

1913.

VICTORIA.

FORTY-FIFTH REPORT

OF THE

BOARD OF VISITORS

TO

THE OBSERVATORY;

TOGETHER WITH THE

REPORT OF THE GOVERNMENT ASTRONOMER

FOR THE PERIOD FROM 1ST SEPTEMBER, 1911, TO 31ST DECEMBER, 1912.

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

By Authority

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FORTY-FIFTH REPORT OF THE BOARD OF VISITORS TO THE OBSERVATORY.

*To HIS EXCELLENCY SIR JOHN MICHAEL FLEETWOOD FULLER, Baronet, Knight
Commander of the Most Distinguished Order of Saint Michael and Saint
George; Governor of the State of Victoria and its Dependencies in the
Commonwealth of Australia, &c., &c., &c.*

We have the honour to report to Your Excellency that we made our customary visitation to the Observatory on 22nd January, 1913, and received the Report of the Government Astronomer, which is attached hereto.

We found the grounds and buildings in a satisfactory condition with the same exception to which we have referred in several former Reports, namely, the sewerage necessity, and to which we are forced to refer again with a renewed recommendation that provision be made by the Government to have this very necessary work done.

We found also that the instrumental equipment of the Observatory has been maintained in good working order and that the Astronomical work and the usual public duties of the institution have been satisfactorily carried out.

Our attention has been directed to the probability that in the near future the present site of the Observatory will be rendered unsuitable for a continuation of its magnetic work by the extension of electric tramways.

In view of the importance of our magnetic station, which, being the only one in existence in Australia, is indispensable in all investigations now in course in Europe, in America, and elsewhere for the improvement of our knowledge of Terrestrial Magnetism and the greater safety of navigation, we have no hesitation in recommending that means and facilities be provided by the Government to enable the magnetic station of the Observatory to be removed to some locality beyond the suburban area, where it may be reasonably expected that the continuous registration of the magnetic elements will not be subject to the disturbing effects of electric tramways.

THOMAS R. LYLE, Chairman.

W R. CRESWELL.

A. J. PEACOCK.

ALFRED DEAKIN.

THEODORE FINK.

J. M. REED.

CHARLES A. TOPP.

A. W. CRAVEN.

REPORT ON THE STATE OF THE MELBOURNE OBSERVATORY AND ON THE WORK DONE DURING THE PERIOD 1st SEPTEMBER, 1911—31st DECEMBER, 1912.

Buildings and Grounds.—Some urgent repairs to the roof of the main building and to the floor of the Laboratory have been done, but the sewerage and sanitary accommodation still remain incomplete. The general repainting recommended by the Board in its last Report will very probably be carried out before the end of the current financial year.

The state of the grounds is satisfactory.

The Equipment.—An Evershed Solar Spectroscope by Hilger, a 1-metre Cathetometer, and some minor laboratory appliances were obtained early in the year. With the exception of the Great Reflector, the mirrors of which require repolishing, the Instrumental Equipment of the Observatory has been maintained in good working order.

The Staff.—The permanent staff remains the same as at the date of my last Report, viz. :—

Mr. J. M. Baldwin, M.A.	..	..	Chief Assistant.
Mr. C. J. Merfield	..	..	Assistant Observer and Computer.
Mr. F. Kemp	..	..	Meteorological and Photographic Assistant.
Mr. J. J. Mannix	..	..	Meteorological and General Assistant.
Mr. J. A. Moroney	..	..	Junior Assistant Observer and Computer.
Mr. G. H. Woodhouse	..	..	Junior Assistant Observer and Computer.
Miss C. E. F. Peel	..	..	Assistant Computer.
Mr. T. R. Sorrell	..	..	Clerk.
Mr. J. Byrne	..	..	Senior Messenger and Mechanical Attendant.
Mr. A. Chamberlain	..	..	Office Cleaner.

In the temporary staff of the Measuring Bureau the following changes took place :—

Miss E. Sheldon went on three months' leave without pay from 1st December, and resigned her position at the expiration of that period.

Miss M. A. Browne resigned on 9th March, 1912.

Miss C. Frayne resigned on 14th December, 1912.

Miss G. M. Moore resigned on 24th December, 1912.

