THE SOLAR ECLIPSE.

In view of the fact that some time must elapse before it is possible to publish a complete account of the results of observations on the solar eclipse of May 17th–18th, the following letter, written from Padang by a correspondent of the London *Times*, describing the preliminary arrangements, is of interest:

The last few days of our very prosperous voyage across the Indian Ocean in the Dutch mail boat *Koningin Regentes* have brought with them the sense that we are coming to a land where it is 'always afternoon.' But our days of eating lotus were nearly over just as we reached this beautiful land. The lighthouse close to Siberut, rising high above the palms, warned us that Padang was not more than ten hours away. The sight of this light produces the same thrill that seizes one when, after crossing the Atlantic, the Fastnet comes into view and tells that the voyage is safely accomplished. It is the first land that we sighted since we passed the splendid headland of Somaliland, Cape Guardafui, on March 27th; our course took us through the Maldives at night; and, though we passed through the '8° Canal,' Minicoy was left so far to the north that we got no glimpse of the light. All the members of the expedition who have traveled out by this direct route to make observations during the total eclipse of the sun visible in Sumatra disembarked at Padang.

Three parties of observers have traveled out on the *Koningin Regentes*—(1) the English expedition, consisting of Mr. H. F. Newall, of Cambridge, Mr. F. W. Dyson, of the Royal Observatory, Greenwich, accompanied by Mrs. Newall and by Mr. J. J. Atkinson, who has volunteered assistance to the party in this distant land, just as he did to the Astronomer Royal's party last year in Portugal; (2) the Dutch expedition, consisting of Dr. A. A. Nijland, of Utrecht, Dr. W. H. Julius, professor of experimental physics at Utrecht, and Mr. J. H. Wilterdinck, of the Leiden Observatory, accompanied by Mr. J. H. Hubrecht, a son of Professor Hubrecht, the eminent embryologist, who lately received the honorary degree of Sc.D. at Cambridge University; (3) a party from the Massachusetts Institute of Technology, consisting of Professor Burton, Mr. H. W. Smith, Mr. G. Hosmer, and Mr. G. H. Matthes. The instruments of all these parties were also carried by the same mail boat, which starts from Amsterdam and calls at Southampton and Genoa.

The eclipse of the sun which will occur on the 17th–18th of May is of special interest on account of the long duration of the total phase. The shadow of the moon will first touch the earth at sunrise near Madagascar, and in the course of the next five hours it will traverse a long path on the earth's surface. Passing at first in a northeasterly direction over Mauritius, it speeds across the Indian Ocean and traverses Sumatra and Borneo. It grazes the equator, but only a small part of the shadow touches the northern hemisphere. Then its course bends southeastwards and passes over the Malay Archipelago, Celebes, Seram, and thence over New Guinea. At sunset in the Coral Sea, between Melanesia and Australia, the shadow leaves the earth.

The partial phase of the eclipse will be visible over a vastly greater region of the earth's surface, as far north as Somaliland, India, Siam, and China, and also over the whole of Australia; but the real interest of the eclipse lies in the total phase, which can only be observed at stations lying on the line indicated. The shadow of the moon will be about 140 miles across as it passes over Sumatra, and it will travel with a speed of about 1,500 miles an hour. Hence any observer stationed near the path of the center of the circular shadow will be in the shadow for about a tenth of an

hour, or, if more exact calculations are used, for 6 min. 29 sec.

In recent eclipses the duration of totality has been much shorter; thus in America, Spain, and Algiers, in May, 1900, the total phase lasted not much more than one minute; whilst in India, in January, 1898, the duration was only a little more than two minutes in the most favorable stations.

Hence the coming eclipse is welcomed as an unusual opportunity for collecting observations by the photographic methods which play so important a part in modern investigations. Especially in spectroscopic researches is the photographic method serviceable; for by the nature of this kind of research the light gathered by the instruments is spread out over a much greater extent of the photographic plate. Accordingly to collect information about the spectrum of the faint light of the corona long exposures of the photographic plate are necessary.

