*THE TOTAL SOLAR ECLIPSE OF AUGUST 29–30, 1905.**

THE path of the shadow of the moon during the eclipse of August 29–30, 1905, is conveniently accessible at several points; that fact, together with the large duration for totality which for the maximum is 3 minutes 45 seconds, renders the observation of this eclipse desirable.

A brief sketch of the location of the path of the shadow will show the comparative accessibility of the different parts. In general the width of the shadow path is approximately 120 geographic miles.

The moon's shadow strikes the earth at sunrise in the province of Manitoba near the south end of Lake Winnipeg. The shadow sweeps eastwardly through the British possessions, passing over the southern part of James Bay and the peninsula of Labrador, and enters the Atlantic Ocean about 100 miles north of the eastern entrance of the Strait of Belleisle, which separates Labrador from the island of Newfoundland. After leaving the American coast no land is met by the shadow until it reaches the north coast of Spain, where the middle of the shadow crosses the coast line about 100 geographic miles west of the city of Santander and sweeps southeastwardly across the Spanish peninsula, leaving Madrid about 40 miles and Valencia about 2 miles distant from the southern edge and outside of the shadow path. Some of the cities within the limits of the shadow path are Leon and Burgos, not far from the central line, Valladolid, near the southern edge, and Zaragoza, near the northern edge, while the old city of Sagunto lies about 20 miles within the southern edge. The numerous railroads passing into and through the shadow path afford a means of access to observing stations from ports on the Bay of Biscay or the Mediterranean Sea.

After leaving the Spanish coast the shadow sweeps over the Columbretes, a group of small islands, close to the central line and about 40 miles from the coast. The Columbrete Grande, the largest of these islands, is less than a half mile long and rises to an elevation of 262 feet above the sea. This island is crescent-shaped and affords an anchorage protected in every direction except the northeast.

About sixty miles farther southeast the shadow passes over two islands of the Balearic group—Ivica, just within the southern edge, and Majorca, within the northern edge—but the only satisfactory harbor is the port of Palma, on the southern shore of Majorca and about 40 miles north of the central line.

After crossing the Mediterranean Sea the shadow strikes the African coast about midway between the cities of Algiers and Tunis. A railway line not more than 60 miles from the coast, connecting the cities of Algiers and Tunis, has various branches, by means of which observing stations may be reached at any desired distance from the central line of the shadow path.

In the vicinity of the shadow path several ports are available for landing. The port of Bona is located about 230 geographic miles east of Algiers and about 120 miles west from Tunis. It is supplied with a fine artificial harbor of 195 acres with an inner basin of 25 acres. This port is now one of the best and safest on the Mediterranean coast. It is visited annually by about 3,000 vessels and enjoys telegraphic communication with Marseilles and regular steamship connections with France, Algiers and Tunis.

ground that a male spermatozoon as well as a female spermatozoon has entered the egg, the latter alone fusing with the egg nucleus. It might appear that a count of the number of the chromosomes in the male and female parts of the body of the gynandromorph would give an answer to the problem; for, on Boveri's view, the female-half might be expected to contain twice as many chromosomes as the male-half of the body. On my view the same condition might be expected, but if Petrunkewitsch's observations are correct, there is a doubling of the chromosomes in the later stages of the drone egg, and possibly the same increase in the number of chromosomes might happen in the descendants of the single sperm nucleus or the half egg-nucleus. The conditions were too uncertain to make an appeal of this sort of any value at present, and the other test that I have suggested offers apparently a simpler and safer means of reaching a conclusion.

* Circular of the U. S. Naval Observatory, March 18, 1905.

The port of Benzert, on some maps called Bizerta, is located about 50 miles northwest from Tunis. The harbor facilities of Benzert, which are naturally very good, have been of late years very much improved by the French government by dredging and by protective works in order to make it the location of an extensive naval station. As a harbor it is very commodious and accessible to large vessels. It is connected with the railway system and is the terminus of a submarine cable.

The port of Tunis is inferior in harbor facilities to either Benzert or Bona, and need not be considered as a landing-point.

From this region the shadow path proceeds southeastwardly across the desert into Egypt, where it crosses the river Nile in the neighborhood of Assonan. The total phase occurs here something more than one hour before sunset. The shadow leaves the earth in central Arabia.

Some of the points to which the attention of astronomers will be directed may be briefly stated as follows:

(*a*) *The Relative Position of the Sun and Moon at the Time of the Eclipse.*—The angular distances between the centers of the sun and moon may be derived from observations of the four contacts, by visual or by photographic methods. This necessitates an accurate determination of the latitude and longitude of each observing station, which necessarily consumes a large amount of time and labor, and demands the use of a special instrumental outfit.

Since the position of the moon is so well cared for by meridian observations, and since the additional data derived from contact observations is small in quantity and of a distinctly lower grade in quality, it follows that contact observations should be considered of secondary importance compared with the work in other lines.