An examination was held on 15th May, 1912, for applicants to fill vacant positions, which was attended by only one candidate, namely, Miss Winifred Appleton, who passed successfully the required tests, and was appointed on 1st June, 1912, to the position rendered vacant by the resignation of Miss N. E. McKay on 28th February, 1911.

The changes which occurred in the temporary staff of the Magnetic Department were as follow :—

Mr. F. Jenkin resigned on 7th October, 1911.

Mr. P. H. Wallace resigned on 28th December, 1911.

Messrs. W. H. G. Liebert, W. J. Johnson, and E. F. Murnane joined the Magnetic Staff on 14th, 22nd, and 25th March, 1912; but Messrs. Murnane and Johnson resigned on 15th October and 16th December, respectively.

Mr. E. A. Wood has been on trial since 23rd December in order to ascertain his fitness for the position rendered vacant through the resignation of Mr. Murnane. I expect to get another lad soon to replace Mr. Johnson.

The full list of persons who are at present temporarily employed at the Observatory is as follows :—

Mr. G. F. Johns	..	..	Assisting in Astrophotographic work.
Mr. C. M. Otto	..	..	Instrument-maker.
Mr. G. A. T. Sangster	..	..	Employed in clerical and library duties.
Mr. W. H. G. Liebert	}	..	Reducing Magnetic records for publication.	
Miss N. J. Moroney		..		
Mr. E. A. Wood		..		(On trial).
Miss W. Appleton		..		Measuring and reducing plates for the Astrophotographic Catalogue.

In addition to the above, Mr. R. Vaughan has attended daily to the self-registering tide-gauge and the dropping of the time-ball at Gellibrand Point, Williamstown; and a gardener and a charwoman have also been employed as usual.

Meridian Work.—Mr. C. J. Merfield has continued to be in charge of this Department, assisted by Messrs. Moroney, Woodhouse, and Sorrell.

The Observations shown in the Table below were made with the 8-in. Transit Circle.

Objects observed.	Number of Observations in—	
	R.A.	N.P.D.
Clock Stars	851	379
Azimuth Stars	530	302
List Stars	2,436	2,445
Nova Geminorum	3	3
Total	3,820	3,129

In addition to the above 447 Clock Stars were observed in daylight for purposes of the Time Service.

Observations for Instrumental errors comprised—

Observations for Collimation	173
Level	320
Nadir	306
Flexure	8

The List stars are those which were selected from the C.P.D. to form a supplementary list of 2,449 Reference stars required for the determination of Plate-constants of the Astrophotographic Catalogue, as stated in my last Report. Each star is being observed three times, thus making a total of some 7,347 Observations in Right Ascension and Declination, about one-half of which have already been done; so that if the same rate is continued we may hope to have this list fully dealt with by the end of 1914.

The annual Catalogues for the years 1910 and 1911 have been completed, and the computations for the Catalogue of 1912 are well advanced.

The card system now adopted for this class of work has been found to possess a very considerable advantage over the older methods of tabulating and combining separate results.

The General Catalogue for the epoch 1900, which will contain the positions of the Reference stars of the Astrophotographic Catalogue, observed up to the end of the year 1910, is in course of preparation, and will probably be ready for publication at the beginning of next year. The additional stars of the Supplementary List above-mentioned, together with a few outstanding stars of the original list, form a separate Catalogue for the epoch 1910.

A redetermination of the division-errors of the 8-in. Transit Circle, so far only as the degree-divisions, was carried out during the period 11th July to 14th November, 1911, the method adopted being that described by Dr. Hough, in the Monthly Notices of the Royal Astronomical Society, No. 5, Vol. 64 (1904).

Four observers took part in the work, each observer devoting about 2 hours and 40 minutes daily, Saturdays and Sundays excepted.

The results of this investigation were worked out by Mr. Baldwin, and show that the magnitude of the error is small, ranging from 0.3 inch to 0.5 inch, which may be regarded as a satisfactory proof of the excellence of this circle.

Astrophotographic Work.—This work has been in charge of the Chief Assistant, Mr. J. M. Baldwin, assisted by Mr. G. F. Johns and the ladies of the Measuring Bureau.

The actual astrographic operations consisted almost entirely in obtaining chart plates with triple exposure of 30 minutes each, and plates for adjustment to the extent indicated in the subjoined Table—

Objects photographed.	No. of Plates.
Triple exposure chart	109
Catalogue	2
South Polar region	52
Oxford charts	10
Adjustment	15
Rejected	70
Total	258

The large number of rejected plates is due partly to a defect in the carrier which occurred in November, 1911, and remained undetected for some time, and partly in consequence of clouds interfering during the exposure.

