1904.

VICTORIA.

# THIRTY-EIGHTH REPORT

OF THE

# BOARD OF VISITORS

TO

# THE OBSERVATORY;

TOGETHER WITH THE

# REPORT OF THE GOVERNMENT ASTRONOMER

FOR THE PERIOD FROM 1ST APRIL, 1903, TO 31ST MARCH, 1904.

PRESENTED TO BOTH HOUSES OF PARLIAMENT BY HIS EXCELLENCY'S COMMAND.

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# THIRTY-EIGHTH REPORT OF THE BOARD OF VISITORS TO THE OBSERVATORY.

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*To* His Excellency the Honorable Sir Reginald Arthur James Talbot, *Knight Commander of the Most Honorable Order of the Bath, Governor of the State of Victoria and its Dependencies in the Commonwealth of Australia, &c., &c., &c.*

We have the honour to inform your Excellency that we made our annual visitation to the Melbourne Observatory on the 11th inst., and received the Report of the Government Astronomer, which is appended.

From this Report, and from other sources of information, we have ample evidence that the special, as well as routine, duties of the Observatory in all its Departments have been efficiently carried out, and that the instruments and apparatus are in good condition and well cared for.

On the other hand, the condition of some of the buildings, domes, and fences is not so satisfactory, and we consider it necessary for their preservation that some expenditure on painting and general repairs should be allowed.

The sanitary accommodation and drainage are still in a very primitive state. The new out-houses which were built last year, as a necessary improvement, cannot be utilized until the sewerage connexions are completed, and we would urge that these works be carried out as early as possible.

We desire to express our satisfaction at the action of your Excellency's Government in granting £700 for the erection of a new room which is so urgently needed. This sum will provide a laboratory, in which will be located the Standardizing Bureau of Weights and Measures that was lately transferred from the Customs Department to the Observatory, as well as the large apparatus by means of which air-meters can be tested at the Observatory for the Mines Department and the public. We find that the charges which can be made by the Chief Secretary's Department to Municipalities for testing and adjusting authorized copies of standard weights and measures at the Observatory, as fixed by Act of Parliament, are not commensurate with the labour and expense involved in carrying out these operations, and we would recommend that this matter be revised, and a higher scale adopted, in order that adequate compensation may be obtainable by the authorities for this class of Observatory work.

We again have to express our regret that no appointment has been made to the vacant position of Chief Assistant. We consider it a matter of vital importance, both to the present and future welfare of the Observatory, and also to its repute among the Observatories of the world, that this post be filled at the earliest possible date by a young, but thoroughly qualified, Astronomer, who would partly relieve the Government Astronomer of his many routine duties, and who would soon be able, in case of necessity, to take charge of, and efficiently direct, the whole work of the institution.

That such an officer is necessary is clear when we consider the dilemma in which we would be placed should Mr. Baracchi be prevented, by illness or other causes, from attending to his duties, or should he resign. It is still more clear when we consider that the existence of the Observatory, and the cost of its maintenance, can only be properly justified by the additions that are made by its means

to Astronomical knowledge, and that, under existing conditions, the present head is, to a great extent, precluded from devoting his time and energy to Astronomical research, which would greatly enhance the value of his services, and for which the unique position of the Observatory, as one of the most southerly in the world, and its fine equipment, are so suitable.

One other important matter we desire to bring under the notice of your Excellency.

For a number of years the more important work of the Melbourne Observatory, both Astronomical and Meteorological, was regularly published by authority of the Government. In 1895, owing to retrenchment, these publications were limited to the annual Meteorological Statistics; and even these have been stopped since the year 1901. We now find a great accumulation of matter ready for the printer,* in the procuring of which many thousands of pounds have been expended, and which can be of no practical utility until it has been published and distributed. It comprises results of international value which are constantly asked for by Observatories in different parts of the world.

Professor Auwers, of the Berlin Observatory, to whom two lengthy abstracts from the third Melbourne Star Catalogue had recently been sent at his request, wrote suggesting that the records, in which he was interested, should be sent to Europe, where some Astronomical Society would be glad to publish them.

Such a suggestion could not, however, be entertained, for we deem it common fairness that each Government should bear the expense of publishing the work of its own Observatory or Observatories, as is done with the utmost liberality by every civilized country.

