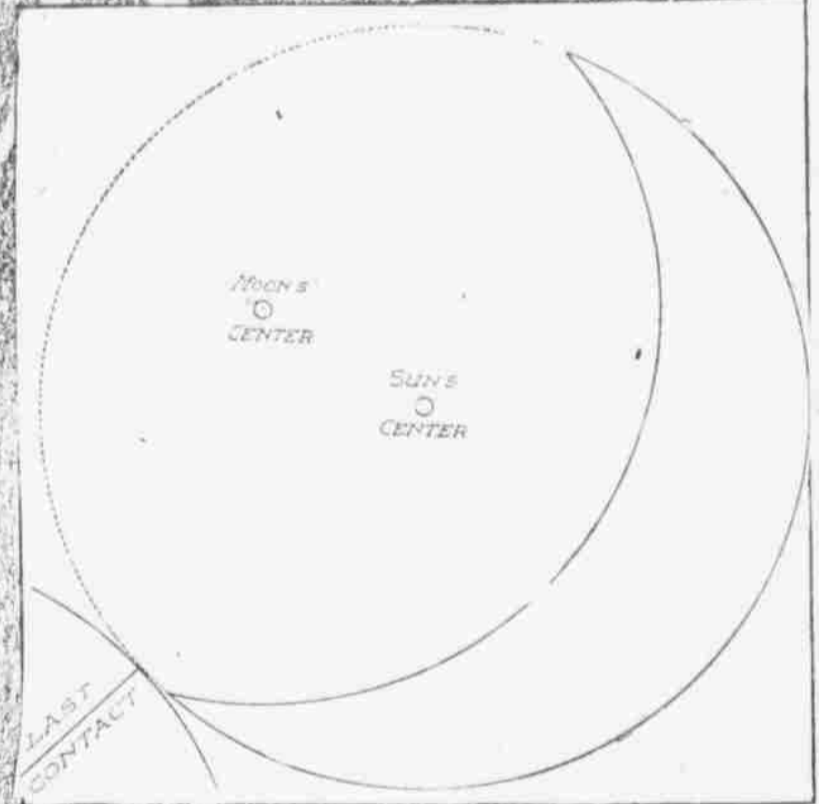
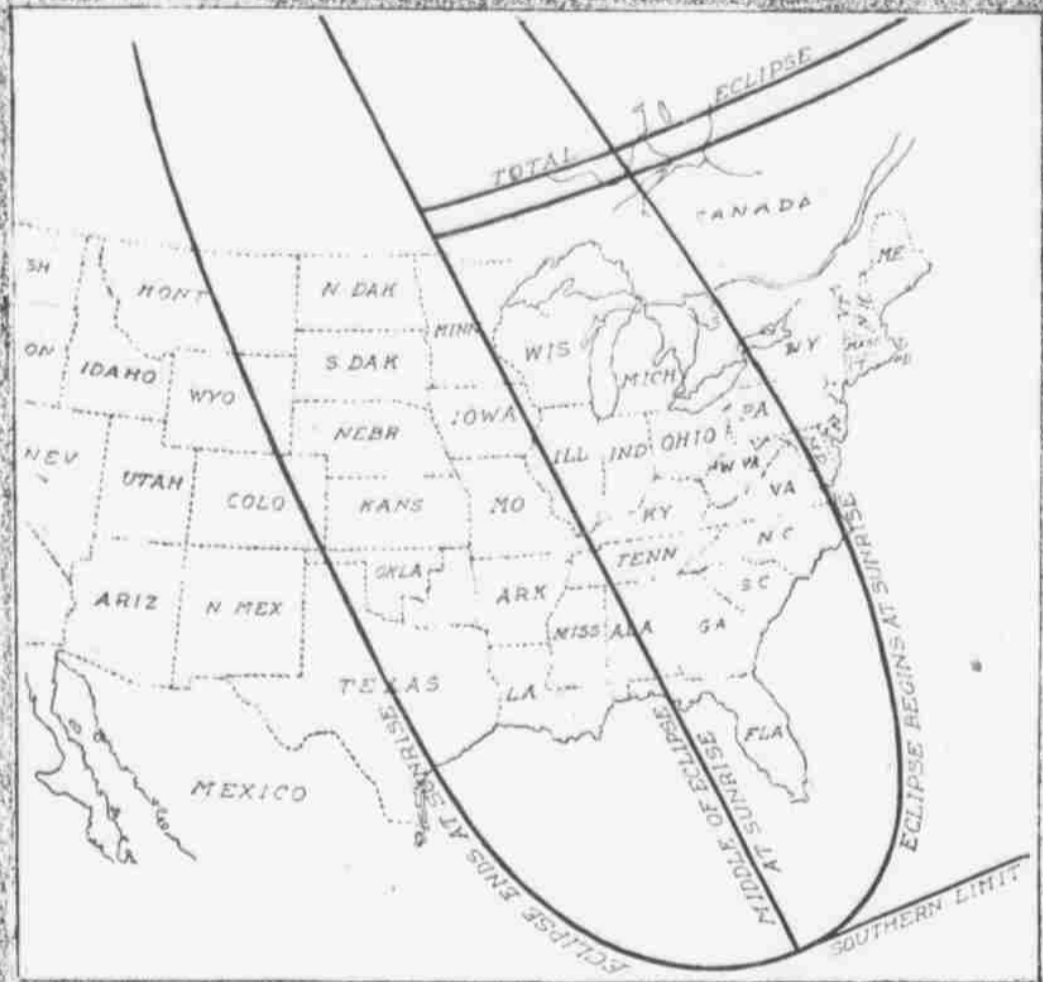


