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MADRAS RECORD OFFICE.

Government of Madras.

Lubie DEPARTMENT.

G.O. No.	357	Press Mis.
Dated	5-11-1867	

Not to be folded or roughly handled

5th April 1867.

Read the following papers :—

No. 11. From the Secretary to the Government of India, to the Secretary to Government, Fort Saint George; dated Fort William, 22nd January 1867, No. 707.

Home Department.

I am directed to invite your attention to the Despatch of the Secretary of State, addressed to the Government of India, No. 91, dated the 31st October last, a copy of which has already been forwarded to the Government of Madras direct, with the Secretary of State's Despatch, No. 37, dated 31st idem, and to request that you will move His Excellency the Governor in Council to favor this Government with a full expression of opinion as to the best mode of giving early effect to the proposals contained therein, with reference to the Madras Observatory.

No. 12. From N. R. POGSON, Esq., Government Astronomer, to the Chief Secretary to Government, Fort Saint George; dated Madras Observatory, 25th February 1867.

With reference to the Proceedings of the Madras Government, Public Department, 11th December 1866, on the proposed amalgamation of the two Government Observatories of Madras and Bombay, I have the honor to submit to your notice the following considerations upon the subject, and, although not yet actually called upon to do so, I trust that such a step will not be thought premature at so early a stage of the questions involved, as any anxiety I may feel or express thereupon is chiefly due to my high regard for the science of Astronomy and to the interests of the Public Service. The very considerate and liberal spirit which pervades both Despatches, on all points relating to myself, demands my most grateful acknowledgment, and enables me to take a tolerably disinterested view of the case, and, having stated the unbiassed facts and arguments in favor of retaining the present Madras Establishment, patiently to await the decision of Government thereupon.

2. I shall, of course, comply with the instructions furnished in the Order of His Excellency the Governor in Council, dated 11th December 1866, No. 1254, as promptly as possible, and shall now proceed to remark, seriatim, upon the separate paragraphs of each Despatch, as briefly as their importance will permit.

3. Commencing with the Despatch from the Right Honorable the Secretary of State for India, to His Excellency the Right Honorable the Governor in Council, Fort Saint George, dated India Office, 31st October 1866, No. 37,—*Paragraph 1* :—

Refusal of increased pay and of an English Assistant.

It is scarcely necessary to state that the refusal of the two recommendations referred to, viz., the very moderate addi-

tion to the salary of the Government Astronomer, and the appointment of an English Assistant, was a severe disappointment. The vast increase in the inevitable expenses of Indian life has rendered the present small scale of pay totally inadequate for the position of an Astronomer; while the refusal of the long expected and urgently needed aid of an English Assistant is a misfortune, alike to the Astronomer, to the sciences he pursues, to the reputation of the Observatory, and to its efficiency as a Public Department. The truth of this assertion will be fully borne out by the remarks upon subsequent paragraphs. In the event of the combination of the two Observatories, both these points will become more necessary than ever, and it is to be sincerely hoped that their refusal under present circumstances may prove to be a mere postponement of such reasonable and moderate requests.

Secretary to the Govt. of India

4. *Paragraph 2.*—As a very natural deduction from the fact, that, with the exception of the announcement of several discoveries, no published volume or report of proceedings has yet been laid before the astronomical public, beyond the annual Administration Reports, which it is probable the Astronomer Royal may not have seen, it appears to have been gratuitously assumed that the work of the Madras Observatory is, to some extent, a repetition of what has been sufficiently performed elsewhere; and the Right Honorable the Secretary of State, apparently under this impression, suggests that it is, therefore, capable of considerable curtailment. Publication of the observations and details of the work done is alone requisite to correct this erroneous supposition, and to reverse Mr. Airy's opinion in regard to the nature of the pursuits in which I have been engaged, and the manner in which the now ample instrumental means at my disposal have been employed. Since the erection of the new Transit Circle, in May 1862, it has been my most earnest aim to avoid the very error into which I am supposed to have fallen, and the objects entered in the working lists have been chiefly Stars not hitherto recorded at any other Observatory in the world. The value of such determinations in that part of the Southern Heavens not visible in Europe, and but little explored elsewhere, is too evident to need more than the mere record of the fact, that the Madras Meridian Circle has been directed thereto, to disprove what has been assumed as above stated. Almost the only cases of repetition of labor will be found in the inevitable use of the Nautical Almanac Stars, for determination of clock and instrumental corrections; and the independent re-observation of these, at a nearly equatorial Observatory, is considered most highly desirable by no less an authority than the Superintendent of the Great Trigonometrical Survey of India. As to extra-meridional work—a highly important, though secondary, branch of the duties of a Public Observatory—the pursuits of the Madras Observatory are therein utterly unlike those undertaken at any similar establishment. It is true that such works might be accomplished by the co-operation of two separate Observatories, one in Europe and the other in the Southern Hemisphere, but nothing of the kind has ever yet been attempted, nor could the united exertions of two Observatories so situated ever equal what may be done at a tropical station, supplied with instruments such as are now ready to hand at Madras, but which it is to be regretted can only be partially used, owing to the positive need of European aid, such as has been afforded to almost every other Observatory throughout the world.

Curtailment of observations undesirable, and no relief to the Astronomer.

In the face of such considerations, it is manifest that curtailment of any of the observations would be nothing short of loss of new work, of a nature most calculated to raise the character of the Observatory in the estimation of the scientific world, and to promote the advancement of Astronomy in branches not followed up elsewhere. And even if, for the sake of enjoying the usual annual leave of absence allowed by the Rules of the Service, I were to sacrifice the interests of the science it is alike my duty and pleasure to pursue, there still remains an insurmountable obstacle to my doing so in the fact, that, while the pay of the office remains so far below the minimum now requisite to support life on the most economical scale in India, the considerable additional outlay inseparable from travelling and temporary residence at a Sanitarium, is an indulgence

from which I am as completely shut out as if no leave were obtainable throughout the entire period of my service.

