11/16 The Moon, Venus, and Jupiter lie within a circle with a diameter of 4.9 degrees at 11:00 p.m.  
11/17 Comet 24P/Schaumasse is at perihelion at 1.206 A.U.  
11/17 Asteroid 1288 Santa is at closest approach to Earth at 1.810 A.U.  
11/17 Henry Gellibrand's 420th birthday (1597).  
11/17 Venus is 4° south of the Moon at 1:00 a.m.  
11/17 Leonids meteor shower (major activity - 15 to 20 per hour) peaks at 1:00 p.m. Duration is from 13th to 20th. Observing and history: <http://meteorshowersonline.com/leonids.html>  
11/18 Comet 209P/LINEAR is at opposition at 3.432 A.U.  
11/18 Asteroid (484) Pittsburghia is at closest approach to Earth at 1.727 A.U.  
11/18 Louis Daguerre's 230th birthday (1787).  
11/18 Asteroid (7) Iris at perihelion (1.8334 astronomical units from the Sun) at 4:00 a.m.  
11/18 New Moon (lunation 1174) occurs at 6:42 a.m.  
11/19 Comet P/2011 VJ5 (Lemmon) is at opposition at 0.965 A.U.  
11/19 Comet 5D/Brorsen is at opposition at 2.203 A.U.  
11/19 Kuiper Belt Object 90377 Sedna is at opposition at 84.262 A.U.  
11/19 The Martian northern hemisphere summer solstice occurs at 9:00 p.m.  
11/20 Mars summer solstice.  
11/20 Comet 54P/de Vico-Swift-NEAT is at closest approach to Earth at 1.746 A.U.  
11/20 Comet 236P/LINEAR is at perihelion at 1.837 A.U.  
11/20 Comet C/2017 F2 (PANSTARRS) is at perihelion at 6.931 A.U.  
11/20 Otto von Guericke's 415th birthday (1602).  
11/20 Mercury is 6.8° south of the Moon at 6:00 a.m.

11/20 Saturn is 3.0° south of the Moon at 8:00 p.m.  
 11/21 The Moon is at apogee, subtending 29' 25" from a distance of 406,131 kilometers (252,358 miles) at 1:53 p.m.  
 11/21 Alpha Monocerids meteor shower (minor activity) peaks. Duration is from 11/13 to 12/2. Observing and history: [http://meteorshoweronline.com/showers/alpha\\_monocerotids.html](http://meteorshoweronline.com/showers/alpha_monocerotids.html)  
 11/22 Comet 24P/Schaumasse is at closest approach to Earth at 1.460 A.U.  
 11/22 Comet 302P/Lemmon-PANSTARRS is at opposition at 3.066 A.U.  
 11/22 Comet 282P/2003 BM80 is at opposition at 4.039 A.U.  
 11/22 Neptune is stationary in right ascension at 12:00 a.m.  
 11/23 Comet C/2017 E4 (Lovejoy) is at opposition at 2.893 A.U.  
 11/23 Comet C/2016 A1 (PANSTARRS) is at perihelion at 5.328 A.U.  
 11/23 The Sun enters Scorpius (longitude 241.12° on the ecliptic) at 1:00 a.m.  
 11/23 Mercury is at greatest eastern elongation (22.0°) at 7:00 p.m.  
 11/24 Mercury is at its greatest eastern elongation of 22°  
 11/24 Sacrobosco (sunrise) lunar light ray predicted to occur at 8:17:40 p.m. Moonset 10:04 p.m.  
 11/25 The Moon is at the descending node (longitude 318.0°) at 3:25 a.m.  
 11/25 Alpine Valley/Mt Blanc (sunrise) lunar light ray predicted to occur at 6:46:10 p.m.  
 11/25 The Lunar X (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 7:46 p.m.  
 11/25 Parrot (sunrise) lunar light ray predicted to occur at 8:21:05 p.m.  
 11/26 Comet 145P/Shoemaker-Levy is at closest approach to Earth at 1.124 A.U.  
 11/26 First Quarter Moon occurs at 12:03 a.m.  
 11/27 Comet 317P/WISE is at opposition at 3.641 A.U.  
 11/27 Neptune is 1.0° north of the Moon, with an occultation occurring in western and central Antarctica, at 12:00 a.m.  
 11/28 50th Anniversary (1967) of the discovery of first pulsar by Jocelyn Bell & Antony Hewish.  
 11/28 Mercury Passes 3.0° from Saturn.  
 11/28 Mercury is 3.4° south of Saturn at 4:00 a.m.  
 11/29 Comet 229P/Gibbs is at closest approach to Earth at 11.937 A.U.  
 11/29 The Sun enters the constellation Ophiuchus (longitude 248.02° on the ecliptic) at 8:00 p.m.  
 11/30 Asteroid 310 Margarita is at opposition at 1.949 A.U.  
 11/30 Uranus is 4.1° north-northwest of the Moon at 7:00 a.m.

