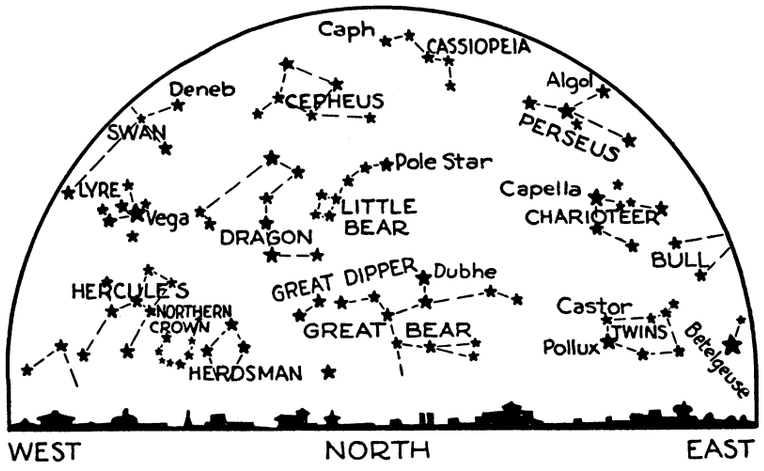
Moon Eclipse Is Feature of November

Astronomy

By James Stokley

To see the most interesting astronomical event of November, 1928, one will have to stay up a little later than the evening—except in the western part of the country. This will be during the night of Monday, November 26. At that time the moon, in its monthly trip around its orbit, will get into the shadow of the earth. The moon will be in the full phase at the time, as it must always be when it is eclipsed, and so a person who watches it that night will see the earthly shadow gradually cover its face. When it is all covered, the moon will assume a coppery-red color. Then the shadow will pass, and before sunrise, and moonset, the moon will again be shining with its accustomed brilliance.

In its most general meaning, an eclipse is caused whenever one astronomical body gets directly between two others. However, when the astronomer speaks of an eclipse, he usually refers to the moon coming between the earth and the sun, thus causing a solar eclipse; or to the earth getting between the sun and the moon. The latter case is an eclipse of the moon. In the first instance, the moon's shadow falls on the earth, in the latter it is the earth's shadow that falls on the moon. Because the earth is so much larger than the moon, its shadow is able to engulf completely the moon. When the moon's shadow falls on the earth, however, its "umbra," or darkest portion, is not more than a couple of hundred miles in diameter. Therefore, the sun is seen eclipsed in a very restricted part of the earth, though solar eclipses happen oftener than those of the moon. When the moon is eclipsed, it can be seen from any place in the darkness of night at the time.



On the night of the 26th, or early in the morning of the 27th, the moon thus enters the shadow of the earth. The time table is like this, in eastern standard time:

1:25 a. m.—Moon enters penumbra, or outer part of earth's shadow. No noticeable effect.

2:24 a. m.—Moon enters umbra, or inner part of shadow. Soon afterwards the southeast edge of the moon begins to darken, and the shadow gradually covers the moon.

3:33 a. m.—Moon completely engulfed in shadow. Beginning of total phase. Probably appears of coppery red color.

4:29 a. m.—End of total phase. Moon begins to emerge from umbra, soon afterwards the northeast edge begins to brighten.

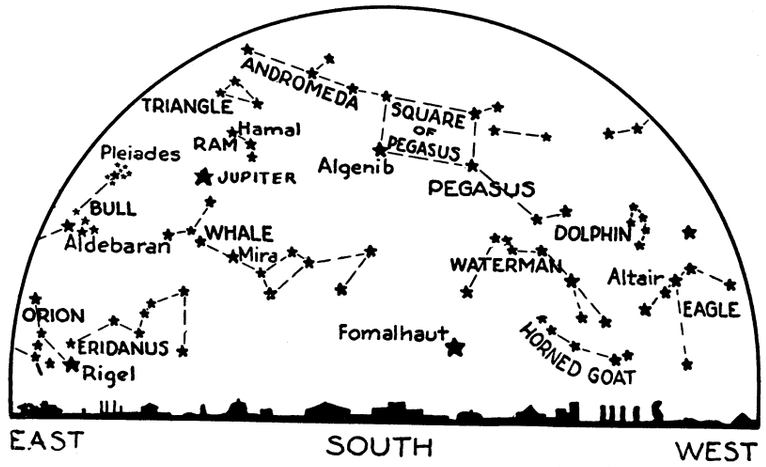
5:39 a. m.—Moon leaves umbra completely, and appears almost as bright as ordinarily.

6:38 a. m.—End of eclipse. Moon has completely emerged from the shadow.

The difference between the umbra and penumbra is a result of the fact that the sun is not a point source of light, but has an appreciable area. Hold up your hand at noon so that the shadow falls on a smooth surface on the ground. You will notice that the shadow is not sharp. In the center is a dark area (the umbra) and around it is a region in which the darkness gradually shades off (the penumbra). An ant on the ground in the umbra would not be able to see the sun at all, though in the penumbra it would be able to see part of the solar disc, the hand hiding the rest. At night, with an arc light, however, the shadow would be much sharper. This is because the light of the arc is practically concentrated at a point.

The same thing occurs during an eclipse. When the moon enters the penumbra, a person on the moon, if he existed (which he probably doesn't) would see the sun partly covered by the earth. As the eclipse progressed, more and more of the sun would be covered, but, as long as any of it was still visible, the sun would still be very bright. Then, as the last shred of sun was covered, it would suddenly get much darker. That is the reason that the edge of the umbra is so clear on the moon's surface, and the curved edge of the earth's shadow can be seen.

