Summer skies: Planets, an eclipse, and shooting stars

This summer, in addition to viewing several of the bright visible planets, there will be an opportunity for viewing the target of an upcoming NASA mission, the asteroid Vesta. While the planets may be seen without optical aids such as binoculars or telescopes, viewing Vesta will require binoculars to track its motions among the stars in the background.

This summer we will also have another opportunity for viewing a lunar eclipse. During the March eclipse, viewers near the East Coast were able to watch a rising, totally eclipsed Moon, while further west the Moon rose as partially eclipsed or as just a full Moon. This next eclipse will favor the western half of the United States, with the totally eclipsed Moon over the western horizon before sunrise.

The visible planets this summer

Mercury will reach greatest eastern elongation, its maximum separation from the Sun, on June 2, and will remain well placed for viewing through the first several weeks of June as an evening planet visible after sunset. Mercury, however, will be moving westward back toward the Sun, setting earlier each evening until by the end of the month it will be between the Earth and the Sun, at inferior conjunction. Mercury will reappear as a morning planet during the first several weeks of July, move toward greatest western elongation on July 20, and then head eastward back toward the Sun and superior conjunction

Bob Riddle (bob-riddle@currentsky.com) *is the planetarium director for the Kansas City, Missouri school district. Visit his astronomy website at* www.currentsky.com.

TABLE 1 **Lunar eclipse data for August 28**

Location	Moonset
Washington, DC	0636 EDT (UTC -4)
Kansas City	0650 CDT (UTC -5)
Denver	0633 MDT (UTC -6)
San Francisco	0648 PDT (UTC -7)
Anchorage	0603 AKDT (UTC -8)
Honolulu	0731 HADT (UTC -9)

during the middle of August. By the time school starts at the end of August or early September, Mercury will have completed an orbit around the Sun.

Venus, moving slower than Mercury, will also reach greatest eastern elongation during the first few days of June, and then will move in retrograde, westward, toward the Sun and inferior conjunction during mid-August. Through the summer months Venus will gradually appear lower over the western horizon at sunset until it is lost in the Sun's glare in August.

Mars will remain a morning planet during this three-month period. Each month, Mars will rise about two hours earlier, and by August it will rise at around 2:00 a.m. local time. For the past several years, since the close opposition with Mars in 2003, there has been an e-mail circulating the internet with incorrect claims that Mars will be at its closest to the Earth this summer. Just to clarify—Mars reaches opposition approximately every 26 months. During August of 2003 the distance between Earth and Mars was about as small as it could ever be. However, Mars has an elliptical orbit, which means that not every opposition is the same distance. This year Mars will be at opposition during November, and while it will be close, it will not be as close as the one in 2003. (*Opposition* is when the Earth is directly between an outer planet like Mars and the Sun. It may also coincide with when the planet is closest to the Sun and hence closest to Earth for that particular opposition. Picture a full Moon arrangement and that is what opposition looks like.)

Jupiter will reach opposition on June 6, and as with any outer planet at opposition, it will be visible essentially the entire night. Outer planets at opposition rise at sunset and set at sunrise.

Saturn will be visible over the western horizon after sunset and will slowly move toward superior conjunction, behind the Sun, by mid-August. Viewing Saturn will become increasingly difficult as the separation between Saturn and the Sun decreases through June and July. However, adding to the viewing experience is the much brighter planet Venus. At the end of June through part of July, Saturn and Venus will be within about 1 degree of each other. This should make for a very striking view through binoculars or low-power eyepieces on a telescope.

Vesta comes into view

In the months preceding the launch of the *Dawn* spacecraft, asteroid Vesta, the mission's first scheduled target for orbital study, can be observed in the early hours of dawn. As the asteroid becomes 10% brighter each day, professional and amateur astronomers, using both large and small telescopes, are taking advantage of the opportunity to expand upon our growing knowledge of Vesta. An article by Lucy McFadden, *Dawn* co-investigator and education and public outreach director, explains the contributing factors to Vesta's increasing magnitude. See the Viewing Vesta web resource for a link to the article and locator maps showing the position of asteroid Vesta during the summer months.