ECLIPSE of the SUN to be visible in the United States



An eclipse of the sun, visible to a large part of the North American continent, will take place on the morning of Aug. 30. The area from which the eclipse can be observed includes the eastern two-thirds of the United States, nearly all the Gulf of Mexico, and the southern portion of the eastern half of Canada.

The accompanying map is intended to indicate the course of the eclipse in America. The narrow band shows the position of the "belt of totality," that being the area to which the sun will be completely obscured for the space of a little more than two minutes by the moon's shadow. The belt sweeps eastward from near Winnipeg to the southern part of James Bay, and thence over the Labrador peninsula, which it leaves about 100 miles north of the eastern entrance to the strait of Belle Isle. From that point the "belt" crosses the Atlantic ocean, meeting no land till it reaches the north coast of Spain, crossing that country, passing about forty miles north of Madrid.

Crosses Ocean Into Spain

It then crosses the Mediterranean, Egypt, the Red sea, and Arabia, ending at sunset where the south coast of that country meets the Arabian sea, after having passed over Mecca, the "holy city" of the Mohammedans. The dark band of shadow averages nearly 140 miles in width, the greatest diameter of the shadow, perpendicular to its axis, at the point where it meets the earth, being about 100 miles. The shadow passes over about 152 degrees of longitude in nearly two hours and fifty-five minutes, the longest time occupied in passing over any one point being three minutes and forty-five seconds, the maximum point being in Europe.

The curve near the left hand side of the map passes through all those points to which the eclipse will end at sunrise. To all points farther west, including the whole of the Pacific slope, the eclipse will have ended before the sun and moon reach the horizon. The middle line passes through all those points at which the middle of the eclipse occurs at sunrise, and the right hand line of the three indicates the positions of all points in the United States at which the eclipse will begin when the sun is rising there.

Visible Here in Early Morning.

It is easy to see from the map that the phenomenon will have begun some time before the sun and moon rise here. The fact is that at about 5:15 a. m. the sun will appear (clouds not preventing), with a dashed out hollow of darkness on his upper left, and from that time the obscuration will increase till 5:32, the time of maximum or middle of the eclipse, as seen from Chicago and vicinity, a little more than three-quarters of the solar diameter being hidden by the moon. As the sun mounts in the heavens the moon is carried relatively lower by the motion in her orbit, and they part company at 6:28, the last thread of darkening being on the lower left of the solar disk, as indicated in the diagram.

The amount of greatest darkening for any point in this part of the world may be ascertained roughly in an easy

manner. Thus, the eclipse is total at 30 degrees latitude, and the penumbra extends to 20 degrees north. Hence, if we subtract the latitude at any point from 30 (50 minus 20) and divide the remainder by 30, the resulting decimal will represent the width of sunlight at the time of greatest obscuration. For Chicago this would give 50 minus 42, to be divided by 30, being 0.25 nearly, or not far from one-quarter, as stated. Of course, it will be understood that the curving of the earth's surface makes the computation much more complicated than this if we wish to arrive at precise results for any named point.

