

ASTRONOMY

Solar Eclipse Soon Visible

Mercury, Venus, Mars and Saturn shine in evening sky. Partial eclipse of sun will be visible over most of North America. Path of totality sweeps over more land than water.

By JAMES STOKLEY

► MARS, NOW making its closest approach in many years, is joined by three other planets in the June evening skies. Indeed, of the five naked-eye planets, only Jupiter, so prominent during evenings of the past spring, has now passed from view.

An added attraction on June's all-star program, there is a total eclipse of the sun, first to be seen in the United States and Canada since 1945.

The eclipse occurs on June 30. Only along a path starting near Minneapolis, then proceeding to the northeast, will the sun be totally obscured, but over most of Canada and all of the U. S. except the southwest there will be a partial eclipse, early in the morning.

Brightest of the month's planets is Venus, which remains visible in the western sky for about two hours after sunset. It is so brilliant, of magnitude minus 3.4, that it appears well before any other planet or any star. Thus, it can easily be identified.

Mars in Opposition

On June 24, Mars will be in opposition, which means that it is directly opposite to the direction of the sun. Hence it rises at sunset and sets at sunrise, so it is visible all through the night.

At this time Mars will be at the comparatively close distance of 40,160,000 miles. In early July, however, it will be nearly a half million miles closer still. Mars will be more fully discussed in next month's article.

Our third planet is Saturn, shown on the accompanying maps in the constellation of Virgo, the virgin, high in the south. This is where it will be about 10:00 p. m. your own kind of standard time at the beginning of June, and an hour earlier on the 15th. (Add one hour if you are on daylight time).

Saturn is about three-fourths again as bright as the star Spica, just to the right.

Mercury, the fourth June planet, will make a brief appearance in the evening sky for a few days around the ninth, when it will be farthest east of the sun. Thus it will remain above the horizon for a short while after the sun has gone down, and may be glimpsed very low in the west as twilight falls.

Mercury will be a little lower and to the right of Venus, as well as considerably fainter. Since it will set before the sky is fully dark, one should look carefully to locate it. Of course, a clear western horizon will be essential.

Among the stars of June, which are distant suns and, unlike the planets, shine by their own light, Vega is the brightest. It is high in the eastern sky, in the constellation of Lyra, the lyre. Just below it is the figure of Cygnus, the swan, of which the northern cross is part, and where we find another first-magnitude star, Deneb. To the right of this group is Aquila, the eagle, with Altair.

Arcturus, in Bootes, the bear-driver, is high in the south, while Regulus can be seen in the west, in Leo, the lion. This star is part of a sub-group called the sickle, which is divided between our northern and southern maps. Low in the south Antares now appears, in Scorpius, the scorpion.

Brief Observation Time

When the moon's shadow touches earth as the sun is rising in northeastern Nebraska on June 30, astronomers, both amateur and professional, will be poised along a 9,000-mile path crossing North America, Europe and Asia, ready to make their observations during the fleeting moments when the shadow passes their stations.

For this will be a total eclipse, with the moon's dark disk hiding the bright globe of the sun, making possible many observations that can be made at no other time.

Total eclipse observations are generally for the purpose of learning more about the sun, for example, its corona. This is its outermost layer, and it can only be observed fully at a total eclipse, when the suppression of the glare from the solar disk permits it to be seen.

This eclipse, however, will be used to learn more about the earth itself, particularly to get accurate distances between North America and Europe. Although both

Europe and North America have been mapped with great precision, and the distances between points inside each continent may be accurately determined, there remain small uncertainties in getting distances between points on one continent and those on the other.

The weapons of modern warfare require that such distances be known with the greatest possible precision. If wars of the future are to be fought with guided missiles, provided with robot navigators and capable of carrying an atomic or hydrogen bomb across an ocean, those who start them on their deadly journeys must know exactly the relative position of their own base and the target.

More Accurate Distances

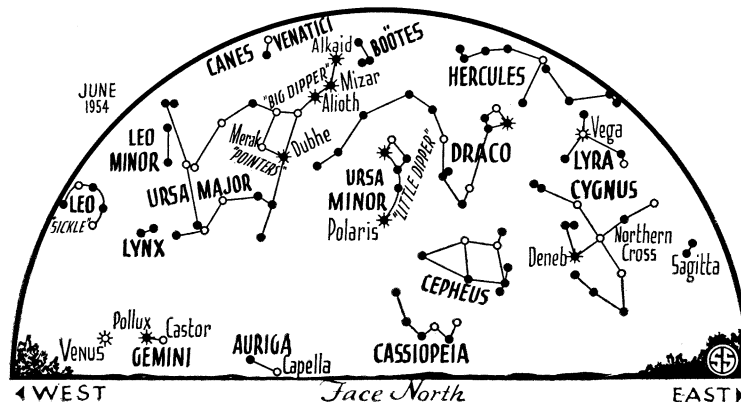
Such considerations suggest why the U. S. Air Force, through the Cambridge Research Center, is sponsoring an elaborate series of eclipse observations, in Canada, Europe and Asia, to time the moon's shadow as it rushes past.

