

predominating in intensity. Both these sets of strings of "beads" travelled, or rather were successively formed, until they almost met in the middle of the limb in the south-west quadrant.

Unfortunately I could not observe any longer, as I had previously arranged at this stage to move a lever on my Thorp grating camera to expose a plate for one second; thus my attention had to be turned to the instrument. When I looked up again, about two seconds afterwards, the sunlight had just begun to break out in the south-western quadrant.

The accompanying sketch (Fig. 3) illustrates approximately the conditions I observed just previous to the beginning of the annular phase. The impression I gained was that the eclipse, from our point of observation, *must have been very nearly if not actually central.*

Mr. Frank McClean, who was likewise observing, also concluded that the eclipse was central; he recorded prominences at about 9, 1, and 7.30 o'clock, and estimated the duration as two or three seconds.

Mr. W. N. McClean observed two prominences, one at 8 o'clock and the other at half-past one, and both were visible, according to him, "some time before Baily's beads flashed out round the dark arc." The eclipse "appeared to be quite central, and the duration of darkness about two seconds."

Our attention being fixed on the immediate region of the sun, no observations were made of stars, planets, shadow-bands, or such like phenomena.

Since my return to London, Dr. Crommelin kindly communicated to me the position of his predicted line of central eclipse, and this I have inserted in Fig. 1. This line, it will be seen, lies a little to the north of that representing the American prediction. Dr. Crommelin saw the eclipse well from a station on the road from St. Germain-en-Laye, just north-west of the railway crossing, and in the above mentioned communication he says, "But from the actual result I think that the true line was nearer the 'American Ephemeris' line than my line."

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#### French Observations of the Eclipse.

In the *Comptes rendus* for April 22 (No. 17) there are seventeen papers giving accounts of the observations made, chiefly by French observers, during the eclipse of the sun which took place on April 17, but in the following notes we can only refer to some of the more important results.

M. Deslandres organised a very complete set of observations at Meudon, and also despatched observers to Grignon, where M. Bernard used a large spectrograph with a circular slit fed by a cœlostast, and other members of the expedition took direct photographs of the sun through red screens. At both stations excellent results were secured.

At Meudon M. Perot's attempt to measure the rotational velocity of the corona was frustrated by the fact that he could only be sure of measuring the wave-length of the green corona line on the west

side of the sun, 1' from the limb just before the maximum phase. By a rapid setting he found the wave-length to be 5303.7, the value published by Sir Norman Lockyer.

The spectroheliograms secured show that, although there were no spots or faculæ on the disc, there was considerable activity, in the form of prominences and dark filaments, in the upper layers of the solar atmosphere, especially near the poles. M. Deslandres suggests that at sun-spot minimum the activity is transferred from the lower to the higher layers and latitudes.

The positions, dimensions, and intensities of the chief prominences shown on the photographs in "K" (calcium) light, taken with the smaller spectroheliograph at 8h. 56m., are shown in the following table:—

Latitude	E. or W.		Breadth	Height	Intensity	
					(1-5)	
22° N.	...	E.	...	1	...	4
47 N.	...	E.	...	3	...	2
17 N.	...	W.	...	2	...	5
53 S.	...	E.	...	2.5	...	5
47 S.	...	W.	...	15	...	3
28 S.	...	W.	...	7	...	2
12 S.	...	W.	...	2	...	3

It will be seen that the largest prominence (47° S.) was duplicated by one diametrically opposite, and it will be interesting to see the coronal extensions in these localities if such have been photographed. Photographs taken with the *spectroheliographe polychrome* show that the congeries of particles were more intense thereabouts than in the neighbouring regions, and a similar intensification is shown on the plates taken with the large spectroheliograph, using the green coronal line.

At Grignon the red-screen photographs show the larger prominences, but no details attributable solely to the corona. The photographs with the large photoheliograph are 10 in. in diameter, and should furnish exact measures of position; the central line was obviously south of the observing station at Grignon.

M. Bigourdan gives a chart of the positions of his several instruments at Corneilles-en-Parisis, and finds that he was very near the central line; this was in longitude 0° 7' 20" W. of Paris, and latitude 48° 58' 55" N., the altitude being 163 m. Baily's beads were very fine, and frequently the horns of the decreasing solar crescent were completely detached by the interposition of irregularities on the moon's limb.

A little before second contact M. Bigourdan believed he saw the exterior edge of the dark moon projected against the lower corona or the upper chromosphere. M. Eysséric, who successfully observed shadow bands at the 1905 eclipse, was unable to detect any on this occasion.

In addition to those actually observing at the observatory itself the Paris Observatory had several parties located at various points along the eclipse path, and the results secured were so numerous and various in character that but a small part of them may be briefly mentioned here. It appears certain, however, that nowhere in Europe was the eclipse definitely total. Even in Portugal, M. Salet reports, Baily's beads were to be seen around the moon throughout the whole of the maximum phase, and no one at Ovar saw the corona; he was located near the Bay of Aveiro. Messrs. Slater and Worthington, located about 1.5 km. north of Ovar, saw it for the fraction of a second, and thus it would appear that the "Connaissance des Temps" line was too far south. M. Salet's report would place the central line

about half-way between it and that given by the "American Ephemeris." This was confirmed by observations made from a dirigible, and a captive, balloon, by MM. Fournier and Bourgeois near St. Nom-de-Bretèche, where the respective observers quite independently registered the passing of the shadow at the same moment.