Other Eclipses Seen Here.

The eclipse will be over before the ordinary times of rising for many of the people in Chicago and vicinity; but it will be well worth an extra effort to see it. Only two eclipses of the sun have occurred within the last half century which presented here a greater amount of obscuration, and neither of them was total at Chicago. Those were on Aug. 7, 1824, and July 29, 1878, the writer visiting Des Moines, Ia., and Denver, Colo., to observe them respectively from stations near the middle of the belt of

totality. The one next in importance to dwellers in this section was the one of May 26, 1834, and that of July 18, 1890, which also occurred early in the morning, and presented the closest parallel to the one of Aug. 30, its belt of totality passing through Canada, across the Atlantic, and thence over Spain and Egypt.

Discoveries in Astronomy Expected.

Of course, it will be understood that the sight from any part of the United States will be little more than the gratification of a curiosity; but that needs not to be an idle one, if it helps to an idea of the immense strides that have been made in astronomical knowledge since the days when certain astronomers in Babelonia watched three whole days for an eclipse of the sun without being able to see it, and the times still farther back when nobody thought such an event could be anticipated at all. Contrast this with the fact that the beginning of totality at Des Moines occurred within four seconds of the time that had been computed for it some days beforehand, and then say if the human intellect has not demonstrated its ability to reach out at least a long way towards a knowledge of the infinite.

Lunar Motion Theory.

And from this it may be inferred that not much remains to be done in perfecting the theory of the lunar motion. But even if so there still is much to be discovered, for which the study of a total eclipse of the sun affords the best opportunity. Prominent among the items of work which it is proposed to do on Aug. 30 are the search for an intramercurial planet, the study of the coronal, and work with the spectroscopic, the photometer, and the polariscope. The observing stations will be near the Atlantic, on both sides of that ocean, the object being to have the sun at as great an altitude as possible, and these will be occupied by several parties of American and European astronomers. The search for one planet or more revolving around the sun at a less distance than Mercury was undertaken systematically in 1878. Prof. James C. Watson, at a station in Wyoming, claimed to have seen one, and Lewis Swift, at Denver, thought he saw two, but subsequent search has not verified these "discoveries," though those analysis of the planetary motions, particularly those of Mercury, seems to render it almost certain that there must be some such planet or planets (perhaps many of them), or else we have to fall back on the hypothesis that the force of attraction does not vary precisely in the inverse proportion to the square of the distance. So, the space in the neighborhood of the sun will be scanned by many eager observers, not only visually but by means of photographic apparatus.

The Recurrence of Eclipses.

The eclipse cycle is a period of eighteen years ten and one-third days, or eleven and one-third days, according as the series contains five or four leap years. In that time there are 223 new moons, and nearly one revolution of the nodes, or points in which the orbit of the earth intersects that of the moon. Eclipses can occur only when the luminaries, at the time of new or full, are within a few degrees of these points. This permits the occurrence of about seventy eclipses in each cycle, twenty-nine of which are of the moon and forty-one of the sun, but the latter are much the less often witnessed from any particular spot on the earth's surface, because each of them is visible from a relatively small area, while the lunar eclipse can be seen from every point on that half of the earth's surface which is turned away from the sun. In one year there may be not more than seven eclipses, five of which will be solar, and not less than two, both of which will be solar. There cannot be more than three lunar eclipses, and may be none. Also, there seldom are more than six of both kinds. In the present instance the length of the moon's conical shadow is about 7,500 miles greater than her distance from the earth's center, hence the moon completely obscures the sun under the conditions above stated. This because the moon's distance then will be about 12,000 miles less than the average. But when, at the time of a solar eclipse, the earth's distance from the sun be near the least possible, and that of the moon from us be near the greatest, the apex of the shadow does not quite reach the earth, and then the eclipse is annular, the sunlight extending all around the moon, like a ring during a few seconds to those who are on the central line. Such an eclipse occurred March 5 of this year, the annular band passing over south Australia, and the ocean west and east of it.

It may be added that after the lapse of the above named cycle, another series of eclipses occur in about the same order, and that the Metonic cycle, of nineteen years, measures the duration of two hundred and thirty-five lunations to within about an hour and a half, so that the moon's age at any named date is the same at intervals of nineteen years.