5. *Paragraph 3.*—There cannot be two opinions in regard to the value of the Astronomer Royal's recommendation, to bring up the arrears of reduction and the discussion of the observations already recorded with the least possible delay; and I am happy to be able to state that this has already been nearly accomplished, although the final step, publication, has not yet been commenced, so far as the astronomical results are concerned. The unpublished records of the Madras Observatory now extend over a period of fourteen years, viz., from 1853 to 1866, and must be reported upon under two heads—the unfinished labors of my predecessors, which awaited me upon assuming charge of my office, in February 1861; and the subsequent observations made with the new instruments

Astronomical arrears prior to 1861.

up to the end of 1866. The arrears of the older class comprise the following subjects:—A Catalogue of 2183 Stars, chiefly selected from Taylor's Madras Catalogue and from that of the British Association, with a view to the settlement of all doubtful cases in the authorities referred to. All the instrumental corrections for this work have been deduced for each night from 1853 to 1858, but require applying throughout, and the final places have yet to be collated into one general Catalogue. The total number of observations to be thus brought up to the epoch 1855 will be little short of ten thousand. There are also 1331 observations of the Sun; 345 of the Moon; 1680 of the Principal Planets; 333 of Minor Planets; and 25 of Donati's fine Comet of 1858. The mean places of the 144 Nautical Almanac Stars, from 1853 to 1858, form a separate list. Observations of Mars at the oppositions of 1854 and 1856; Moon Culminations, for determinations of Longitude; and a very extensive list of Occultations of Planets and Stars, and of the Phenomena of Jupiter's Satellites, complete the statement of the old astronomical arrears. With the exception of the Minor Planets (which are more than half prepared), Donati's Comet, and the Occultations, all these last named observations are not only reduced, but the copy is written out and ready for press. It must be remarked that all the older observations can only be regarded as second class work, owing to the inferior quality and power of the instruments with which they were made. They are, however, well worthy of publication, and prove satisfactorily that the successive Astronomers in charge conscientiously exerted themselves for the attainment of such results as were within their very limited instrumental means.

6. In Meteorology and Magnetism, it must be recollected that a system of hourly observations was commenced so far back as the year 1841, and was continued up

Physical arrears prior to 1861.

to February 1861, so as to complete a cycle of twenty years. All the Meteorological results have been completely reduced, from first to last, and, what is still more important, the materials collected have been carefully discussed, so as to furnish tables of corrections applicable to India in general, similar to those which have been found so valuable in England, known as "*Glaisher's Hourly Correction Tables*." Two quarto volumes, containing respectively the hourly records from 1841 to 1845, and those from 1846 to 1850, were published and distributed many years back; the third, giving the continuation of the records from 1851 to 1855, is nearly ready for

issue, requiring only its title page and a short preface to complete it. The fourth and last volume, comprising the records from 1856 to 1861, is now in hand, and besides the conclusion of the hourly observations will contain the tables before named, and all other results which it may be deemed advisable to deduce from the whole twenty year series. The Magnetical reductions are also completed from 1846 to the middle of the year 1860. The manuscript records of the first quarter of the series, viz., from 1841 to 1845, were many years back entrusted by Government to Captain (now Colonel) S. O. E. Ludlow, for reduction and publication; but that Officer having retired from the Service, without fulfilling his intentions, or even without returning the papers to the Observatory, they have never been published, and I am not able to state to what extent their reduction may have been effected, though I have reason to believe that they are far advanced and nearly ready for press. The papers in question were left in charge of a Native Assistant, without any directions as to what was to be done with them. They should, undoubtedly, have been returned to the Observatory before Colonel Ludlow quitted India, and I presume that he is still responsible for their safe custody, reduction, and publication. The second volume (1846 to 1850) was issued some years back; the third (1851 to 1855) is, like the Meteorological volume, only awaiting its preface and title page; and the reductions for the fourth volume are very nearly completed; but both first and fourth have yet to be printed.

7. Of the works undertaken in my own time, *i. e.*, since February 1861, I have next to treat. The Observatory has been fresh equipped with valuable instruments, capable of yielding first class observations.

Meridional proceedings since 1861.

The difficulty of erecting new instruments in India can scarcely be conceived by those who have had no experience of the painfully slow progress of building operations in this country. The Transit Circle, an admirable specimen of the best work of its distinguished makers, Messrs. Troughton and Simms, was from 1857 to 1862 before it could be got ready for work. Regular observations have been carried on with it since June 1862, and, in the four years ending with 1866, the total number of complete positions of celestial objects recorded, amounted to 10,858. My working list, of about 1800 objects, comprises new stars beyond 120 degrees of Polar Distance, intended to serve as zero points in a Great Survey of the Southern Heavens; the stars employed for comparison of faint planets, and of comets, with the Equatorials; and all the known Variable Stars. The Minor Planets have been observed at their successive oppositions, especial attention being paid to such as were badly situated for English Observers. The number of such positions on record is 325. The planet Mars was carefully observed at the oppositions of 1862 and 1864 on 66 evenings. And, lastly, 270 observations of the Moon and Moon Culminating Stars, available for longitude determinations, deserve to be mentioned. The reduction of all these Meridian observations is in a very forward state, and, if it were not for the deficiency of hands and pressure of the older arrears, would never be more than two months behind. I propose, almost immediately, to commence printing the astronomical results for the years 1861-62 and 63.

8. In former times, meridional observations constituted the sole duty of the Director of a Public Observatory; but such is no longer the case, and in the present state of science the extra-merid-

Extra-Meridional proceedings since 1861.

ional pursuits are by far the most arduous portion of his labors. The Madras Observatory is now provided with two good Equatorial Telescopes: one by Messrs. Lerebours and Secretan, which was acquired about the year 1855; the other, a large and magnificent instrument, supplied only last year, by Messrs. Troughton and Simms, and fitted up with all the most refined appliances of modern invention. The revolving dome for this instrument may be cited as another remarkable instance of the building difficulties against which an Astronomer has to contend in India. The first plan and estimate for its construction bears the date March 1860, but it was not ready for the reception of the new Equatorial until June 1866. The extra-meridional works in hand with these instruments next claim consideration, and first the ATLAS OF KNOWN VARIABLE STARS.

