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MADRAS RECORD OFFICE.

Government of Madras.

Public W. DEPARTMENT.

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Dated <i>8-4-</i>	<i>18 68.</i>

Not to be folded or roughly handled

*Proceedings of the Madras Government, Public Works Department,
8th April 1868.*

No. 176. Read the following Proceedings of the Madras Government in the
Public Department :—

Passing orders on certain proposals submitted by
the Government Astronomer for observing the
Total Eclipse of the Sun on the 18th August } (Here enter 4th April 1868, No. 433.)
next.

No. 177. ORDER THEREON, 8th April 1868, No. 1,120.

ESTABLISHMENT, No. 25.

Communicated to the General
Superintendent of Public Works Stores
and Workshops, whose particular atten-
tion will be called to the Orders in
paragraph 3.

(True Extract.)

(Signed) CHARLES A. ORR, Colonel, R. E.,
Secretary to Government.

To the General Superintendent of Public Works Stores and Workshops.

Ed. S. T. Augustin.

3

*Proceedings of the Madras Government, Public Department,
4th April 1868.*

No. 28. Read the following letter from Lieutenant-Colonel J. T. WALKER, R. E., Superintendent, Great Trigonometrical Survey of India, to the Chief Secretary to Government, Fort Saint George; dated Dehra Doon, 5th February 1868, No. 7-100.

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 favorable circumstances as in India, and very many years will elapse before the recurrence of as favorable 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 expedition 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 purpose, 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 Madras 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 Lieutenant 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.

No. 29. From Lieutenant-Colonel J. T. WALKER, R. E., Superintendent, Great Trigonometrical Survey of India, to the Chief Secretary to Government, Fort Saint George; dated Dehra Doon, 11th February 1868, No. 13-136.

With reference to my No. 7-100, dated 5th instant, I beg leave to request that you will be so good as to cause the following correction to be made at the end of the 3rd question of the Circulars for distribution—for "7 and 8," write "8 to 10," as in the accompanying copy.

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.

DEHRA DOON.
31st January 1868.

(Signed) J. T. WALKER, Lieut.-Colonel, R.E.,
Superintendent, Great Trigonometrical Survey of India.

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 favorable 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 favorable 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.

No. 20. From N. R. POGSON, Esq., Government Astronomer, to the Chief Secretary to Government, Fort Saint George; dated Madras, 7th March 1868.

I have the honor to submit, for the consideration of Government, the arrangements which I propose to make for observing the very important Total Solar Eclipse, the shadow line of which will cross this Presidency, the Bay of Bengal, and the Tonnasserim Provinces, between the hours of 8½ A. M. and noon, local time, on Tuesday, August 18th, of the current year. A few remarks in reference to the expeditions so liberally equipped by the Royal Society and by the Royal Astronomical Society of London, as communicated in the Proceedings of the Madras Government, 30th January 1868, and in a letter from C. G. Walker, Esq., your Under Secretary, of the 24th ultimo, may well precede my own proposals upon the same subject.

2. It certainly does appear remarkable and far from complimentary, that both of the learned Societies referred to should so completely have ignored the very existence of the Government Observatory at Madras; but it is still more surprising that the Home Authorities should so readily have acceded to so costly an expedition as that of Major Tennant's, when their own Astronomer on the spot could so easily have effected the same ends at a comparatively trifling expense. An outlay of several thousand pounds is thereby incurred for the attainment of results contingent upon the mere chance of securing a fine interval of six minutes, at a proverbially cloudy season of the year. The rarity of the phenomenon has been strangely exaggerated, for even within the last ten years there have been nine Total Eclipses of the Sun visible at one or another part of the world, though it is perfectly true that the greater duration of the one in question invests it with especial interest, and offers unusual facilities, weather permitting, for the investigation of the physical constitution of the sun, by means hitherto untried, simply because only recently invented. I allude, of course, to the Spectrum Analysis of the supposed solar appendages, known as the Red Prominences and Corona, always seen surrounding the sun's disc during the brief interval of totality. The interest evinced by the two leading Scientific Societies of London, and the ready acquiescence of the Home Government in their recommendations, are sufficient evidence that it is

desirable for every Astronomer, who has facilities for so doing, to place himself upon the central line, and to contribute his share towards the attainment of the objects in view, while in consideration of the great risk of cloudy weather in August, at any one, or indeed at most of the suitable stations that can be selected for such observations, it will be highly desirable that several observers shall be distributed along the shadow line, as widely separated as possible, in the hope that some at least may be so fortunate as to witness and record the phenomena of the eclipse.

