ASTRONOMY

Total Moon Eclipse Coming

Second lunar eclipse this year, it will be visible both in North and South America. Another event of the month will be the partial eclipse of the sun.

By JAMES STOKLEY

➤ MOST interesting event of the astronomical calender for October comes on the evening of Thursday, Oct. 6. Then, for the second time this year, the moon is totally eclipsed as it enters the earth's shadow. And again the eclipse will be visible generally over North and South America. For an hour and 14 minutes (from 9:19 to 10:33 p. m., EST) our planet will obstruct the usual supply of light on the moon, putting it in total eclipse. Then it will take another hour and 15 minutes for the moon to emerge from the shadow.

This is not the only eclipse that October brings, but the other, on Oct. 21, is not of any great importance, even though it is the sun this time that will be hidden partially as the moon passes in front. First of all, it is visible only from New Zealand, parts of Australia and New Guinea and Antarctica. From the point where the eclipse is greatest, near the coast of the Antarctic continent, only 96% of the solar diameter is covered. Thus, there will be none of the features that induce astronomers to travel great distances to see a total eclipse when the sun is completely hidden.

Aside from the lunar eclipse, the evening skies of October bring us the characteristic constellations of autumn. The only planet easily seen in the evening is Jupiter, whose position in the figure of Capricornus, the sea-goat, is shown on the accompanying maps. These depict the skies as they appear at about 10:00 p. m., your own kind of standard time, Oct. 1, an hour earlier at the middle of the month, and about 8:00 p. m. at the end. Since Jupiter is very bright (of astronomical magnitude minus 1.9) it is easily found as it shines in the southwest.

Now an evening star, and considerably brighter than Jupiter, is the planet Venus, which is in the constellation of Scorpius, the scorpion. Since it sets about two hours after the sun, it is not shown on the maps. The other planets of October are seen in the morning sky before sunrise. Mars, in Leo, the lion, comes up in the east about an hour after midnight. Saturn, in the same constellation, rises a little later. Mercury will be seen low in the east just before sunrise about Oct. 19, when it is farthest west of the sun.

Among the evening stars Vega, in Lyra, the lyre, is brightest, and shines in the western sky, as shown on the maps. Above it is Deneb, in the figure of Cygnus, the swan, and nearby to the left is Altair, in Aquila, the eagle. These are all of the first magnitude, as also is Capella, in Auriga, the charioteer, shown low in the northeast. Nearby, to the right, is Taurus, the bull, with brilliant Aldebaran. Still another first magnitude star is seen low in the south, Fomalhaut, in Pisces Austrinus, the southern fish.

A characteristic figure seen high in the south is the "great square of Pegasus," the winged horse. These four stars are easily identified, the one in the upper left being part of Andromeda, the chained princess. Below and to the left are the fishes, Pisces; while still lower and to the right, under the row of stars beginning with Markab that forms the horse's head, is Aquarius the water carrier. Below Pisces is Cetus, the whale, making this part of the sky, all in all, rather a watery region!

Although a total moon eclipse is not as spectacular as the corresponding condition of the sun, it does have many points of interest, and has the great advantage of wide visibility. A total eclipse of the sun actually occurs more frequently than one of the moon but is visible only along a path perhaps 150 miles wide and several thousand miles in length, where the core of the moon's shadow hits the earth. The last time such a "path of totality" crossed any part of the United States was in July, 1945, and the next will not come until October, 1959. In contrast, an eclipse of the moon, when it does occur, is visible over more than half the earth. Thus, from the United States, we have two in 1949, and another next year, on Sept. 26.