We would therefore recommend that the sanction of the Honorable the Treasurer be given for printing the accumulated material referred to above.

In further support of this request we may add that some 500 publications are annually presented to this Observatory from Astronomical and other scientific institutions in every part of the world, for which no return is given.

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* Results of observations in Meteorology and Terrestrial Magnetism for the years 1902 and 1903. Special cloud observations in the years 1896-97, and photogrammetric measurements of cloud. Annual star catalogues and other astronomical observations, 1884-1903. The third Melbourne General Star Catalogue, containing 3,100 stars. The Melbourne Zones—65 deg. to −68 deg. inclusive. Hourly ordinates of some 26,000 day curves of the magnetic elements, comprising the period 1868-1892. Rectilinear co-ordinates of some 300,000 stars of the Astrophotographic Catalogue.

THOMAS R. LYLE, Chairman.
ALFRED DEAKIN.
R. L. J. ELLERY.
THEODORE FINK.
W. C. KERNOT.
A. J. PEACOCK.
J. M. REED.
F. TICKELL.
H. J. WRIXON.

# REPORT ON THE STATE OF THE MELBOURNE OBSERVATORY, AND ON THE WORK DONE DURING THE PERIOD 1ST APRIL, 1903, TO 31ST MARCH, 1904.

Although a sum of £1,000 figures on the Estimates for the financial year, 1903-4, for the erection of a new testing room and necessary repairs to existing buildings, and notwithstanding that I have several times applied to the authorities to have these works carried out, nothing has been done up to the present, in consequence of which I have been unable to make permanent arrangements for the verification of weights and measures, the testing of air-meters, and the installation of two new instruments, viz.:—the Dines pressure tube anemometer, and a maximum wind pressure plate, which arrived from England last year.

No provision has yet been made for proper sanitary accommodation and drainage. The main drive and enclosure around the Astrophotographic buildings are in a bad state, and the domes and fences require general repair and re-painting. Two rooms in the Great Telescope House have been fitted to accommodate, temporarily, the stock of weights and measures, and the apparatus for current verification and adjustment of authorized copies of the standards, including two 40-inch beams. The new strong-room has been fitted with shelving, and an iron safe for the storage of original records and documents, astronomical negatives, and the State primary standards of weights and measures. This room is fire-proof, and perfectly suitable for the purpose. Shelves for books have been erected on the eastern wall of the board-room. Shelves and cases for books and instruments have also been erected in the chronometer room, store-room, and two other rooms formerly occupied by the caretaker.

*Instruments.*—The whole instrumental equipment is in good working order. Mr. C. Otto, the mechanician to the Observatory, has attended to all necessary repairs, alterations, and work required by the instruments, excepting time-keepers. He has also constructed in the Observatory workshop, a comparator for verifying standard yard measures, and a large balance, with 41-inch beam, for the comparison and adjustment of authorized copies of large standard weights. This balance is adjusted to show a difference of only a fraction of a grain when loaded with any weight up to 56 lbs. avoirdupois in each pan.

Three other balances of precision have been purchased, one by Paul Bunge, of Hamburg, for loads not much greater than 1 lb. avoirdupois, sensitive to ·01 grain. One by F. Sartorius, of Göttingen, for weights up to 8 lbs avoirdupois, sensitive to 0·1 grain, and another by F. Sartorius, of Göttingen, for weights below 400 grains, adjusted to turn with ·001 grain. A stereo-comparator, by the firm of Carl Zeiss, of Jena, was obtained, chiefly for the purpose of measuring the Melbourne pairs of cloud photographs taken simultaneously from two stations, about one mile apart, with the object of determining the height and velocity of clouds, and so far I have employed the instrument only in this class of work, for which I have found it admirably suitable and convenient; but it seems to be also applicable to various studies of stellar photographs, and may possibly be of the greatest service to us in facilitating future investigations based on the examination and comparison of our astrophotographic plates. A new apparatus for registering the maximum pressure of wind was made for us by Adie, of London, under the supervision of Dr. Chree, and reached Melbourne last July. As I have already pointed out, this instrument cannot be permanently mounted until the new testing-room is erected by the Public Works.