9. There are at present about 125 Stars known, which, retaining their fixed position in space, alternately fade away, for the most part vanishing altogether, and then regain their brilliancy, in

Atlas of known Variable Stars.

definite periods varying from two days to three centuries. Such are the Variable Stars, and I may be pardoned for stating that seventeen of these singular objects are of my own discovery. While every other celestial phenomenon has been more or less satisfactorily accounted for, the changes of these strange bodies have hitherto baffled all attempts at explanation. Nothing remains but to watch them unremittingly for some years to come, and to seek, from the records of their periodical fluctuations, the key to the mystery in which they are still involved. To facilitate this object, I undertook, in 1858, to construct an Atlas of all known Variable Stars, then only 53 in number; and I have since found the task far heavier than I at first anticipated. Suffice it to add that the maps forming this Atlas have been my chief personal care at Madras, and that the whole work is far advanced, and I trust likely to be in the hands of the astronomical public within the next two years. As a proof of the interest felt in this work by some English Astronomers, I may adduce the following circumstance:—As the Atlas was commenced by me when in charge of the late Dr. Lee's Observatory, at Hartwell House, Buckinghamshire, and afterwards continued at Madras, it was arranged that, upon publication, Dr. Lee should bear the expense of such portions of the work as were executed at his Observatory, and that Government should be charged only with those maps constructed at Madras. The recent death of my late venerable employer gave rise to the fear that difficulties might arise in regard to the funds for the Hartwell portion of the Atlas, and it has been intimated to me by a leading English Astronomer, that in such case there were several wealthy patrons of the science willing to subscribe towards the completion of the work. I merely mention this in proof of the interest felt in regard to the subject under consideration; but such help is, I feel sure, needless. The superior means at my disposal at Madras, and the infinitely finer climate, soon convinced me that the English portion of the work must be entirely re-constructed to render it uniform with the Madras portion; and as, after all, the expense of lithographing the maps will be but moderate, the Government will, I am sure, prefer to have the whole issued as a Madras work, without private aid in the matter of publication. The printing is now in hand, and two proofs accompany this Report, as specimens of the nature of the work, and of the style of its accomplishment by our Madras lithographer, Mr. A. Barren.

10. As the revision of the Atlas maps can only be proceeded with on nights

Southern Celestial Survey.

when the sky is perfectly free from haze and clouds, and in the absence of moon-light, the overpowering brilliancy of which obliterates the minute stars required to be inserted to give a complete delineation of the vicinity of each Variable Star, another and far greater work has been commenced, viz., an extension southward of "Professor Argclander's Great Survey of the Northern Heavens," recently completed at the Bonn Observatory, from which it appears that, in that half of the Heavens alone, there are not less than 309,000 stars of the ninth and brighter magnitudes. More simply expressed, this amounts to stating the number of stars visible over the whole celestial sphere, with a small telescope of one inch and a half in aperture, as considerably above six hundred thousand. It was my original hope and intention to accomplish as much of this great task as the northern latitude of Madras would permit, viz., about five-sixths of the whole work, and then to endeavour to get sent out for a year or two to a southern station, to finish the part not visible in India. The Council of the Royal Astronomical Society, however, considering that I had undertaken far more than it was probable I could ever accomplish, have induced the Directors of the Cape and Melbourne Observatories to take up the extreme southern portions of the work, and have left me only such part (about two-thirds of the whole) as may be easily finished at Madras. I regret to say that, owing to the continued interruptions arising from building operations, the reduction of the arrears before enumerated, and the prior claim of the Variable Star Atlas, which I wish to have out of hand before embarking thoroughly in the more extensive undertaking of the Southern Survey, I have hitherto done but little towards this work. I have, however, mapped some portions of the Southern Heavens, and several long zones await reduction and plotting when other duties permit.

11. Being in possession of some unpublished zodiacal maps, as nearly perfect

Eight Discoveries made since 1861.

as possible, I occasionally compare them with the Heavens, and have thus been led to the discovery of three new minor planets, Asia, Sappho, and Sylvia; the re-discovery of a lost one, Freia; and the detection of four new Variable Stars, in Gemini, Virgo, Scorpio and Sagittarius. These eight results, achieved since 1861, are certainly no mere repetition of work sufficiently performed elsewhere!

12. I have always made it my practice, and one of which, I am sure, Mr.

Observations of Minor Planets & miscellaneous work.

Airy would approve, to obtain positions of such of the minor planets as arrive at opposition too low south for European Observers, and also of others, which, from their extreme faintness and difficulty, are scarcely visible, except in a brilliant tropical sky. Of my own six planets, I always endeavour to secure at least three observations at each successive opposition. I have 175 such planetary observations on hand, most of them awaiting reduction. There are also 36 observations of Comets; 9 measures of the Double Star, Alpha Centauri, taken with a double image crystal Micrometer, and sundry miscellaneous records of Eclipses, Occultations, Phenomena of Jupiter's Satellites, and a transit of Mercury in 1861. And lastly, of the Variable Stars before alluded to, I have made numerous records of the changes of those most recently found, of which the ranges of variation and periods of return are as yet undetermined; but in this, as in all other branches, I have most scrupulously

avoided wasting my time over making notes upon objects which I knew to be under examination by other Astronomers, or which had been already sufficiently observed elsewhere.

13. The excellent method of determining the Sun's mean distance from the

Investigation of the Sun's mean distance from the Earth.

