

Planets highlight the evening skies

This year comes to an end with four of the brightest planets visible above the horizon at sunset. Like a celestial sunset buffet, the two inner planets shine over the western horizon while two of the outer planets, Mars and Saturn, shine over the southern and eastern horizons, respectively.

Inner planets

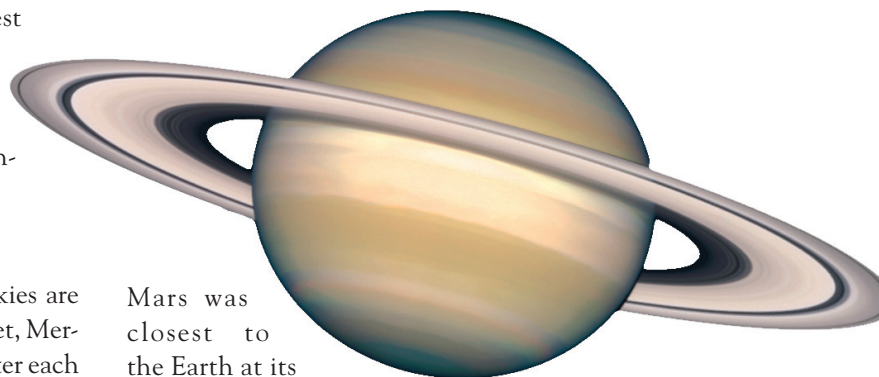
Slowly working their way back into the evening skies are the brightest planet, Venus, and the innermost planet, Mercury. Watch for Venus to steadily brighten and set later each day as it moves from behind the

Sun toward the east. Venus, an inner planet, moves more quickly than the Earth does.

If you want to observe the fastest-moving planet, Mercury, start watching the western horizon toward the end of November. Mercury will also be moving out from behind the Sun at superior conjunction and, like Venus, is moving eastward. Unlike Venus, however, Mercury never moves that far from the Sun, limiting its duration of visibility considerably more than Venus. By the 9th of December, Mercury will reach the greatest eastern elongation (angle from the Sun) and will then start moving in retrograde toward the Sun in the west, setting earlier each day as it does so.

Outer planets

While Venus and Mercury are playing orbital tag over the western horizon, you will find Mars shining brightly over the south-southwestern horizon at sunset. Several months ago,



Mars was closest to the Earth at its maximum appar-

ent size and, since that time, the distance between the two planets has been steadily increasing. Still, some of Mars' surface features are viewable with larger telescopes.

Even though Mars' visibility is decreasing, our observation of it will only get better as two spacecraft are scheduled to arrive there over the next two months. On December 14th, the Japanese Space Agency's *Nozomi* spacecraft is set for orbital insertion around Mars following a journey across the solar system of more than five years. Then, on the 20th, the European Space Agency's *Express* spacecraft will release the *Beagle 2* surface probe. Five days later, the *Beagle 2* will enter the atmosphere for a landing just north of the Martian equator in the Isidis Planitia Basin. Interestingly, when the *Beagle 2* "phones home" to announce its safe touchdown it will signal this event with a nine-note tone from a song appropriately titled "Beagle 2" (written specially for the mission by the musical group Blur).

Saturn returns to the evening skies as it rises near sunset over the eastern horizon during November and December. On the last day of this year, Saturn will reach its point of opposition, which occurs whenever an outer planet is positioned such that the Earth is between it and the Sun, like the orientation for a full Moon phase. And, like the full Moon, a planet at opposition rises at sunset and is above the horizon all night, finally setting at sunrise. Thus, for a while at least, Saturn may be viewed as both an evening and morning planet over the opposite horizon from the Sun.

Bob Riddle is a science educator living in western Missouri. You can reach him via e-mail at starwalk@currentsky.com or visit his website at www.currentsky.com.

Total lunar eclipse

During the evening of November 8th, the full Moon will be eclipsed as it passes through the southern portion of the Earth's darker umbral shadow. This total lunar eclipse will be seen from all across the United States, with longitude location determining the extent of visibility. Observers on the east coast will be able to see nearly the entire event while those further west, especially on the west coast, will see the Moon rising with the eclipse already in progress. The Moon makes first contact with the fainter penumbral shadow at 5:15 P.M. EST, but changes in brightness won't be noticeable until it makes contact with the darker umbral shadow at 6:32 P.M. EST. Mid-eclipse occurs at 8:19 P.M. EST, and the trailing edge of the moon leaves the umbral shadow at 10:05 P.M. EST. Two weeks following the lunar eclipse the new Moon will pass between the Earth and the Sun for a total solar eclipse—viewable across parts of Antarctica.

December solstice

December 22nd marks the solstice, or the official beginning of northern hemisphere winter and southern hemisphere summer. This date is determined by tracking the Sun in its apparent eastward motion along the ecliptic until it reaches a specific celestial coordinate location within the constellation of Sagittarius. With regard to the Earth's surface and seasons, the Sun is described as being south of the equator, over the Tropic of Capricorn. Students may follow and plot the Sun's regular apparent motion along the ecliptic throughout the year using equatorial star charts available from SFA Observatory (see Resources).

Visible planets

- Mercury is visible low over the western horizon at sunset for the first half of December.
- Venus is visible over the southwestern horizon at sunset.
- Mars is visible over the southern horizon at sunset and sets around midnight.
- Jupiter is over the eastern horizon at sunrise.
- Saturn rises around sunset, is visible all night, and then sets at sunrise.

Celestial events

- 11/03 Mars near Moon
- 11/08–09 Total lunar eclipse
- 11/14 *Nozomi* spacecraft arrives at Mars
- 11/18 Jupiter near Moon
- 11/23 Total solar eclipse

Tracking our Sun

Sun distance

December 15th—Distance: 0.9842 AU, Apparent diameter: 33'

Along the ecliptic

December 22nd—Constellation: Sagittarius, Declination: -23.5 degrees, Right ascension: 18^h

- 11/25 Mercury near Moon
- 12/01 Mars near Moon
- 12/05 Launch of *Swift* satellite
- 12/09 Mercury at greatest eastern elongation
- 12/13 Geminid meteor shower peak
- 12/16 Jupiter near Moon
- 12/22 December solstice
- 12/25 *Beagle 2* lands on Mars
- 12/25 Venus near Moon
- 12/27 Mercury at inferior conjunction
- 12/30 Mars near Moon
- 12/31 Saturn at opposition

Moon phases

	November	December
First quarter	11/01	—
Full Moon	11/09	12/08
Last quarter	11/17	12/16
New Moon	11/23	12/23
First quarter	11/30	12/30

Internet resources

- Sky Charts from SFA Observatory—observe.phy.sfasu.edu
- Total lunar eclipse—sunearth.gsfc.nasa.gov/eclipse/OH/OH2003.html#LE2003Nov09T
- Leonids meteor shower—www.comets.amsmeteors.org/meteors/showers/leonids.html
- Total Solar Eclipse—sunearth.gsfc.nasa.gov/eclipse/TSE2003/TSE2003.html
- Launch of the *Swift* satellite—swift.gsfc.nasa.gov
- Geminid meteor shower—www.comets.amsmeteors.org/meteors/showers/geminids.html
- Nozomi* spacecraft—nssdc.gsfc.nasa.gov/database/MasterCatalog?sc=1998-041A
- Mars Express—www.esa.int/SPECIALS/Mars_Express
- Isidis Planitia Basin—www.space.com/scienceastronomy/solarsystem/mars_daily_020411.html
- December solstice—www.equinox-and-solstice.com/html/winter_solstice.html
- Solar System Educators Program—www.ssep.org