ASTRONOMY

Total Moon Eclipse

For nearly an hour, on Sept. 25, our satellite will be completely eclipsed by earth's shadow. The moon will shine with a dull red glow.

By JAMES STOKLEY

➤ THE GIANT JUPITER, largest member of the family of bodies, including the earth, that revolves about the sun, is the only planet visible during the month of September throughout the evening. The month is not without its attractions, however, for there is a total eclipse of the moon coming on Monday evening, Sept. 25. For nearly an hour our satellite will be immersed in the earth's shadow, shining with the curious coppery-red color characteristic of such an event.

Earlier on September evenings it will be possible to get a glimpse of the planet Mars in the constellation of Libra, the scales, low in the southwest as darkness falls. Mars sets about two and a quarter hours after the sun. It is about as bright as an average first magnitude star, but being so low when it appears, it is fainter than normal.

Jupiter, on the other hand, rises in the east about the same time that the sun is going down. It is therefore visible throughout the night. Its position in the constellation of Aquarius, the water-carrier, is shown on the accompanying maps. These depict the sky as it looks around 10:00 p. m. at the first of September, an hour earlier in the middle and two hours earlier at the end. (Add one hour if you are on daylight time.)

Vega Brightest

Turning to the stars which are self-luminous suns, quite different from the planets which shine by the light they reflect from our sun, we find that Vega, in Lyra, the lyre, is brightest. This shines high in the west. Not far from it and directly overhead at the times for which these maps are drawn, we see Cygnus, the swan. In this is the bright star Deneb, at the top of a group sometimes called the northern cross. The bottom of the cross points toward the southwest. Just below the star at the lower end, called Albireo, there is another of the first magnitude—Altair, in the figure of Aquila, the eagle.

Our other stars of the first magnitude, besides Vega, Altair and Deneb, are all low in the sky. Capella, in Auriga, the charioteer, is shown near the northeastern horizon, a harbinger of winter. Later in the night, as in the evenings of winter, it will climb high overhead. On the other hand, Arcturus, in Bootes, the bear-driver, is near the northwestern horizon, about to vanish for a while after having been prominent in the evening skies of spring and early summer.

Low in the south we find the constellation of Piscis Austrinus, the southern fish. As shown in the imaginative pictures of the old star maps, it is represented as swallowing a stream of water falling from a jar being emptied by an old man in Aquarius, the water-carrier, just above. The southern fish contains the bright star Fomalhaut which will be seen in the evenings of the next few months, never rising much higher than it is now.

Mercury Seen

At the very end of September, it may be possible to see Mercury, innermost of the planets, low in the southeastern sky just before sunrise. It will be seen best in this position in early October, for on the second it will rise farthest ahead of the sun. Early in September Venus, much more brilliant, may be seen in the same time and place. It is drawing near the sun, passing Mercury on the 23rd, by which time it will hardly be visible.

Also on the 23rd, at 9:44 a. m., EST, the sun, which has been journeying southward through the sky since June 21, will be directly over the equator. This is the autumnal equinox which, for us, marks the beginning of autumn. For countries south of the equator, it is the beginning of spring.

Approximately every 27 1/3 days the moon makes a complete revolution about the earth in a period called the sidereal month. That means it comes back to the same direction among the far distant stars in the background. However, the time between successive full moons, or between the recurrence of any particular phase, is a little longer. Actually it is about 29½ days and is called the synodic month.

Reason for the difference in the two kinds of months is found in the earth's own movement, once a year, about the sun. As our direction from the sun changes, its direction from us likewise changes. Thus it seems to travel around the sky, from west to east, once ever year.

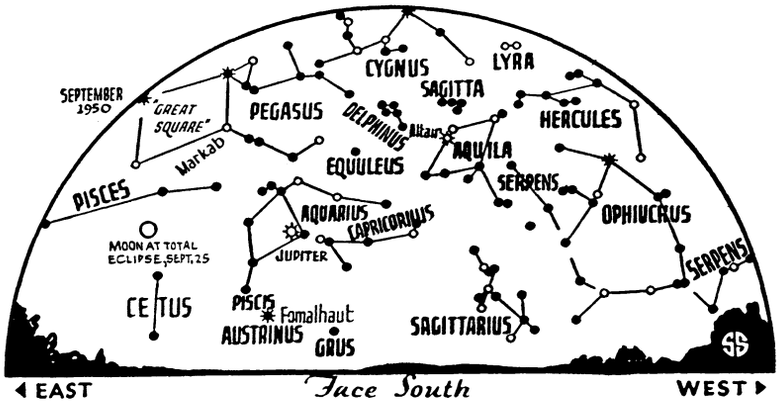
The phase of the moon depends on how nearly it is in the same direction in the sky as the sun. When the two bodies are nearly in the same direction, the moon is new; when they are in opposite directions, the entire sunlit half is turned toward us and we see a full moon. When it is a quarter of the way around the sky from the sun, either to east or west, we see just half of the illuminated hemisphere—or a quarter of the complete moon—and we have the phase of first or last quarter.

