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Separate paging is given to this Part, in order that it may be filed as a separate compilation.

PART III.—Supplements.

Papers relating to the Total Eclipse of the Sun.

No. 530.

EXTRACT from the Proceedings of the Government of Bombay, in the General Department, dated 17th March 1868.

READ the following letter from Lieut.-Colonel J. T. Walker, R E., Superintendent Great Trigonometrical Survey of India, to the Secretary to the Government of Bombay, No. 8—101, dated 5th February 1868, with accompaniments.

In the month of August next a total eclipse of the sun will take place of almost the greatest possible duration, and consequently affording more time than usual for such observations as can be made during the brief interval of totality. In this brief interval, of about five minutes, an opportunity will be afforded for the investigation of the physical nature of the corona and red flames that appear to surround the sun when its light is intercepted by the moon, which happens only during the occasion of a total eclipse. By analyzing the light emanating from the corona and flames for polarization, and more especially by observing its prismatic spectrum in both instances, information may be acquired which will be of peculiar scientific interest.

2. The path of the total phase, and on a larger scale, that portion of the path which crosses the Indian Peninsula, are shown in the accompanying Nautical Almanac Circular. The eclipse can nowhere be observed under such favourable circumstances as in India, and very many years will elapse before the recurrence of as favourable an opportunity, in any part of the world, for investigations of this nature, which are deeply interesting in the information they afford of the physical nature of the solar photosphere.

3. Impressed with the importance of making the most of the coming opportunity, both the Royal Society and the Royal Astronomical Society have taken the necessary steps to provide the requisite instruments, and train Officers to be employed in using them in observing the eclipse. The Astronomical Society has secured the services of Major Tennant (of the Royal Bengal Engineers) and a few men of the Royal Engineers, under instructions from the Secretary of State for India, who has undertaken to defray the cost of the expenditure conjointly with Her Majesty's Government. It is, however, desirable to multiply the stations of observation, and consequently the number of observers, as much as possible, for the eclipse may be visible at some places and hidden by clouds at others.

Consequently, the Royal Society have provided, at a cost to themselves of upwards of £400, the necessary instruments to enable observations to be taken at other stations than the one selected by Major Tennant, which will probably be Guntoor or Masulipatam.

4. I propose, with the consent of the Government of India, to depute some of the Officers of the Trigonometrical Survey to places along the central line of the eclipse, west of Guntoor, to make the necessary observations. It is a matter of the greatest importance to ascertain, in the first instance, full information of the climatic conditions ordinarily prevailing at these places during the middle of the month of August, in order that positions may be selected where there is the greatest probability that the weather will be fine and the sky unclouded during the hours of 7 and half past 8 in the morning, between which the sun will be totally eclipsed at these places.

5. The requisite information will be best obtained from places situated within the path and near the central line of the eclipse, where systematic meteorological observations have been taken of late years; less accurate, but still very valuable, information may be obtained from Local Officers who are at present resident at such places, or have been long resident thereat, though now stationed elsewhere. Much light may be thrown on the subject by an examination of the records of rain-fall which are believed to be kept at all places where there are civil stations and jails, and Officers in charge of Districts might supplement the information contained in their records by inquiries from intelligent Native gentlemen. Many Officers in charge of Districts and Native States, Medical and Engineer Officers who are located in the belt of country within the path of the total eclipse, would probably be able to furnish information which would be valuable.

6. Being unfortunately unacquainted with the existing disposition of the Districts and Native States in this part of India, the positions of Meteorological Observatories, and the names or official designations of the persons who would most probably be able to supply the requisite information, I am constrained to solicit the assistance of the Bombay Government in the matter, and to beg that copies of the accompanying Circular may be transmitted to the proper persons, with a view to their communicating such information as they may already possess, or be able to acquire, to Lieut. John Herschel, R.E., Bangalore, who has been entrusted with the charge of the operations. A Chart is attached to the Circular, which shows the positions of a number of places along the central line of the eclipse, and within the path of the total phase; it will serve as a guide to the localities in which inquiries should be instituted.

7. Forty copies of the Circular are herewith forwarded to your Office under a separate cover.

I have the honour to be,

Sir,

Your most obedient Servant,

J. T. WALKER, Lieut.-Colonel, R. E.,

Superintendent G. T. Survey of India.

CIRCULAR.