Dawn mission overview

On June 20, 2007, NASA's Discovery mission, *Dawn*, will launch to characterize the conditions and processes of the solar system's earliest epoch by investigating two of the largest objects in the main asteroid belt, the dwarf planet Ceres and asteroid Vesta. Both of these objects orbit the Sun in the extensive zone between Mars and Jupiter, known as the asteroid belt. Each has followed a very different evolutionary path constrained by the diversity of processes that operated during the first few million years of solar-system evolution. (See "NASA's *Dawn* mission" on pg. 54.)

June solstice

On June 21 at 2:11 p.m. EDT, the Sun will reach the celestial coordinates of 23.5° north and six hours right ascension. This marks the astronomical position of the Sun, the end of Northern Hemisphere spring, and the beginning of Northern Hemisphere summer.

Earth at aphelion

On July 6, the Earth will reach a point in its slightly elliptically shaped orbit around the Sun where it will be at the maximum distance from the Sun. This is known as *aphelion* and on this date the separation between the two will be 152,097,053 km (94,528,930 miles), approximately 3.4% more distant then at aphelion during January.

Perseid meteor shower

Each year during the middle of August, the Earth passes through debris left behind by Comet 109P Swift-Tuttle, a comet discovered in 1862. The comet is the parent, or source, for the meteors that enter our atmosphere, giving rise to the shooting stars, or meteors, of the Perseid meteor shower. Meteor showers are named for the constellation that they radiate from, and in this case it is the constellation of Perseus. Perseus will rise over the east-northeast horizon around 11:00 p.m. local time and is visible all night. The peak time (maximum numbers of meteors) for the shower is before sunrise on the 13th; however, viewing the meteor shower could be done for a day or two before or after that date. This year, the Moon will be in a new phase, so its reflected light will not brighten the sky and interfere.

Total lunar eclipse

During the early morning hours before the Sun rises on August 28, the full Moon will enter the Earth's two shadows (the outer and lighter penumbral shadow, and the inner and darker umbral shadow), offering an opportunity for viewing a total lunar eclipse for observers across the entire continental United States. For the continental United States, the Moon will still be in the total phase as it sets. Consult Table 1 for times of each eclipse stage, and compare them with the time for moonset. The times for each eclipse stage are given as Coordinated Universal Time (UTC) and these are easily converted to a local time zone by subtracting the appropriate number of hours as shown in the second column of Table 1. See Resources for a link to determine the time of moonset for your location.

Celestial events: Summer calendar

June

1 **Full Moon**
2 Mercury at greatest elongation: 23°E
4 Mars at perihelion
5 Jupiter at opposition
8 **Last quarter**
9 Venus at greatest elongation: 45°E
12 Moon at perigee: 363,778 km
15 **New Moon**
19 Pluto at opposition
21 June solstice (1406 EDT)
12 **First quarter**
24 Moon at apogee: 404,540 km
28 Mercury at inferior conjunction
30 **Full Moon**

July

6 Earth at aphelion
7 **Last quarter**
9 Moon at perigee: 368,534 km
14 **New Moon**
20 Mercury at greatest elongation: 20°W
22 **First quarter**
22 Moon at apogee: 404,152 km
30 **Full Moon**

August

4 Moon at perigee: 368,892 km
5 **Last quarter**
12 **New Moon**
13 Neptune at opposition
Perseid meteor shower peak
15 Mercury at superior conjunction
18 Venus at inferior conjunction
19 Moon at apogee: 404,621 km
20 **First quarter**
21 Saturn-Sun conjunction
28 Total lunar eclipse; magnitude
28 **Full Moon**
31 Moon at perigee: 364,174 km

Resources

Daily moonrise and -set—*http://aa.usno.navy.mil/data/docs/RS_OneDay.html*

Dawn mission—*http://dawn.jpl.nasa.gov/mission/index.asp*

Lunar eclipse— *http://sunearth.gsfc.nasa.gov/eclipse/OH/OH2007.html#2007Aug28T*

Monthly Sun and Moon rise and set—*www.sunrisesunset.com/custom_srss_calendar.asp*

SFA star charts—*www.midnightkite.com/starcharts.html*

Solar eclipse—*http://sunearth.gsfc.nasa.gov/eclipse/OH/OH2007.html#2007Sep11P*

Viewing Vesta—*www.dawn-mission.org/feature_stories/Vesta_nightsky.asp*

Meteor showers—*www.meteorshowersonline.com*