

## Winter viewing

While the year is coming to a close, opportunities for observing our solar system certainly are not. Whether in the pre-dawn or the evening skies, all of the viewing action for the next few months will be toward the eastern horizon. The visible planets are either rising ahead of the Sun in the morning skies, or approaching opposition and rising at about sunset. During the months of November and December there will be several chances to see meteor showers, witness planet conjunctions, and view a lunar eclipse.

### Conjunctions

The elusive planet Mercury starts out at superior conjunction on the other side of the Sun. However, it very quickly swings out to the left, or east, of the Sun. By the middle of December it is visible as an evening planet over the southwestern horizon at sunset.

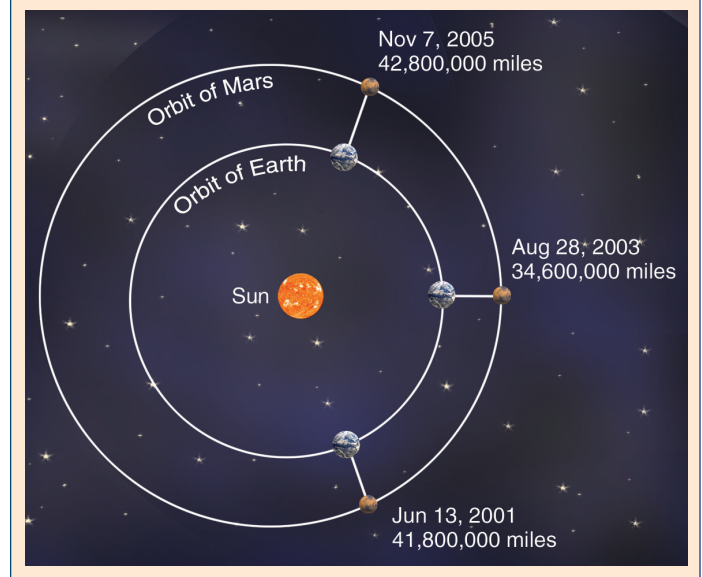
Our twin planet, as Venus is sometimes known, is between the Earth and the Sun at inferior conjunction during the first part of November. It will gradually move to the right, or west, of the Sun. By December it will be visible over the southeastern horizon at sunrise. Twice during December (on 12/01 and 12/30) the waning crescent Moon will be within two degrees of Venus, resulting in a striking conjunction in the pre-dawn morning skies. Venus also spends a good portion of December within a couple of degrees of the planet Mars.

Mars is slowly, but steadily, becoming brighter and more visible as the Earth is catching up with it. Mars rises shortly after midnight and is visible over the southeastern horizon before sunrise, very close to the much brighter-appearing planet Venus. In a way, this is the beginning of a once-in-a-lifetime opportunity to see Mars at its closest point to the Earth. We are approaching an alignment of the two planets known as *opposition*—when the Earth is directly between the Sun and an outer planet, Mars in this case (see Figure 1). Mars has an elliptical orbit that is slightly more eccentric than the Earth's orbit (see October's Scope on the Skies). Like the Earth, Mars has a point along its orbit where it is at greatest or least distance from the Sun. Both planets have elliptical orbits and aphelion and perihelion dates. Mars is at opposition, near or at perihelion (closest to the Sun), while Earth is near or at aphelion (most distant from the Sun). Combining these factors at the about the same time, as is the case for the next opposition of Mars (August 2003), means Mars will be about as close to the Earth as it will ever be, and nearly at its maximum apparent size.

The two largest planets in the solar system, Jupiter and

FIGURE 1

Oppositions of Mars 2001–2005



Saturn, are both becoming more visible over the eastern horizon at sunset. Saturn is at opposition during the middle of December and, like the Earth's full Moon, will rise at sunset and set at sunrise. Saturn will be visible all night, while Jupiter, which has not yet reached opposition, rises after sunset and will still be visible at sunrise over the western horizon.

The four Galilean satellites, Io, Europa, Ganymede, and Callisto, are planet-sized moons that are visible as pinpoints of light shifting from one side of Jupiter to the other. This regular motion of the large moons orbiting Jupiter caught Galileo's attention about 400 years ago. Even with a small telescope the changing positions of these moons can be observed (see October's Tech Trek).

### Eclipse

At full Moon phase on November 20th, the Moon will pass through the Earth's outer shadow in what is called a *penumbral lunar eclipse*. There is hardly a change in the Moon's brightness or coloration during this type of lunar eclipse, so it will barely be visible. Since eclipses occur as pairs, there will be a solar eclipse two weeks later on December 4th when the Moon, at new Moon phase, will pass between the Earth and the Sun. The Moon's shadow across the Earth will track from Africa, across the ocean, to Australia.

### Meteor showers

During this period there will be two opportunities for viewing annual meteor showers. The annual Leonid meteor shower,

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which peaked as a storm last year, reaches its peak activity twice—Leonid “a” at 11 P.M. EST on November 18th and Leonid “b” at 6 A.M. EST on November 19th. A meteor shower gets its name due to the location, or constellation, that the meteors appear to radiate outward from. For viewing in the United States, the constellation Leo does not rise until about 2 A.M. EST but is very high in the sky over the southern horizon by the time the second Leonid peaks at 6 A.M. EST. During the night hours of December 13th and 14th, the annual Geminid meteor shower will reach its peak. The first quarter Moon is to the west of the constellation Gemini but sets by about 2 A.M. EST, leaving a darker sky for viewing these meteors.

## Moon phases

	November	December
New Moon	11/04	12/04
First quarter	11/11	12/11
Full Moon	11/20	12/19
Third quarter	11/27	12/26

## Celestial events

11/19 Leonid meteor shower peak (potential meteor storm)  
 11/20 Penumbral lunar eclipse

12/04 Solar eclipse (visible from southern Africa)  
 12/13 Geminid meteor shower peak  
 12/21 December solstice

## Visible planets

- Mercury is visible over the western horizon at sunset during last half of December.
- Venus is visible over the eastern horizon at sunrise.
- Earth is visible under your feet.
- Mars is over the eastern horizon at sunrise.
- Jupiter rises after sunset and is visible for most of the night.
- Saturn rises before sunset and is visible all night.

## Internet resources

Leonid meteor shower—[comets.amsmeteors.org/meteors/showers/leonids.html](http://comets.amsmeteors.org/meteors/showers/leonids.html)

Lunar eclipse—[sunearth.gsfc.nasa.gov/eclipse/LEplot/LEplot2001/LE2002Nov20N.gif](http://sunearth.gsfc.nasa.gov/eclipse/LEplot/LEplot2001/LE2002Nov20N.gif)

Solar eclipse—[sunearth.gsfc.nasa.gov/eclipse/SEplot/SEplot2001/SE2002Dec04T.gif](http://sunearth.gsfc.nasa.gov/eclipse/SEplot/SEplot2001/SE2002Dec04T.gif)

Geminid meteor shower—[comets.amsmeteors.org/meteors/showers/geminids.html](http://comets.amsmeteors.org/meteors/showers/geminids.html)

December solstice—[www.equinox-and-solstice.com/html/winter\\_solstice.html](http://www.equinox-and-solstice.com/html/winter_solstice.html)