1905.

VICTORIA.

# THIRTY-NINTH REPORT

OF THE

# BOARD OF VISITORS

TO

# THE OBSERVATORY;

TOGETHER WITH THE

# REPORT OF THE GOVERNMENT ASTRONOMER

FOR THE PERIOD FROM 1ST APRIL, 1904, TO 31ST MARCH 1905.

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

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# THIRTY-NINTH 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 27th April last, 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 the routine, duties of the Observatory in its different departments have been carried out as efficiently as it was possible for the present limited staff to perform them.

Although we have in several previous Reports drawn Your Excellency's attention to the great necessity of filling the vacant post of Chief Assistant, no action has been taken in the matter. We consider it a matter of vital importance both to the present and future usefulness of the Observatory, that this post should be filled at once by a young, but thoroughly qualified, astronomer.

Without such an Assistant to relieve Mr. Baracchi of a portion of the routine scientific work of the Observatory, it is impossible for him to find time to devote to astronomical research. The unique position of the Observatory, as the most southerly in the world, and its fine equipment, render it specially suitable to play a part in the advancement of astronomical knowledge, and the liberal expenditure, in years gone by, on its equipment is not bearing the fruit we feel it certainly would do if properly manned.

Apart from this consideration, there is no one at present available to carry out Mr. Baracchi's duties at the Observatory, should necessity arise.

We desire to express our gratification at the completion of the additional buildings recommended by us in 1901.

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

# REPORT ON THE STATE OF THE MELBOURNE OBSERVATORY, AND ON THE WORK DONE DURING THE PERIOD 1ST APRIL, 1904—31ST MARCH, 1905.

*Buildings and Grounds.*—A new spacious room has been erected at the southern end of the Great Telescope House, which is to be utilized as a general testing-room, but more particularly for testing air-meters with the whirling apparatus, and for the verification of Standard weights and measures.

This room completes the additional building accommodation recommended by the Board in 1901.

The Balance-room has been renovated. Fireproof shutters have been fixed to the windows of the old strong-room under the North Equatorial Telescope. The domes of the Astrophotographic Telescope and Photoheliograph, and the roofs of the Prime-vertical Room and Absolute-Magnet House have been repaired and repainted. Outside blinds have been added to the western windows of the offices. The electric-light service, which was introduced in the Observatory some fourteen (14) years ago, had become worn and out of date, and the City Council's inspectors condemned it. This necessitated a renewal of all the fittings and total re-wiring, in accordance with modern regulations, which work was done and satisfactorily completed last month.

A new path leading to the western entrance of the Great Telescope House has been made, and the grounds have been generally improved by the addition of new flower-beds and plantations, especially around the new buildings. The existing paths have been re-asphalted.

Among the works still required, the following are considered urgent:—

Structures for new wind-recording apparatus.
Sewerage connexions and fittings.
Repairs to the roof of the main buildings.
Repairs and painting of fences.
Work on the main drive.
Painting of the Astrophotographic Houses.

*Instruments.*—The usual work of cleaning and keeping the instrumental equipment of the Observatory in good order was done by Mr. Otto. The alterations and repairs effected were unimportant.

The new instruments purchased were chiefly in connexion with the weather service, and are as follows, viz.:—

100 Rain-gauge measures.
50 8-inch standard rain-gauges.
2 Thermographs.
5 Thermometers.
1 Aneroid.
6 Stevenson's screens.

A laboratory spectroscope, a Brown Boveri ½-horse-power motor for the whirling machine, and a few small appliances were purchased.

*The Permanent Staff.*—No changes have occurred in the permanent staff, nor in the duties allotted to any of the persons permanently employed. It consists as follows:—

| | |
|---|---|
| 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. A. INGAMELLS. |
| Weather Telegraph Clerk ... ... ... | Mr. D. HODGE. |
| Clerk ... ... ... ... ... ... | Mr. J. T. CURTAIN. |
| Assistant Astronomical Computer ... ... ... | Miss C. E. PEEL. |
| Caretaker, also acting as Clerk ... ... ... | Mr. J. J. MANNIX. |
| Senior Messenger and Mechanical Attendant ... ... | Mr. J. BYRNE. |
| Office Cleaner ... ... ... ... | Mr. A. E. ANNISS. |

*The Temporary Staff.*—Two sets of persons have, as in previous years, been temporarily employed. One set consists of young ladies, who are engaged in the measurement of the plates of the astrophotographic catalogue, and constitutes the Astrophotographic Measuring Bureau, which is maintained at the joint expense of the States of New South Wales and Victoria. The other set consists of young men, who are engaged by contract, to measure and reduce the hourly ordinates of some 40,000 photographic daily traces of the magnetic elements, which have been accumulating during the last thirty-seven years.