Earth, by means of the planet Mars when in opposition, proposed by the Astrono-

mer Royal, can only be successfully executed at a tropical Observatory; and if none existed, it would be well worth while for Government to establish one expressly for this investigation alone! Further, the new Equatoreal is, from its admirable stability, one of the best and most suitable instruments for the purpose. The most favorable opportunities for these observations recur at intervals of fifteen years; but, aided by a Chronograph, it would be well to have them repeated at every opposition, *i. e.*, nearly every other year. In 1860, my predecessor, well aware of the insufficiency of the Madras Equatoreal as it then stood, declined to make the attempt. In 1862, in compliance with Mr. Airy's wishes, I tried with the same telescope and signally failed; although my observations sufficed to show that the considerable reduction supposed to be required in the Sun's distance from the earth was actually necessary. Roundly stated, the old value of ninety-five millions of miles is now known to be too great, and ninety-one millions to be nearer the truth. My results gave it a little over eighty-nine millions; but, owing to the instability of the telescope, they were worth but little, except as an example of Mr. Airy's very ingenious suggestion. At the next opposition, in 1864, I repeated the observations with the same instrument, repaired and considerably improved, and using a higher magnifying power, but the weather was very unfavorable, and other duties have not yet allowed me leisure to discuss this second short series. With the new Equatoreal and a Chronograph, the method could be tried to the best advantage, and under the most favorable circumstances, at Madras; and should I and the Observatory be spared through the successive oppositions between 1870 and 1880, I shall make a point of giving Mr. Airy's plan the fullest possible trial, and, I may add, with every reasonable hope and prospect of success.

14. The long period of twenty years, during which hourly meteorological and

Magnetical and Meteorological Records.

magnetical records were maintained at the Madras Observatory, having afforded

ample data for the determination of nearly all the ordinary daily and annual fluctuations of atmospherical and magnetical phenomena, a reduced system of registration has been carried on in each subject since March 1861. Daily and half monthly means have been deduced of every meteorological record, except in the cases of Ozone and Electricity. No Ozone test papers or Electrometer have been supplied to the Observatory. The former I regard as of little importance, but the latter is a deficiency to be regretted, and one which should be remedied. The unsatisfactory

New Anemograph.

nature of the old anemometrical records rendered it advisable to institute an

entirely fresh series of observations in regard to the velocity or force of the wind, and a new self-registering Anemograph, of the Kew construction, was accordingly procured from Mr. P. Adie, of London. It has been in regular use since June 1864, and continues to furnish unexceptionable results. All the meteorological reductions have been effected by means of provisional Indian Tables, almost identical with those

now finally deduced, and are completed up to date. The magnetical results are, on the contrary, wholly unreduced, but, though made with the old instruments, are yet worthy of reduction, and will be attended to as soon as the higher and more important labors of the Observatory will permit.

15. *Paragraph 4.*—It is so obviously the interest of every Colonial Astronomer to keep himself in frequent correspondence with the Astronomer Royal, that it is a matter of surprise to me that any recommendation upon this point should have been thought necessary. In my own case especially, besides the profound respect which, in common with all other Astronomers, I feel towards that distinguished Officer, I am further impelled to do so from the circumstances that I have for many years past enjoyed the privilege of his friendship, and that it was upon his sole recommendation that my present post was conferred upon me. Without official instructions upon the subject, I should at any time regard his wishes and recommendations as obligations demanding my most prompt attention and compliance. Trying interruptions, chiefly arising from slow building operations and inadequate personal establishment, have caused me to write to Mr. Airy much less frequently than I should have done had matters progressed more to my own satisfaction; but, in future, I shall have far more occasion to trouble him in the way of correspondence than hitherto. I shall always consider it equally my duty and pleasure to keep Mr. Airy well informed as to the progress of the works in hand, and of all future arrangements which I may see fit to make, so long as I have the honor to fill the position to which he so kindly recommended me. It is, however, equally desirable

Correspondence with the Astronomer Royal.
More extensive circulation of Reports desirable.

that, not only the Astronomer Royal, but also the Council of the Royal Astronomical Society, and the leading British and Foreign Astronomers, should be fully informed as to what is in hand at the Madras Observatory; and to effect this with as little delay and interruption of my own labors as possible, a more extensive circulation of the annual Report appears the best course that can be adopted.

16. Referring next to the Despatch from the Right Honorable the Secretary of State for India, to His Excellency the Right Honorable the Governor General of India in Council, dated India Office, London, October 31st 1866, No. 91:—

Paragraph 1. contains nothing requiring consideration or remark.

17. *Paragraph 2.*—Although founded in the year 1792, and steadily kept at work ever since, there is little to be found in the Annals of the Madras Observatory prior to the year 1831 of value to modern science. The astronomical instruments in use were so insignificant as to be incapable of rendering efficient service; but the same remark would apply, with few exceptions, to most contemporaneous Government Establishments of a similar nature.

Brief retrospective review of the proceedings of the Observatory.
Mr. T. G. Taylor's Catalogue of 11,015 Stars.

In 1830, Mr. T. G. Taylor, formerly of the Royal Observatory, Greenwich, commenced operations with an entirely new instrumental equipment, and by his assiduous and judicious superintendence through a period of eighteen years, the

Observatory acquired a high and well earned reputation, chiefly by the important Catalogue of 11,015 Stars made under his direction. Meridional Astronomy, Meteorology, and Magnetism were the sole pursuits in hand, no fixed Equatoreal having then been provided for extra-meridional observations. Mr. Taylor's suc-

cessor, Captain W. S. Jacob, supplied this deficiency by the private purchase of an Equatoreal Telescope, at a total

expense of over five hundred pounds, for which the East India Company liberally reimbursed him upon the transfer of the instrument to the Observatory. Thus equipped, Captain Jacob directed his attention chiefly to the measurement of Double Stars, of the Satellites of Jupiter and Saturn, and other determinations in practical Astronomy, not hitherto attempted at any public Observatory. By his own personal exertions, so sadly overstrained as to lead to his premature resignation and subsequent lamented decease, he acquired for the Observatory a high reputation in the modern branches of the science, while, at the same time, he carefully superintended the continuation of the meridional work and formation of Star Catalogues

Acquisition of a new Transit Circle.