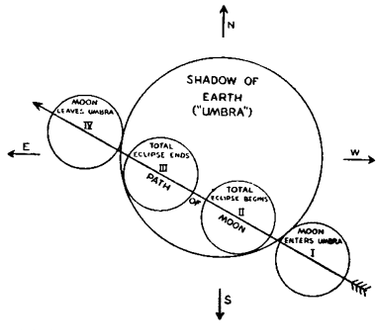
Like any solid object, the earth casts a shadow into space, on the side away from the sun. This shadow is in two parts. There is a deep, inner core, called the umbra, from which the sun is completely hidden by our globe. But outside this is a larger area, the penumbra ("almost-shadow") where the earth partially hides the sun.

Whenever the moon is full, it is opposite the sun in direction from the earth. Since the plane in which the moon encircles the earth does not coincide with that in which the earth goes about the sun, however, usually the full moon misses our shadow, passing either to its north or south. Twice each lunar month, in which the moon goes through its cycle of phases, it crosses the plane of the earth's orbit, at points called nodes. And when full moon happens to come at or near a node, the moon goes into the earth's shadow and an eclipse occurs. This month the moon is both at a node and at full phase on the evening of Oct. 6, and so we have an eclipse.

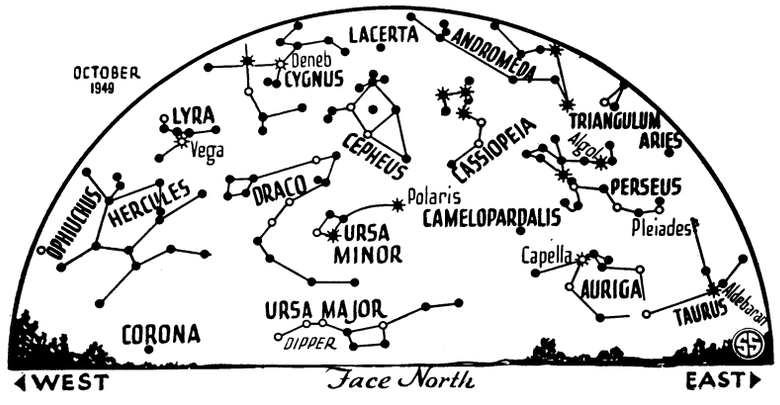
The following table gives the times of the principal features of this event:

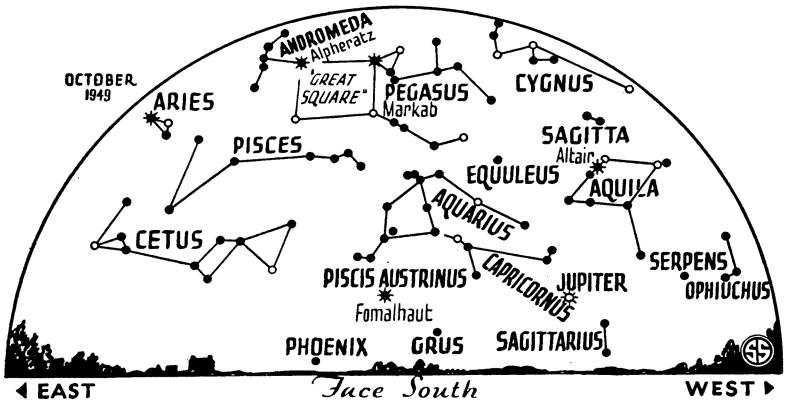
		EST
Moon enters penumbra	Oct. 6	6:50 p. m.
Moon enters umbra		8:05 p m.
Moon completely eclipsed		9:19 p. m.
Middle of eclipse		9:56 p. m.
Total eclipse ends		10:33 p. m.
Moon leaves umbra		11:48 p. m.
Moon leaves penumbra	Oct. 7	1:03 a. m.

Nothing will be visible at 6:50 p. m. because then only a minute proportion of the sunlight will be cut off from the moon. But an hour later the northeastern edge of the moon will begin to pale. At 8:05 this edge will make contact with the earth's shadow, as shown in I in the diagram. It



should be noted, by the way, that in this diagram north is the direction toward the





pole star. Throughout the United States and Canada, the eclipse will occur in the evening, earlier the farther west you are. To get the moon oriented, as it will appear in the sky, hold the diagram with the arrow labeled "north" pointing upwards and to the left. Thus, it will be the left hand edge of the moon, as you see it in the sky, where the shadow will first appear.

