

The Total Solar Eclipse of September 21.

By Dr. A. C. D. CROMMELIN.

THERE are at present in the Saros Cycle two series of eclipses which have unusual length of totality; one including those of 1865, 1883, 1901, 1919, the other including the great Indian eclipse of 1868, in which the spectroscope was first applied to the prominences; also those of 1886 (West Indies) and 1904 (Pacific). The forthcoming eclipse, September 21, being three Saroses after that of 1868, is in nearly the same longitude, but has moved southward, the only land stations available being the Maldives, Christmas Island, and Australia.

The Maldives have the disadvantages of a rather low sun, some difficulty of access, owing to the reefs surrounding the islands, probability of high wind, together with a poor health record for European visitors; they are, however, being occupied by Mr. Evershed. Christmas Island lies in the longitude of maximum totality (6 minutes), but being near the northern limit of totality it will enjoy only $3\frac{1}{2}$ minutes. This is, however, amply long enough for the programme planned. The station is occupied by Messrs. Jones and Melotte from Greenwich, their equipment consisting of the 13-inch astrographic equatorial, on a mounting specially constructed for the low latitude of the station. When the same instrument was used in Brazil in 1919 the star-images were diffused, owing probably to slight warping of the cœlostast mirror by the heat of the sun before totality. The unsuitability of the cœlostast had been foreseen, but the short interval between the armistice and the departure of the expedition made it impossible to provide an equatorial mounting.

On the present occasion it is desired to secure a completely satisfactory check on the 1919 results; these tended to confirm the amount of shift of light by the sun's gravitation predicted by Einstein; the difference in the results given by the two instruments in Brazil was, however, too large to permit the results to be taken as absolutely final, and a further test is desirable. The star-field at this totality is, unfortunately, much less favourable than that in 1919, which was probably the field containing the largest number of bright stars close to the ecliptic. There are, however, a fair number of stars of the eighth magnitude or brighter in the present field, and it is hoped that these may be photographed with somewhat longer exposures than those given before. The corona will probably be of the "Minimum" type, with little extension near the poles; this should enable stars fairly near the sun,

which will have a large factor of shift, to be photographed.

Christmas Island is occupied by a Phosphate Company, under Scottish management, which has given great assistance to the expedition in transporting their baggage, in erecting huts, providing workmen, etc. Reports received in July stated that the adjustment of the instruments was complete, but that the weather during May had been very wet, and little observing was possible; check plates of the eclipse field had, however, been secured. The rainy season was, however, nearly at an end, and it was hoped that more work would shortly be possible; in addition to the eclipse programme it was planned to take a series of photometric plates, to connect the magnitude scales of the northern and southern hemispheres. Profs. Freundlich and Einstein also arranged to observe from Christmas Island, their programme being much the same as that of the British observers.

The station on the coast of West Australia has a high sun, long totality, and excellent weather prospects; but it is difficult of access, it being necessary to anchor some miles out, and land in small boats through surf. Several parties are there; that with the largest equipment is from the Lick Observatory, under Prof. Campbell. This party also makes the Einstein problem the chief item of the programme. To avoid a long stay at the eclipse camp the check plates were taken at Fiji on the voyage out. Other parties at this station are from Canada and from Perth (Australia).

The observatories of Adelaide, Melbourne, and Sydney are sending expeditions to stations in Central Australia and in Queensland. The weather prospects are good at both, but the sun in Queensland is rather low. They are understood to be attempting the Einstein problem, in addition to the older eclipse work of photography of the corona and its spectrum.

There is every reason to hope for success at some of the stations; fine weather at all of them should lead to results of a decisive character on the Einstein problem. The results will not be available for some time, as the plates will not be measured till the return of the different parties. They will, however, be developed, *in situ*, which will permit a good idea of their character to be formed. In this connexion it may be noted that there is no cable to Christmas Island, but it is expected that a Dutch man-of-war will be there, which might send a wireless message to Java.

The Deflection of Light in a Gravitational Field.

By HERBERT DINGLE.

FROM an experimental point of view, Einstein's general theory of relativity is at present in an ambiguous position. It is well known that there are three conceivable tests between its conclusions and those of the traditional ideas which it attempts to displace. With regard to the first of these—the movement of the perihelion position of Mercury—the success

of the theory is decidedly impressive; all the more so, perhaps, because the result was stumbled upon, as it were, involuntarily. In seeking first the gravitational field of the sun, Einstein found the true orbit of Mercury added unto him. On the other hand, the predicted displacement of the solar spectrum lines certainly conjures up a serious obstacle. The evidence,