Information on certain points is required, with a view to the selection of the best localities for the observation of the Total Eclipse of the Sun, which will happen on the 18th August 1868, and of which the path of the total phase over the Indian Peninsula is shown on the accompanying Chart. The nature of the information required is stated on the following page. The answers should be written opposite the questions, and the document forwarded to Lieutenant Herschel, R.E., Great Trigonometrical Survey, Bangalore.

J. T. WALKER, Lieut.-Colonel, R.E.,

Superintendent Trigonometrical Survey of India.

Dchra Doon, 31st January 1868.

What weather may be expected at that date in the immediate neighbourhood of
Give the average amounts of rain-fall in each of the three first weeks of August in
preceding years.

Are the mornings usually bright and clear in August, or is there any probability that
the sun will be obscured by clouds during the hours of 8 to 10 A.M.?

Would any uncertainty in this respect be increased or diminished by the selection of
a more elevated station?

Are you acquainted with any locality on or near the central line of the eclipse where
more favourable conditions may reasonably be expected? *Ceteris paribus* an easily
accessible elevated site would be preferred, because there is more chance of a
clear atmosphere on the summit of a hill than on low ground; on the other hand
in some localities hills are liable to be capped with clouds at the hour when the
eclipse will take place, and such positions would have to be avoided.

Any reliable information on the above points, as well as on the nature of the ground
—whether hilly or otherwise—in your neighbourhood, will be of the greatest value.

The duration of total eclipse will only be about *five minutes*, and it is only during this
brief interval that an opportunity will occur of investigating phenomena which are of
great scientific interest, in that, if successfully analyzed, they will probably afford much
information regarding the physical nature of the solar photosphere.

Many years will elapse before an equally favourable opportunity for investigating these
phenomena will occur in any part of the world, and the results of the observations in
this country are awaited with the greatest interest by the leading scientific societies of
England.

NAUTICAL ALMANAC CIRCULAR, No. 11.

*Path of the Total Phase of the Solar Eclipse, August 17-18, 1868, from
Aden to Torres Straits.*

The accompanying Map of the Path of the total Phase of the Solar Eclipse, August
17-18, 1868, between Aden and Torres Straits, has been constructed at the suggestion of
the ASTRONOMER ROYAL; it will be found useful in the selection of stations for observa-
tion, and will give a general idea of the leading characteristics of the phenomenon, at
intervals sufficiently frequent for intermediate determination.

In the immediate vicinity of the central line, and particularly that portion of it
which crosses the Peninsula of India, the times of the middle of the Eclipse and the dura-
tions of total darkness may be estimated with considerable approximation. As examples,
the places Kolapoor, Muktul, and Masulipatam, may be taken. Kolapoor stands a little
above the line of central Eclipse, and nearly midway between the figures $15^{\text{h}} 58^{\text{m}}$ and
 $16^{\text{h}} 0^{\text{m}}$; these have beneath them $5^{\text{m}} 13^{\text{s}}$ and $5^{\text{m}} 19^{\text{s}}$ as the durations of total darkness at the
respective central points; it is therefore inferred that the Greenwich Mean Time of the
middle of the Eclipse at Kolapoor will be $15^{\text{h}} 58^{\text{m}} 55^{\text{s}}$, and the duration of total darkness
 $5^{\text{m}} 16^{\text{s}}$. A similar process will give for Muktul $16^{\text{h}} 5^{\text{m}} 5^{\text{s}}$, and $5^{\text{m}} 32^{\text{s}}$, and for Masulipatam
 $16^{\text{h}} 12^{\text{m}} 25^{\text{s}}$ and $5^{\text{m}} 48^{\text{s}}$.

Major Tennant in his paper on this Eclipse, *Roy. Astron. Soc. Monthly Notices*, Vol.
xxvii. pp. 173—178, has, in addition to much valuable information, given the results of
special calculations for Kolapoor, Muktul, and Masulipatam—they are nearly in accord-
ance with the above.

The data employed in the calculation were those of the NAUTICAL ALMANAC, and the
points used in laying down the path were as in the opposite page.*

J. R. HIND,

Superintendent of the Nautical Almanac.

Nautical Almanac Office, October 21, 1867.

* See following page.

TOTAL SOLAR ECLIPSE.

August 17-18, 1868.

