REPORT OF THE ASTRONOMER ROYAL

TO THE

BOARD OF VISITORS,

Read at the Annual Visitation of the Royal Observatory, Greenwich, June 4, 1842.

THE custom of presenting to the Board of Visitors a written report, embracing generally a statement of those occurrences in the history of the Observatory during the last year, which are not likely to offer themselves in the Annual Inspection, and which do not fully appear in the published volume, appears to be attended with so many advantages, that I beg leave again to offer a report, in nearly the same form as the six which precede it.

1. Grounds and Buildings.—Everything remains in the same condition as at the last Visitation of the Observatory, with only the following alterations:—The vastly-increased business of the Observatory (including the Planetary and Lunar Reductions, and the Magnetic and Meteorological Establishment) making it very desirable that a convenient place for office-work, in easy communication with the assistants generally, and, at the same time, in the immediate neighbourhood of the books and papers most frequently referred to, should be provided for myself: I represented to the Lords Commissioners of the Admiralty the advantage of enlarging the Computing-room, according to a plan which I presented. Their Lordships, although no sum had been provided upon the annual estimates, were pleased to accede to my urgent representation, and the work was immediately dispatched. This transaction occurred in the course of last summer. The great advantage gained will be obvious to the Visitors, who have seen the Computing-room in its present state, and who remember it in its former confined dimensions, when I was compelled to place in my own dwelling apartments all the books and papers which were not actually in use, and were not so old as to be stored away in the Safe-room; and when much time was lost by reference from one room to another.

An alteration has been made in the wall-shutters of the Transit-room and Circle-room. It will be remembered by the Visitors, that Dr. Maskelyne, in one of the volumes of

his Observations, mentions with very great interest the alteration which had then been made in the shutters of the Observing-rooms, to allow a wider opening to be used in observation. When the method of observing by reflexion was introduced by my respected predecessor, it became necessary to provide means of contracting the apertures, in order to prevent the disturbance of the surface of the mercury by strong currents of air; small doors were therefore inserted in the central part of the shutters: it became therefore easy to display the narrow apertures, and troublesome to open the large shutters; and the consequence was, that the large shutters were never opened. I have now made such an alteration, that in the Transit-room the full width only can be used, and in the Circle-room it is easier to use the wide opening than the narrow one. With reasonable care, I trust to obtain the advantages reckoned on by Dr. Maskelyne, retaining the power of protecting the mercury from the wind, which is necessary for reflexion-observations.

The trussed frame, which was erected some years back, for supporting the Ordnance Theodolite above the Octagon-room, resting only on the walls of the Observatory, was found, on examination, to be so much decayed in several important parts, that if occasion for its use should again occur, it would be necessary to take it to pieces for restoration: I have therefore thought it prudent to remove it entirely.

2. Moveable Property in General.—I am not aware that any alteration has been made in this, except the construction of desks, &c., for the large establishment of computers employed on the Lunar Reductions.

3. Manuscripts.—In the last report I stated to the Board, that the whole of the manuscript papers (as far as is known) of the late Board of Longitude, had been collected at the Royal Observatory, and that Mr. Main, my first assistant, was engaged occasionally in arranging them. The severe pressure of business during the last year has prevented the completion of this arrangement, although the first sorting out and cataloguing is very nearly finished. I am happy to state, that in bringing together the two great parcels, the whole of the Minutes of the Board of Longitude have been found; and these, as most precious documents relating to the scientific history of the country, I have at once placed in the Safe-room of the Observatory.

4. Library.—I have no new remark to make respecting the Library. It is maintained generally as an Astronomical and Physical Library, and the books are found extremely useful to the assistants.

5. Instruments.—In my last report, I alluded to the state of the object-glass of the Transit instrument: I have only to add, that as the adjustment of the object-glass was sufficiently good for the most delicate observations which we have to make with it, I have not thought it worth while (under very pressing employment) to take trouble for further adjustments.

The new steel collar, for Jones's second or Cape Circle, has been attached, and the circle has been mounted on the pier of Jones's first circle, and is nearly adjusted in position. I had intended to use it for the observations of the current year; but the adjustment at the beginning of the year was found troublesome (it being found necessary to supply several small parts), and the Observations with Troughton's Circle having been commenced, I have not pressed upon the time of the assistants for the completion of the adjustments of Jones's Circle.

An inspection of the results of the Zenith Tube Observations has convinced me that it will never be possible to obtain results quite satisfactory unless the double observation (in opposite or reversed positions of the instrument) can be made at one transit. I have therefore made some small alterations in its mounting for facilitating rapid observation (the principal novelty, as regards the observation, being that two wires are provided, one for the observation of γ Draconis in each position), and it is found that the double observation can be made without the smallest difficulty. I am not yet able to pronounce on the value of the new observations.