Edmund Halley, William Herschel, Harlow Shapley, and Edwin Hubble were born this month.

Wolfgang Schuler discovers Tycho's Supernova on November 6, 1572. Cornelius Gemma independently discovers Tycho's Supernova on November 9, 1572. Tycho Brahe observes Tycho's Supernova on November 11, 1572. Nicolas-Claude Fabri de Peiresc makes the first telescopic observations of M42 (the Orion Nebula) on November 26, 1610. Jan Munck discovers Comet C/1743 X1 (the Great Comet of 1744) on November 29, 1743. Captain James Cook observes a transit of Mercury from New Zealand on November 9, 1769. The first photograph of a meteor was taken on November 26, 1885. The minor planet/comet 2060 Chiron or 95P/Chiron was discovered by Charles Kowal on November 1, 1977.

The peaks of the Southern and Northern Taurid meteor showers take place on November 5th and November 12th respectively. These streams form part of the complex associated with Comet 2P/Encke. Moonlight compromises the peaks of these two minor meteor showers. The Leonid meteor shower occurs on the morning of November 17th. Leonid meteors are debris from the periodic comet 55P/Tempel-Tuttle. Due to their high speed (71 kilometers or 44 miles per second), the fastest of any shower, the Leonids produce more fireballs than most meteor showers.

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

The Moon is 12.2 days old, is 86.9% illuminated, subtends 31.8 arc minutes, and resides in Aquarius on November 1st at 0:00 UT. Large tides will take place following Full Moon on November 4th. New Moon occurs on November 18th. The Moon reaches its greatest northern declination on November 8th

(+19.5 degrees) and its greatest southern declination on November 22nd (-19.6 degrees). Longitudinal libration is at a maximum of +6.7 degrees on November 13th and a minimum of -7.6 degrees on November 29th. Latitudinal libration is at a maximum of +6.5 degrees on November 5th and a minimum of -6.6 degrees on November 18th. The Moon occults Aldebaran (magnitude +0.9) from most of North America on the night of November 5th and Regulus (magnitude +1.4) from southwestern North America during the day on November 11th (see <http://www.lunar-occultations.com/iota/bstar/bstar.htm> and page 51 of the November 2017 issue of *Sky & Telescope*). The waxing gibbous Moon occults Neptune from portions of Antarctica on November 27th. Consult <http://www.lunar-occultations.com/iota/iotandx.htm> for information on lunar occultations taking place this month. 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 this month are available at <http://www.lunar-occultations.com/rlo/rays/rays.htm>

The Sun is located in Libra on November 1 at 0:00 UT. It moves into Scorpius on November 23rd and Ophiuchus on November 30th.

Brightness, apparent size, illumination, distance from the Earth in astronomical units, and location data for the planets and Pluto on November 1: Mercury (-0.4, 4.9", 93% illuminated, 1.36 a.u., Libra), Venus (magnitude -3.9, 10.4", 96% illuminated, 1.61 a.u., Virgo), Mars (magnitude +1.8, 3.9", 97% illuminated, 2.41 a.u., Virgo), Jupiter (magnitude -1.7, 30.7", 100% illuminated, 6.43 a.u., Virgo), Saturn (magnitude +0.5, 15.5", 100% illuminated, 10.73 a.u., Ophiuchus), Uranus (magnitude +5.7, 3.7", 100% illuminated, 19.03 a.u. on November 16th, Pisces), Neptune (magnitude +7.9, 2.3", 100% illuminated, 29.63 a.u. on November 16th, Aquarius), and Pluto (magnitude +14.3, 0.1", 100% illuminated, 34.02 a.u. on November 16th, Sagittarius).