So far as scientific value is concerned, an eclipse of the moon is not very important, probably at most observatories in the United States, if the weather is clear, (*Turn to next page*)



HOLD THESE MAPS IN FRONT OF YOU. The upper then shows you the northern and the lower the southern sky as it appears on November evenings

Moon Eclipse November Feature—*Continued*

the astronomers will watch it through their telescopes, make a record of the times at which the different stages occur, take photographs of the eclipsed moon, or perhaps make photometric measurements of the brightness. But these will all be routine observations, and if cloudy weather intervenes, there will not be a great deal of disappointment. For the layman, however, and, in fact, for the astronomer as well, the eclipse is an interesting spectacle. The color of the eclipsed moon is always somewhat uncertain in advance, for it depends in a measure upon the weather conditions on the earth. It is probably the only way in which terrestrial conditions ever produce any apparent effect on another astronomical body.

The cause of the red eclipsed moon is the same as the cause of the red sunset. At noon the light from the sun is white, but at sunset the light has to pass through a much greater layer of air, and the blue rays are more completely absorbed than the red ones. The latter get through to our eyes, and so the setting sun often looks red. It is also a fact that we can see the sun after it has set. The atmosphere acts like a prism and bends the rays of light around the horizon. If you place a coin in the bottom of a shallow pan, place your eye at such a level that the edge just obscures the coin, and then pour in water, the coin will again be visible. This is because of the bending of the light rays as they pass from the water to the air. The same sort of thing happens with the air. If the earth were airless, and we watched the sun set, then suddenly poured on a layer of atmosphere, the sun would appear again.

As a result of this atmosphere, the shadow, even the umbra, of the earth is not completely dark. The atmosphere bends some of the rays of sunlight around and into the otherwise dark shadow. As these rays pass through twice as much air as even light from the setting sun, they are even more ruddy, and so the eclipsed moon, when illuminated by these feeble rays, appears coppery red. But if there are widespread clouds around the earth along the line at which the sun is either rising or setting, they absorb much of the light. Sometimes, therefore, the light reaching the totally eclipsed moon is much less than at others, and so eclipses have been recorded when the moon has almost completely disappeared. Such an eclipse, however, is quite rare.

The 27th, however, does not bring the only eclipse of the month. The moon makes one of its orbital trips around the earth in 28 days, so that 14 days before or after an eclipse of the moon, its own shadow might fall on the earth and we would have a sun eclipse, if the conditions are right. Last spring this occurred both before and after. There was a sun eclipse on May 19, one of the moon one June 3 and another of the sun on June 17, though both of the solar eclipses were devoid of scientific value. This month a sun eclipse occurs on November 12, but it will not be seen at all from the United States. To people in Europe, however, the sun will be partly covered, but at no place on the earth's surface will it be completely obscured. On this account, it is also without scientific importance. Fourteen days after the 27th the moon's shadow completely misses the earth, and there will not be another eclipse until May 9, 1929. Then the sun will be totally eclipsed along a band crossing Sumatra, the Malay Peninsula and some of the southern of the Philippine Islands. This will be one of the most favorable eclipses for many years, and astronomers from all parts of the world will flock to the path of totality to see it. But not until April 13, 1930, will there be another eclipse of the moon.

The most conspicuous planet during November is Jupiter, seen in the southeast during the evening, as shown on the map. Its great brightness, and steady light, makes it easy to identify. But early in the evening, for an hour or so after sunset, a bright planet is seen in the southwest. This is Venus, and in the coming months it will continue to get brighter and higher in the sky. Saturn, which was so prominent during the summer, is still visible in the western evening sky, but it is quite low and not nearly as bright as either Jupiter or Venus. Mars is visible later in the night. About midnight it is seen in the eastern sky, its brilliant red color identifying it.

The stars in November are shown on the maps. One of the most noticeable groups is the Great Square in Pegasus, in the south. This is easy to locate, and from it the amateur star-gazer can easily find his way to the other constellations. Cygnus the swan, is high in the west, and nearby are Aquila, the eagle, and Lyra, the lyre. Over to the east appears Taurus, the bull, in which can be seen the brilliant red Aldebaran, and the two loose clusters of the Pleiades and the Hyades. Aldebaran itself is among the latter.

With the mention of the Leonid meteor shower, the description of the principal astronomical events of November, 1928, will be completed. This comes about the 15th. If you watch the northeastern sky during that evening or the evening of the 14th, the night before, you will probably see a few streaks of light, or shooting stars, as they are commonly called, all seeming to emanate from a point below the horizon. At midnight the constellation of Leo, the lion, rises and then the meteors will seem to come from a point in the familiar "Sickle" of this group. Then they will become more numerous. Actually these meteors are moving along parallel paths, and at this time of year the earth gets in their way, so a number come into our atmosphere. Here the friction heats them to incandescence and they vanish in a flash of light. The effect of their seeming to come from a point in Leo, and which gives them their name, is merely one of perspective, as the walls of a long corridor seem to vanish to a point in the distance.

Meteors consist mostly of crystalline rock, judging by the meteorites, the samples that sometimes reach the ground, and may weigh many tons, though usually they are much smaller. Iron meteors also occur, while still others consist of iron alloyed with nickel and cobalt. Sometimes they are a mixture of rock and iron. There is good evidence that the meteors of certain groups, at least, are remains of comets of former times.

On page 284 of this issue of the SCIENCE NEWS-LETTER are given full directions for observing the Leonid meteors. By watching for them, and carefully recording your results, you can help the astronomers in their study of these visitors from outer space. There is an association of amateur astronomers, the American Meteor Society, that makes a special study of them. As no telescopic aid is required, it is work particularly adapted for amateur cooperation.