While speaking on Instruments, I beg to call the attention of the Board to a Zenith Sector on a new construction, made on a plan proposed by myself (at the request of Colonel Colby) for the use of the Ordnance Survey, and now mounted on the Magnetic Ground, for trial. The object of its peculiarities of construction is, to obtain general strength of frame, and to retain every facility for making the double observation at each transit.

In the Magnetic Department there are two instrumental points worthy of notice. The first is that, after encountering various difficulties, we have succeeded (by the adoption of a construction proposed by Mr. Baily) in making the insulation of our electrometer wire sufficiently perfect to transmit good indications of the atmospheric electricity. The only electrometer now attached to it is the common pith-ball electrometer, and for powerful electricity probably nothing better can be used. I am, however, in expectation of receiving an indicator of far greater delicacy, procured by the kind offices of Professor Wheatstone: and that, or any other instrument for the same purpose, can now be efficiently tried. The other point is that, having given some attention to the determination of the absolute power of magnetism, and having for this purpose mounted a free declination-magnet in Fitzroy's Observatory for the purpose of clearing our observed deflections from the constant change of magnetic direction, we have found (as has been found by others) that the motions of the two magnets do not correspond. I have, therefore, suspended these observations until a proper box for the vibration of each magnet shall be provided, which shall tend to maintain equality of temperature in the included air. For this purpose I have already constructed for one magnet a double wooden case, each of whose walls is to be covered on both sides with brilliant gilded or lacquered paper.

From some delay in the furnishing of this, I have not been able yet to finish the mounting of the magnets.

6. Observations.—Observations on the stars of the Nautical Almanac List visible in this latitude are always made to such an extent, that (if possible) in any three consecutive years twenty meridional observations of each star, both in A.R. and in N.P.D., may be found. Many of the stars required for clock error or for zenith points are of course observed much more frequently. The Sun, the Moon, and all the Planets, are also observed at every opportunity. Besides these, the lists of objects to be observed are nearly the same as those specified last year, namely, Moon-culminating Stars in the N.A. List, Stars of comparison observed with Equatoreals, Col. Everest's stars, and low circumpolar stars. To these I may add a few stars used by Mr. Sheepshanks in the determination of the longitude of Oxford and Hartwell. With the Equatoreals, the Moon's diameter, and the places of Encke's Comet in its late appearance, have been observed. With the Zenith Tube, γ Draconis has been regularly observed: with the double-image micrometer, diameters of the planets have been occasionally measured: with the detached telescopes, occultations and eclipses have been observed.

The Magnetical and Meteorological Observations differ in no important respect from those made last year. The free-meridional needle, the horizontal-force needle, and the vertical-force needle, the barometer, and the wet and dry thermometers, are observed every two hours, day and night, except on Sundays; the dew-point four times every day; the dipping needle twice each week; circumpolar stars are frequently observed for the meridional verification; two of the three instruments are observed every five minutes on one term-day in each month. Many of these observations are made incessantly when any extraordinary disturbance renders it desirable; and several most surprising magnetic storms have been observed in considerable detail. The anemometer and rain-guages are carefully attended and noted. The electrometer is carefully observed when there is any sign of disturbance.

With regard to the adjustments, it has been found that the attention given last year is not sufficient. The time of vibration of the vertical force magnetometer (upon which the evaluation of its scale entirely depends) altered materially in the year. Measures are now taken for ascertaining much more frequently its time of vibration. Indeed I am fully aware that in these as in all other observations there is nothing which requires so much care as what may be called the *standing adjustments:* and though I cannot engage that all shall be made perfect at once, yet I can engage that any which are once found defective shall from that time be corrected on a regular system.

7. Reductions.—The reductions of the Observations are not so forward generally as I could wish. The Transits are completely cleared off (the results being entered in ledger) to the middle of June 1841, and are in a very advanced state as far as September 1841.

The Circle Observations are completely cleared off (the results being entered in ledger) as far as the middle of May 1841, and great progress is made to the middle of September. Indeed the state of these reductions is not so backward as it might at first appear, because the current observations are now reduced every day or every week to a more advanced point than at any previous time since my residence at the Observatory. Still they are further in arrear than I could desire, and have considerably dropped behind since last year; this circumstance I shall be enabled to explain fully under the general remarks.

The Magnetic Observations of 1841 are entirely reduced (the changes of deviation being expressed in minutes and seconds, and the changes of horizontal force and vertical force in terms respectively of the whole horizontal and vertical forces), but no correction is applied for the effects of temperature. These I do not consider that I can safely determine until the meridional magnets shall be freed from the serious irregularities to which (as above mentioned) they appear to be subject at present. The Meteorological Observations are also fully reduced. Some of the magnetic curves are not yet completed.

8. Printing.—The volume for 1840 has been but very lately received by me. This unusual delay is not a consequence of tardiness in our preparations for Press, for the press has not once been stopped for want of copy. It may be due, in part, to the extent of the volume, or to the arrangement of its subdivisions under different series of paging, upon which the rapidity of the printer's progress materially depends. I shall make it my business shortly to examine into the causes of the slowness of printing, and if possible to prevent their recurrence in the printing of the next volume and the other extensive astronomical work (Planetary Reductions, &c., as well as Magnetical and Meteorological Observations) now in the printer's hands. Two sheets only of the Observations of 1841 have yet been received by me.