3. I beg leave, therefore, to propose, that not only should I and my Native Assistant be directed to post ourselves at convenient and suitable stations, but that a few gentlemen of known scientific attainments should be invited to do likewise, at the Government expense, and that they should be provided with whatever appliances the Mathematical Instrument Maker of the Public Works Department can prepare for them in readiness for the event. I would particularly suggest that the records of E. B. Powell, Esq., the Director of Public Instruction, whose European reputation as an Amateur Astronomer, especially in the delicate and difficult subject of Double Star measurements, is second to none; of Colonel W. K. Worster, so frequently your Acting Astronomer at Madras in past years; of Captain Edgcome, Principal of the Civil Engineering College; and of your Under Secretary, C. G. Walker, Esq., C. S., would all be of the highest value, and that their aid should be requested, as before named, at separate and independent stations along the central line. With Mr. Doderet's assistance in regard to instruments, the outlay on that score will be but trifling, and it is only by such a prudent distribution of competent observers that reliable accounts of the phenomena can be safely looked for at all. It is so likely to be overcast at several of the stations, that, in order to prevent the total loss of so rare an opportunity, the greater the number of qualified observers who can be induced to assist the better; while the unquestionable value of the corroborative evidence of all who are so fortunate as to enjoy favorable weather is too obvious to need suggestion.

4. When the actual number of observers is decided upon (and the sooner that is settled the better), it will be time enough for me, in communication with Major Tennant, Colonel Walker, Superintendent of the Great Trigonometrical Survey, and the gentlemen who may kindly agree to participate in the undertaking, to select the best and most accessible stations; but it will be well to leave much on this score to the discretion of each individual concerned, as local information and a variety of other circumstances may, upon arrival at any previously selected spot, render some other, not far off, evidently preferable. Although Guntoor has been specially named for Major Tennant's most elaborately equipped expedition, it is far from certain that such will be his destination; indeed, when recently in Madras, he was, I well knew, inquiring about the chances of better weather towards Kolapoor, quite at the other side of India. Lieutenant Herschel's party has been named for near Mukkul; but that is, I believe, still less decided upon than Major Tennant's post. For myself, if upon inquiry I find reasonable hope of fine weather, and convenient access to so distant a part, I should prefer some point in the Tennasserim Provinces, or better still any conveniently accessible Island of the Mergui Archipelago, near Auckland Bay, where, instead of five minutes only, the duration of totality

will be 6 minutes 45 seconds, and the sun nearly in the zenith. My First Assistant, C. Ragoonatha Chary, whose able preliminary calculations (made in his leisure hours), with regard to the eclipse, are already before the public, might best be despatched to some interior station near Suggur, a quarter, I presume, less trying to a Native's health and habits than to an Englishman's; and the gentlemen volunteers would of course prefer the nearest and most easily accessible places, probably in the Kistna or Kurnool District.

5. With regard to instruments, and in the first place those for the Observatory vice, I have already requested my friend Mr. W. Huggins, F. R. S., of London, distinguished originator of the entirely new application of the Spectroscope to the determination of the actual materials of which celestial objects are composed, to have a Spectroscope constructed for me by Messrs. Troughton and Simms, to fit the Telescope with which I propose to observe the eclipse. He will, I have no doubt, comply with my request at once, but even if received in time, I have still to acquire the practice of a very perplexing and difficult instrument, only invented, be it remembered, long since I left England, and hence quite new to me except by description. Messrs. Tennant and Herschel are similarly provided, but both have, I suppose, had the advantage of previous training in England. I am not, however, sanguine of any great results being arrived at in the first attempts at spectroscopic measurement during a Total Solar Eclipse.

6. I am not prepared to promise; but I think it probable that, with the aid of Colonel W. K. Worster, it may be possible to make arrangements for taking photographs of the totality, by far the most important item in all Major Tennant's arrangements, and which it would be well to strain every nerve to secure at least at one other station than that he may select. Apart from these comparatively new researches, for which the two English expeditions have been especially fitted out, there are still all the older class of records to be made; such as cusp measurements; time observations of the phases of the eclipse; general description of all the mind and eye can grasp in the few precious minutes available; micrometrical measurements of any remarkable red prominences; polarization experiments, and meteorological observations, especially of the black bulb thermometer in vacuo in sunshine; and of the general effects and appearances, terrestrial as well as celestial. Our instrumental wants will be very few and reasonable, and nearly as follows:—

- 1.—Alterations in the equatoreal mounting of the Telescope intended for my own use, estimated at under Rupees 100.
- 2.—An entirely new mounting for the Telescope to be used by C. Ragoonatha Chary, with various optical alterations, probably costing about Rupees 150.
- 3.—Firm portable stands with slow motions, for three spare Telescopes available in the Observatory, not exceeding Rupees 50 each.
- 4.—One stand for a Sextant for my own use, and a Sextant complete on stand, with artificial horizon, for the Assistant, to enable each to find local time, and approximate position of the places of observation.
- 5.—The loan of any Telescopes, Sextants, or meteorological instruments from the Public Works Stores, that may be required for the occasion, for any one participating in the observations.

6.—Cleaning and repair of Chronometers supplied to observers, Rupees 10 to 20 each. The one for my own use, requiring a new mainspring, probably about Rupees 50.

Estimated total instrumental outlay, under Rupees 900 for six observers. To these must be added travelling allowances and reasonable expenses for each observer, necessarily dependant in amount upon the localities hereafter to be decided upon, and upon the number of individuals engaged in the undertaking.

