

ASTRONOMY

Venus Shines in Early Evening

Moon, Venus and Jupiter are brightest objects in November sky. Mercury, closest planet to the sun, will cross the sun's face Nov. 7, James Stokley reports.

► SINCE EARLY SUMMER the planet Venus has been visible low in the western sky at twilight. But now it is drawing farther from the sun and remains visible long enough that you can see it in the west even after the sky is completely dark. As it is many times brighter than any other star or planet, you should have no trouble identifying it.

During November Venus moves south of another bright planet. This is Jupiter, and although it is about a sixth as bright as Venus, it still exceeds any other object in the sky, except for the moon. The two planets will be closest on Nov. 18. On Nov. 21 the crescent moon passes Jupiter and then Venus. This happens during daylight hours in North America but that evening the three bodies will be in the same part of the sky. And a little farther east is a third planet, Saturn, about an eighth as bright as Jupiter. During the night of the 21st, the moon passes Saturn.

Of all the planets, the closest to the sun is Mercury, which never gets far enough from the sun to be visible except low in the west at twilight or in the east at dawn. On Nov. 24 it will be farthest west of the sun. For a few mornings about that date you may be able to see it near the southeastern horizon before sunrise.

Mercury Crosses the Sun

On Nov. 7 Mercury does something quite unusual when it crosses the sun's face, in what is called a "transit." To see the tiny spot on the bright solar disc, however, you will need some kind of telescope, properly equipped to observe the brilliant sun. The last such transit was in 1957; the next after this will be in 1970.

None of the planets mentioned appear on the accompanying maps, which show the sky as it looks about 10 p.m., your own kind of standard time, at the first of November; 9 p.m. on the 15th and 8 p.m. on the 30th. However, Mars is shown. It rises about nine at the beginning of November and seven at the end.

Mars is in the constellation of Gemini, the twins, and is distinctly red in color. It is about half as bright as Jupiter but when it first appears, low in the east, its light will be dimmed on account of increased absorption by the earth's atmosphere.

Near Mars are some of the brilliant winter constellations, now beginning to appear in the evening sky. Just to the right of Gemini is Orion, the warrior, with two first magnitude stars: Betelgeuse and Rigel, likewise dimmed on account of their low altitude. Above Orion is Taurus, the bull, with the reddish star Aldebaran. And above

Gemini is Auriga, the charioteer, in which Capella shines.

Low in the south you may see the star Fomalhaut, in Piscis Austrinus, the southern fish. Considerably higher are the four stars making the "great Square," which connects Andromeda, the chained princess, and Pegasus, the winged horse. And toward the west you find Aquila, the eagle, with Altair, another star of the first magnitude.

Since the earth is the third planet out from the sun, only Mercury and Venus, which are closer to the sun, can come between the sun and earth. Our distance from the sun is about 93,000,000 miles; Mercury's about 36,000,000 and that of Venus about 67,000,000 miles. While the earth takes 365¼ days to go once around the sun, Mercury goes around in 88 days and Venus in 225 days. These periods might be called the "years" of the planets.

Suppose that Mercury and the earth are both in the same direction from the sun, as they were on July 16. On Oct. 12, just 88 days later, Mercury had completed a trip around the sun but it was not in the direction of the earth. We had moved on, so not until Nov. 7 will Mercury again be in the position known as "inferior conjunction," between sun and earth.

Mercury comes to inferior conjunction

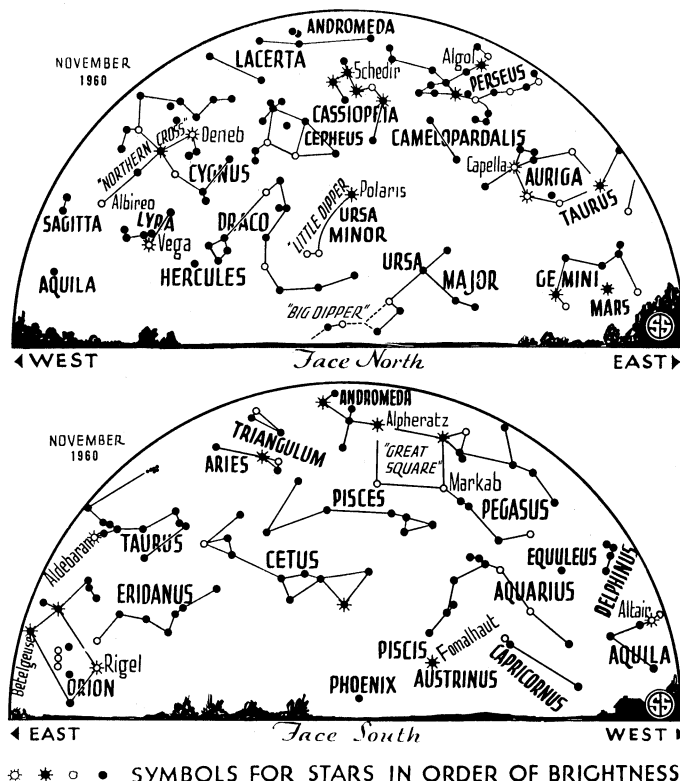
every 116 days, on the average. This is known as its "synodic period." But generally, when it comes to such a conjunction, it is not exactly between sun and earth. Generally it is a little to the north or south of the line that joins these two bodies. From earth, therefore, it does not pass in transit across the solar disc. Only in November or, less often, in May, can Mercury approach closely enough to the sun-earth line that a transit occurs, and that happens now.

