

THE ECLIPSE OF JULY 29.

Solar Eclipses of the Present Century.
 A total eclipse of the Sun by the Moon, at any particular place, is a phenomenon of such rare occurrence, it is not improbable that at many places in the United States there has not been even one, since the settlement of the country. In this century the largest and finest in the United States was the one which occurred about noon of a clear day, June 16, 1806, when the shadow in crossing North America was in places (Albany to Boston) about 150 miles wide, and the duration of totality full five minutes, and the excitement produced near the central line has perhaps never since been equalled. This eclipse was most carefully observed by our great astronomer, Dr. Bowditch, then a resident of Salem, and his many memoirs on the subject, in the American Academy of Arts and Sciences, are frequently quoted and referred to.

As eclipses return in 18 years 10 1/2 days, under circumstances not very different, the one of June, 1824, returned shortly before sunset of June 20, 1824, and the beginning of the eclipse was seen at 7 1/2, 27m. 5s. by the late Professor Bond, first director of Harvard Observatory, and by the writer of this note, from a hill in Dorchester. At the second return of the eclipse, on July 9, 1842, it was visible throughout Europe, the north of Africa and the greater part of Asia, but not in the United States. In Italy it was carefully observed, by means of the heliograph, and an account of it given by Arago has often been quoted. At its third return, on July 18, 1860, it was visible as a partial one throughout the United States; total in Oregon; thence across the continent to Labrador, to Europe, Africa and Asia. Its fifth return, on August 9, 1878, will be invisible here, but total soon after sunrise in the north of Sweden and Norway, and later, in the centre of Asia; but on its fourth return, on July 29, 1878, the eclipse will be visible throughout the United States, and on a curved line not over 100 miles wide from near Behring's strait to St. Domingo, the eclipse will be total; but the length of the total eclipse will not at any place exceed three and one-half minutes. Indeed the centre of the Moon's shadow first touches the Earth at sunrise in Asia, at 8h. 21m. (Greenwich mean time, in long. 118° east, lat. 58° north, then will take a northeasterly direction, and will cross over to America at about its greatest latitude, 66 degrees; then, taking a southeasterly direction, it will pass over part of British Columbia, of Idaho, Wyoming, Colorado, Kansas, Texas, to lat. 30°, long. 95°, where it will leave the United States; then pass over the island of Cuba (city of Havana) to a point in 17 1/2° north 70° west, a little south of St. Domingo, where, at 11h. 10m. (Greenwich time), the centre of the shadow will leave the Earth. It hence appears that this eclipse will be total at only two cities in America, viz Denver, in Colorado, and Havana, in the island of Cuba, unless some other city may have been named and marked, but not laid out, on the map.

In the catalogue of all the eclipses of sun visible in Boston between 1823 and 1901, computed fifty-six years ago by the old tables of Delambre and Burckhardt, and with a somewhat different latitude and obliquity, the eclipse of the 29th instant, it is said, will begin at 4h. 56m. 10s. P.M. The greatest obscuration will take place at 5h. 50m. 1s, and the end take place at 6h. 30m. 8s., and that three-fifths of the sun will be eclipsed; but on recomputing this eclipse for the observatory of Harvard by the later tables of Le Verrier and Hansen, taken from the English Nautical Almanac with great care, the eclipse at the observatory will happen about a minute later, viz: Beginning at 4h. 57m. 3s. P.M., at a point on the right side of the Sun 133° from the vertex or highest point. Erect telescope. The greatest obscuration 0.61, or 61 P.M., apparent conjunction sun and moon in longitude 5h. 55m. 29.5s. Eclipse ends 6h. 30m. 42.7s. Duration of the eclipse 1h. 33m. 6.4s. Three-fifths of the sun will be eclipsed on the southern side.

At the city of Denver, Colorado, in latitude 39° 45' 19" longitude 104° 59' 40.87" (as determined with much care by Professor Safford, formerly of Harvard observatory, now of Williams College,)—

The eclipse in Denver, will begin at.....	2 19 54 P.M.
1 1/2 from vertex on right side of sun.	
Apparent conjunction of Sun and Moon in latitude.....	3 24 33 "
Beginning of total eclipse.....	4 42 "
Least distance of centres (127).....	3 30 4 "
Apparent conj. Sun and Moon in longitude.....	3 31 15 "
End of total eclipse.....	3 31 25 "
End of eclipse.....	4 34 52 "

The duration of totality at Denver (where the eclipse will not be exactly central) will be 2m. 42 1/2 s., and the length of the whole eclipse 2h. 15m. 58s. The motion of the moon in apparent latitude during totality will be very rapid; at beginning of totality, the apparent latitude of the Moon will be only half a second (0.58) south of the Sun's, but 2 1/2' at the end, 2m. 42 1/2 s. only.

At the city of Havana, lat. 23° 9', long. 82° 19', the eclipse will also be total, but, as the Moon will then be quite low, its augmentation of diameter for altitude small, and its apparent motion in longitude more rapid, so that the length of totality in Havana and its environs cannot exceed 1m. 56s. (6h. 34m. 30s. to 6h. 36m. 24s.) The Sun will set there at about half-past six.

During the remainder of this century there will be, after this month, four central eclipses in some part of the United States. The first will take place on January 11, 1886, when the Moon's shadow, coming across the Pacific, will strike California, near sunset, in lat. 36°, long. 122° west (near San Francisco), but the Sun will set in a few minutes. The second will take place on March 16, 1885, and be annular in northern California and Montana. This is the third return of the beautiful annular eclipse which was so finely observed at and near Nantucket, February 12, 1831; the third, on May 23, 1860, the shadow of the Moon, passing from the Gulf of Mexico across Alabama, North Carolina, etc., to the Atlantic, a little south of Norfolk, will cause a total eclipse in part of those States of nearly a minute. The central line of this eclipse will continue its northeasterly direction after passing Norfolk, so that at many of our large cities on the coast the eclipse will be of the magnitude of eleven digits, such as Washington, Baltimore, Philadelphia, Boston, New York; also, on October 20, 1892, there will be a large eclipse here, not central in the United States, but annular in Canada and Labrador. The third return of the annular eclipse was observed at Washington, at the Capitol, in September, 1838.

ECLIPSE OF THE MOON.

Early in the evening of Monday, next August 12, the Moon will rise about half eclipsed about seven P.M., but at 8h. 50m. P.M. will be wholly passed out of the shadow.
 July 1, 1878. P.

The Eclipse of July 29.

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