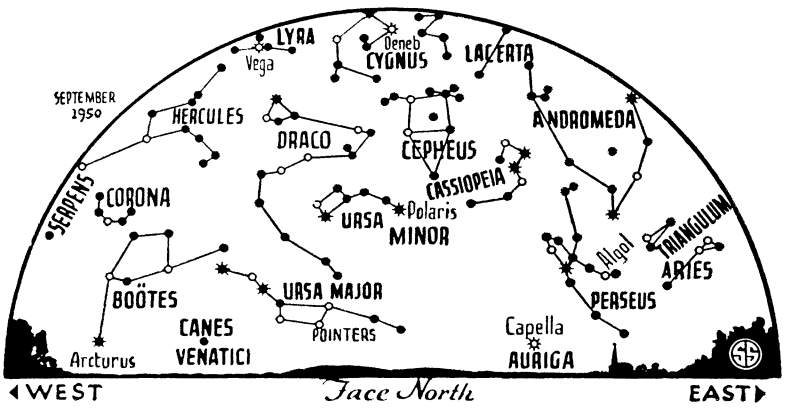
Both moon and earth, being solid spheres, cast shadows out into space, though generally they are not apparent. If the plane in which the moon revolves around the earth coincided exactly with that in which our planet travels about the sun, then every time the moon was new its shadow would fall upon the earth, and from the part of our planet where the moon passed in front of the sun there would be a total eclipse of the sun. Similarly, at full moon, our satellite would be entirely in the earth's shadow and there would be a total lunar eclipse.

Shadow Misses Earth

Since the plane of the moon's orbit does not coincide with that of the earth's, but is inclined to it by about five degrees, at most new moons the lunar shadow misses the earth. Similarly, at full moon that body generally passes either north or south of the terrestrial shadow.

Occasionally, however, it happens that the moon is full when it passes through the





earth's orbital plane, and then it does go into our shadow. This will happen on Monday evening, Sept. 25, at the time of the "Harvest Moon," producing a total eclipse visible over practically the whole of the Western Hemisphere.

There are two parts to such a shadow. The inner core, called the umbra, is the true shadow, where the light of the sun is completely obscured. Around this is a region of partial shadow, called the penumbra, from which an observer would see the dark earth partly covering the disk of the sun.

On Sept. 25, at 8:20 p. m., EST, the moon enters the penumbra, but at first so little sunlight is cut off that no noticeable effect will be observed. An hour later, however, the eastern edge of the lunar disk will be noticeably dimmed. At 9:31 this edge makes its first contact with the umbra, as shown at I in the diagram. More than an hour will elapse while the moon catches up with the shadow, which is also moving through the sky toward the east. Then, at 10:54, the moon will be at II, totally eclipsed, remaining so until position III is reached, at 11:40 p. m. At mid-eclipse (11:17) the moon will be at the position indicated on the map, in Pisces, the fishes.

Will Not Disappear

Although in total eclipse, the moon will not disappear from view but will continue to glow with a dull, coppery-red color. Despite the fact that the earth's globe completely eliminates the direct solar rays, some of these are bent by the prismatic action of the terrestrial atmosphere, so that they illuminate the totally eclipsed moon. As sunlight penetrates the atmosphere, some of the blue rays are scattered, to give the daytime sky its blue color. Similarly, at the time of a total lunar eclipse, some light from the sun filters through the earth's atmosphere around the base of the shadow, and is refracted and diffused into the shadow and onto the moon. The red predominates in this light, the same effect that makes the sun look red when it is setting.

If a passenger on a rocket ship had reached the moon in time to be there when a total lunar eclipse happened, he would be able to see the earth itself totally eclipsing the sun. Around the dark disk of the earth he would see the atmosphere as a brilliant ring of red, an effect that has been reproduced on several occasions in the planetaria of New York, Philadelphia and other cities when they have presented their "Trip to the Moon" show.

After the total eclipse ends, at 11:40 p. m., EST, the northern edge of the moon starts to emerge from the umbra. Again, as during the first partial phases, the curved edge of the shadow of our globe may be seen on the lunar disk. The eclipse ends at 1:02 a. m., Sept. 26, with position IV. For a time the moon will still be noticeably dimmed, until 2:14 a. m., when it is completely clear even from the penumbra, and shines with undiminished brilliance.

This is not the month's only eclipse, though it well might be, for all that most of us will be able to see. Two weeks earlier, on Sept. 11, as the moon is new, its shadow will fall across the earth, tracing out a path from which a total solar eclipse will be visible. It passes close to the North Pole, across northeastern Siberia, the Aleutian Islands, and ends in the northern Pacific. The sun will be partially eclipsed as seen from northern Asia, including Siberia, China, Korea and Japan, Alaska and a large part of the Pacific Ocean.

Time Table for September

Sept.	EST	
3	5:00 a. m.	Moon farthest distance 251,300 miles
4	8:53 a. m.	Moon in last quarter
10	2:40 p. m.	Moon passes Venus
11	10:29 p. m.	New moon (total eclipse of sun, visible from Asia and N. Pacific)
12	5:21 a. m.	Moon passes Saturn
15	2:00 a. m.	Moon nearest, distance 227,500 miles
	10:00 p. m.	Saturn in line with sun
16	12:13 p. m.	Moon passes Mars
17	3:00 a. m.	Mercury in line with sun
18	3:54 p. m.	Moon in first quarter
23	7:37 a. m.	Moon passes Jupiter
	9:44 a. m.	Sun crosses equator, autumn begins in Northern Hemisphere
	10:00 p. m.	Mercury passes Venus
25	11:21 p. m.	Full moon (Harvest Moon), moon totally eclipsed
30	11:00 p. m.	Moon farthest, distance 251,800 miles

Subtract one hour for CST, two hours for MST, and three for PST.

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ZOOLOGY

Tuco-Tuco and Armadillo Unusual Zoo Specimens

➤ LATEST Washington arrivals from Paraguay—at the zoo in Washington, D. C.—are the first specimens to reach there of a little rodent called tuco-tuco, about the size of our ordinary rat, and the three-banded armadillo, about four to five inches long.

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