The last November transit occurred in 1953, on Nov. 14, and the last in the spring on May 5, 1957. The next transit after this will come May 8, 1970.

Venus Transit in 1882

Venus, which is the other planet that moves in an orbit inside ours, may also transit the sun's disc, but this happens much more rarely. The last was in 1882 and the next will be in 2004. When that happens one can see it with the naked eye, provided, of course, that he has some protection for the eyes, such as heavily smoked glass. Looking at the sun directly may cause serious injury.

Mercury is considerably smaller than Venus, as well as farther away. Hence the tiny dot that it makes against the bright background of the sun is so small that you cannot see it with the naked eye, even with the necessary protection. A telescope is required, and this also must have a special attachment, in order to look at the sun safely.



However, you can use a telescope to project an image of the sun on a sheet of white paper. The instrument must be firmly mounted, as on a tripod, and pointed toward the sun.

Then, if you pull the eyepiece out from its normal focus and hold the white paper perhaps a foot or so away from the eyepiece (moving the paper back and forth until the focus is located), you should be able to get a sharp solar image, the size of a dinner plate or larger.

The paper will also be illuminated by the direct rays of the sun but you can shade it by a large piece of cardboard, with a hole in the middle, placed around the eye end of the telescope. With such an arrangement, and a telescope of at least moderate size, Mercury should show as a tiny speck, slowly moving across the disc of light.

The exact times of the beginning and end of the transit, known as "ingress" and "egress," will vary a little with the observer's location. However, it will start at about 9:35 a.m., EST, and end at about 2:12 p.m. Ingress will take place across the lower edge of the sun, as viewed generally in North America; and egress from the right hand edge. West of a line from the northwest shore of Hudson Bay to southern California, ingress will occur before the sun has risen.

Celestial Time Table for November

3	6:58 a.m.	Full moon
7	12:00 noon	Mercury between earth and sun
8	7:00 p.m.	Moon passes south of Mars
9	4:00 a.m.	Moon in apogee (farthest from earth), distance 251,500 miles
10	3:08 a.m.	Algol (variable star in Perseus) at minimum brightness
11	8:48 a.m.	Moon in last quarter
12	11:57 p.m.	Algol at minimum
15	8:46 p.m.	Algol at minimum
16	early a.m.	Meteors visible apparently radiating from constellation of Leo (Leonids)
18	6:47 p.m.	New moon
	9:00 p.m.	Venus passes south of Jupiter
20	11:00 p.m.	Moon in perigee (nearest earth), distance 225,700 miles
21	10:00 a.m.	Moon passes north of Jupiter
	2:00 p.m.	Moon passes north of Venus
22	3:00 a.m.	Moon passes north of Saturn
24	3:00 a.m.	Mercury farthest west of sun; visible low in southeast just before sunrise for a few days about now
25	10:42 a.m.	Moon in first quarter
28	2:00 a.m.	Venus passes south of Saturn

• Science News Letter, 78:266 October 22, 1960

ROCKETS AND MISSILES

Ball Simulates Satellite Tumbling

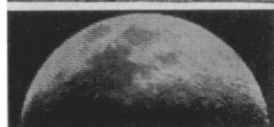
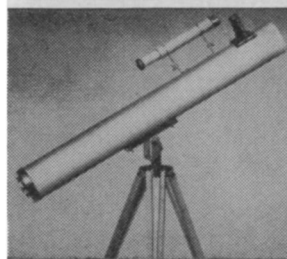
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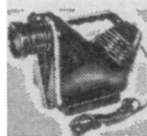
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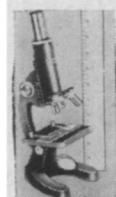
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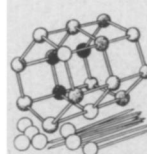
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