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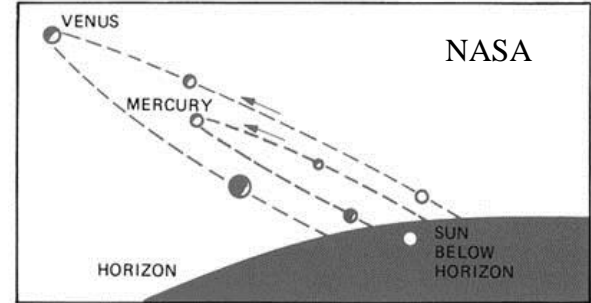
A transit of a planet across the face of the Sun is a tightly-scripted alignment between the motions of the Earth and the planet as the pair independently orbit around the Sun. Only Mercury and Venus, the so-called inferior planets can be seen in silhouette against the face of our nearby star. Superior planets, those with orbits larger than the Earth's, can never be seen transiting the Sun.

Caution! Danger!

However, as with all observations of the Sun, precautions for eye safety **MUST** be followed; these are described on the other side of this document.

Earthly and Mercurial Motions

The Earth and all planets orbit the Sun in nearly circular, but slightly elliptical orbits. The period of those orbits is greater for planets farther from the Sun and shorter for planets nearer to the Sun such as Mercury and Venus, being only 88 days and 224.7 days, respectively. Since the Earth is also moving, the apparent (synodic) orbital periods stretch to 115.88 and 583.92 days.

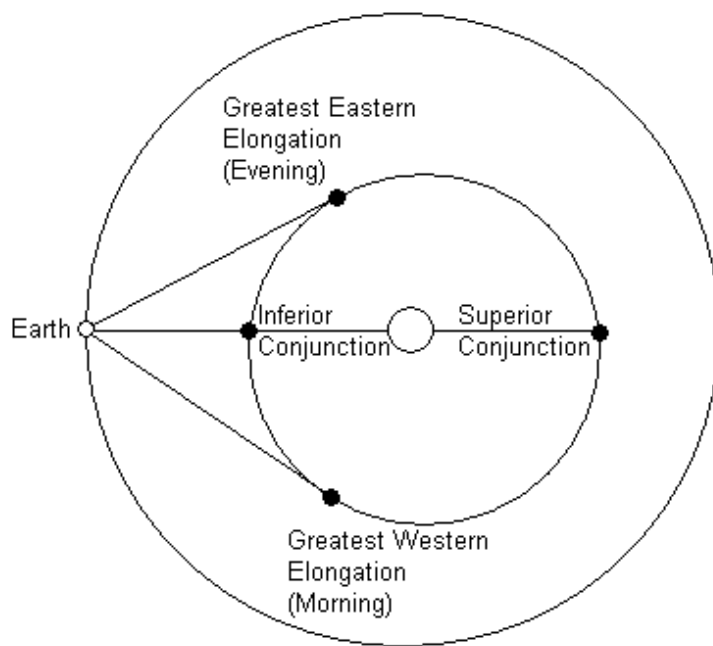


As seen from Earth, both Mercury and Venus are restricted to the same general part of the sky as the Sun and are typically only visible in twilight for a few hours before sunrise and after sunset when these planets are in the appropriate parts of their orbits. Of the two, Mercury is more elusive because its smaller orbit and greater distance from Earth means that it never can be seen far from the Sun. Mercury is also fainter than Venus, compounding the difficulty in spotting it.

Conjunctions and Transits

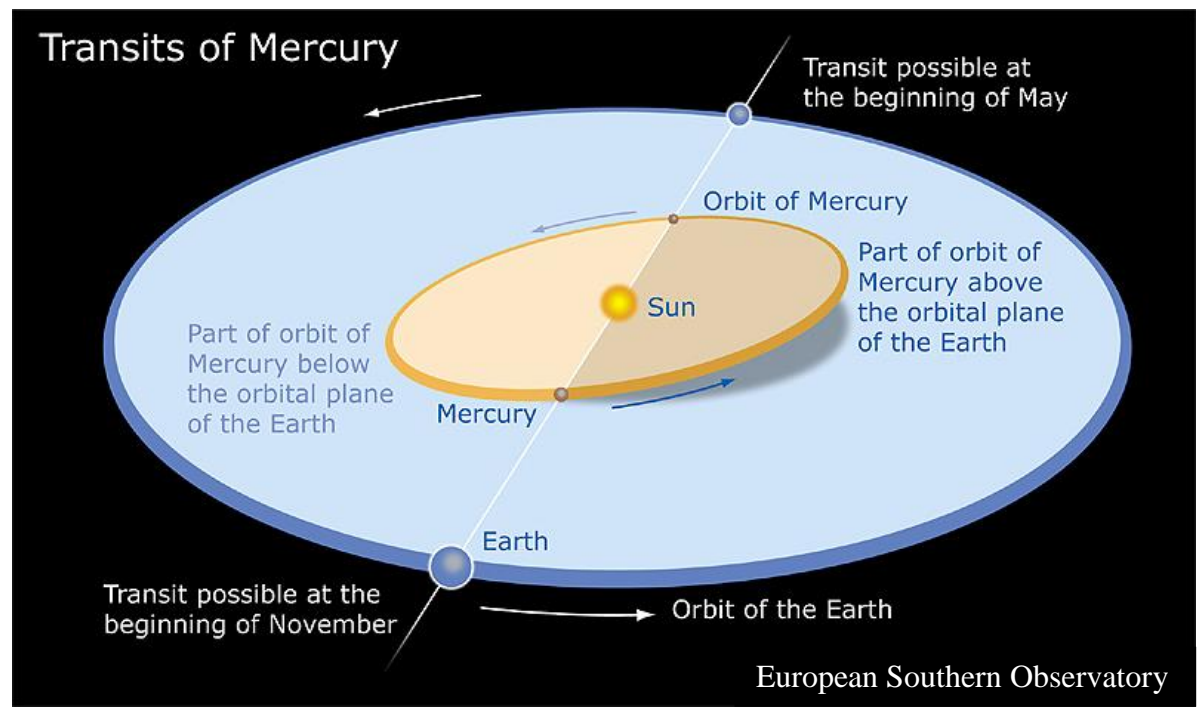
Twice in each synodic period, the inferior planets are closely grouped with the Sun as seen from Earth – the planets are said to be in conjunction with the Sun. When the planet is on the far side of the Sun, it is in superior conjunction, and when on the near side, inferior conjunction.