inaugurated by his predecessor. Feeling, however, that, owing to the great improvements which had been made in Meridian Instruments since the supply of the Transit and Mural Circle in 1830, they were no longer sufficient to maintain the prestige of the Observatory in the Meridional Department, he applied for a new Transit Circle, by Messrs. Troughton and Simms, the result being the acquisition of the fine first class instrument now in use, made under the immediate superintendence of R. C. Carrington, Esq., of the Redhill Observatory—a facsimile of the one with which that eminent Astronomer observed his valuable Circumpolar Catalogue of 3735 Stars, published by the Royal Society in 1857. As both these Circles, and also that of the larger instrument furnished by the same makers to the Royal Observatory in 1850, were divided by the same engine, it is probable that all three are capable of yielding equally accurate first class results. Of the pursuits in which the ample resources of the now remodelled Observatory are employed, I have already treated

Present scheme of work devised in consultation with the leading European Astronomers.

in detail, in my remarks upon paragraph 4 of the former Despatch. I wish, however, to add that the scheme of investigation which I marked out for myself was not undertaken without previous consultation with esteemed friends and leaders of European Astronomy. My Variable Star Atlas and Southern Survey had the expressed approval of Professor Argelander; Sir John Herschel; the Reverend R. Main, Radcliffe Observer; Mr. Hind, Superintendent of the Nautical Almanac; Mr. Carrington; the late Captain Jacob; and several other well known Astronomers.

18. It has also been my continual aim to render the resources at my disposal

General endeavours to utilize the Observatory.

available for the occasional discharge of any other demands which might arise, whether purely astronomical or otherwise. Such are the maintenance of accurate public time signals, and the intended regulation of public electrical clocks; co-operation with the Great Trigonometrical Survey of India, whenever such is required; the preparation of a Map, showing the distribution of rainfall throughout the Presidency,

for the Revenue Board; superintendence of Meteorological Stations, proposed to be started in connection with, and for the information of, the Madras Sanitary Commission; comparisons of various scientific instruments, such as Chronometers, Barometers, Thermometers, &c., which I have never refused, whether for public or private use; and lastly, and by no means least important, and which my geographical position well enables me to do, to give timely warning of stormy or severe weather, especially in May, October, and November, whenever its approach is rendered evident by meteorological indications, which is almost invariably the case along the eastern coast of India.

19. *Paragraph 3.*—The notification of correct time to the shipping at any port is undoubtedly a vastly important matter, and infinitely more so upon so treacherous

and dangerous a shore as that of the Coromandel Coast; and this alone would require the maintenance of a small establishment, involving no inconsiderable portion of the very moderate outlay of the present Madras Observatory. I wish, however, to remark

that time-bells are far less adapted for time signals in India than guns, the smoke of which by day, and the flash by night, are far more conspicuous and observable than the dropping of a ball or the turning of a semaphore. It would be quite

practicable, by placing the lines of telegraph at my disposal for the short space of ten minutes a day, to fire guns at Calcutta, Bombay, Madras, Galle, Bepore, and at every military station simultaneously, at any even hour of Greenwich Mean Time. I should suggest 2 p. m., Greenwich Time, corresponding to 6h. 51m. 16s., at Bombay; 7h. 20m. 57s., at Madras; and 7h. 54m. 0s., at Calcutta, as the most convenient hour for such general signal, —and, if authorized by Government, shall be most happy to carry out the proposal, by controlling the requisite electrical clock at Madras: provided only that the lines of telegraph can be cleared daily at the required time, and kept in good working order for the transmission of the signals to whatever spot they may be desired to be sent. A better plan would probably be to have the Telegraph Office nearest to each gun supplied with a good ordinary seconds clock, with compensated pendulum; to transmit the proposed Greenwich time signal from Madras, so as to notify the daily errors of such clocks; and to have the usual Noon and 5 p. m. guns fired, at true local time, by means of electrical discharge, agreeably to the corrections signalled daily from the Madras Observatory.

20. *Paragraph 4.*—Whatever opinion may now be held with regard to the present use of the old magnetical instruments, supplied in 1841 to the four Observatories of Madras, Bombay, Simla, and Singapore,

it must not be forgotten that they were all constructed by the best makers of the day, and, in strict conformity with the recommendations of the Committee of Physics appointed by the Council of the Royal Society. It may, therefore, be presumed, that the long series of hourly observations obtained, extending over twenty-three years

at Bombay, twenty years at Madras, and five years at each of the other two stations, besides above twelve years of similar records made at the Trevandrum Observatory, will afford ample data for the determination of all the leading magnetical and meteorological phenomena of India, when the time arrives for a complete discussion of

New Magnetical Instruments desirable.

the results obtained. In Magnetism, as in Astronomy, it is unquestionably true that the rapid progress of science demands new investigations with modern instruments, but such an admission in no way affects the value of the deductions to be made from past records. The diurnal

Discussion of past results now most needed.

and decennial magnetic variations can surely be decided within narrow limits from the mass of observations, carefully, and there is every reason to believe truthfully, recorded; and what appears to be now most wanted is discussion of past results, and the separate maintenance of a single Physical Observatory supplied with the best modern appliances for current registrations and absolute determinations, with a view to the discovery of changes

A physical Observatory desirable, free from astronomical interruptions.

extending over longer and yet unknown periods of years. Local absolute determinations at numerous widely distributed positions, are ever highly desirable, and a Physical Observatory, under the direction of an experienced European, with a moderate staff of Native Assistants, must ever be necessary for the promotion of magnetical science. The Superintendent of such an Establishment should first turn his attention to working up the past Indian Records wherever made, and upon the completion of that heavy task, which would certainly occupy his whole time for some few years to come, he might advantageously commence a Magnetic Survey of India, with portable instruments, retaining the superintendence of the fixed Observatory as the Head Quarters of Magnetism in Asia. The very nature of his pursuits would, however, render it impossible for him to accomplish more than is now suggested, with the addition of ordinary meteorological observations; and the attempt to mix up celestial observations with his other duties would undoubtedly prove highly detrimental to his physical investigations, and useless to the higher and far more comprehensive science of Astronomy.

21. *Paragraph 5.*—With the utmost deference to the opinion of the Astronomer

A tropical position best for Astronomical Observations.

