

ASTRONOMY

Another Eclipse

This Time of the Sun, It Will Be Visible Along a Belt Across Pacific; Width of Ring Almost Maximum

By JAMES STOKLEY

IN DECEMBER, and for the second time this year, an eclipse of the sun will be visible along a belt crossing the Pacific Ocean. But this one is being very differently received by astronomers. The first one, on June 8, made many astronomers travel great distances to the points where it would be seen. The writer, for example, made a special trip to Honolulu, then voyaged for an entire month on a ten-knot freighter en route from that city to New York, in order to be close to the point in mid-ocean where the eclipse would have been seen to best advantage. This was a journey of some 13,000 miles for an observation lasting just over seven minutes.

The area where the new eclipse, on December 2, may be seen covers practically the same part of the world. Yet no astronomers have betrayed the slightest interest in going to look at it. The reason is that the June eclipse was total—then the moon completely covered the sun. Its bright disc hidden, the sun's corona flashed into view. Many other observations, possible only at eclipse time, were made by the various expeditions.

This month's eclipse is of the type called "annular." That is, the moon goes directly between the earth and sun, but fails completely to cover it. Thus, there is a ring of the sun's bright disc in view around the dark circle of the moon, and this light is enough to prevent the usual eclipse observations. Should an astronomer happen to be in the path, he would undoubtedly look, but it has little scientific importance to warrant his journeying to be there.

South of Japan

The region in which the ring of sunlight will appear around the moon is a belt, about 225 miles wide, starting some 700 miles south of Japan. The belt passes southeastward, crossing the northernmost of the Marshall Islands, then Palmyra Island, Washington Island, and Fanning Island, three small bits of land about a thousand miles south of Hawaii. The path is then northeastward, to a location a few hundred miles west of lower California.

This eclipse has one peculiarity, which it shares with the one of June—it starts the day after it ends! Many eclipses do this, all in which the path of visibility crosses the meridian marking 180 degrees of longitude. This is the International Date Line, where the new date begins. When it is Monday to the west of this line, it is still Sunday just to its east. Where the eclipse begins, the sun is just rising, on Friday, December 3, but as soon as it crosses the Date Line, it is Thursday, December 2. At Washington Island, for example, the center of the eclipse will come about noon on this date. At the point of ending it is sunset on Thursday. All this time, however, it is Thursday in the United States. By eastern standard time, the eclipse begins at 3:05 p. m. and ends at 9:05 p. m.

Partial Eclipse

Over practically the entire northern, and a large part of the southern, Pacific Ocean there will be a partial eclipse, with the disc of the moon only partly covering the sun. In the Hawaiian Islands a large partial eclipse will be seen in the middle of the day. Along the west coast of Mexico, the United States and Canada, as well as part of Alaska, the sun will set while partially eclipsed.

In Kamchatka, Japan and the Philippines, the sun will be partly eclipsed when it rises.

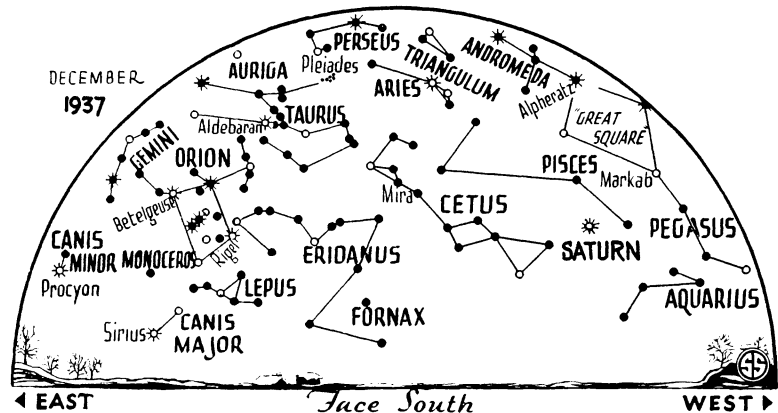
A comparison of this eclipse with the one in June reveals the contrast between the two types of eclipses, a contrast which is unusually great in the case of these two. The sun is about 400 times the diameter of the moon, but is also about 400 times as distant, so the two seem about the same size as we see them in the sky. The distance of each one varies, and so does their apparent size. With an average distance of 92,870,000 miles, the sun came as close to the earth as 91,337,700 miles on January 1.

Nearing Minimum

On July 4 it had receded to 94,454,200 miles, and now it is again nearing the minimum. The moon also varies. Its average is about 232,000 miles, but it can come as close as 217,750 miles to the earth's surface, or recede as far as 248,500 miles from the surface. These variations produce the change in their apparent diameters in the sky.

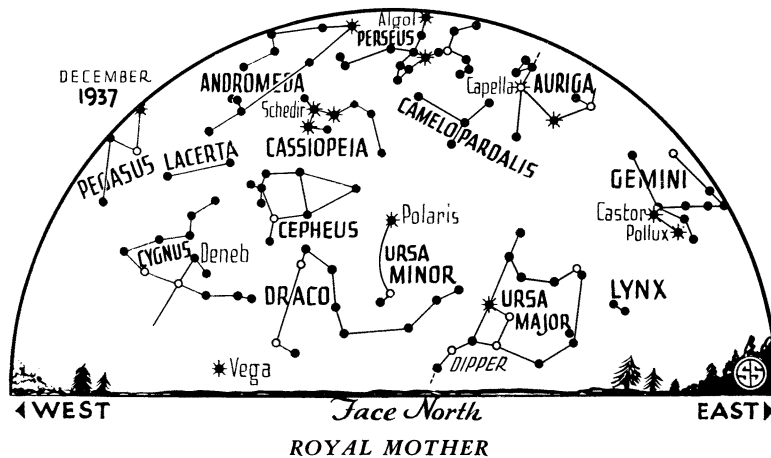
The eclipse in June came less than a month before the sun was farthest, and hence smallest. It happened also to come less than a day after the moon was closest for that month. This meant that the excess in size of the moon was almost at its greatest possible figure, and so it took longer to pass across the sun than in any eclipse for many centuries, lasting 7 min-

☼ * ○ • SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS



WINTER STARS

Their glory makes up for lack of bright planets.



