

Where have all the planets gone?

If you missed seeing five planets over the western horizon during April, don't despair; there are still three months of evening viewing before the Earth moves around the Sun and we lose sight of them. The orbital motion of the Earth causes a shift in the direction we look to see the planets. In addition to the Earth's own orbital motion eastward relative to the stars, the area of sky it is passing through gradually moves westward due to the Earth's orbital motion. The net effect is that planets may be observed moving eastward across the boundary of a constellation while at the same time the constellation is further west and setting

earlier. This is always the case for an outer planet, however the two inner planets will move eastward in the evening sky, but they will also move westward as their orbit brings them between the Sun and the Earth.

Over the next three months, May–July, the brightest planets will be visible while facing west during the hour or two following sunset. They will be grouped even closer together over the western horizon than they were in April. Adding to the view during the first half of the month will be the waxing phases of the Moon as it passes closely by the planets. As each month passes, the planets will be noticeably lower over the western horizon until only Venus will be visible.

FIGURE 1 Summer skies



Evening star? Morning star?

So, where have all the planets gone? Planets that are visible soon after sunset eventually become visible just before the Sun rises due to the Earth's orbital motion around the Sun. This is where you will find Saturn, Jupiter, and Mercury, and eventually Mars in the summer.

From a perspective above the solar system the Earth and the visible planets are all on the same side of the Sun as the Earth and thus can be seen in the evening skies. After several months of revolution the position of the Earth and the other planets will have changed enough so that only Venus is still visible in the evening skies (Figure 1).

Even though planet viewing in the evening decreases over the summer, there are still other celestial events to be aware of between the close of this school year and the start of the next one.

Solar eclipse

The Moon pulls in between the Earth and the Sun in an alignment known as an *annular solar eclipse*. While similar in arrangement to a total solar eclipse, the Moon does not completely block the Sun. This leaves a ring, or *annulus*, of fire around the silhouette of the moon. This eclipse will be visible from much of North America during the afternoon of June 10th.

So far yet so warm!

During July the Earth is at its most distant position from the Sun when it reaches a point known as *aphelion*. On July 6th the Earth will be 152,094,200 km from the Sun. In comparison, during *perihelion*, when the Earth is closest to the Sun, the distance separating them is 147,099,500 km. Interestingly, with a difference of only about 5,000,000 km, the Earth's orbit is very nearly a circle—unlike the ellipse shown in most textbooks.

Incoming

Not only does August signal the start of another school year, it is also the month of the annual Perseids meteor shower. Meteor showers, especially regular ones like the Perseids, have their origin in the paths of comets that intersect the Earth's orbit. Comets, which are basically large, snowy dirtballs, gradually come apart as they orbit the Sun, shedding debris behind them. When the Earth passes through this debris cloud, the particles enter the upper atmosphere and glow brightly from friction. We see them as shooting stars during meteor showers. This summer the annual Perseids meteor shower peaks on the 12th and 13th of August and, because the Moon will not have reached first quarter phase, it will be dark enough to start watching for the Perseids.



There is much activity in the space program with the launch of several shuttle missions and supply vehicles to the International Space Station. Additionally the *Stardust* spacecraft, on its way to a 2004 rendezvous with Comet Wild 2, will be conducting its second interstellar dust collection activity.

Celestial events

- 5/02 Space Day
- 5/02 STS-111 launch, *Endeavour*, ISS Utilization Flight (UF-2)
- 5/04 Mars passes 2.2 degrees from Saturn
- 5/14 *Progress Soyuz-U* launch (ISS 8P)
- 5/26 Lunar eclipse
- 6/10 Annular solar eclipse
- 6/21 June Solstice, 13:11 UT
- 7/06 Earth at aphelion (1.017 AU From Sun)

- 7/11 STS-107 launch, *Columbia*, Spacehab
- 7/24 *Stardust* mission, beginning of second interstellar dust collection
- 8/01 STS-112 *Atlantis*, ISS Assembly Mission 9A
- 8/12 Perseids meteor shower peak

Visible planets

- 5/07 Venus near Saturn
- 5/10 Venus near Mars
- 5/14 Moon near Venus and Mars
- 6/03 Venus near Jupiter
- 6/12 Moon near Mars
- 7/02 Mercury near Saturn
- 7/03 Mars near Jupiter
- 7/25 Mercury near Mars
- 8/02 Neptune at opposition
- 8/20 Uranus at opposition

Moon phases

	May	June	July	August
Last quarter	5/04	6/02	7/02	8/01
New Moon	5/12	6/10	7/10	8/08
First quarter	5/19	6/18	7/17	8/15
Full Moon	5/26	6/24	7/24	8/22
Last quarter	—	—	—	8/31

Internet resources

Space Day: www.spaceday.com

STS-111 launch, *Endeavour*: www.ksc.nasa.gov/shuttle/missions/sts-111/mission-sts-111.html

ISS Utilization Flight (UF-20):

www.spaceflight.nasa.gov/station/assembly/flights/2002/uf2.html

Lunar eclipse: sunearth.gsfc.nasa.gov/eclipse/LEplot/LEplot2001/LE2002May26N.gif

Annular solar eclipse: sunearth.gsfc.nasa.gov/eclipse/SEplot/SEplot2001/SE2002Jun10A.gif

June solstice: www.treasure-troves.com/astro/SummerSolstice.html

STS-107 launch, *Columbia*: www.ksc.nasa.gov/shuttle/missions/sts-107/mission-sts-107.html

Spacehab: www.spacehab.com

***Stardust* mission:** stardust.jpl.nasa.gov

ISS Assembly Mission 9A: spaceflight.nasa.gov/station/assembly/flights/2002/9a.html

Perseids meteor shower: www.comets.amsmeteors.org/meteors/showers/perseids.html

STS-113 *Endeavour*, ISS Assembly Mission 11A: spaceflight.nasa.gov/station/assembly/flights/2002/11a.html

September equinox: www.treasure-troves.com/astro/AutumnalEquinox.html