

# Layman Takes Great Interest In Viewing Total Eclipse

Millions are Expected to Watch the Sun When Darkened By Moon for Brief One-and-a-Half-Minute Interval

WHEN, on the afternoon of Wednesday, August 31, the shadow of the moon sweeps across eastern Canada and New England at the rate of some two thousand miles an hour, hiding the sun for a little over a minute and a half, probably millions of people will see this most magnificent of natural spectacles, a total eclipse of the sun. In an earlier day, the event would have struck terror into the hearts of those who observed it. But now, thanks to the wide dissemination of scientific knowledge, laymen know its cause just as well as they know why the sun rises in the east in the morning, and sets in the west in the evening. They can appreciate the grandeur of the eclipse without fear of its consequences.

Beautiful and impressive as the total eclipse is to the layman, it has far more importance to the astronomer. Observable eclipses are rare occurrences, and one in a conveniently accessible part of the world, at a favorable time of day and with good chances for clear weather, is the chance of a lifetime. Only at the time of a total eclipse can the sun's outer layer—the corona<sup>1</sup>—be observed. So rare are total eclipses, and so short are they at best, that in the last half century, since the introduction of photography began the modern study of the sun, the corona has been observed for less than an hour.

## Only Opportunity

Other important observations of the spectrum of the sun's atmosphere, of the stars and planets close to the sun, of the radio effects of the sudden passage of the moon's shadow, of the curious fleeting shadow bands, which may appear on the earth's surface before and afterwards—these and many others can be made either only at an eclipse, or else better than at other times.

<sup>1</sup>FRONT COVER ILLUSTRATION

The pearly corona of the sun, visible only during total eclipse, is expected to appear as pictured on the front cover during the coming eclipse. This photograph was taken by the Yerkes Observatory expedition during the 1900 eclipse. Then as now there were few spots on the sun and the streamers at the poles of the sun were short and bushy instead of long as they are at time of sunspot maximum.

The three actors in the pageant of August 31 are the sun, 864,000 miles in diameter; the earth, 7,918 miles in diameter, and 92,900,000 miles from the sun; and the moon, 2,160 miles in diameter, 238,857 miles from the earth, on the average. Of these three bodies, only the sun shines with its own light. The other two are illuminated by it. Both cast shadows into space behind them. Because the orbit of the moon around the earth is inclined to that in which the earth revolves around the sun, it is only occasionally that the shadow of one of the dark bodies falls upon the other. At every full moon, the three bodies are almost in line, with the earth in the middle. Similarly, at every new moon, they are almost in line again, but with the moon in the middle. Because they are not quite in line, the shadow of one body usually passes to the north or to the south of the other.

## Eclipse of Moon

However, at least twice in a single calendar year, and five times in some years, the moon is at the node, the point where its orbit crosses that of the earth, at the time that it is new. Then the shadow touches the earth, and the sun

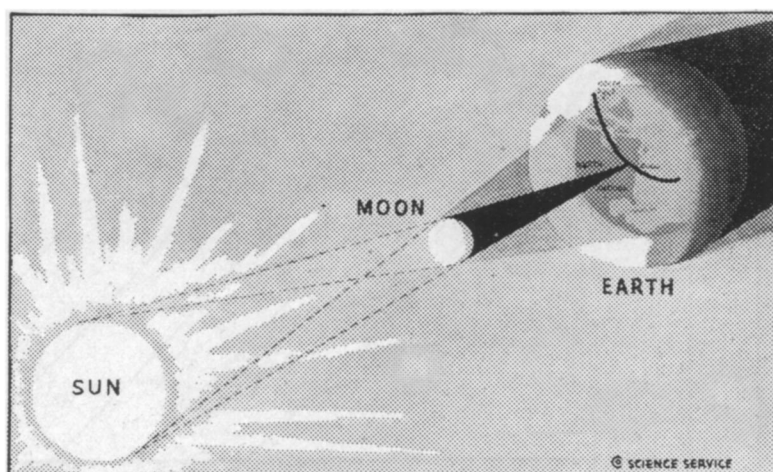
can be seen eclipsed from some part of our globe. When full moon occurs when three bodies are in line, there is an eclipse of the moon, but these are less frequent than those of the sun. There can never be more than three eclipses of the moon in a year, and a year may pass without one. But when the moon is eclipsed, it can be seen from about half the earth. A total eclipse of the sun, however, can only be viewed from the narrow path of totality, seldom more than a hundred miles wide or a few thousand miles long. On the average, a total eclipse of the sun can be seen from a particular point only once in about 360 years.