(*b*) *The Search for Intra-mercurial Planets.*—Hitherto photographic searches for intra-mercurial planets have been made with incomplete apparatus or have been interfered with seriously by clouds.

In this eclipse it is highly important that a photographic search be prosecuted at two or three widely separated stations with very complete apparatus.

(*c*) *The Corona.*—The corona should be photographed with long focus lenses to obtain large scale pictures of the inner corona, and with short focus lenses for pictures of the corona as a whole embracing its ultimate extensions. It would be well to locate the parties at a number of widely separated stations, and Professor Campbell, director of the Lick Observatory, suggests the use of lenses of a standard aperture and focal length, say five inches aperture and forty feet focus, to furnish data for studying changes in the corona as the shadow sweeps over the earth.

The work on the corona should be considered of the highest importance.

(*d*) *Spectrum Work.*—All the facilities available to the astronomy of the present day for photographing the spectrum of the reversing layer, the chromosphere, the prominences and the corona, should be used to their utmost capacity in the coming eclipse. On account of lack of light the slit spectroscopes used will be confined to a few special problems, leaving the great bulk of the work to be executed by objective spectrographs, using either gratings or large prisms.

It is also suggested that a number of spectrographs be employed to determine the accurate wave-length of the principal coronal line.

The spectrum work should be considered of equal importance with that on the corona.

(*e*) *Photometry; Shadow Bands.*—Of secondary importance are photometric observations and observations of the character of the so-called shadow bands.

(*f*) *Polariscopic Work.*—Polariscopic and polarigraphic work should be well cared for with increased facilities for accurate work.

Polariscopic work should be considered of importance nearly equal to that on the corona and the spectrum.

(*g*) *Meteorology.*—The meteorological conditions existing at the several stations, especially during the progress of the eclipse, should be observed by means of the best self-recording instruments.

This should be considered the most important of the secondary work.

At the present time it is not possible to note many details in reference to the location of the various parties intending to observe this eclipse, but it is reasonably certain that the observers will be quite well distributed over the accessible portions of the path.

The Canadian government expects to locate a party on the coast of Labrador, about 100 miles north of the Strait of Belleisle.

The Indiana State University announces its intention to locate a party in Spain.

The German government has asked permission of Spain to land a party on the Columbretes islands.

One English party will probably locate near Palma on the island of Majorca, one of the Balearic group.

Other English parties will undoubtedly locate in Spain.

Professor Campbell has announced that, through the liberality of Mr. William H. Crocker, the Lick Observatory will send out three different parties for observing this eclipse, one of which will be located on the coast of Labrador, a second in Spain and a third in Egypt.

The director of the observatory of Pulkowa, Dr. Backlund, has indicated his intention to equip two observing parties.

Under an appropriation of $5,000 by Congress, the Naval Observatory will undertake the observation of this eclipse and will equip an expedition. The U. S. S. *Columbia* and the U. S. S. *Cæsar,* vessels detailed by the Navy Department, will carry to ports near the observing stations the expeditionary force, which will consist of the following: Rear-Admiral C. M. Chester, U. S. N., superintendent Naval Observatory, in charge of the expedition, with about seven members of the staff of the Naval Observatory. Mr. L. E. Jewell, of Johns Hopkins University; Dr. S. A. Mitchell, of Columbia University, and Dr. N. E. Gilbert, of Dartmouth College, have accepted invitations to participate in the work of observation. Professor F. H. Bigelow, of the U. S. Weather Bureau, will accompany the expedition and have charge of its meteorological work.

The equipment for three observing stations is being prepared, the more important elements of which are as follows:

1. A station near the central line, possibly on one of the islands of the Columbretes group off the east coast of Spain; a horizontal photographic telescope 5-inch aperture and 40-foot focus; a photographic telescope 8.5-inch aperture and 12-foot focus; a 6-inch Dallmeyer camera, 36-inch focus; a portable telescope for contact observations; several grating spectroscopes; spectral photometric apparatus; meteorological apparatus.

2. A station 10 to 15 miles within the edge of the shadow path, probably near Valencia; a horizontal photographic telescope 7.5-inch aperture and 65-foot focus; a prismatic spectrograph; a photographic telescope 9.6-inch aperture and 14-foot focus with color screen; a 6-inch Dallmeyer camera 40-inch focus; a portable telescope for observing contacts; a grating spectrograph; meteorological apparatus.

3. A station near the central line, probably near the line of the railroad from Tunis to Algiers in Africa; a horizontal photographic telescope 5-inch aperture and 40-foot focus; a photographic telescope 7-inch aperture and 114-inch focus; a 6-inch Dallmeyer camera 40-inch focus; a portable telescope for observing contacts; a concave grating spectrograph; a chronospectrograph; polariscopic apparatus; meteorological apparatus.

Each station will be supplied with instruments for determination of time. Where telegraphic facilities are available the stations will be supplied with chronographs and portable transits for the determination of the difference of longitude.

The location of the Naval Observatory stations can not be finally settled until the local conditions are personally examined, but those mentioned above are especially indicated as desirable stations to occupy.

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