Points from which the lines in the accompanying Map were laid down:—

Greenwich Mean Times.	Northern Limit of Total Phase.		Line of Central Eclipse.		Southern Limit of Total Phase.		Duration of total darkness on Central Line.
	Long.	Lat.	Long.	Lat.	Long.	Lat.	
h m	°	°	°	°	°	°	m s
15 31	E. 45 30	N. 14 15	E. 45 59	N. 13 24	E. 46 23	N. 12 32	
15 33	50 11	15 9	50 32	14 15	50 49	13 22	
15 36	55 3	15 58	55 16	15 3	55 23	14 7	3 58
15 40	59 52	16 39	60 1	15 42	60 8	14 45	
15 44	63 43	17 5	63 49	16 7	63 54	15 8	
15 48	67 0	17 22	67 4	16 22	67 6	15 22	4 45
15 52	69 55	17 32	69 56	16 31	69 56	15 31	
15 56	72 32	17 37	72 30	16 35	72 28	15 34	5 7
15 58	73 45	17 38	73 43	16 36	73 40	15 34	5 13
16 0	74 55	17 37	74 52	16 35	74 48	15 33	5 19
16 2	76 3	17 36	75 58	16 34	75 54	15 31	5 24
16 4	77 8	17 34	77 3	16 31	76 57	15 29	5 29
16 6	78 11	17 31	78 5	16 29	77 58	15 26	5 34
16 8	79 12	17 28	79 5	16 25	78 57	15 22	5 39
16 10	80 11	17 24	80 3	16 21	79 54	15 17	5 43
16 12	81 8	17 19	80 59	16 16	80 50	15 12	5 47
16 14	82 4	17 14	81 54	16 10	81 44	15 7	5 51
16 16	82 58	17 8	82 47	16 4	82 36	15 1	5 55
16 20	84 43	16 55	84 31	15 51	84 18	14 47	
16 24	86 23	16 39	86 9	15 35	85 55	14 32	6 10
16 28	87 58	16 22	87 43	15 18	87 27	14 14	
16 32	89 30	16 3	89 14	14 59	88 57	13 56	
16 36	90 59	15 43	90 41	14 39	90 23	13 36	6 27
16 40	92 25	15 21	92 6	14 17	91 46	13 14	
16 44	93 49	14 57	93 28	13 54	93 7	12 51	
16 48	95 10	14 32	94 49	13 29	94 26	12 26	6 38
16 52	96 30	14 6	96 7	13 4	95 44	12 1	
16 56	97 48	13 39	97 23	12 36	96 59	11 34	
17 0	99 4	13 10	98 39	12 8	98 13	11 6	6 44
17 4	100 19	12 40	99 52	11 39	99 27	10 37	
17 8	101 33	12 9	101 6	11 8	100 39	10 7	
17 12	102 46	11 37	102 18	10 36	101 51	9 35	6 46
17 16	103 58	11 4	103 30	10 4	103 2	9 3	
17 20	105 11	10 29	104 42	9 29	104 12	8 29	
17 24	106 23	9 54	105 53	8 54	105 23	7 54	6 42
17 28	107 36	9 17	107 5	8 18	106 34	7 19	
17 32	108 49	8 39	108 17	7 40	107 46	6 41	
17 36	110 1	7 59	109 29	7 1	108 58	6 3	6 33
17 40	111 15	7 19	110 43	6 21	110 11	5 23	
17 44	112 30	6 37	111 57	5 40	111 25	4 42	
17 48	113 46	5 54	113 18	4 57	112 41	4 0	6 20
17 52	115 4	5 9	114 31	4 13	113 58	3 16	
17 56	116 25	4 23	115 51	3 27	115 18	2 31	
18 0	117 47	3 35	117 13	2 40	116 40	1 45	6 2
18 4	119 13	2 46	118 39	1 51	118 5	0 56	
18 8	120 42	1 55	120 8	1 1	119 34	N. 0 6	
18 12	122 16	1 2	121 42	N. 0 8	121 8	S. 0 46	5 40
18 16	123 55	N. 0 6	123 20	S. 0 47	122 47	1 40	
18 20	125 41	S. 0 52	125 6	1 44	124 32	2 37	
18 24	127 34	1 53	126 59	2 45	126 25	3 37	5 13
18 28	129 37	2 57	129 2	3 48	128 28	4 40	
18 32	131 52	4 5	131 17	4 56	130 44	5 47	
18 36	134 24	5 19	133 49	6 9	133 16	6 59	4 40
18 40	137 18	6 39	136 44	7 23	136 11	8 17	
18 44	E. 140 47	S. 8 8	E. 140 12	S. 8 56	E. 139 39	S. 9 45	