For this latter work, lads are usually taken on trial on the recommendation of some head of a public school, until they are found efficient for the work.

For the Measuring Bureau, the ladies are required to pass an examination in trigonometry and logarithmic computations, and to show fitness and aptitude for micrometric measurements.

Since the beginning of 1904, it was decided by the Public Service Commissioner, at my suggestion, that in these examinations, which were formerly conducted entirely by myself, two other examiners should be associated with me, and take some share of responsibility in selecting the most suitable candidates for appointment. Professor Lyle and the Surveyor-General, Mr. Reed, were asked, and kindly consented to act in this capacity, and have since done so. Three examinations have been held during the last twelve months, at which five candidates were found sufficiently qualified, and received appointment on our joint recommendation.

These are:—

Miss E. Watts, appointed 26th April, 1904;
Miss B. C. Scott, appointed 9th May, 1904;
Miss M. C. Greer, appointed 9th May, 1904;
Miss A. Alexander, appointed 31st January, 1905;
Miss I. Trigge, appointed 31st January, 1905.

Other changes which have taken place during the last twelve months are as follow:—

Miss R. Rayson, resigned 30th September, 1904;
Mr. G. Macgowan, resigned 22nd September, 1904;
Mr. L. R. Quayle, resigned 4th January, 1905;
Mr. H. M. Parke, appointed 6th February, 1905.

The Temporary Staff now consists of—

For the Measuring Bureau—
Miss E. Sheldon,
Miss E. Watts,
Miss B. C. Scott,
Miss M. C. Greer,
Miss A. Alexander,
Miss I. Trigge.

For the Magnetic Reductions—
Mr. J. A. Moroney,
Mr. R. S. Browne,
Mr. G. Woodhouse,
Mr. H. J. Exley,
Mr. H. M. Parke.

*Other Employés.*—Mr. C. Otto has been continuously engaged since my last report as instrument maker.

Mr. R. Vaughan has continued to be in charge of the tide-gauge and time-ball tower at Williamstown.

A gardener and a charwoman have been employed as usual.

In conexion with the Weather Service, there are still ten observers at light-houses, who receive a bonus of £10 a year, and 882 voluntary observers at country stations, under the control of the Observatory.

*The Work.*—The astronomical work has been confined almost entirely to meridian observations and Stellar photography. Only occasional observations have been made with the Great Telescope and the 8-inch South Equatorial for the same reasons I have often given in former reports, namely, that the routine occupations of the present staff, the want of a Chief Assistant, and the increasing demand on our time for local public requirements, make it impracticable to undertake any systematic use of these instruments.

Astrophotographic operations, and other ordinary Observatory duties, have been considerably interfered with during the past year, by the prolonged absence of three officers, owing to sickness. Mr. Wallace was absent for over two months, Mr. Ingamells for three months, and Miss Peel is still away on a four months' leave.

*Meridian Observations.*—These have been invariably made with the 8-inch transit circle, and are shown in the table below:—

| Stars. | Observations in — | | Observations for— | |
|---|---|---|---|---|
| | R.A. | N.P.D. | | |
| Azimuth stars ... ... | 344 | 87 | Collimation ... | 93 |
| Clock stars ... ... | 565 | ... | Level... ... | 90 |
| List stars ... ... | 1,349 | 1,355 | Nadir... ... | 88 |
| | | | Runs ... ... | 41 |
| Totals ... ... | 2,258 | 1,442 | Flexure ... | 14 |

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 4,933.

The annual catalogue for 1903 has been prepared, and the separate results for 1904 have been completed.

The *Fourth Melbourne General Catalogue* for the epoch 1900, being intended to include all the stars which are to be used for the reduction of the astrophotographic plates, cannot be definitely constructed until all the observations have been made, but the places of the stars which have been already observed three times have been reduced to the epoch of the catalogue, and other preliminary computations are being carried out as far as practicable, so that it is hoped that the completion of the catalogue will not be delayed long after the completion of the observations.

