

ASTRONOMY

Two Darkesses

Total Eclipse of Moon, Partial of Sun, This Month; Astronomers to Mark Bi-Centenary of Herschel's Birth

By JAMES STOKLEY

See Front Cover

NOVEMBER brings two eclipses. One, a total eclipse of the moon, on the seventh, will be visible in all parts of the United States except the far west. The second, a partial of the sun on the 21st, will not be visible in the United States except in the far west, which seems to be a very equitable arrangement. However, the lunar eclipse will be considerably more interesting.

An eclipse is caused when a dark object comes in front of something else and conceals it from view, or when a dark body comes between a bright one and another dark one on which its light is shining. The moon eclipse is of the latter sort. The moon, like the planets, has no light of its own but shines by reflected sunlight.

Every time the moon is full, it is in practically the opposite direction from the sun, so we see its entire sunlit half. Usually, however, the earth is sufficiently far above or below the exact line joining the other two bodies so that our shadow does not fall on the moon. But occasionally, as this month, the three come in the same line. The solid earth prevents sunlight from reaching the moon, which is then eclipsed.

The moon passes through the terrestrial shadow from right to left. At 3:41 p. m. Eastern Standard Time, the eastern edge of the moon makes its first contact with the shadow. About an hour later, at 4:45 p. m., it is completely engulfed and the eclipse is total. At 6:08 p. m. the edge of the moon begins to emerge, and at 7:12 p. m. the total eclipse is over.

"Blood on the Moon"

Even in the eastern part of the country the eclipse will not be visible in its entirety. At Philadelphia, for example, the moon does not rise until 4:46 p. m. When it does, the eclipse will have started. The moon then will have a curious coppery red color, for the earth's shadow is not entirely dark. It would be were it not for the earth's atmosphere, which acts as a lens, and bends some sunlight around into the

shadow. This light has a ruddy hue, for some of the blue rays are removed by passage through the atmosphere. These give the daytime sky its usual color.

For observers in the eastern part of the country, this eclipse has a very strange feature, which occurs some place at every such eclipse, though it has not happened to occur in the United States for many years. They will be able to see the sun and the totally eclipsed moon at the same time. At first glance, this might seem physically impossible, for does not the total eclipse occur when the earth, moon and sun are in the same straight line? If so, how could the sun and moon then both be above the horizon at once?

Refraction

The answer to this seeming paradox is found in the same cause that makes the light shine into the earth's shadow: refraction. This bends the light from any celestial body so that it always appears slightly higher in the sky than it really is. The lower it is, the greater is the effect. At the horizon, the elevation is a little more than the diameter of the sun or moon.

When we see either one just above the horizon, they are actually below it, and would vanish if the atmosphere were suddenly to be removed. Thus, wherever the moon rises totally eclipsed or between 4:45 p. m. and 6:08 p. m., Eastern Standard Time, it will appear a few minutes before sunset.

If you were able to view this happening from a crater on the moon, it would look like the illustration on the front cover of this week's SCIENCE NEWS LETTER. James Perry Wilson, staff artist for American Museum Natural History, made the painting.

The month's second eclipse, of the sun, is merely partial, because the dark inner part of the moon's shadow will not reach the earth at all, though the outer part will. Where it is at a maximum, in the middle of the Pacific Ocean, a little more than three-quarters of the sun's diameter will be covered by the dark lunar disc.

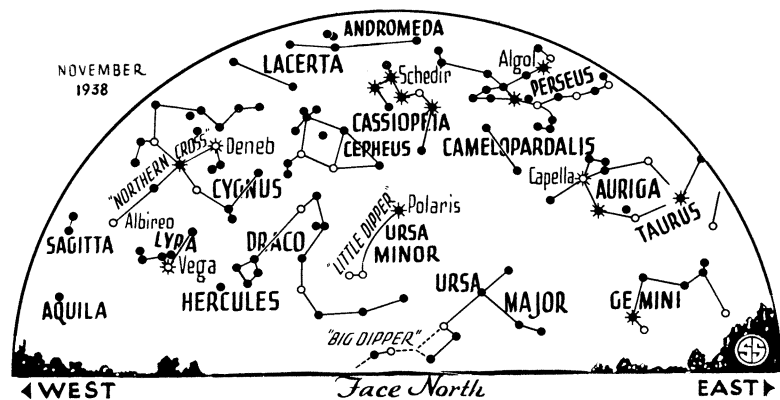
Crosses Date Line

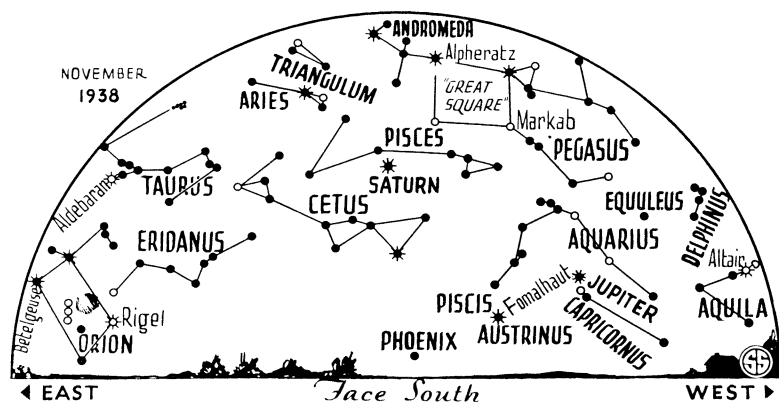
The same eclipse will be seen over most of the northern Pacific Ocean, the western coast of the United States and Canada, Alaska, eastern Siberia and China, and Japan. On the Asiatic side of the International Date Line, which divides the area almost in half, it will be November 22, but on the North American side it will still be the 21st.

