ASTRONOMY

Mercury Crosses Sun's Face

The planet Mercury may be seen as a small, black dot on the face of the sun on Nov. 14, with aid of only a small telescope. This rare event occurs only about 13 times a century.

By ANN EWING

➤ A TINY, black dot, the planet Mercury, will cross the face of the sun Saturday, Nov. 14. This rare astronomical event, known as a transit, occurs on the average only 13 times in 100 years.

In an astronomical sense, the transit is the same as an eclipse of the sun by the moon. The difference is that the moon is near the earth and, therefore, has an apparent size sufficient to block out the entire light of the sun's disk. Mercury, however, is only 3,100 miles across and it is much farther away, so it will occupy only about one two-hundredths of the sun's visible surface.

For observing purposes, the coming transit of Mercury is the most favorable so far this century, for the United States, since the entire transit can be seen across most of the North American continent.

With clear skies, with proper protection for your eyes and with a low-power telescope, you can see this solar show. Astronomers, both amateur and professional, will be aiming their telescopes at the sun on Nov. 14, noting carefully the time that the entire planet first becomes visible on the sun's face, and also the time it starts to leave.

Relative Sizes Shown

Because Mercury is so small, it is not easy to see against the sun. Dr. Fletcher G. Watson of Harvard University has calculated that during the transit Mercury will appear to have about the same size as that of a penny seen from a quarter of a mile away.

"To see Mercury distinctly when it is in front of the sun," he states, "a magnifying power of at least 100 should be used."

Looking at the sun directly through a telescope would damage your eyes beyond repair. A safe method to view the sun, and a most convenient way to show it to several people at the same time, is simply to attach to the telescope a small frame carrying a screen of white paper or smooth white cardboard at a distance of a foot or more from the eyepiece. In this way, the sun's image can be watched without harm to your eyes, and the principal solar features are quite clear.

Mercury's full sphere will first be visible at about 10:40 a.m. EST, astronomers at the U. S. Naval Observatory in Washington have calculated. Their prediction is made for an observer standing at the earth's center. Since no observer is in such a position, the actual time that all of the planet first shows against the solar disk will vary across the country by a few seconds.

Just before the full sphere becomes visible, the phenomenon known as the "Black Drop" can be seen. This occurs just before Mercury's full sphere is entirely visible, and it appears as if a dark ligament connects the planet to the sun's edge. Because it is fairly easy to time, astronomers carefully note the second at which this connection seems to break rather than the time of Mercury's first contact with the sun.

14 Transits This Century

The tiny black spot that is Mercury will take just about two and a half hours to cross the face of the sun. At 1:08 p.m. EST, Mercury will first touch the west limb. About four minutes later it will have slipped completely off the sun's face.

Every 116 days this tiny planet, about half again as big as the moon, comes almost between the sun and earth. Since its orbit is tilted seven degrees to the earth's orbital plane, it usually comes either below or above a line joining the earth and the sun, and we do not see it actually in front of the sun except 13 times a century on the average. The 20th century, however, happens to be one in which Mercury transits 14, not 13, times.

The dates on which Mercury can be seen against the sun's disk fall near May 7 and Nov. 9.

More November Transits

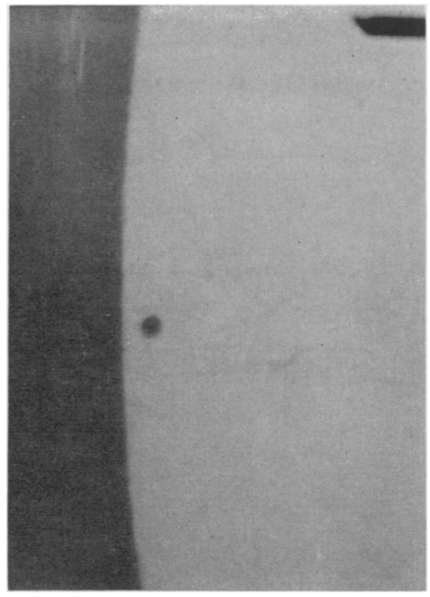
Since at the May transits, Mercury is much closer to the earth than it is ordinarily, the chances of transits taking place are reduced. For the November transits, the planet is nearer the sun, and the chances of transits at this time are about twice as good.

November transits can occur at intervals of 7, 13 and 46 years. May transits, however, can occur only at 13- and 46-year intervals.

Six more transits of Mercury are scheduled during the next 40 years. Its most recent crossing of the sun's face occurred on Nov. 11, 1940. On Nov. 15, 1999, the last transit of the 20th century will take place. Dr. Watson states that this transit may also be the first observed case of a partial transit of Mercury, for at that time, Mercury will skim very close to the sun's edge, grazing it near the northern pole.

Accurate timing of Mercury's transits furnishes scientists with valuable information on irregularities in the earth's rotation. This period is the standard of astronomical time, and Mercury, as well as the moon, can be used as independent timekeepers to check this rate.

Such exact timings were among the first experimental evidences by which Einstein's general theory of relativity was verified. This theory holds that the mass of a body depends upon how fast it is moving. Mercury's orbit, or path, around the sun is quite irregular, and thus its velocity varies from 23 miles a second when it is farthest from the sun to 35 miles per second when it is nearest the sun.



SIC TRANSIT MERCURY — This photograph shows the tiny planet, Mercury, as it first appeared on the sun during its last transit, or crossing, of the sun in 1940. The photograph is reproduced from a frame of a movie made at Mt. Wilson Observatory at that time.

Small as this difference is, it is sufficient, according to the relativity theory, to change the effective mass of Mercury and thus account for what had previously been a discrepancy between the observed times of its transits and the predicted times.

The planet Mercury has been known for thousands of years, the first recorded observations of it having been made in 264 B.C. Mercury is so near the sun that it is comparatively seldom seen as a "star" with the naked eye. In March and April, however, it is easily visible as a brilliant object low down in the twilight; and in September or October, it can be best seen as a morning star.

The best astronomical evidence now available is that Mercury, like the moon, is completely without air, any that it may have had having escaped into space long ago. Although Mercury has no atmosphere to hide its surface, only a few vague markings have been detected, and there are considerable differences between the descriptions of the various observers.

An Exceptional Planet

Mercury is an exceptional planet in many ways. It is the closest to the sun, the distance ranging all the way from 28,600,000 to 43,400,000 miles. Its velocity of from 23 to 35 miles a second is the swiftest of any planet. From this planet, the sun would look four and one-half times larger than it does from the earth.

Mercury's distance from the earth ranges from about 50,000,000 miles to about 136,000,000 miles. Of all the planets, it receives the most light and heat from the sun, a given area of its surface receiving on the average nearly seven times as much as the same area on earth. However, it keeps the same face always toward the sun, just as the moon does toward the earth.

The temperature of the sunlit side has been estimated to be about 350 degrees Centigrade, or about 660 degrees Fahrenheit. At this temperature, tin would melt. The opposite face, which never receives any sunlight, is believed to be intensely cold. Between these two faces is a region in which the sun alternately rises above the horizon and drops back again, thus causing extreme variations of temperatures.

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