During the evening, Mercury and Saturn are in the southwest, Uranus is in the east, and Neptune is in the southeast. Uranus lies in the southwest and Neptune in the west at midnight. Venus and Jupiter are located in the east and Mars in southeast in the morning sky.

Venus, Mars, and Jupiter are all located in Libra on November 1st.

Mercury is well positioned in the evening sky in November. It departs Libra and enters Scorpius on November 5th and subsequently enters Sagittarius on November 27th. The smallest planet lies 2.2 degrees north of Antares on November 12th and is at its greatest heliocentric latitude south on November 18th. Mercury is 6.8 degrees south of the Moon on November 20th and is at greatest eastern elongation on November 24th. It passes three degrees south of Saturn on November 27th.

Venus rises approximately 90 minutes before sunrise and is situated about four degrees north of Spica on November 1st. Venus lies 16 degrees from the Sun on that date. By November 30th, its elongation is only 10 degrees. The brilliant planet lies four degrees south of a very thin waning crescent Moon on November 17th.

On November 1st, Mars rises almost three hours before the Sun. The planet's eastward motion carries it 1.8 degrees south of the binary star Porrima or Gamma Virginis (magnitude +2.8) on November 9th and 3.3 degrees north of Spica (magnitude +1.0) on November 28th. The Martian northern hemisphere summer begins on November 30th. Mars increases in angular size from 3.9 to 4.2 arc seconds this month.

Jupiter rises some two hours before the Sun by the end of November. It shines at its minimum brightness of magnitude -1.7 and subtends just 31 arc seconds this month. Jupiter lies four degrees south of the waning crescent Moon on November 16th.

Saturn sinks into evening twilight as November progresses. It lies just 15 degrees above the horizon in the southwest an hour after the Sun sets on November 1st. M8 (the Lagoon Nebula) and M20 (the Trifid nebula) are about six degrees east of Saturn in early November. The Ringed Planet departs Ophiuchus and enters Sagittarius on November 19th. It is three degrees south of the waxing crescent Moon on the evening of November 20th.

Uranus continues to retrograde through Pisces this month. The ice giant planet lies 4.1 degrees north-northwest of the Moon on November 30th. Uranus can be found 2.3 degrees west of the fourth-magnitude star Omicron Piscium on November 1st and 3.2 degrees west of that star on November 30th. Browse <http://bluewaterastronomy.info/resources/uranus-finder-chart-2017.png> for a finder chart.

Neptune is stationary in right ascension and resumes direct (eastward) motion on November 22nd. The eighth planet is occulted by the waxing gibbous Moon from parts of Antarctica on November 27th. Neptune is positioned 0.6 degree south of the fourth-magnitude star Lambda Aquarii this month. 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](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.

Pluto lies too close to the horizon to be observed this month.

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

Asteroid 7 Iris shines at seventh magnitude as it travels southward through Aries this month. Iris lies two degrees east of Beta Arietis (magnitude +2.7) in early November, 0.4 degree east of the excellent binary star Gamma Arietis (magnitude +3.9) on November 12th, and 0.5 degree east of 4 Arietis (magnitude +5.9) on November 29th. Asteroid 44Nysa (magnitude +9.6) is at opposition on November 3rd. Other moderately bright asteroids reaching opposition this month include 532 Herculina (magnitude +10.4) on November 2nd, 48 Doris (magnitude +10.9) on November 8th, and 42 Isis (magnitude +10.4) on November 17th. For information on this year's bright asteroids and upcoming asteroid occultation events respectively, consult <http://www.curtrenz.com/asteroids> and <http://asteroidoccultation.com/>

Comet C/2015 R2 (PanSTARRS) may reach tenth magnitude in brightness as it passes northwestward through Orion during November. The rather dim Oort Cloud comet is located one degree north-northwest of the second-magnitude star Delta Orionis (Mintaka), the westernmost star in the Belt of Orion, on November 1st and one degree north of Rho Orionis (magnitude +4.5) on November 21st. For additional information on comets visible this month, browse <http://cometchasing.skyhound.com/> and <http://www.aerith.net/comet/future-n.html>

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 November can be downloaded at <http://www.skymaps.com/downloads.html> and <http://www.telescope.com/content.jsp?pageName=Monthly-Star-Chart>

Two stars with exoplanetary systems, Upsilon Andromedae (magnitude +4.1) and 51 Andromedae (magnitude +5.5), can be seen this month without optical aid.