Seventy (70) rain-gauges and a few other minor appliances were purchased in the course of the year.

Towards the end of last December I went to Sydney to take charge of a new instrument, designed by Mr. H. C. Russell, and constructed under his supervision in the workshop of the Sydney Observatory, for the measurement of astrophotographic plates. A description of this instrument is given by Mr. Russell in the monthly notices of the R.A.S., of November, 1902. It differs from existing types of machines employed for this kind of work in the principle of its measuring micrometer. This principle consists in causing the movements of two ordinary micrometer slides (at right angle to each other, each carrying a pair of close parallel wires), not by means of the usual micrometer screws with divided heads, but by the rotation of two cylinders (one for each slide), around each of which winds a fine steel band, similar to a watch spring, having one of its ends fastened to the cylinder, and the other to the slide. The amount of rotation of the cylinders and corresponding displacement of the wires is read off on large graduated circles which turn with the cylinders. I find, so far, that measurements are made with this machine very quickly, but, until further experience has been gained, especially in regard to permanency of the adjustments, no definite opinion can be given as to its relative merits in comparison with other existing machines.

*The Staff.*—There have been no changes in the permanent staff since the date of my last report.

In the temporary staff the following changes have occurred, viz.:—

Computers employed in the reduction of the magnetic records—

A. E. Gorham, resigned on 22nd April, 1903.

A. Maguire obtained a permanent position in the Federal Service, after a successful examination, and left the Observatory on 30th June, 1903.

C. Otto, junior, was employed on probation from 13th July to 19th September, 1903. He was not kept on, as he did not exhibit sufficient aptitude for the work.

The following appointments were made during the first quarter of the current year, viz.:—

G. Woodhouse entered upon his duties 14th January, 1904.
R. S. Browne ,, ,, ,, ,, 4th February ,,
H. Exley ,, ,, ,, ,, 21st March ,,
L. R. Quayle ,, ,, ,, ,, 21st March ,,

The only change in the Measuring Bureau is the resignation of Miss L. E. Lewis, which took place on 30th June, 1903.

The subjoined list gives the name and position of all persons employed at the Observatory at the end of the period covered by the report, viz. :—

PERMANENT STAFF.

| | |
|---|---|
| Chief Assistant ... ... ... ... | Vacant. |
| Assistant Observer and Computer ... ... | Mr. W. J. SWAN. |
| Assistant Observer and Computer ... ... | Mr. E. T. QUAYLE, B.A. |
| Assistant Observer and Computer ... ... | Mr. W. J. WALLACE. |
| Meteorological and Photographic Assistant... ... | Mr. F. KEMP. |
| Meteorological and General Assistant ... ... | Mr. F. N. INGAMELLS. |
| Weather Telegraph Clerk ... ... ... | Mr. D. HODGE. |
| Clerk ... ... ... ... ... | Mr. J. T. CURTAIN. |
| Assistant Computer ... ... ... ... | Miss C. E. PEEL. |
| Caretaker, also acting as Clerk ... ... ... | Mr. J. J. MANNIX. |
| Senior Messenger and Mechanical Attendant ... | Mr. J. BYRNE. |
| Office Cleaner ... ... ... ... ... | A. E. ANNISS. |

TEMPORARY STAFF.

Messrs. J. Moroney, G. Macgowan, G. Woodhouse, R. S. Browne, H. Exley, and L. R. Quayle, employed in the reduction of arrear magnetic records.

Miss E. Sheldon and Miss R. Rayson, employed in the measurement of astrophotographic plates for Melbourne and Sydney.

Mr. J. H. McDonogh, of the Government Statist's Office, relieved Mr. F. N. Ingamells during the latter's absence from duty for nine weeks, owing to sickness.

Mr. H. J. R. Laurence was occasionally engaged in astronomical computations.

Mr. C. M. Otto was continuously employed as instrument maker.

Mr. R. Vaughan has attended daily to the dropping of the time-ball, and to the self-registering tide-gauge at Point Gellibrand (Williamstown).

A gardener and a charwoman have been employed as in previous years.

There are also eleven meteorological observers who receive an annual bonus of £10, and honorary observers and rainfall recorders under the control of the Observatory.

WORK DONE.