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## Earth is Only Planet Where Eclipse is Visible

IF THE SUN were a little larger, or a little nearer the earth; or if the moon were a trifle smaller, or farther away, a total eclipse of the sun, like that to be viewed in Eastern Canada and New England, would be impossible. The earth is particularly favored, because from none of the other planets are the conditions right to make a total eclipse.

When you look at the sun in the sky, it seems to have the same diameter as that of the moon, about half a degree in angular measure. This is approximately the size that your little finger nail appears at arm's length. Yet the moon is far larger than the finger nail, and the sun is much bigger than the moon. The three objects appear to be the (*Turn Page*)



## HOW THE MOON WILL ECLIPSE THE SUN

*The sun is 864,000 miles in diameter and is 92,900,000 miles from the earth. The moon is 2,160 miles in diameter and 238,857 miles from the earth on the average. Only the fortunate spacing of the sun, moon and earth in space allows the phenomenon of a total solar eclipse.*

same size because they are at different distances.

**Sun Just Covered**

For this reason, when the moon comes between earth and sun, it just covers the bright solar disc. The intense glare from that part eliminated, the outer envelope, the corona, which is only about a millionth as bright, comes clearly into view. But the relative distances of the earth, sun and moon change little, and an eclipse may occur when the moon is farther from the earth than the average. Then, the moon seems a bit smaller than the sun, and though it comes directly in front, a ring of sunlight remains visible around its dark disc. This is called an annular eclipse, and is not so important scientifically, because even the small remaining part of the sun's disc is bright enough to blot out the corona. Were the

moon a little smaller than it is, all solar eclipses would be annular, and we would never know that such a thing as the corona encircles the sun.

Something like this would take place on Mars. Though that famous planet has two satellites, they are both extremely small. Phobos, the larger, is probably not more than 10 miles in diameter, while Deimos, which is the outer one, is believed to be about 5 miles in diameter. Phobos is about 3,720 miles from the Martian surface, so that even under best conditions, its diameter in the sky would be only about a third that of the full moon as seen from the earth, and every solar eclipse there would be annular. Deimos, in addition to being smaller, is much farther away, and would appear merely as a bright planet, something as Venus appears to us. When it came between Mars and the sun, it would ap-