The famous eclipsing variable star Algol (Beta Persei) is at a minimum, decreasing in brightness from magnitude +2.1 to magnitude +3.4, on November 2nd, 5th, 8th, 10th, 13th, 16th, 19th, 22nd, 25th, and 28th. Consult <http://www.skyandtelescope.com/observing/interactive-sky-watching-tools/> and page 51 of the November 2017 issue of *Sky & Telescope* for the eclipse times. 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>

Comet information for: November 18, 2017 (New Moon).

	Constellation	Rises	Transits	Sets
240P/NEAT	Sculptor	5:02 p.m.	9:07 p.m.	1:12 a.m.
24P Schaumasse	Virgo	3:08 a.m.	9:35 a.m.	4:02 p.m.
62P/Tsuchinshan 1	Leo	1:49 a.m.	8:29 a.m.	3:09 p.m.
C/2016 N6 (PannSTARRS)	Boötes	1:57 a.m.	12:32 p.m.	11:08 p.m.
C/2016 M1 (PanSTARRS)	Hercules	7:53 a.m.	2:52 p.m.	9:51 p.m.
C/2015 ER61 (PanSTARRS)	Aries	5:15 p.m.	12:21 a.m.	7:26 a.m.
71P/Clark	Capricorn	1:57 p.m.	6:22 p.m.	10:47 p.m.
C/2015 O1 (PannSTARRS)	Hercules	6:22 a.m.	1:32 p.m.	8:42 p.m.
29P/Schwassmann-Wachman 1	Aquarius	1:15 p.m.	6:31 p.m.	11:47 p.m.
217P/(LINEAR)	Cancer	11:02 p.m.	5:39 a.m.	12:15 p.m.
C/2016 R2 (PannSTARRS)	Orion	8:23 p.m.	2:35 a.m.	8:47 a.m.
C/2015 VL62 (Lemmon-Yeung-PannSTARRS)	Sagittarius	11:18 a.m.	4:20 p.m.	9:21 p.m.
C/2016 N4 (MASTER)	Draco	circumpolar	5:01 p.m.	
C/2017 O1 (ASSASSN)	Cepheus	circumpolar	1:52 a.m.	

For location (40°16'N 76°45'W) Hummelstown, PA, USA:

November 1:

Event	Time	Altitude	Azimuth
Minimum altitude:	00:51	-64.2°	0°
Astronomical twilight begins:	06:05	-18.0°	94°
Nautical twilight begins:	06:37	-12.0°	99°
Civil twilight begins:	07:09	-6.0°	104°
Sunrise:	07:37	-0.8°	109°
Maximum altitude:	12:50	35.1°	180°
Sunset:	18:04	-0.8°	251°
Civil twilight ends:	18:32	-6.0°	256°
Nautical twilight ends:	19:04	-12.0°	261°
Astronomical twilight ends:	19:36	-18.0°	266°

December 1:

Event	Time	Altitude	Azimuth
Minimum altitude:	23:56	-71.7°	360°
Astronomical twilight begins:	05:34	-18.0°	104°
Nautical twilight begins:	06:07	-12.0°	109°
Civil twilight begins:	06:41	-6.0°	114°
Sunrise:	07:11	-0.8°	118°
Maximum altitude:	11:56	27.8°	180°
Sunset:	16:41	-0.8°	241°
Civil twilight ends:	17:12	-6.0°	246°
Nautical twilight ends:	17:45	-12.0°	251°
Astronomical twilight ends:	18:18	-18.0°	256°