In compliance with the suggestion of the Board of Visitors, copies of the most important of the skeleton forms used in the computations made at the Observatory have been bound up with the volume for 1840.

No alteration has been made in the general form of printing, except that the results for stars in A. R. and in N. P. D. have been included in one catalogue.

I have given instructions to the printer to strike off 350 copies of the volume for 1841, as directed by the Board at the last Visitation.

9. Chronometers.—The oppression from Chronometers in the year since the last Visitation has been beyond all precedent. We have usually been pretty free from Chronometers in the autumn; but in the last autumn the demands of the naval service required the immediate purchase of a considerable number of chronometers, and, in consequence, our Chronometer-room has been constantly full. In the present spring, the number of Chronometers on hand for daily rating has been one hundred and seventy; it is now reduced to

about one hundred and thirty. The rating and reporting on these Chronometers occupies very nearly the whole computing time of three assistants.

The abstract of rates of purchased Chronometers, alluded to in the report of last year, has been continued. The digest of the expense of repair has been completed, and is now kept up.

Considerable attention has been paid to the comparison of irregularities in the rates of Chronometers, especially as depending on temperature. Great certainty will be given to all determinations of this nature at the Royal Observatory by the use of a Chronometrical Thermometer (a Chronometer with the laminæ of its compensation bar reversed), suggested and constructed by Mr. R. Molyneux, which gives with the greatest delicacy the summation of the daily or weekly effects of temperature.

An account of constructions, proposed by Mr. Eiffe and Mr. Molyneux, for the correction of Chronometers at extreme temperatures, has been printed under my superintendance. The interest which this inquiry has excited among Chronometer-makers will lead, I am persuaded, to the most beneficial results in the construction of these important instruments.

10. Personal Establishment.—The establishment now consists of six Astronomical assistants, three Magnetic assistants, and an additional computer now employed (for a limited time) with the consent of the Admiralty. Our strength has been much diminished by the long continued and serious illness of one of the chief assistants, and the occasional illness of another. With due allowance for these impediments, I am sure that everything has been done which regularity and zeal could effect.

The establishment of the Magnetic Department, though sufficient when all is going on well, is found to require assistance from the Astronomical Department either in pressure of observations or in the occasional disablement of the magnetic observers. If this establishment be long continued, it will be desirable to add to it another observer.

I have made no allusion in the above enumeration to the computers employed on the Lunar Reductions, their department being kept entirely distinct from the others.

11. Reduction of Ancient Observations.—The Secretary of the Board will probably communicate to the Board a correspondence regarding the printing of the reductions of the Planetary Observations, as suggested by the Board at their last meeting. The result of this correspondence was that the proper sum was inserted in the Parliamentary Estimates of the present year, and that the greater part of the manuscript is now in the printer's hands. Specimens of the mode of printing have been received, but no sheet has actually yet been printed.

Fourteen computers have been employed under the able superintendance of Mr. Breen, for the reduction of the Lunar Observations from 1750 to 1830; and this immense work is now proceeding rapidly. I trust that this comparison of observations uniformly reduced with places calculated on one theory, will be one of no ordinary benefit to Astronomy.

12. General Remark.—I have in one of the preceding articles alluded to the backwardness of our reductions. In those which follow it I trust that I have sufficiently explained it. To say nothing of the loss, from ill health, of the services of most efficient assistants, I am certain that the quantity of current work will amply explain any backwardness. Perhaps I may particularly mention that in the Observations of 1840, there was an unusual quantity of equatoreal observations, and the reductions attending these occupied a very great time. But, as regards myself, there has been another cause. The reduction of the Ancient Lunar and Planetary Observations, the attention to Chronometer constructions, the proposed management of the printing of papers relating to important operations at the Cape of Good Hope; these and similar occupations have taken up much of my time. I trust that I am doing well in rendering Greenwich, even more distinctly than it has been heretofore, the place of reference to all the world for the important observations, and results of observations, on which the system of the universe is founded. As regards myself, I have been accustomed, in these matters, to lay aside private considerations; to consider that I am not a mere Superintendant of current observations, but a Trustee for the honour of Greenwich Observatory generally, and for its utility generally to the world; nay, to consider myself not as mere Director of Greenwich Observatory, but (however unworthy personally) as British Astronomer, required sometimes by my office to interfere (when no personal offence is given) in the concerns of other establishments of the State. If the Board supports me in this view there can be little doubt that the present delay of computations, relating to current observations, will be considered by them as a very small sacrifice to the important advantage that may be gained by proper attention to the observations of other times and other places.

G. B. AIRY.

Royal Observatory, Greenwich, June 4, 1842.