Triple exposure chart plates cover the Melbourne zones with centre at odd degrees of declination. The total number of regions comprised in these zones is 584, of which 431 have been taken and passed as satisfactory and 153 still remain to be taken.

Astrophotographic Measuring Bureau.—Until 30th June, 1912, this bureau was maintained at the joint expense of the Governments of New South Wales and Victoria, and dealt with the measurement of plates of both the Sydney and Melbourne zones. Since that date the Sydney Observatory having withdrawn from the compact, the Bureau has been employed with the measurement and reduction of Melbourne plates only.

The measures effected during the period covered by this Report were as follow, viz. :—

10 Sydney plates containing 8,604 stars.

3 Melbourne plates containing 674 stars.

The three Melbourne plates so measured were taken recently to replace others which had been rejected.

The re-measurement of the co-ordinates of Standard Reference stars for which measures had not been obtained independently by two observers is now being proceeded with, the zones -65° , -66° , and part of zone -67° having been completed.

The Standard co-ordinates of 341 plates in other zones have also been re-measured.

Reduction of the Plates.—The computation of Standard co-ordinates of Reference stars has been carried out in duplicate for all stars the places of which were determined by observation with our Transit Circle up to 31st December, 1909.

The arrangement of the stars in order of the \times co-ordinates (RA) and the reduction of the measures from Reseau-intervals to minutes of arc, have been completed for 72 plates in zone -65° .

These reductions are proceeding slowly for want of assistants. I find it very difficult at present to find suitable persons for this phase of the work.

Study of Reseaux.—The investigation of the errors of Reseau Melbourne No. 23 is now complete, and that of Melbourne No. 6 is in course and nearly finished. The maximum error found for the former is $+0.012$ mm., which occurred in the extreme corner of the plate.

South Equatorial.—This Telescope has been used by Mr. Baldwin for the observation of long period variables south of 30° South Declination, and for observations of Comets, as follow :—

Comet Borelli, observed 2 nights.

„ Gale, „ 8 „

„ Tuttle, „ 6 „

Other Comets were looked for, but not found.

Time Service.—The Time-ball at Williamstown Old Lighthouse was dropped daily (Sundays excepted) at the instant of 1h. 0m. 0s. Victorian Statute Time, corresponding to 3h. 0m. 0s. a.m. Greenwich Civil time. But this signal failed on thirteen occasions owing to faults on the lines or other accidents outside the control of the Observatory.

Time signals were supplied daily (Sundays excepted) to the General Post Office in Melbourne and repeated automatically to all telegraph stations of this State and to Hobart, Tasmania.

The principal Railway clock at Spencer-street station and other public clocks were kept under electrical control from the Observatory.

The clock of the General Post Office was compared daily on the Observatory chronograph, and its error published next day in the morning papers.

The rating of ship's chronometers and other time-pieces for the public was duly attended to as usual.

Terrestrial Magnetism.—The Kew Pattern Magnetographs, which record photographically the variations of the magnetic elements, have been constantly in use, with the exception of slight interruptions amounting in all to about four hours. The base mirror of the vertical force magnetograph having been taken down for repairs and re-silvering, the photographic traces on six sheets are without base line.

A series of quick runs in connexion with the Antarctic Expeditions was undertaken in conjunction with other Magnetic Observatories at specified dates, and in accordance with a pre-arranged programme.

Further progress has been made in the reduction of arrear magnetic records which cover a period of 45 years (1868–1912), and the work now stands as follows, viz. :—

Hourly ordinates of all curves measured and tabulated up to 30th September, 1912.

Mean hourly variation for each day computed and tabulated for Declination and Horizontal component up to September, 1912, and for the Vertical component to January, 1910.

In the Declination the absolute range for each day has been computed to date. Also the maximum, minimum, and absolute range for each month.

Hourly readings in Declination and the amount differing from the monthly mean for each hour by $3'$ or more are being tabulated.

The Classification and Cataloguing of magnetic disturbances have been commenced. The curves dealt with are those of the year 1868 and part of the years 1869 and 1870.