For location (40°16'N 76°45'W) Hummelstown, PA, USA:  
November 1:

	<b>Mercury</b>	<b>Venus</b>	<b>Mars</b>	<b>Jupiter</b>	<b>Saturn</b>	<b>Uranus</b>	<b>Neptune</b>	<b>Pluto</b>
Right ascension	15 <sup>h</sup> 20 <sup>m</sup> 31.9 <sup>s</sup>	13 <sup>h</sup> 23 <sup>m</sup> 3.5 <sup>s</sup>	12 <sup>h</sup> 22 <sup>m</sup> 42.2 <sup>s</sup>	14 <sup>h</sup> 10 <sup>m</sup> 10.5 <sup>s</sup>	17 <sup>h</sup> 35 <sup>m</sup> 42.7 <sup>s</sup>	1 <sup>h</sup> 36 <sup>m</sup> 26.5 <sup>s</sup>	22 <sup>h</sup> 52 <sup>m</sup> 35.6 <sup>s</sup>	19 <sup>h</sup> 12 <sup>m</sup> 56.0 <sup>s</sup>
Declination	-19° 52' 44"	-7° 8' 9"	-1° 13' 1"	-12° 3' 6"	-22° 19' 44"	9° 24' 2"	-8° 10' 22"	-21° 49' 8"
Range (AU)	1.358	1.609	2.405	6.430	10.731	18.941	29.399	33.792
Elongation from Sun	14.3°	16.9°	33.0°	4.3°	45.7°	167.1°	122.7°	68.2°
Brightness	-0.4	-3.8	1.8	-1.5	0.5	5.7	7.9	14.3
Equatorial Diameter	4.96"	10.37"	3.89"	30.66"	15.49"	3.72"	2.32"	0.10"
Phase Angle	31.8°	23.6°	19.0°	0.8°	4.0°	0.6°	1.6°	1.6°
Constellation	Libra	Virgo	Virgo	Virgo	Ophiuchus	Pisces	Aquarius	Sagittarius
Meridian transit	13:46	11:48	10:46	12:33	15:58	00:01	21:14	17:35
Rises	08:58	06:13	04:51	07:15	11:20	17:26	15:42	12:55
Sets	18:34	17:22	16:41	17:50	20:36	06:32	02:49	22:14
Altitude	-59.7°	-56.7°	-47.6°	-60.8°	-36.7°	59.1°	28.7°	-18.1°
Azimuth	304.5°	5.7°	27.6°	342.5°	270.6°	179.6°	227.4°	256.3°
% illumination	92.5	95.8	97.3	100	99.9	100	100	100

December 1:

	<b>Mercury</b>	<b>Venus</b>	<b>Mars</b>	<b>Jupiter</b>	<b>Saturn</b>	<b>Uranus</b>	<b>Neptune</b>	<b>Pluto</b>
Right ascension	17 <sup>h</sup> 55 <sup>m</sup> 1.0 <sup>s</sup>	15 <sup>h</sup> 52 <sup>m</sup> 59.1 <sup>s</sup>	13 <sup>h</sup> 34 <sup>m</sup> 9.1 <sup>s</sup>	14 <sup>h</sup> 35 <sup>m</sup> 33.1 <sup>s</sup>	17 <sup>h</sup> 49 <sup>m</sup> 39.2 <sup>s</sup>	1 <sup>h</sup> 32 <sup>m</sup> 32.6 <sup>s</sup>	22 <sup>h</sup> 52 <sup>m</sup> 11.6 <sup>s</sup>	19 <sup>h</sup> 15 <sup>m</sup> 56.1 <sup>s</sup>
Declination	-25° 1' 12"	-19° 30' 30"	-8° 41' 36"	-14° 9' 17"	-22° 28' 58"	9° 2' 10"	-8° 12' 7"	-21° 47' 3"
Range (AU)	0.841	1.679	2.202	6.282	10.997	19.194	29.900	34.227
Elongation from Sun	19.4°	9.3°	44.6°	28.6°	18.1°	135.2°	91.7°	38.1°
Brightness	0.2	-3.8	1.7	-1.6	0.5	5.7	7.9	14.3
Equatorial Diameter	8.00"	9.94"	4.25"	31.38"	15.11"	3.67"	2.28"	0.10"
Phase Angle	105.3°	12.7°	24.8°	5.0°	1.7°	2.0°	1.9°	1.0°
Constellation	Sagittarius	Libra	Virgo	Libra	Sagittarius	Pisces	Aquarius	Sagittarius
Meridian transit	13:19	11:16	08:58	10:00	13:13	20:55	18:15	14:40
Rises	08:53	06:26	03:28	04:50	08:36	14:25	12:44	09:59
Sets	17:45	16:07	14:28	15:10	17:51	03:29	23:46	19:20
Altitude	24.4°	20.9°	7.8°	14.5°	26.8°	-7.3°	11.3°	26.7°
Azimuth	186.7°	217.6°	251.5°	236.7°	188.3°	71.6°	111.1°	165.9°
% illumination	39.2	98.7	95.4	99.8	100	100	100	100

