

Summer astronomy

The skies this summer will not be as planet-rich as we have gotten used to over the past few months, yet there are still quite a few celestial thrills to anticipate. In addition to the planet viewing opportunities, there is a very rare Venus transit of the Sun and the annual Perseid meteor shower.

This summer also marks both an end and beginning for the Cassini/Huygens spacecraft. It is the end of a seven-year cruise that started in December 1997, taking the spacecraft past Venus in 1998 and 1999, the Earth later in 1999, and Jupiter at the end of 2000. The spacecraft's orbit was modified from a circular shape to a more elliptical shape using a gravity assist from each planet as it went past. This gravity assist method is a more practical way for reaching the outer solar system than by packing a lot of fuel and blasting out there. While this method is slow, it considerably reduces the amount of fuel required, thus saving weight for more scientific instruments.

This is also the beginning for Cassini/Huygens in that the exploration of Saturn will just be starting as the spacecraft enters orbit during the first few days of July. The mission plans call for orbiting in the Saturnian system until 2008, with the possibility of extending the mission an additional year or two. One large component of this mission is the study of the atmosphere and surface of Saturn's moon Titan. The Huygens probe will be released on the 24th of December and will reach Titan on the 14th of January where it will drop through the atmosphere toward the surface. As the probe descends to the surface, images and data will be relayed to the Cassini spacecraft for transmission back to Earth.

Titan has a dense atmosphere of mostly nitrogen with a smog-like haze of organic compounds, such as ethane and methane, in its upper atmosphere. Given what is understood from Earth-based observations and *Voyager* data, it is thought that the surface of Titan has lakes or oceans filled by rainfalls of ethane.

Visible planets from May to August

Mercury will make a complete orbit around the Sun between May and September. In May, Mercury will reach its greatest western elongation as a morning planet, visible over the eastern horizon before sunrise. By mid-June, Mercury will be at superior conjunction, on the other side of the Sun, and will not be visible until it starts reappearing in the evening skies after sunset in July. It will reach greatest eastern elongation on July 27th. From this orbital position it will not take long for Mercury to move between the Earth and the Sun, and inferior conjunction, on August 21st. By



NASA

September 9th, Mercury will once again be at western elongation in the morning skies.

Venus will be bright and low over the western horizon at sunset as it nears the end of a several month period of evening visibility. During the summer months, Venus will shift from the evening skies to the morning skies. Moving toward inferior conjunction on the 8th of June, Venus will pass between the Earth and the Sun in a rare transit. Imagine a solar eclipse, except this time, rather than the Sun being blocked completely, picture a small dot moving across the disk of the Sun. This is the first opportunity to view a transit of Venus across the Sun since 1882. Venus transits only occur about 14 times every 1,000 years. This transit is particularly exciting for two reasons—part of the event may be seen from the eastern half of the United States as the Sun is rising, and the next transit of Venus is only nine years away—June 6th, 2012 (see Resources).

Mars is gradually setting earlier as it moves toward the Sun and superior conjunction next September. By the end of June, Mars will be too low over the western horizon at sunset to be seen. Saturn will be close to Mars during this time. During May and June, the motion of the eastward-moving Mars will be easy to discern as it catches up with, and passes, Saturn. On the evening of the 24th of May, the two planets will be closest, coming within about two degrees of each other.

Jupiter has been in retrograde motion this spring and, by early May, the giant planet will resume its eastward motion. Jupiter will spend much of the summer months low over the western horizon at sunset and, by August, will be very difficult to see as it moves into the glare of the Sun. By the second half of September, Jupiter will be in conjunction with the Sun and will not be visible again until it reappears in the morning skies in late October.

Saturn will be visible low over the western horizon at sunset and, by early June, will be lost in the Sun's glare. By

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the 8th of July, Saturn will be in conjunction with the Sun and will not be visible again until it reappears in the morning skies during August.

Celestial events

Lunar eclipse—On May 4th, the full Moon will pass through the Earth’s shadow setting up conditions for the first of this year’s total lunar eclipses. This eclipse will be visible from the other side of the Atlantic Ocean. The eclipse will be ending as the Moon rises over the east coast of the United States, so we will miss this one, but not the one in October!