*Astrophotographic Operations.*—The table below gives the number of negatives obtained during the past twelve months:—

| | Passed as satisfactory. | Rejected. |
|---|---|---|
| Chart plates with triple exposures of 30m each ... | 99 | 6 |
| Catalogue plates, duplicate series ... ... ... | 54 | 2 |
| Test plates on South Polar Region ... ... | 30 | ... |
| Test plates on Oxford Type Regions ... ... | 9 | ... |
| Plates for Trails, adjustment of Centre, &c.... ... | 22 | ... |

The total number of regions photographed and passed as satisfactory up to 31st March, 1905, is as follows:—

Catalogue series, 1,149 plates. Complete.
Second catalogue series, 455 plates.
Chart series, with single exposure of $60^m$, containing all regions in the Melbourne zone, with centre at even degrees of declination, 565 plates. Complete.
Chart series, with triple exposure of $30^m$ each, with centres at odd degrees of declination, 495 plates.

*The Work of the Measuring Bureau.*—The measurement of plates of the *Astrophotographic Catalogue* of the Sydney and Melbourne zone has been continued during the last twelve months, using principally the two measuring instruments made by the Repsolds, on the plan of Sir David Gill, occasionally the micrometric machine made at Sydney, on the plan of Mr. H. C. Russell, and those made at this Observatory, have been employed for experimental purposes and training. The work of the year consists in the complete measurement of the rectilinear co-ordinates of—

78 Sydney plates, containing in the aggregate ... ... 39,257 stars
90 Melbourne plates, containing in the aggregate ... ... 55,261 stars.

The total number of plates measured, to 31st March, 1905, are as follows:—

317 Sydney plates, containing in the aggregate ... ... 177,069 stars
612 Melbourne plates, containing in the aggregate ... ... 206,604 stars.

*Terrestrial Magnetism.*—The magnetographs have been continuously at work, and the usual absolute measurements of the magnetic elements have been made for standardizing the photographic curves. The interruptions caused by accidental failure of the lights or re-adjustment amounted in the aggregate to three hours.

Further progress was made in the important task of measuring and reducing the long series of magnetic curves extending thirty-seven years back.

The curves measured covered the years 1896, 1897, 1898, 1899, 1902, and 1903, and parts of the years 1895 and 1904. Their total number is 7,490, of which—

2,356 are curves for declination,
2,528 are curves for horizontal component,
2,606 are curves for vertical component.

The total number of day-curves measured up to 31st March, 1905, is 37,212.

The number of curves still remaining to be measured is under 3,000. These will be completed in the course of a few months, after which it is intended to deal exhaustively with the magnetic disturbances, and to commence the preparation of the whole work for publication.

The reductions of magnetic records taken during the years 1902-1904 in connexion with Antarctic Exploration are well advanced, and will shortly be transmitted to the Royal Society of London, to be dealt with as a part of the programme laid out at the Geographical Congress held in Berlin in 1899.

In May and June of last year, Professor Dr. Otto Hecker, of the Prussian Geodetic Institute, spent some time at the Observatory for the purpose of making observations of gravity and terrestrial magnetism. I took the opportunity of comparing his instruments with ours, by making series of observations with both sets of apparatus. Professor Hecker was provided with an earth-inductor, for determining magnetic dip; with this instrument the dip can be determined in less time, and with far greater accuracy than is possible to obtain with the ordinary dip circles, and so great is its superiority and convenience that I felt justified in asking for authority to order one, which was done, and I hope to receive the instrument shortly.

*Time Service.*—The time-ball was dropped at Williamstown on week days at $1^h.\ 0^m.\ 0^s.$, standard Victorian time, corresponding to $3^h.\ 0^m.\ 0^s.$ a.m., civil Greenwich time. There were eleven failures, due in most cases to defects on the line outside the Observatory.

Time signals were also supplied as usual to all telegraph stations in the State, and to the Railways. In the winter, the Postal Department carried on experiments in connexion with the Observatory to test the practicability of extending the time signals at 1 p.m. to all telephone subscribers by short automatic rings of the telephone bells. The system was found to work quite satisfactorily.