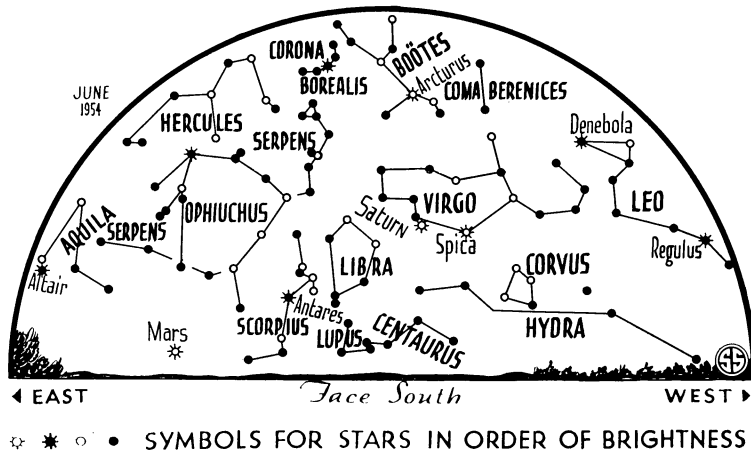
By correlating these data, since the relative motions of the moon and earth are known, it may be possible to obtain distances between North America and Europe far more accurately than ever before. Not until June 14, 2151, will another total eclipse path span North America and Europe in a comparable manner.

Because such a large portion of the earth's surface is covered by water, the average eclipse path is mainly over the oceans, and sometimes touches scarcely any land. This one is unusual, since it passes over more land than water. Some of the land that it traverses, as in Canada, Labrador and Greenland, is largely uninhabited.

However, other parts, in the United States, southern Canada, Scandinavia, Russia, the Middle East and India, are thickly inhabited, and this eclipse may well be seen by many millions of people.

Although the path of the shadow begins in Nebraska, the total eclipse there will





occur immediately after sunrise, and it will hardly be as favorable a location as one farther east. Minneapolis, the largest city in the path, will be somewhat better. There the moon will start to cover the sun before sunrise, so when the sun is first seen it will be partially eclipsed.

At Minneapolis, the total eclipse will occur at 5:08 a.m. CST, and the sun will be about five and one-half degrees above the horizon. At this position the path of the shadow will be about 72 miles wide, so places to the north and south of the Twin Cities will likewise have a chance of seeing the total eclipse. The duration, however, will be less than 76 seconds on the central line, which passes through Minneapolis.

Finale: Sunset in India

From Minnesota, the path, getting somewhat wider, passes across the northern peninsula of Michigan, Lake Superior and Canada. It crosses James Bay at the southern end of Hudson Bay. Then it goes to Labrador where the total phase occurs at about 7:55 a.m. Newfoundland time. Now the path is 88 miles wide and the sun will be hidden for about 116 seconds.

After crossing southern Greenland and just skirting Iceland, the path heads southward. It traverses the Faeroe Islands, Norway, Sweden, Lithuania, the Ukraine and Georgia in the U.S.S.R., the Caspian Sea, Iran, Afghanistan, Pakistan and India.

The moon's shadow leaves earth as the sun is setting near Jodhpur, so that a little less than three hours will have been required for its trip from Nebraska to India.

Over a much larger area, a partial eclipse, where the moon will only partly cover the sun's disk, will be seen. This will include all of Europe, western Asia, north Africa, most of Canada and the United States, except the southwestern part. Of course, the nearer one is to the central line, the path of totality, the more of the sun will be covered.

The following table indicates the times of the partial eclipse for a few typical places in the United States, and the percentage of the sun's diameter that the moon will cover.

	Beginning a.m.	Ending a.m.	Per Cent
Atlanta, Ga.	—* EST	6:47	68
Boston, Mass.	5:07 EST	7:02	75
Buffalo, N. Y.	5:08 EST	7:01	83
Chicago, Ill.	—* CST	5:59	90
Cincinnati, Ohio	—* EST	6:55	81
Cleveland, Ohio	5:08 EST	6:59	83
Denver, Col.	—* MST	5:00	48
Des Moines, Iowa	—* CST	5:59	95
Nashville, Tenn.	—* CST	5:51	76
New Orleans, La.	—* CST	5:43	60
New York, N. Y.	5:06 EST	6:59	74
Pittsburgh, Pa.	5:07 EST	6:57	79
Richmond, Va.	5:04 EST	6:52	70
St. Louis, Mo.	—* CST	5:55	85
Washington, D. C.	5:05 EST	6:55	73

(*For these locations, where no beginning time is given, the eclipse starts before sunrise.)

Even though the partial eclipse will be visible from much of the country, anyone within reach should try to get to the path of totality. Then, if it is clear, he will see the sun completely covered, so that the corona flashes out around it, and just to the west the planets Mercury and Venus will shine.

After the brief minute or so of totality, the narrow crescent of the solar disk will reappear and increase, as the moon moves off until the sun is once more shining unobstructed.

Celestial Time Table for June

June	EST	
2	11:11 a.m.	Moon passes Jupiter.
	3:21 p.m.	Moon passes Mercury.
3	6:05 a.m.	Moon passes Venus.
8	4:13 a.m.	Moon in first quarter.
9	2:00 a.m.	Mercury farthest east of sun.
11	10:00 a.m.	Moon farthest, distance 251,800 miles.
12	6:13 a.m.	Moon passes Saturn.
16	7:06 a.m.	Full moon.
17	2:31 a.m.	Moon passes Mars.
21	5:55 p.m.	Sun farthest north, summer commences.
23	2:46 p.m.	Moon in last quarter.
24	12:00 noon	Mars opposite sun.
27	5:00 a.m.	Moon nearest, distance 227,300 miles.
30	7:26 a.m.	New moon, sun eclipsed.
	1:00 p.m.	Jupiter in direction of sun.
		Subtract one hour for CST, two hours for MST, and three for PST.

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