*Meridian Observations.*—These were made with the 8" Transit Circle, and are as follow :—

| | Observations in— | | Observations for— | |
|---|---|---|---|---|
| | R.A. | N.P.D. | | |
| Azimuth stars ... ... | 283 | 81 | Collimation ... | 87 |
| Clock stars ... ... | 452 | ... | Level... ... | 82 |
| List stars ... ... | 1,162 | 1,161 | Nadir... ... | 80 |
| Cape stars ... ... | 440 | 443 | Runs ... ... | 37 |
| | | | Flexure ... | 17 |
| | 2,337 | 1,685 | | |

The list stars were, as in previous years, selected from the plates of the Astrophotographic Catalogue, to serve as fundamental stars for the reduction of these plates. The total number of this class of stars now completely observed three times or more, is 4,533.

The Cape stars complete the series of zodiacal stars selected by Sir David Gill for Heliometer comparison with the major planets at opposition in the years 1902, 1903, and 1904, the observations of which were commenced in January, 1902.

*Reductions.*—The annual catalogue for 1902, and the separate results for 1903, both in R.A. and N.P.D., have been completed.

The current reductions are well advanced.

ASTROPHOTOGRAPHIC OPERATIONS.

The following table gives the numbers of negatives obtained during the year :—

| | Passed as satisfactory. | Rejected. |
|---|---|---|
| Chart plates with three exposures of $3^m$ each ... | 142 | 24 |
| Catalogue plates, duplicate series ... ... ... | 62 | 4 |
| Test plates on South Polar Region ... ... | 42 | ... |
| Test plates on Oxford Type Regions ... ... | 11 | ... |
| Plates for Trails, adjustment of Centre, &c.... ... | 27 | ... |

The total numbers of regions photographed and passed as satisfactory up to 31st March, 1904, are as follow:—

Catalogue series, 1,149 plates—complete.
Second catalogue series, 403 plates.
Chart series with single exposure of 60m. each, containing all regions in the Melbourne Zone, with centres at even degrees of declination, 565 plates.
Chart series with triple exposures of 30m. each, with centres at odd degrees of declination, 402 plates.

*Measurement of Astronomical Plates (Catalogue Series).*—This work was carried on as in previous years by the Measuring Bureau, which is maintained at the joint expense of the Governments of New South Wales and Victoria. The Bureau has been considerably reduced since 31st March, 1903, but it is intended to again increase its strength shortly.

The work done during the year is as follows:—

Plates completely measured—
15 Sydney plates, containing 6,751 stars.
160 Melbourne plates, containing 47,838 stars.

The total numbers of complete measures are—
239 Sydney plates, containing 137,812 stars.
522 Melbourne plates, containing 151,343 stars.

*Time Service.*—The time-ball at Williamstown Lighthouse was dropped on 299 days at 1h. 0m. 0s. Victorian statute time, corresponding to 3h. 0m. 0s. a.m. Greenwich time. It failed on two occasions, owing to faults on the line. Time signals were also supplied on week days to the Melbourne Post Office, and thence to all telegraph stations in Victoria; also to railways, tramways, and public buildings.

*Weather Service.*—This service has been continued practically under the same system and conditions as in previous years. There have been 48 rainfall stations, 3 barometer stations, and 1 temperature station newly established during the year.

The total numbers of stations existing at present under the official weather service are as follows, viz.:—

One first order station, Melbourne Observatory.
Thirty-one second order stations, equipped with barometer, full set of thermometers, wind vane, and rain gauge, making three observations daily at 9 a.m., 3 p.m., and 9 p.m.
Forty-two third order temperature stations, provided only with thermometers and rain gauges, making one observation daily at 9 p.m.
Seven hundred and forty-eight rainfall stations provided with rain gauges only.
Thirty-nine wind and weather stations, not provided with instruments, sending daily reports by telegraph.

*Terrestrial Magnetism.*—The photographic registration of the magnetic elements has been carried on as usual, and absolute observations have been made twice in each month. The programme for special magnetic and meteorological observations, as laid out by the Anglo-German Committee appointed by the Geographical Congress of Berlin in 1899 in connexion with Antarctic exploration, in which this Observatory was asked to co-operate, was further extended to April, 1904, owing to the detention of the exploring ship *Discovery* in the Antarctic ice to the end of 1903. Our share of the work was duly carried out as requested.