The valuable information published by the *Koninklijke Natuurkundige Vereeniging* in Batavia over the signatures of Major Muller, the chief of the Trigonometrical Survey, and Dr. Figee, the director of the Meteorological Observatory, Batavia, showed that the weather conditions were probably most favorable, or, shall we say, least unfavorable, in Sumatra, especially near the west coast. It is therefore not surprising that most of the observing parties converge on Padang, the port that gives access to the province of the West Coast, and lies actually on the course of the moon's shadow.

The joint permanent eclipse committee of the Royal Society and the Royal Astronomical Society favored the sending of an expedition to Mauritius, and we understood on leaving England that Mr. E. W. Maunder, of the Royal Observatory, Greenwich, was to go thither to make observations in conjunction with Mr. Claxton, the director of the Royal Alfred Observatory, Mauritius. We also learn that Mr. D. P. Todd, of Amherst, U. S. A., is to be stationed at Singkep, an island noted for its tin mines, lying on the east coast of Sumatra, due south of Singapore. Otherwise all the observers have come to Padang and are receiving the most courteous and helpful reception by the Dutch authorities. Probably most of the parties have similar obligations to acknowledge. The English expedition received every assistance from Mr. Joekes, the Governor of Sumatra's west coast. Thus Mr. Dyson was at once made welcome to use the Government launch to make preliminary inspection of Trusan Bay and of the island Aoer Gedang, about six miles to the west of Painau and 30 miles to the south of Padang; whilst Mr. Newall received every assistance from Mr. Delpeat, the chief of the railways, to go inland and search for a suitable site on the east side of the Barisan Mountains. And so within four days of landing at Padang the sites for observing stations of the English expedition were chosen.

In order to increase the chances of securing observations of the eclipse, the parties distribute themselves as far apart as possible. The extreme stations in Sumatra are occupied by English parties. Mr. Dyson and Mr. Atkinson, assisted by his Majesty's ship *Pigmy*, a gunboat commanded by Lieutenant Oldham, R.N., and sent from the China Station to assist the observers, have established their camp on the island Aoer Gedang, and will be the first to catch the eclipse. Here the program of observations will be to secure (1) photographs of the corona on a large scale to show details of the structure; (2) photographs on a small scale to get the greatest possible extensions of the coronal streamers; (3) photographs of the ultra-violet spectrum of corona and chromosphere and also of the green and yellow spectrum, with slit spec-

troscopes in both cases. At the eastern extremity of the Sumatra stations Mr. Newall will be established at Doerian, above the Oembilien Coal Mines, near Sawah Loento, at the extreme end of the railway. The engineer of the mines, Mr. van Lessen, has put a house at the disposal of this party, and a very good site has been found close at hand for the setting up of the instruments, which consist of (1) a powerful flint spectroscope, to be used in an attempt to determine whether the corona rotates; (2) a quartz spectroscope, to be used for photographing the extreme ultra-violet spectrum and for a special search for Fraunhofer lines such as might be attributed to sunlight reflected by dust in the corona; (3) a cœlostat, to be used in connection (*a*) with polariscopic cameras in investigating the polarization of the light of the corona, (*b*) with a telephoto camera in photographing the corona, (*c*) with a powerful grating spectroscope in getting monochromatic images of the corona. This station is 1,200 ft. above sea level and it is at a considerable distance to the east of the main range of the Barisan Mountains. It is to be hoped that, with the considerable uncertainty that exists in the weather and wind conditions, one at least of these extreme stations may be favored with a good view of the eclipse. At various points between these extreme stations many other parties are established. The Dutch party have a large camp at Karang Sago, close to Painau, on the coast, and have an extensive programme, including (*a*) photographs of the corona with cameras of very varied dimensions ranging from a 40-ft. telescope with aperture f191 to a short camera with aperture f13.5; (*b*) spectroscopic observations of the corona and chromosphere; (*c*) polariscopic observations to be carried out visually; (*d*) measurements of the heat-radiation of the corona. (Professor Julius has constructed a specially delicate thermopile with a view of getting absolute measures of the total radiation of the whole corona and comparing it with that of the uneclipsed sun.) A party will probably also be sent with a prismatic camera to Fort de Kock, near the northern limit of the shadow.