Royal, as stated in this paragraph, I must beg permission to express my most profound astonishment at its enunciation, and my entire dissent therefrom. Systematic astronomical observations can certainly be carried on, for all considerations save one, to incomparably better advantage at a tropical Observatory than at any other, either in northern or southern latitudes. The simple consideration that the most important Standard Stars which form the basis of the whole superstructure of astronomical science can be observed near the Zenith, free from all uncertainties of refraction, and under circumstances of such exquisite definition and steadiness as can never be known when they transit the meridian at lower altitudes in higher latitudes, impels me to state my conviction that, if it were possible to transfer the Royal Observatory itself to a tropical station, the value of its future results would be considerably enhanced by the infinite improvement of its

geographical position. As I have previously stated in this Report, in reference to the investigation of the Solar Parallax, by means of the planet Mars when in opposition (a method suggested by Mr. Airy himself, as one of the best for the exact determination of the the Earth's mean distance from the Sun—the mighty base line by which we measure, and with which we compare, all other celestial distances), such observations can only be made successfully at a tropical Observatory. I repeat that, for this one purpose alone, if for no other, it would be a reproach to British scientific enterprise to omit starting an Observatory near the equator, were no such establishment already in existence. The greatest drawback, and one which admits of no denial, is the general unsuitability of the climate to the English constitution; but even in this solitary argument against the maintenance of an Indian Observatory, it must be remembered that an Astronomer's duties call for his exertions most chiefly in the coolest portion of the twenty-four hours, and only under favorable atmospherical conditions, so that he has really a far better chance of preserving his health than others whose occupations compel their exposure, more or less, to the trying midday sun. It is not possible for any one to accomplish the same amount of labor, bodily or mental, in India, as in a cooler and more bracing climate, and hence efficient assistance is doubly needed; but in all other respects the advantages are so evidently and decidedly in favor of a tropical Observatory, that I should never have thought it possible for any one to have held a contrary opinion, and least of all should I have expected it from my distinguished friend the Astronomer Royal of England. I would confidently appeal to the Council of the Royal Astronomical Society, to Sir John Herschel, and to all the other leading astronomers of Europe, and I feel convinced that my own views would be supported by an overwhelming majority in their favor.

22. *Paragraph 6.*—Having already endeavoured to prove that the maintenance of a tropical Observatory is most urgently desirable, and in some points more beneficial to the progress of Astronomy than

Prosecution of Astronomy and Meteorology recommended, and restriction of Magnetical Observations.

that of any other situated in either more northern or southern latitudes, I have little further to add in reply to this paragraph. For the purpose of supplying time to the shipping, it has also been suggested that a limited establishment must still be maintained at Madras. If, therefore, upon further consideration, the welfare and progress of Astronomy should find more favor in the estimation of Government, and the magnetical observations, already accumulated to the enormous aggregate of sixty-five years of hourly records at the five observing stations in India, be deemed sufficient to warrant a considerable reduction in the further prosecution of that subject, a single establishment would still suffice; and a restricted scheme of magnetical registrations, with new instruments, might well be substituted for the very inferior records now being made with the older instruments at Madras. Meteorological observations having been always carried on contemporaneously with the past magnetical records, it is manifestly unnecessary to attempt more, in future, in that science, than the ordinary register usually kept at all astronomical observations. Reliable observations, made at a number of widely distributed stations, all promptly reduced and published upon one uniform system, would be alike valuable for sanitary and scientific considerations; but the further accumulation of hourly

records at any of the former stations is perfectly needless, and can add little or nothing to the already well determinable results derivable from past observations. The scheme mutually proposed by the Madras Sanitary Commission and myself, for the establishment of a number of Meteorological Stations throughout the Madras Presidency, might well be extended over the length and breadth of the Indian Empire; but, aided by an efficient staff of assistants, the whole might be readily superintended by the Government Astronomer, without seriously interfering with the higher and more absorbing astronomical investigations in which he should be engaged. Further, there is a limit to the time for which such meteorological registers are required, and five, or at most ten, years would suffice to determine the local peculiarities and climate of each station to which the requisite set of instruments might be supplied.

23. *Paragraph 7.*—The consideration of the point at which the future single Indian Observatory should be fixed, will, of course, depend solely upon the decision

Reasons for retaining the Madras Observatory.

of Government in regard to the future prosecution of astronomical science. If Astronomy is to be still favored with Government protection and patronage, the Madras Observatory is ready to hand, remodelled and refitted with first class instruments, the purchase and erection of which cannot have cost less than fifty thousand Rupees. It has been shown that all these recent acquisitions have, after a struggle of some years against the extraordinary obstacles attendant upon their erection in India, been brought into effective working order; and that they are further actively employed at the present time in carrying on valuable observations, for the most part of a nature not elsewhere undertaken, and which, in some instances, can only be accomplished at a tropical Observatory. My proceedings have been sadly crippled and curtailed, and their publication delayed, solely from the want of more adequate assistance; but, if this were conceded to such moderate extent as to enable me to develop the resources of the establishment, and to accomplish the works which, although with the approval and advice of many leading European Astronomers, I fear I have undertaken too hastily and with more zeal than discretion, there would be little doubt of my being able to realize a rich harvest, and to render valuable service to Astronomy.

24. Upon paragraphs 8 and 10 I can, of course, have no remarks to offer.

25. *Paragraph 9.*—At the commencement of this report, I stated my deep sense of the very considerate manner in which the Right Honorable the Secretary of State for

The Astronomer's reasons for wishing to retain office at Madras.