During an inferior conjunction, a transit of the planet across the face of the Sun may take place.



If all the planets orbited in the same plane around the Sun, there would be a transit during each synodic period.

Since Mercury's orbital plane is at a 7° angle to the Earth's orbit, most of the time the planet, the Earth, and the Sun will not lie in one line when Mercury is in inferior or superior conjunction. Typically, at conjunction, Mercury will pass, sight unseen, just above or below the solar disk. A transit can occur when the inferior conjunction takes place while Mercury is near the points in its orbit where its orbital plane intersects the plane of the Earth's orbit around the Sun. The geometry is such that transits can occur at two possible times of the year; the beginning of May, or the beginning of November.



Time of Transit

Regardless of location, Canadians will see the transit at very nearly the same instant, with a variation of only about a minute in time from coast to coast. However, because of geography and the presence or absence of daylight saving time, the clock time of the transit varies widely. In addition, eastern Canada will see the entire transit, but for some westerners, the Sun will rise with the transit already in progress.

Generalised Times

Time Zone	Start	End
Nfld	09:05:56	14:34:14
Atlantic	08:36:00	14:04:17
Eastern	07:36:04	13:04:24
Central	sunrise	12:04:33
Mountain	sunrise	11:04:40
Pacific	sunrise	10:04:43

See <http://eclipsewise.com/oh/tm2019.html> for exact times in your region.

Safely Observing the Sun

The Sun is an energetic incandescent ball of plasma powered by the fusion of hydrogen to helium in its core. Even at the Earth's great distance from the Sun (150,000,000 km), the energy emitted from the Sun has the potential to do great harm if proper precautions are not followed.

Damage to the retina of the eye occurs because of the intensity, in visible, infrared and ultraviolet wavelengths of each part of the solar surface. Normally, the body's natural glare response to bright light causes us to look away. However, eye damage is

likely, given the tendency to stare at the Sun to see if Mercury is visible.

The following safety guidelines are courtesy of B. Ralph Chou, Professor Emeritus and optometry and vision specialist:

*****WARNING! Never look at the Sun with unprotected eyes! Permanent damage, and even blindness, will result. If in doubt about the effectiveness of personal protective equipment, do not use them. *****

Home-made or improvised solar filters, such as smoked glass, exposed film, sunglasses (single or multiple pairs), photographic neutral density filters and polarizing filters or CDs are **NOT SAFE** as these provide no protection against harmful ultra-violet and infrared rays.

The fact that the Sun appears dim, or that you feel no discomfort when looking at the Sun through the filter, is no guarantee that your eyes are safe. A person with eye damage from improper viewing may not notice the damage until hours later.



It is safe to view the transit of Mercury and similar events through "Transit of Venus" or designated solar eclipse viewers. They are

equipped with scratch resistant, double-aluminized mylar that filters out 99.999% of solar radiation, including harmful ultra-violet and infrared rays of the sun.

Before viewing the Sun, always check the condition of your solar viewers. Hold them up to a bright artificial light and look for holes, scratches and other abrasions. If the surfaces are damaged,

do not use the glasses to view the Sun. Protect the optical parts of your solar glasses, and store them away from humidity, dust, and sharp objects.

Mercury will be exceedingly small and may not be distinguishable with the unaided eye with such filters.

DO NOT attempt to use these or any other filter with an optical device (e.g. binoculars, telescope, or camera) unless that filter has been SPECIFICALLY designed for that purpose and is mounted at the front end (i.e., end towards the Sun).

Find out more

To learn more about the Royal Astronomical Society of Canada, or membership in the Society, contact your local Centre or the Society's National Office:

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