*Seismological Records.*—A continuous photographic record of earth-tremors has been kept throughout the period under review, by means of the Milne Horizontal Pendulum Seismograph, with the exception of a few short interruptions, amounting in the aggregate to 139 hours, caused by repairs and re-adjustments of the instrument, and some accidental failures of the driving-clock.

Eighty-seven disturbances were recorded, some of which are very probably connected with distinct earthquakes, including that which occurred in India recently.

*Weights and Measures.*—Authorized copies of standard weights and measures were issued, after verification and adjustment, including eighty-seven weights, thirty measures of capacity, and three yard measures.

Twenty-four (24) balances and other weighing apparatus were tested, repaired, and adjusted in the workshop of the Observatory, for the Customs Department, and Victorian Municipalities.

*Weather Service.*—This service has been continued practically under the same system and conditions of previous years. There have been 31 rainfall stations, 2 temperature stations, and 1 second class barometer station newly established. The total number of stations existing at present under the control of the Observatory are as follows, viz.:—

One first order station, Melbourne Observatory.
Thirty-two second order stations, equipped with barometer, full set of thermometers, wind vane, and rain gauge, making three daily observations, at 9 a.m., 3 p.m., and 9 p.m.

Forty-two third order stations, provided only with thermometers and rain gauge, making one daily observation, at 9 a.m.

Seven hundred and seventy-nine simple rainfall stations.

Forty wind and weather stations, sending daily telegraphic reports, not provided with instruments.

The usual weather forecasts have been issued regularly on all week days, at 1 p.m. and at 6 p.m.

Climatological statistics were supplied periodically to the Government Statist, and to the *Journal of Agriculture*.

Maps were compiled at the request of the Lands Department, showing climatological data for each square degree of the State, for insertion in the *Victorian Settlers' Guide*, recently issued.

*Tides.*—The self-registering tide-gauge has been in continuous action at Point Gellibrand, Williamstown.

Tide observations were made throughout the year at Point Lonsdale, Geelong, and South Channel Pilot Light, and the results have been regularly supplied to the Observatory.

The usual routine duties of rating chronometers, testing air-meters, meteorological, nautical, and surveying instruments for the public were carried on as usual.

*The Library.*—The new card catalogue of the Observatory library has now been arranged in a suitable cabinet, specially made, and is gradually approaching completion.

The task of cataloguing loose scientific papers and pamphlets is well advanced.

The new additions to the library since my last report are as follows:—

| | | | |
|---|---|---|---|
| Books presented ... | ... 132 | Books purchased ... | ... 35 |
| Pamphlets presented | ... 275 | Periodicals purchased | ... 17 |
| Periodicals presented | ... 62 | | |

Also 256 stellar charts, forming part of the English, French, and Spanish zones of the International Photographic Chart of the Heavens.

*Visitors.*—Four hundred and six visitors were received during the year, mostly on Wednesday afternoons.

In January last, the Hon. the Premier asked for information in regard to the cost of the buildings, equipment, and maintenance of the Observatory, and the estimated value of the land reserves for Observatory purposes. The following figures were supplied to him:—

| | |
|---|---|
| 1. The present annual cost of the Department ... ... | £4,365 |
| 2. The value of the land ... ... ... ... ... | 30,000 |
| 3. Value of buildings ... ... ... ... ... | 15,800 |
| 4. Value of the equipment, library, and furniture ... ... | 24,500 |

The Observatory enclosure occupies an area of 6 acres, 2 roods, 30 perches, and the land occupied by the Observatory quarters is about 1½ acres. On the advice of the Surveyor-General, its value has been estimated on the basis of £20 per foot, if cut up and sold in residential allotments.

The value of the buildings was supplied by the Public Works Department.

Although the above account shows that the work in hand is advancing towards completion, I must point out that if we are not to remain intolerably behind other co-operating observatories, quicker progress, as well as a considerable amount of extra expenditure for the reproduction, in double size, of the chart plates will be required.

I see no prospects of increasing the present working speed, under existing conditions, and it may be necessary to make some radical changes, or to obtain one or two additional observers.

I do not think it advisable, however, to make any definite proposals in regard to this at present, owing to the uncertainty now existing as to the future control of the Australian Observatories, as it is very probable that any demand for increased expenditure, or changes, would not receive the consideration of the authorities, until it has been decided whether these institutions are to be taken over by the Commonwealth Government.

P. BARACCHI.

Melbourne Observatory,
April, 1905.

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