India was kindly pleased to recognize my earnest endeavours to discharge efficiently the scientific duties committed to my care. Maintaining as I do the advantages of a tropical Observatory over any other, and bearing in mind that I have, with the full intention of retaining my Office long after the expiration of my covenanted period of service, undertaken and partially executed works which will extend over many years, and which it is impossible for me to complete in Europe, it may be readily understood how deeply I should regret being prevented from attaining these objects, in the event of the abolition of the Madras Observatory. Nothing, except failing health, would ever induce me voluntarily to resign until the execution of my

plans had been creditably effected. While gratefully acknowledging the liberal offer of additional pension in the event of my resignation being rendered desirable, I most respectfully submit that nothing of the kind could compensate for the annihilation of my schemes for the promotion of my favorite science. To bring out my family to India involved me in nearly four times the amount of the outfit allowance granted upon my appointment, and the distressing subsequent increase in price of all the necessaries of life in India, has, as before stated, rendered my present pay insufficient for the maintenance of my position as Government Astronomer; but, in the face of all such considerations, I have no wish to leave unfinished the works in hand, or to sacrifice the scientific advantages I enjoy, for mere pecuniary advancement. I should have been truly thankful if the small increase of pay applied for could have been granted, and the circumstance that it would have enabled me annually to recruit my health and energy would undoubtedly have had a beneficial effect upon both the quantity and quality of my own personal share of the observations. But having, from pure attachment to the science, renounced far more lucrative prospects to take to Astronomy in the first instance, and having already passed twenty-one years in its steady pursuit, with considerable success in all points save emolument, I hope and intend to devote the remainder of my life to its promotion, here or wherever else I may be placed. If, therefore, the Superintendence of the Bombay Observatory were to be offered me, upon the only condition upon which such a contingency

Resignation preferred to transfer to Bombay, and renunciation of Astronomy.

is probable, viz., the renunciation of my Astronomical pursuits, I should most respectfully decline it, and prefer to take my chance of obtaining the direction of some other well equipped establishment, as soon as my labors in connection with the

Estimated time required to complete works in hand.

publication of the Madras observations were brought to a close. It will probably require not less than four years to publish the present accumulation of observations on hand; but to complete the Southern Survey and all the plans I had formed and hoped to accomplish, with the new instruments recently supplied to the Observatory, would find full employment for myself, an English Assistant, and my three Native observers, for thirteen or fourteen years to come.

26. That it may be my privilege to continue to serve Her Most Gracious Majesty in my present position, for the promotion of the noble Science which, by its

Conclusion.

aid to Navigation, Commerce, and the exaltation of the human intellect, has, both directly and indirectly, contributed largely, for centuries past, to the welfare and honor of the British Nation, is my highest ambition and most sincere wish, the expression of which will not, I trust be deemed misplaced as a conclusion to this report.

No. 13. From the Director of Public Instruction, Madras, to the Chief Secretary to Government, Fort Saint George; dated Madras, 16th January 1867, No. 100.

I have the honor to address you in reference to the Despatch of the Right Honorable the Secretary of State for India, in connection with which was passed Order

of Government, No. 1254, Public Department, of the 11th December 1866, and, in thus venturing to write upon the subject of the Despatch, which was not communicated to me, and which does not refer directly to my Department, I trust his Excellency in Council will not consider me presumptuous, when he recollects that, in my position of Director of Public Instruction, I am naturally interested in any matter which affects the progress of science in this Presidency.

2. I have long felt that the Astronomer at Madras should be placed in communication with the Astronomer Royal of England, care being taken that the connection between the two should not be of such a nature as to damp the ardour of a zealous observer by compelling him to act in direct subordination to the Astronomer Royal. In England, public opinion is the main check upon the Government Astronomer, and this opinion is more especially represented by the views of the gentlemen who are appointed annual visitors of the Greenwich Observatory, and who, in this capacity, receive from the Astronomer Royal a report upon the work of the Observatory for each year. Public opinion would be no check in this country, as there is not a sufficient number of men competent to form a judgment regarding the work of the Astronomer. What then is required is that an annual statement should be drawn up by the Madras Astronomer, to be submitted to the Home Government, through the Astronomer Royal. An abstract of this statement might, with much propriety and advantage, be published in the notices of the Royal Astronomical Society, the Council of which body are in the habit of publishing such abstract statements. An arrangement of this character, while securing the application of a check upon the Madras Observer, would not subject him to a direct pressure from the Astronomer Royal; and I must remark that to place the Astronomer here under the direct orders of even so eminent a man as Mr. Airy, for whom all members of the astronomical body, wherever they may be carrying on their researches, entertain the very highest respect, would cramp the energies of the former, and take away from him that independence of feeling which is essential to a successful follower of science.

3. I have hitherto spoken of the relation which should, in my opinion, exist between the Madras Astronomer and the chief astronomical authority of the British Empire. I now turn to the still more important point—the description of Observatory to be maintained in India.

4. Here I beg to call especial attention to the fact that the views of Mr. Airy are based simply upon the question as to what work is absolutely required to supplement the work done at Greenwich and other first class Observatories. I earnestly hope that the Rulers of India will take a higher and more extended view of the matter, and consider what is due to this country. Universities have been founded here, great inducements are being held out to the Natives of India to advance in knowledge, and without attempting to enumerate the various directions in which progress is encouraged, it may fairly be stated that one of the brightest pages in English History will be that recording the manner in which England is endeavouring to fulfil the duties imposed upon her by the stewardship of India, which Providence has placed in her hands.

*Proceedings of the Madras Government, Public Department,
5th April 1867.*

5. Having regard to the considerations I have just ventured to put forward, and recollecting that almost every Petty State has a National Observatory, I earnestly hope that Government will be pleased to make a strong representation to the Right Honorable the Secretary of State, urging that India should have at least one well equipped and well officered Astronomical Observatory, and that the Astronomer in charge, while required to present an annual statement of the work performed by him and his staff, should be left in independence, and not made a subordinate of another Astronomer.

6. There are one or two points on which I would beg to be allowed to address Government in connection with the question of a National Observatory for India; but to do so in this letter, while the very existence of such an Observatory is in doubt, would I consider be out of place.

No. 14. To the Secretary to the Government of India, Home Department, dated Fort Saint George, 5th April 1867, No. 357.

In acknowledging the receipt of your letter of the 22nd January last, No. 707, calling for an expression of the views of this Government as to the best mode of giving early effect to the proposals made in the Despatch addressed by the Secretary of State to the Government of India, under date the 31st October last, with reference to the Madras Observatory, I am directed to submit, for the consideration of His Excellency the Viceroy and Governor General of India in Council, the annexed copies of letters from the Government Astronomer and from the Director of Public Instruction, and to state that the Governor in Council concurs with those Officers in thinking it advisable that the Madras Observatory should be retained on its present footing.