High in the northwest is Andromeda's mother, the queen Cassiopeia, a familiar landmark.

tes 4 seconds. This month conditions are almost the reverse. The moon is at apogee, or farthest from earth, less than a day after the eclipse, and the sun in about a month will be at its least distance. Thus the moon now is considerably smaller in relation to the sun, and the width of the ring seen around it is almost as great as it can be.

Though but one planet appears on the accompanying maps of the December evening skies (which show them for 10:00 p. m., Dec. 1; 9:00 p. m. on the 15th and 8:00 p. m. on the 31st), two others can be glimpsed. Soon after sunset Jupiter can be seen low in the southwest. Farther east, and fainter, is the red planet Mars, but both have set by the times for which the maps are drawn. Saturn, however, is visible as shown, in the constellation of Pisces, the fishes, to the southwest.

But the winter constellations make up in glory for what the December skies may now lack in planets. These constellations are visible to the east and southeast. First comes Orion, the great warrior. The three stars in a row, supposed to represent his belt, make him easy to locate. Above and to the left is Betelgeuse, marking one of his shoulders, and on the opposite side of the belt is Rigel, in one leg.

Taurus

Above Orion is Taurus, the bull. A V-shaped group of stars, the Hyades, outline his face. Most of these are rather faint, but there is one very brilliant orb, red in color. Aldebaran it is, in the eye of the bull. High in the east is the constellation of Auriga, the charioteer, in which Capella shines. Below are Gemini, the twins, with Castor and Pollux, the latter the more brilliant.

But brightest of all stars, in fact the brightest ever seen (except, of course, the sun) is Sirius, low in the southeast, below Orion. It is in Canis Major, the great dog, one of the two dogs following the warrior Orion across the sky. The other dog, Canis Minor, is above and to the left, and contains Procyon.

Two other first magnitude stars are shown on the maps, low in the northwest, where they are vanishing from the evening skies after being conspicuous during the autumn months. Vega is near the horizon, and forms part of Lyra, the lyre. Above Vega is Cygnus, the swan, or the northern cross, as it is sometimes called. Deneb is the bright star marking the top of the cross.

Pegasus

Among the other groups that are conspicuous, though containing no stars as bright as first magnitude, is Pegasus, the winged horse, high in the west. In this is the "great square," the upper star of which is in Andromeda, the princess who was chained to the rock, according to the mythological account. Beyond her, almost directly overhead, is Perseus, the champion who rescued her. Cetus, the sea monster who tried to devour her, is conspicuous in the south.

In the north, the great dipper, part of Ursa Major, the great bear, is swinging up into the northeast with the pointers, now in the top of the dipper, indicating the direction of Polaris, the pole star. High in the northwest is Cassiopeia, the queen, Andromeda's mother.

The sun's annual motion around the sky, actually the effect of the earth's motion around the sun, brings it on December 22, at 1:22 a. m. eastern standard time, to its farthest south position, when it is directly over the tropic of Cap-

ricorn. This is the winter solstice; the beginning of winter, in the northern hemisphere. Also, for us, it marks the shortest day of the year.

Below are given the moon's phases for the month. Its changes in distance have been referred to above. On December 3 it is in apogee, at 12:00 noon, eastern standard time, with a distance, between centers, of 252,600 miles. On December 17 it will be closest, at perigee, 226,800 miles distant. December 30 will bring the second apogee of the month, at 1:00 p. m. with 252,500 miles.

Phases of the Moon

	E. S. T.
New	Dec. 2 6:11 p. m.
First Quarter	Dec. 10 8:12 p. m.
Full	Dec. 17 1:52 p. m.
Last Quarter	Dec. 24 9:20 a. m.

Science News Letter, November 27, 1937

PSYCHOLOGY

Persons Falling Asleep Give Clues to Mental Ills

DIFFERENT parts of the brain apparently go to sleep separately and to different degrees, Drs. H. Davis and P. A. Davis of Harvard Medical School and Drs. A. L. Loomis, E. N. Harvey and G. Hobart of the Loomis Laboratory at Tuxedo, N. Y., have found in brain wave studies (*Science*, Nov. 12). Their studies also suggest that clues to the cause of many mental diseases or abnormalities may be found in studies of the normal falling asleep process.

Four kinds of brain waves or electrical patterns appear during the going to sleep process, they found. First there is the state when the person is at rest but awake. Next follow different kinds of waves in the drowsy, "floating" state. A second intermediate state is characterized by a still different brain wave pattern and this merges into the fourth pattern found in real sleep.

Of practical importance, they point out, is the fact that the patterns of early sleep in normal persons are strikingly like those seen in some mentally sick or otherwise abnormal persons. Scientists making brain wave studies should not be misled by the pattern of an unsuspected dozing or "floating" state into diagnosing a state of mental abnormality.

This similarity suggests that many abnormal mental conditions may depend on general modifications of brain function which are fundamentally like those of normal sleep. The scientists are now investigating this possibility.

Science News Letter, November 27, 1937