Visible comets—Two comets may be visible during May and June according to software-based predictions. Both comets have names that indicate their discovery was by an automated telescope system rather than someone at the eyepiece. Comet caveat: despite predictions “comets are like cats, they both have tails and they both do what they want” (David Levy, www.jamac.org). Comet NEAT (C/2001 Q4) may become visible over the west-northwest horizon as it moves toward perihelion with the Sun. The comet will first appear low and bright over the western horizon around the 5th of May at 9 P.M., and may be around 1st magnitude (very bright). Through May and part of June, this comet will rise higher over the horizon and gradually become dimmer as it moves away from the Sun. Its path will take it past Procyon in Canis Major, Pollux and Castor, and the bowl of the Big Dipper. Comet LINEAR (C/2002 T7) appears toward the end of May as it joins Comet NEAT (C/2001 Q4) over the western horizon during the evening hours after sunset. Start watching for the comet around the 28th at 9 P.M. as its path takes it higher over the western horizon past the star Alpheratz in the constellation Hydra. Jupiter will shine brightly above the comet throughout the period of visibility. This comet will not be as bright as Comet NEAT (C/2001 Q4), around 2nd magnitude, when it becomes visible over the horizon. Also, this comet is outbound from the Sun, so it will dim as each day passes. It will only be visible for about two weeks and it will set by about 9:30 P.M., so the viewing opportunities are more limited.

Perseid meteor shower—Moonlight will not interfere with viewing this year’s annual meteor shower. The Perseids will reach their peak after midnight on the 12th of August, however there are several days before and after the peak day when Perseid meteors may also be seen.

Moon phases

	May	June	July	August
Full Moon	5/4	6/3	7/2	8/30
Last quarter	5/11	6/11	7/9	8/11
New Moon	5/19	6/17	7/17	8/19
First quarter	5/27	6/25	7/25	8/23
Full Moon	—	—	7/31	8/30

Celestial events

- 5/4 Total lunar eclipse
- 5/14 Mercury at greatest elongation
- 5/16 Mercury south of Moon
- 5/21 Venus very close to Moon
- 5/22 Mars near Moon
- 5/27 Jupiter near Moon
- 6/8 Venus at inferior conjunction
- 6/11 Cassini/Huygens encounter with Jupiter’s moon Phoebe
- 6/18 Mercury at superior conjunction
- 6/20 Mars near Moon
- 6/21 June solstice
- 6/23 Jupiter near Moon
- 7/1 Cassini/Huygens Saturn orbit insertion maneuver
- 7/5 Earth at aphelion
- 7/8 Saturn-Sun conjunction
- 7/21 Jupiter near Moon
- 7/27 Mercury at greatest elongation
- 8/5 Neptune at opposition
- 8/8 Mars at aphelion
- 8/17 Venus at greatest elongation
- 8/18 Jupiter near Moon
- 8/23 Mercury at inferior conjunction
- 8/28 Uranus at opposition

Internet resources

- Lunar eclipse—sunearth.gsfc.nasa.gov/eclipse/LEplot/LEplot2001/LE2004May04T.gif
- Venus transit—www.venus-transit.de
- Saturn Observation Campaign—soc.jpl.nasa.gov/index.cfm
- Cassini/Huygens Mission to Saturn—saturn.jpl.nasa.gov/index.cfm
- Near Earth Asteroid Tracking—neat.jpl.nasa.gov
- Lincoln Near Earth Asteroid Research—www.ll.mit.edu/LINEAR
- Solstice—scienceworld.wolfram.com/astronomy/SummerSolstice.html
- Equinox—currentsky.com/articles/eggquinox/index.html

Tracking our Sun

Sun distance

May 5th—Distance: 1.0111 AU, Apparent diameter: 32'

Along the ecliptic

May 13th—Constellation: Taurus, Declination: 18° 37',
Right ascension: 03^h 24^{min}