2. It is confidently believed by this Government that when the Secretary of State and the Astronomer Royal have perused the able and interesting report presented by the Government Astronomer, and have thus made themselves acquainted with the important nature of the objects prosecuted by Mr. Pogson, and with the disinterested and devoted spirit in which he performs his duties, they will suspend their views for the modification of the Madras Establishment. The Governor in Council advocates the maintenance of the Observatory on its present, and even on an improved, footing, alike in the positive interests of science, and with a view to the incentives to intellectual exertion and development which the existence of such an Institution may offer in a place where there are few encouragements to studies of an abstract and elevated character.

(Signed) A. J. ARBUTHNOT,
Chief Secretary.

Edw. J. H. Burns.

N. 707.
From
E. C. Bayley Esq.
Secy to the Govt of India
To
J. N. Simm, Esq.
Secy to Govt, Fort St. George
Fort William 22 Jan'y 1867

Home Dep^t N. 14,

I am Directed to invite your attention to the Despatch of the Secretary of State, addressed to the Govt of India, N. 91, dated the 31st October last, a copy of which has already been forwarded to me Govt of Madras Direct, with the Secretary of State's Despatch N. 37, dated 31st Decem, and to request that you will move His Excellency the Governor in Council to forward this Govt with a full expression of opinion as to the best mode of giving early effect to the proposals contained therein, with reference to the Madras Observatory.

Have the honor to be,

Sir,
Your Most Obedt Servant,
E. C. Bayley
Secretary to the Govt of India

Completed by 20/4/00

Public 1867 Dept
v. 11
From
Secy to Govt of Canada
Public Dept
80707

12/22 Jan 1867
19/4 Feb 1867

No 144
Request to expression of
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in regard to the recent
proposal of the Secy
of State with reference
to the Ecuador Ocean
tory.

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R 9 April

Public DEPARTMENT.

No. 56.

From The Director of Public Instruction

Dated 15th January 1867.

FOR ORDERS.

19
I think that Mr. Smith's letter
may be taken at consideration
after we have received the
report or nomination for
Mr. Poyson in the recent
dispatch for the Secretary
of State. Mr. Poyson appears

He that has communicated
with the center in a few days.

Mr. Smith in his last letter
until he receives a communi-
cation from the post-offices.

on Lord Cranbourne's des-
patch of 31 Oct last. He

of 31 Dec 55 no 1254 - But
there is no sign from Mr. Poyson
in his letter which he has
to consider his and Mr.

21
Poyson's letter at once at the
anvil. communication
from the Department for
J.P.

we should lose ground
I think, if we await the receipt of the
courts from Mr. Poyson & then ~~do nothing~~
until we hear from the Sub: (p. 102). I do
wish Mr. Poyson the receipt of at once
sending in what he may desire to say and
then Poyson to the Sub: (p. 102), both his and
Mr. Poyson's court. The views of these gentlemen
cannot fail to aid the authorities at Salisbury
in forming a conclusion on the important
point involved in the last despatch from
the S of State, even if their views are
unaccompanied by an opinion from their
p. 102 - W.D.

depts of the letter
with 2 proofs of the letter
referred to in para 9 of the
Pigeon's letter -

23

Public Department.

No. 357.

he Secretary to the Government
of India,

Home Department.

Sir,

In acknowledging the
receipt of your letter of
the 22nd January last, No 707,
calling for an expression
of the views of this Govt
as to the best mode of
giving early effect to the
proposals made in the
despatch addressed by
the Secretary of State to
the Govt. of India under
date the 31st October last
with reference to the
Madras Observatory, I
am directed to submit
for the consideration of
H.E. the Viceroy and
Governor General in Council
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by Sir J. P.
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proof -

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WDM

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Person's letter -

23 /

Public Department.

No. 357.

he Secretary to the Government
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Home Department.

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In acknowledging the
receipt of your letter of
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no 707 -

JJ
WDM

PROCEEDINGS of the MADRAS GOVERNMENT.

Read the following letters

From the Director of Public Instruction (Received 15th January 1877 No. 100)
 " Secretary to Govt. of India
 Home Department } " 22nd " " " 797

Order thereon

The Governor in Council directs that a copy of the foregoing letter from the Director of Public Instruction be furnished to the Government Astronomer and that Mr. Pogson be requested to favor Government with any remarks he may desire to offer on the subject of the despatch addressed

J.P.
W.M.

The annexed copies of letters from the Govt Astronomer and from the Director of Public Instruction, and to state that the Governor in Council concurs with those officers in thinking it advisable that the Madras Observatory should be retained on its present footing.

Add.

It is respectfully desired by the Government that when the Secretary of State and the Astronomer Royal have perused the above letter, the reply presented by the Government Astronomer and has thus made themselves acquainted with the important nature of the subject presented by Mr. Pogson and with the desirability and expediency of the

addressed by the Secretary
of State to the Govern-
ment of India under
date the 30th October last

I have the honor to acknowledge the receipt of your letter of the 27th inst. in relation to the proposed establishment of a permanent observatory in India.

I am, Sir, very respectfully,
Yours, Sir, very respectfully,
J. D. H. H. H.

I have the honor to acknowledge the receipt of your letter of the 27th inst. in relation to the proposed establishment of a permanent observatory in India.

Fort St George
5 April 1867

Govt. Astronomer.

in which he performs his
duties they will wish to
their views on the
modification of the Indian
Observatory at least
till the present moment
lays down his charge.
The Governor in Council
advocate the maintenance
of the observatory in its
present form, as it is
the position of interest
of science, and a fitting
recognition of the
fact that the Government
person to whom it is
entrusted and with a
view to the incentives
to intellectual creation
and development which
the existence of such
an institution may
offer in a place where
there are few encourage-
ments to studies of
an abstract or
devoted character.

18-12-25

Public 1864 Dependent

18-12-25

at

the day to the front

of the

dated 15th April 1864

for 5387402 of 1864