Further progress has been made in the measurement and reduction of the magnetic curves of past years since 1868.

The numbers of day-curves measured and reduced are as follows:—

| | |
|---|---|
| Declination ... ... ... ... ... | 625 |
| Horizontal component ... ... ... | 728 |
| Vertical component ... ... ... ... | 728 |
| Total ... ... ... ... ... ... | 2,081 |

The total number of curves measured up to 31st March, 1903, is 29,722, covering the period 1868-94. I hope that this work will be completed and published, probably within the next two or three years.

*The Seismograph.*—The photographic registration of seismic disturbances by this instrument has been continued throughout the year, with very few and short interruptions, occasioned by cleaning, adjusting, and repairs to driving clock. Since 1st April, 1903, some 50 earthquakes have been recorded, several of which are relatively of considerable intensity, and correspond to the occurrence of severe earthquakes reported from distant parts of the world.

*Tides.*—The self-registering tide-gauge has been continuously in action at Point Gellibrand (Williamstown), with an interruption of only a few hours, when the wells and apparatus were cleaned.

The monthly returns of tide observations made at Point Lonsdale, Geelong, and South Channel Pilot Light have been regularly supplied to the Observatory during the whole year.

*Rating of Chronometers, Testing Meteorological, Nautical, and Surveying Instruments for the Public.*—This part of the Observatory duties has been carried on as usual.

The frequent testing of air-meters with the whirling machine, which is still at the model room of the Engineers, has caused considerable inconvenience and waste of time.

## Weights and Measures.

During the year authorized copies of standard weights and measures and weighing apparatus were re-issued to thirty (30) Municipalities, in accordance with the *Weights and Measures Act* 1890. This involved the verification and adjustment of twenty-nine (29) yard-measures, 495 avoirdupois weights, ranging from 56 lbs. to 1 dram; 504 troy weights, ranging from 100 ounces to 1 grain; 310 measures of capacity, ranging from the bushel to $\frac{1}{2}$ gill; and the repair, adjustment, and test of 35 inspectors' balances. This work was carried out under great difficulties and inconvenience for want of room, and consequent imperfect installation of the testing instruments.

## The Library.

The books added to the Library during the period 1st April, 1903, to 31st March, 1904, are as follow:—

172 books, 540 pamphlets, and 56 periodicals were presented to the Melbourne Observatory by British, Colonial, and foreign institutions, and private persons.
19 books and 17 periodicals were purchased.
74 volumes were bound by the Penal Department and 5 by the Government Printer's Department.

The urgent necessity of re-organizing the Library, which had for years drifted into a state of hopeless confusion, owing to a great extent to want of room, was mentioned in my last report. In July, 1903, I obtained authority to employ Mr. Boys, an officer of the Public Library of Melbourne, to put our Library in order. We have now sufficient accommodation for the books, and Mr. Boys, with the assistance of some of the Observatory officers who could be occasionally spared from other duties, has catalogued them according to the system employed in the Public Library. Under this system separate cards have been written for the author of each book, and also for each subject. All the cards are arranged alphabetically in one alphabet, so that the whole catalogue may be easily consulted as a dictionary. The cards for new books may in this way be added to the catalogue without disturbing the arrangement. The books have also been classified under well-defined subject-headings, and arranged alphabetically by authors under each subject. I expect that this work will be completed, including pamphlets and papers, by the end of next August.

*Visitors.*—Two hundred and eighty-seven persons visited the Observatory in day-time, and 107 at night.

Professor Hussey, of the Lick Observatory, who spent some time in Australia last year in search of a suitable climate for astronomical observations on behalf of an American Committee of Astronomers, who propose to instal a temporary observatory for special research, and Professor Klotz, of Canada, who carried out Longitude determinations along the route of the new cable between Vancouver and Australia, honoured this Observatory with several visits. I would have been glad, indeed, to offer Professor Hussey all accommodation and assistance he may have required at our Observatory had the atmospheric conditions of Melbourne been more favorable for his special purposes than they unfortunately are.

P. BARACCHI.

Melbourne Observatory,
April, 1904.

**By Authority:** Robt. S. Brain, Government Printer, Melbourne.