The observers from the United States Naval Observatory, together with affiliated parties from the Yerkes Observatory and the Smithsonian Institution, are established in an excellent site, the old fort at Solok. Here Professor Barnard is setting up his cœlostat and 61-ft. telescope with which he is going to photograph the corona, exposing plates 40 in. square for $2\frac{1}{2}$ minutes, being led to expect detail right up to the edge of these plates. For the shorter exposures he will be content to use smaller plates 30 in. square and 17 in. square. Professor Abbot and Mr. Draper, from the Smithsonian Institution, come with this party and find a room in the fort that will serve admirably for their bolometric apparatus. Dr. Humphrys will probably take spectrographic apparatus to Fort de Kock not far from the northern edge of the moon's shadow. Mr. Jewell brings out a battery of gratings of unusual size, both plane and concave, and will use films 36 in. long and $2\frac{1}{2}$ in. wide in getting extended spectra of the chromosphere and corona, special attention being given to the ultra-violet region of the spectrum. Professor Skinner, who is in charge of the whole party, has also brought large cameras, which will be used in a search for an intra-mercurial planet.

Mr. Perrine, from the Lick Observatory, has established his camp on the race-course at Padang, and is setting up a 40-ft. telescope to point direct at the sun. He also has four 12-ft. cameras to be mounted on one axis and used in a search for Vulcan; in this research 12 plates, 17 in. by 14 in., will be exposed, covering a wide range on either

side of the sun, duplicate plates of each region being taken. He has also two spectroscopes, each with a single prism and with polarizing apparatus, for special study of the coronal light.

Members of the party from the Massachusetts Institute of Technology have found a good site near Sawah Loento, and are setting up in addition to their eclipse intruments, a number of geodetic instruments, among others a short-period pendulum. They also have a program of observations with magnetometers in continuation of their work in last year's eclipse, in which definite movements were detected in the magnets at the moment of totality.

The Japanese party, including Professors Shin Hiroyama and Seiji Hirayama, of Tokio, and five Japanese assistants, will probably find a station at Padang, as also will the parties from the Jesuit Colleges at Calcutta and Manila. We learn that a German expedition is to arrive on April 28th, and that Count de la Baume Pluvinel will arrive on the same date and proceed to Solok.

It is too early to speak of the chances of clear skies for the various parties, and at present it would seem that success is very precarious. It is fortunate that totality occurs at midday; the sky is frequently clear then, though many fleeting clouds pass over the sun. Meanwhile, the preparations are being pressed forward with a good will by observers and resident authorities alike.

SILAS W. HOLMAN.

SILAS WHITCOMB HOLMAN was born at Harvard, Massachusetts, Jan. 20, 1856, and graduated from the Massachusetts Institute of Technology in 1876, having made a specialty of the study of physics throughout his course. He was thereupon appointed to a position as assistant in the physical laboratory of that institution, but on account of illness did not enter upon his duties until a year later. Continuing in the service of the Institute, he was promoted to more advanced positions and was made professor of physics in 1893. Even at this date his health, never firm, had become much impaired, and a few years later it became necessary for him to relinquish active work. In 1897 he was made emeritus professor of physics. He died April 1, 1900.

Professor Holman's original contributions to science are of high merit and give evidence both of great skill in manipulation and of remarkably clear insight into the choice of methods for conducting a difficult investigation.

The most important of his researches are those upon the viscosity of air and carbonic acid as affected by temperature, which were published in the *Proceedings* of the American Academy of Arts and Sciences in 1876 and 1885, the first of which was based upon his graduating thesis at the Institute of Technology. These contain by far the most complete study of this difficult subject which had been made up to their date, and the results are still of standard value. Indeed, within the past few years, they have played an important part in the advancement of the kinetic theory of gases.

In the same *Proceedings* for 1886 is found a further noteworthy paper, written in conjunction with one of his pupils, upon the determination of fixed reference points for thermometric measurements at high temperatures in which several such points are established.

A number of years later, in 1895, appeared another group of papers, the last published by him, relating to the thermo-electric measurement of high temperatures, and a single paper upon calorimetry, which subjects had occupied much of his attention for some time previous. Of these, the one entitled