During the hour and 14 minutes that the moon takes in entering the umbra, the curved edge of the terrestrial shadow will be seen on its face. This, incidentally, is an unassailable argument for the earth's roundness, for it is always curved the same way, and only a sphere invariably casts a round shadow.

While the moon is in total eclipse, it will not be likely to vanish completely, unless conditions are most unusual. Instead it will shine with a ruddy light, bent into the shadow by the prismatic action of the earth's atmosphere. While the sunlight thus passes through the air, its blue rays are scattered to give the characteristic daytime blue sky and the light that remains is predominantly red.

During the eclipse there is a rapid cooling of the lunar surface. Before it starts astronomical instruments would show it to be around 275 degrees Fahrenheit, but during the eclipse this drops to about 175 degrees below zero Fahrenheit, some 65 degrees colder than dry ice. This quick cooling is due to the fact that, unlike the earth, the moon has no atmosphere to ameliorate conditions, and also that it is covered with some sort of material, perhaps like pumice, which cannot hold much heat.

At the end of the total eclipse, shown at III on the diagram, the curved edge of the umbra again appears on the moon's face, and from III to IV it creeps across the disk, which gradually becomes fully illuminated. With its passage out of the penumbra, full sunlight once more is shining on the moon, and again it looks like an ordinary full moon to which nothing has happened.

Time Table for October

Oct.	EST	
3	3:00 p. m.	Mercury between sun and earth
6	9:52 p. m.	Full moon and total eclipse of moon
7	noon	Moon farthest, distance 252,500 miles
14	11:06 p. m.	Moon in last quarter
17	7:44 a. m.	Moon passes Mars
18	7:02 p. m.	Moon passes Saturn
19	4:00 a. m.	Mercury farthest east of sun
20	10:48 a. m.	Moon passes Mercury
21	10:00 a. m.	Moon nearest, distance 222,000 miles
	4:23 p. m.	New moon
24	10:58 p. m.	Moon passes Venus
27	3:32 p. m.	Moon passes Jupiter
28	12:04 p. m.	Moon in first quarter

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

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ENGINEERING

Canada's Power-Use High

➤ CANADA, with less than one-tenth the population of the United States, has developed so far 11,000,000 of her 52,000,000 horsepower hydro-electric potential, as compared to the development of 23,000,000 horsepower of a potential 80,000,000 in her neighbor to the south, the American Institute of Chemical Engineers was told in Montreal, Canada, by Dr. Huet Massue of that city, engineer of the Shawinigan Water and Power Company.

Canada's present capacity places the nation second only to the United States in hydro-electric production, he said, adding that the investment required per horsepower in Canada is only about one-half the amount required in the United States.

Within the province of Quebec alone, the hydro installation is about one and two-thirds horsepower per person, he continued. This is almost double that in any entire country. And the average selling-price per kilowatt hour, he added, is lower than in any other region of North America, or probably in the world. In addition to the 6,000,000 horsepower of hydro-electric energy so far developed in the province, 11,000,000 horsepower remains to be harnessed.

Western Canada is within sight of being able to produce enough oil to meet one-third of Canada's petroleum needs, the engineers were told by M. L. Haider of Imperial Limited. Alberta's crude oil reserves are estimated to be in the neighborhood of 1,000,000,000 barrels, and the fields will be able to produce some 100,000 barrels a day by the end of this year.

Alberta has also great quantities of oil-bearing bituminous sands. In one of the richest areas studied by the Canadian National Research Council, according to W. S. Peterson and Dr. P. E. Gishler of that organization, a bitumen content of 200,000,000 barrels per square mile has been estimated. Processes under study to produce oil from the Alberta sands were described by them. Direct distillation is under a pilot plant test.

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