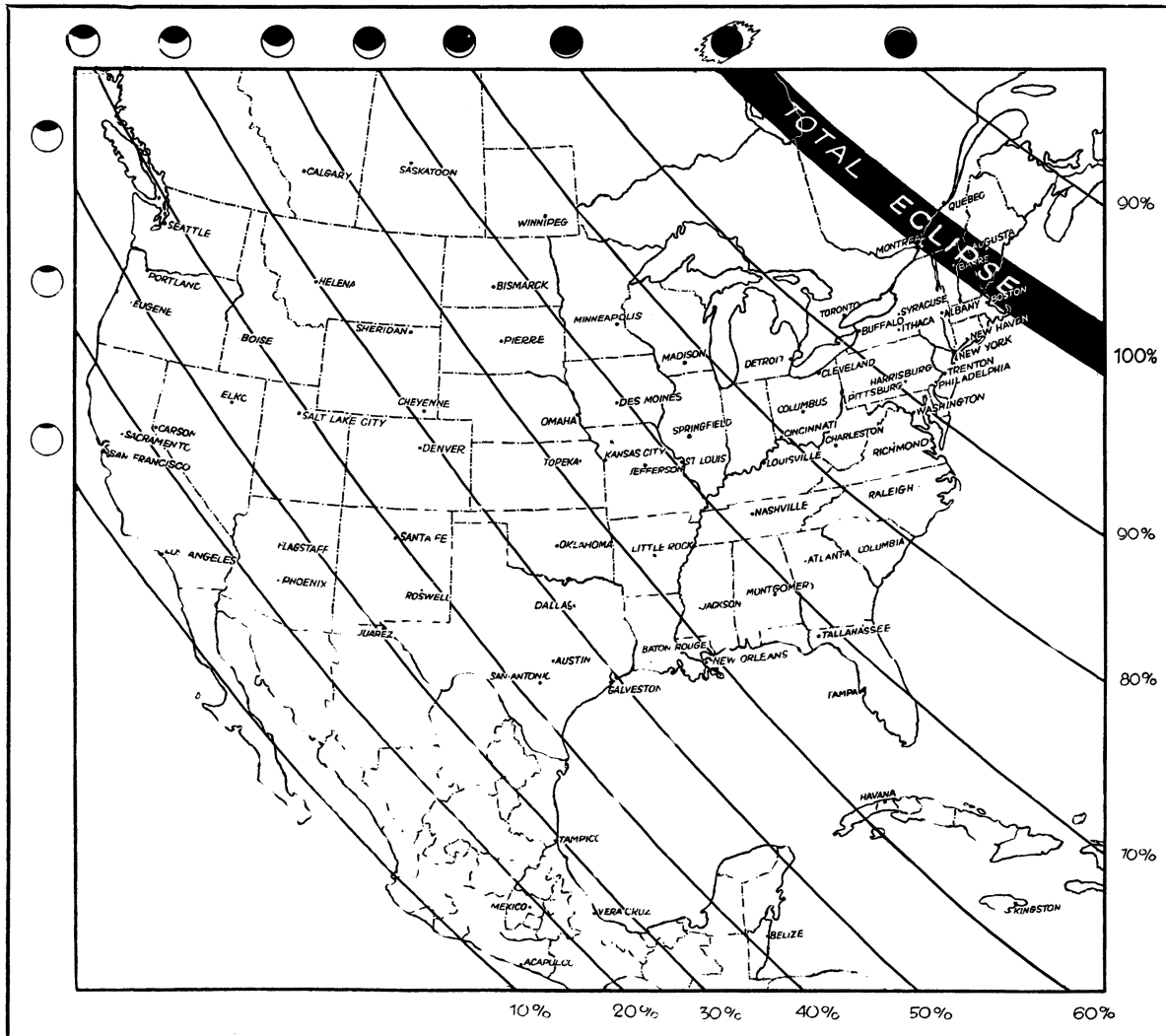
pear only as a small black spot on the solar disc.

**Eclipses on Other Planets**

Since Venus and Mercury have no satellites, they could have no eclipses. Jupiter and Saturn are well provided with them, but they are so far from the sun that it would appear much smaller than from the earth, and the features of a total eclipse from the earth could hardly be observed. The same thing is true, to an even greater extent, for Uranus, Neptune, and Pluto, if that body has any satellites. From these distant planets, the sun would look like a very bright star.

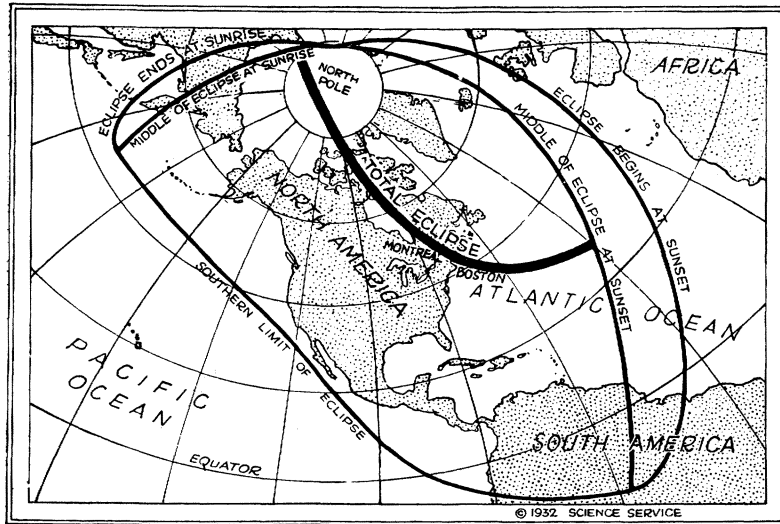
Those who see the magnificent sight of the total eclipse on August 31 will agree that we are fortunate in living on a planet where such an event can occur.