7. Information with regard to the rainfall in the Kistna and Kurnool Districts shall be duly communicated to Colonel Walker, in compliance with his Circular, in the course of this month, as soon as other duties will permit me to complete the examination of the not very trustworthy Revenue Board Rain Reports for past years available for such purpose.

No. 31.

ORDER THEREON, 4th April 1868, No. 433.

In the former of the above letters the Superintendent Trigonometrical Survey of India requests that information as to the climate, &c., of places which will fall within the shadow of the Total Eclipse of the Sun which will occur in August next, may be communicated to Lieutenant Herschel, Bangalore. The Government observe that the shadow line is almost altogether *without* the Madras Presidency, the central line passing through Kurnool and the Kistna and Godavery Districts only, and the shadow extending over parts of these districts and Bellary and Nel-

lore. Copies of Colonel Walker's Circular, corrected as requested, will be sent to the gentlemen named in the margin, who will be requested to forward the original of their replies to Lieutenant Herschel, and a copy to the Government Astronomer. The latter Officer has en-

gaged to furnish Lieutenant Herschel with such information as may be available relative to rainfall, &c., in the localities of which he has record.

2. With reference to Mr. Pogson's proposals for the most efficient observing of the eclipse, these Proceedings will be communicated to the gentlemen named by him, and their co-operation will be requested. The Government will be prepared to relieve them from duty for the necessary period, and to grant them travelling allowance to the places which may ultimately be selected for their positions, and the necessary expense of carriage of instruments, &c., &c. They will, if they consent to assist in the observation, place themselves in communication with the Government Astronomer for the settlement of the stations to be selected. Mr. Pogson will of course make such arrangements with Major Tennant and Lieutenant Herschel, as will ensure the greatest probability of securing at least some good observations of the phenomena, and obviate the clashing of different parties.

3. The Government will be prepared to sanction the expenditure to which Mr. Pogson alludes at the close of his letter, and orders will be issued in the Public Works Department, to the Superintendent of the Government Workshops, to give Mr. Pogson's requisition for Mr. Doderet's services all possible attention. Mr. Pogson's wants in the way of Telescopes, &c., will also be met so far as the Public Works Stores can provide for them.

Mr. G. Thornhill
" T. A. N. Chase.
" W. Wilson.
" A. J. Stuart.
" A. Wedderburn.
" W. S. Foster.
" J. R. Arbuthnott.
" J. Hope.
" J. R. Daniel.
" H. F. Clogstoun.

Mr. F. R. H. Sharp.
Major A. S. Moberly, Bellary.
Captain T. Beckley, Cocanada.
" J. N. Hunter, Kurnool.
Mr. H. O. C. Cardozo, Kurnool.
Lieutenant W. H. Hoskins, Masulipatam.
Lieutenant H. Porteous, Kurnool.

4. With reference to the 6th paragraph of Mr. Pogson's letter, the Government would suggest that Captain Lyons' services might be made available for the photographic requirements of the occasion. The Astronomer will report upon this point.

5. The Government are anxious that the Government Astronomer should have all his reasonable requirements for the observation of this phenomenon met to the extent of their powers, and they will be prepared to sanction any arrangements which, like those proposed in his letter now under consideration, may seem to be well judged. He will, when his arrangements are more matured, address Government again, and inform them what is his detailed scheme of operations.

(True Extract).

Chief Secretary.

To the Superintendent, Great Trigonometrical Survey.
Government Astronomer.
Public Works Department.

To G. Thornhill, Esq.,
" T. A. N. Chase, Esq.,
" W. Wilson, Esq.,
" A. J. Stuart, Esq.,
" A. Wedderburn, Esq.,
" W. S. Foster, Esq.,
" J. R. Arbuthnott, Esq.,
" J. Hope, Esq.,
" J. R. Daniel, Esq.,
" H. F. Clogstoun, Esq.,
" F. R. H. Sharp, Esq.,
" Major A. S. Moberly, Bellary,
" Captain T. Beckley, Cocanada,
" J. N. Hunter, Kurnool,
" H. O. C. Cardozo, Esq.,
" Lieutenant W. H. Hoskins,
" Lieutenant H. Porteous,
" E. B. Powell, Esq. C. S. I.
" Colonel W. K. Worster.
" Captain W. H. Edgcome, R. E.
" C. G. Walker, Esq.

with the Circular.

Exd. F. R. Bantleman.

Ms. A. 9. 2. 1068. *Revised*
 Manuscript for Adam
 Dated Dec 13/15
 Pro: the claims for
 public debt

2/4/88
1/2/88
1/3/88

Expenses on
Carrage, fuel, and
miscellaneous by the Capt &
his family for above
the Decr, 1845, and
from on the 1st day of
Feb 1846 - 8. April 1846
With our Belles

Last month

1116
No 1120

Commd to the
General Dept of
Shoe & Leather, where
he will be called to the
order in June 3-

Wm. H. Bond George
8- April 1868 }

To Mr. J. H. L.
J. H. L. & W. H. L.

10
J.D. 196-119