As a partial eclipse is of no scientific importance, no efforts are being made to observe it. Even in British Columbia, Washington, Oregon and California, it will not be at all spectacular, for the sun will set before the eclipse has reached its height. However, the people in these states may notice, as the sun descends into the ocean, that a piece is apparently bitten out of the lower edge, the effect of the encroaching edge of the moon.

To the astronomer, especially those interested in the history of their science, November 15 will be an important date. It marks the two hundredth anniversary

☉ * ○ ● SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS





of the birth, in Hanover, Germany, of Friedrich Wilhelm Herschel, better known to fame as Sir William Herschel. He served with the Hanovarian guards as a bandsman, but after being released (and not deserting, as sometimes stated) from his military obligations, he emigrated to England. In 1766 he became organist at the Octagon Chapel, in Bath. As he was interested in astronomy, and could not afford to buy proper telescopes, he made his own, the first in 1774, which was followed by many others.

With one of these, a reflector, in which the light was focussed by a concave mirror $6\frac{1}{2}$ inches in diameter, he made his first great discovery in 1781, when he found the planet Uranus. Because of this, King George III appointed him King's Astronomer, and installed him in a house at Slough, near Windsor Castle. He was given a pension, so that he could devote his entire attention to astronomy and telescope construction. His greatest was an instrument with a four-foot mirror; one that, even today, would be considered large.

Other important discoveries followed, including two moons of Uranus and two of Saturn. He found out the true nature of the double stars, pairs of bodies revolving around their common centers. He discovered the true form of the Milky Way system, or galaxy, of which the sun is part. It was his suggestion that the great nebula in the constellation of Andromeda was another such galaxy, or, as he called it, an "island universe." Only as recently as 1925 was this confirmed at the Mt. Wilson Observatory.

Aided by Sister

In many of his observations he was aided by his sister, Caroline Herschel, and, later, by his son, Sir John Herschel, whose fame was almost as great as his father's. Sir William died in 1822, the greatest astronomer of his day, and one of the ten greatest of history.

During November the moon will be visible in the evenings except from about the ninth to the twenty-fourth. Its phases are shown below. It is nearest the earth, at perigee, at 11:00 p. m. on the tenth, with a distance of 227,600 miles. Apogee, the greatest distance, comes at 10:00 p. m. on the 26th. The distance is then 251,900 miles.

Except for the moon, the brightest object seen in the evening sky during November is the planet Jupiter. It stands in the southwest at the time for which the accompanying maps are drawn (10:00 p. m., November 1; 9:00 p. m., November 15 and 8:00 p. m., November 30). Near it is Fomalhaut, a bright star in the constellation of Piscis Austrinus, but much inferior in brilliance to the planet. High in the south, in the fishes, Pisces, is the second planet of the November evening, Saturn. It also is considerably fainter than Jupiter, but it is more brilliant than any other object in the vicinity.

Northern Cross

Several easily identifiable star groups appear in the evening. In the west, standing vertically, is the "northern cross," part of Cygnus, the swan, with Deneb at the top. Near the foot of the cross, to the right, is Vega, of Lyra, the lyre, while in a similar position to the left is Altair, of Aquila, the eagle.

High in the south, above and to the right of Saturn, is the "Great Square of Pegasus," though the star in the upper left corner is Alpheratz, of the neighboring constellation of Andromeda. The rest, however, are part of Pegasus, the winged horse. Low in the east are three stars in a vertical row, the belt of Orion, the warrior. The bright star to the right is Rigel, and the one to the left Betelgeuse, both of the same constellation. Above Orion is Aldebaran, of Taurus, the bull. Next to Taurus, to the left, is Auriga, the charioteer, with first magnitude Capella.

The always familiar "big dipper" this month is in its poorest position, low in the north. High in that direction, above Polaris, the pole star, is the well-known M-shaped figure of Cassiopeia.

A few hours before sunrise the planet Mars rises in the east. On the 25th of the month, Mercury will be in the evening sky just after sunset, but so low that it will be difficult to find. Venus has now gone from the sky, for it is close to the sun, and will, in fact, be in line with it on the 20th.

Phases of the Moon:

E. S. T.

Full	Nov. 7	5:23 p. m.
Last quarter	Nov. 14	11:20 a. m.
New	Nov. 21	7:05 p. m.
First quarter	Nov. 29	10:59 p. m.

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BIOLOGY

Biological Abstracts To Be Published in Parts

BIOLOGICAL Abstracts, key journal for students of the life sciences, has grown too big for the average individual subscriber and is about to do what many organisms do when they become too bulky—split into several parts. Yet this important publication will still manage at the same time to remain one.

Biological Abstracts, like the abstract journals in the other sciences, consists of extremely condensed summaries of articles in all the scientific journals in its particular field, as well as of all new biological books. Scientists, by running through its pages, can get the gist of all articles published everywhere, and thus keep track of what is going on in their chosen lines of activity.

Difficulties have developed, due to the fact that Biological Abstracts summarizes everything that appears in the whole wide field of biology, thus becoming very thick and of course costly to publish. At the same time, practically every biologist is a specialist, reading only the section of the journal devoted to his particular field.

For this reason, the board of editors has announced that Biological Abstracts will henceforward be published in five sections. The individual biologist may subscribe to any section or sections he desires, at annual rates from \$6 to \$9. The entire journal, with all five sections between the same covers, will continue to be used by libraries, at \$25 a year. This arrangement, it is hoped, will do much to solve the financial difficulties previously encountered.

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