The objects listed below are located between 0:00 and 2:00 hours of right ascension.

Seventy binary and multiple stars for November: Otto Struve 514, Alpha Andromedae (Alpheratz), Struve 3, h1947, Struve 19, Struve 24, 26 Andromedae, Struve 40, Pi Andromedae, Delta Andromedae, Struve 47, Eta Andromedae, Struve 79, Beta Andromedae (Mirach), Struve 108, Struve 179, South 404 (Andromeda); 1 Arietis, Struve 178, Gamma Arietis, Lambda Arietis (Mesarthim) (Aries); Struve 3053, Struve 3057, Struve 16, Struve 30, Otto Struve 16, Alpha Cassiopeiae (Schedar), Struve 59, Eta Cassiopeiae, Burnham 1, Struve 70, Otto Struve 23, h1088, Struve 163, Struve 170, Struve 182 (Cassiopeia); 34 Piscium, Struve 8, 35 Piscium, Struve 15, 38 Piscium, 42 Piscium, 49 Piscium, 51 Piscium, 55 Piscium, 65 Piscium, Psi Piscium, Otto Struve 22, Struve 98, Otto Struve 26, Phi Piscium, Zeta Piscium, h636, Otto Struve 30, Struve 122, Struve 132, Otto Struve 31, 100 Piscium, Struve 145, 107 Piscium, h644 (Pisces); h5440, Kappa-1 Sculptoris, h1949, h3442, h3379, Tau Sculptoris, Epsilon Sculptoris (Sculptor); Struve 143, Struve 183 (Triangulum)

Notable carbon star for November: Z Piscium

Seventy deep-sky objects for November: M31, M32, M110, NGC 252, NGC 404, NGC 752 (Andromeda); NGC 680, NGC 691, NGC 697, NGC 772 (Aries); Cr 463, IC 1747, K14, M103, NGC 129, NGC 133, NGC 146, NGC 185, NGC 225, NGC 281, NGC 278, NGC 381, NGC 436, NGC 457, NGC 559, NGC 637, NGC 654, NGC 659, NGC 663, Tr 1 (Cassiopeia); NGC 40, NGC 188 (Cepheus); NGC 151, NGC 175, NGC 178, NGC 210, NGC 227, NGC 245, NGC 246, NGC 247, NGC 274, NGC 337, NGC 578, NGC 584, NGC 596, NGC 615, NGC 636, NGC 681, NGC 720, NGC 779 (Cetus); NGC 7814 (Pegasus); M76, St 4 (Perseus); M74, NGC 128, NGC 194, NGC 488, NGC 524 (Pisces); NGC 24, NGC 55, NGC 134, NGC 150, NGC 253, NGC 254, NGC 288, NGC 289, NGC 439, NGC 613 (Sculptor); M33, NGC 672 (Triangulum)

Top ten binocular deep-sky objects for November: M31, M33, M103, NGC 225, NGC 288, NGC 253, NGC 457, NGC 654, NGC 663, NGC 752

Top ten deep-sky objects for November: M31, M32, M33, M76, M103, M110, NGC 40, NGC 253, NGC 457, NGC 752

Challenge deep-sky object for November: IC 59 (Cassiopeia)