M. Giacobini saw Baily's beads form a chaplet of brilliant points, three or four seconds after maximum phase, which rotated about the lunar circle  $180^\circ$  in eight or ten seconds.

Many bright chromospheric arcs are shown on M. Millochau's plates, taken with the large spectroscope at the Paris Observatory, but the attempt to photograph the green coronal radiation was not successful.

At his station near St. Nom-de-Bretèche, M. Puiseux saw the bright annulus complete, except for the breaks caused by lunar mountains, for about two seconds, and estimates that he was but slightly north of the true central line.

MM. Esclançon and Stephan, at the Château de Talmont (Vendée), recorded that the eclipse was neither total nor annular; Baily's beads appeared almost instantaneously. They, also, conclude that they were very slightly north of the true central line, and to an observer 4 km. further north the eclipse was palpably not central.

Interesting observations were made at the Lyons Observatory, where some 6000 kinematograph pictures were made of a screen on which the images of the sun and moon were projected, and on which a carefully rated watch was also hung. On an average, ten photographs were taken per second, and it is hoped to derive very exact times for the contacts from the results.

Encouraged by the fact that at Vavau last year he was able to see, faintly, the green coronal line two minutes after totality, M. Stéfaniak prepared to photograph the corona at Cormeilles-en-Parisis, using Wratten green-sensitive plates and suitable screens. But only the inner corona, as a very thin ring, is shown on his plate, and is easily distinguishable from the halation effect.

Prof. Iñiguez, at Madrid, found his observations seriously hampered by clouds, but succeeded in seeing, as very intense and long lines, the bright chromospheric radiations of H, Na, He, and Mg. Although the magnitude of the eclipse was only 0.9, he was able to observe the bright lines for some thirty minutes.

M. Eginitis, at Athens, observed the times of the contacts, and compares them with the predicted times as follows:—

	Observed			Calculated from the data of the Conn. des Temps Nautical Almanac		
	h.	m.	s.	h.	m.	s.
First contact ...	0	54	17	0	54	33.6
Last ,, ...	3	20	23	3	20	53.4

As in 1905, the observed are seen to be in advance of the calculated times.

An important series of observations was made by L'École Polytechnique at the suggestion of M. Hamy, and under the supervision of M. E. Carvallo. Equipped with field-glasses ( $\times 8$ ), the students were echeloned in twos across the eclipse track along a line 12 km. long on the route between Trappes and Neauphle; successive pairs were separated by a distance of 1 hectometre, the idea being to locate exactly the central line and to compare the relative sizes of the lunar and solar discs. At the extremities and at the middle of the echelon photographic and kinematographic observations were made. The results show that the central line was situated 35.5 km. along Route No. 12 from Paris to Brest, and

lay between the lines predicted by the "Connaissance des Temps" and the "American Ephemeris," 500 m. from the former and 2400 m. from the latter. They also showed that the minimum diameter of the moon—between the valleys—was about 1.2" less than that of the sun, while the maximum diameter—including lunar peaks—was about 0.8" greater.

[In the article on the eclipse of the sun, in NATURE of April 25, for "disc" in line 23 of column 1 on p. 193 the author should have written "limb," and for 12h. 6m. 18s on the next line he should have given 1h. 31m.]

### COLONIAL SURVEYS.<sup>1</sup>

THE report of the Surveyor-General of New Zealand for the year ending March 31, 1911, has recently been published, and shows both a larger outturn and a decreased cost under most headings. Topographical survey shows the largest output of more than two and a quarter million acres, while nearly half a million acres were covered by the triangulation. The previous report referred to the urgent need for an effective major triangulation as a control for the very extensive network of minor triangles, and the present report shows work on triangulation of the second order as being done in the Wellington district, but apparently not elsewhere, except a new base-line in Taranaki district.

This base-line was almost ten miles long, and formed one of the sides of a polygon of the major triangulation. It was measured twice with each of two standard 100-link steel tapes belonging to the survey, thus giving four values for the length. The tape was supported and strained to a tension of 25 lb. in the same manner as a previously measured base which was described in the report of last year, and satisfactory results were obtained; the mean values of the two measurements with each of the two tapes differ only by 0.0445 link on a length of 79,605 links, and the probable error derived from the measurement of the sections of the base is given as being 1 in 5,142,370; the probable error of the base when temperature, standardisation, and such other sources of error are taken into account is not given. Three months were occupied in preparing the line, and forty-five days were occupied in the measurement which gave such good results. At the present time, when base measurement has been so much simplified and cheapened by the use of wires, this base seems long, and the time it required was considerable, but no doubt local reasons were against the use of a shorter base and a base extension network of triangles. Surveyors will regret the absence of technical details in this report, for they would be most interesting and instructive. The accuracy of the triangulation, the density of the points, and the rate of its execution in different districts could be easily included, and would give a far clearer idea of the work described, and the same may be

<sup>1</sup> Report on the Survey Operations for the year 1910-11. New Zealand Department of Lands. By J. Strauchon, Surveyor-General. (Wellington, 1911.)

Colonial Report No. 685. Annual. The Surveys of British Africa, Ceylon, Cyprus, Fiji, Jamaica, Trinidad, and British Honduras for the year 1909-10. Price 1s. 6d.