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**SUN'S ECLIPSE VISIBLE FROM WHOLE COUNTRY**

*In its partial phases the eclipse of the sun on August 31 will be visible in all parts of the country. This map shows how much of the sun will be obscured at various localities. The band of total eclipse is also shown. Since the path of totality passes near the great centers of population, the phenomenon will present a very striking appearance to most of the people in the United States.*



WHERE MOON'S SHADOW STRIKES EARTH

The black line is the narrow path of total solar eclipse. The area of the earth from which the partial phases of this phenomenon are visible is also shown on this map.

## Paths of Totality Crosses Popular Vacation Section

### Hundred-Mile-Wide Shadow Hits Earth First Among Eskimos But Later Traverses Quebec and Cape Cod Region

MILLIONS of people are expected to view the total eclipse of the sun visible in Eastern Canada and New England. Probably never before, with the possible exception of the eclipse seen in New York, Pennsylvania and the New England states on January 24, 1925, has the attention of so many been concentrated on such a celestial event. Not only is the hundred-mile path over which the eclipse will be seen a well settled region, but it is also a popular vacation resort. The regular population will be greatly augmented by the large number of summer tourists, many of whom are regular visitors, while others are especially attracted by the eclipse.

#### Begins in Arctic Ocean

The greater part of the eclipse path, however, is over uninhabited territory. The shadow of the moon will first touch earth in the Arctic Ocean, north of Taimir Peninsula, in Northern Siberia, at sunrise, which will be at 2:04 p. m., Eastern Standard Time. Then it will travel northward, passing within a few hundred miles of the North Pole. Starting south, it will traverse more of the

Arctic Ocean, northern Canada, Hudson Bay and James Bay. So far, it will have passed over few human beings, including perhaps some Eskimos, an occasional explorer and some trappers. But then it enters the province of Quebec, and begins to reach civilization. A little town named Parent, on the Canadian National Railway is in the path. Then it comes down to the St. Lawrence River, covering that river from Montreal to a point east of Three Rivers, but not as far as the city of Quebec. In southern Quebec it crosses Lake Memphremagog, including the town of Magog.

Entering the United States, it passes over northwestern Vermont, Montpelier being right on the southern edge of the path. It covers all of New Hampshire, except the southwestern corner. Southern Maine, and northeastern Massachusetts are included with such points along the coast as Salem and Gloucester, Mass., Portsmouth, N. H., York Harbor, Kennebunkport, Biddeford, Portland, Boothbay and Newagen, Maine. After crossing Massachusetts Bay, the edge of the shadow crosses Cape Cod, including Provincetown. Chatham is the last bit of land that it touches. Then the shadow

passes out to sea, and ends in mid-Atlantic, at a point in longitude 41 degrees west and latitude 28 degrees north, at sunset, which comes there at 4:03 p. m., Eastern Standard Time. Thus, less than two hours will have been required for the 6,000-mile trip.

#### Red Flames

To a person in the region crossed by the shadow, the dark disc of the moon completely covers the sun's disc, and the sun's outer envelope, the corona, comes into view. Red flames of hydrogen and other gases, shooting out from the sun to heights of hundreds of thousands of miles, may also be seen. The sun obscured, a sudden darkness comes over the earth, for the short period during which the total eclipse lasts. Altogether, it is probably the most impressive of natural phenomena.

Of course, if the sky is cloudy, the eclipse will not be visible from the ground, and every eclipse observer, whether layman, or professional astronomer, has to take a chance with the weather. But records made over recent years for afternoons at the end of August indicate that the chances for clear skies are somewhat better than even, perhaps about 60 per cent., from Quebec south. Even Mt. Washington, which is 6,288 feet high and in the center of the path, has about a 30 per cent. chance of clear weather. And this is better than the chances were on January 24, 1925, when the weather behaved beautifully.

*Science News Letter, July 30, 1932*

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