I must now point out that in view of the probable electrification of suburban railways and the construction of electric trams in the vicinity of the Observatory in the near future, it may very soon become useless to continue our magnetic work on the present site, and that steps should be taken to secure a suitable locality for a new magnetic station sufficiently removed from these disturbing causes. The Narre Warren District would, in my opinion, fulfil the more essential conditions.

The cost of the building apparatus and fittings may be roughly estimated at £2,000. I trust the Board will agree with my view of the case.

Seismology.—Photographic registration of seismic conditions has been obtained as in former years by the Milne Horizontal Pendulum. Various interruptions in the records, amounting in the aggregate to 95 hours, were caused by occasional failure of the light and of the driving clock. The disturbances recorded during the period under consideration comprise 126 slight earth tremors, and 132 distinct earthquakes, of which number 79 were moderate, 41 strong, and 12 very disastrous.

The attached list shows the time and place of origin of earthquakes reported by cable corresponding to the instrumental records at Melbourne :—

Date.	Place.
1911—	
11th September	.. Etna, Sicily.
16th „	.. Santiago di Chili.
5th October ..	.. Hastings, in Napier, New Zealand.
16th November	.. Central Europe.
14th December	.. Cheviot, in Canterbury, New Zealand.
1912—	
26th May ..	.. Auckland, New Zealand.
9th August ..	.. Constantinople, Turkey. Greatest destruction took place in Dardanelles.
14th September	.. Constantinople, Turkey.
19th November	.. Mexico City; town of Acauceh, near Yucatan, destroyed.

Tides.—The Self-registering Tide-gauge at Point Gellibrand gave the usual continuous record of the tides in Hobson's Bay.

Regular records of the time and height of high and low water were taken at the Tide Station at Point Lonsdale.

The original tide curves obtained at Point Gellibrand from 1909 (31st March) to 1911 (31st March) were forwarded to His Majesty's Hydrographer on 10th July last, and on the same date the curves for the period 6th April, 1911, to 23rd April, 1912, were sent to Mr. C. E. Adam, Director of Hector Observatory, Wellington, New Zealand, at their request, for treatment by Harmonic Analysis.

Weights and Measures.—Authorized copies of Standard Weights and Measures were verified, adjusted, and re-issued to the following municipalities according to law, viz. :—

Tungamah Shire.
Donald Shire.
Footscray City Council.
Warrnambool Town Council.
Horsham Borough Council.

Miscellaneous Work.—This comprises the following routine duties, which have been performed by Observatory officers according to previous practice, namely :—

Rating of chronometers, principally for shipmasters.
Calibration of air meters, principally for Mining Inspectors.
Testing meteorological and surveying instruments.

A summary of results based on all available observations of rainfall, wind, and temperature, extending over a period of over 50 years, has been prepared, and is now in course of printing.

The Library.—Acting Librarian, Mr. J. A. Moroney, assisted by Mr. G. A. T. Sangster.

The publications presented or purchased during the period covered by this Report are as follow, viz. :—

Purchased	..	..	68 Volumes.
			20 periodicals.
Presented	..	..	389 volumes, or parts of volumes.
			112 pamphlets.
			38 astrophotographic charts from Paris Observatory.
			39 „ „ „ Bordeaux Observatory.
			27 „ „ „ Toulouse Observatory.
			52 „ „ „ Algiers Observatory.
			60 „ „ „ San Fernando Observatory.
			125 „ „ „ Tacubaya Observatory.

Also Charts 1, 2, and 3 of the new Star Maps published and presented by the Argentine National Observatory of Cordoba, being the D.M. maps of that Observatory which contain only stars to 9.5 magnitude.

Visitors.—The Observatory was visited by 422 persons on Wednesday afternoons, and 433 visitors attended on appointed nights.

The rule of setting apart three nights each month for twelve visitors per night has been adhered to, and the fullest advantage has been taken of it by the public.

General Remarks.—The Astronomical Observations at the temporary Observatory on the summit of Mt. Strom, within the Federal Territory, which I mentioned in my last Report, were duly carried out by myself and my Chief Assistant. Monthly visits to Mt. Strom were made by us for this purpose from September, 1911, up to the present time. The results of this work will be presented in a Report to the Federal Government in the course of the present year.

The Magnetic Survey of Australia as a part of the general Magnetic Survey of the globe, undertaken by the Carnegie Institution, which was referred to in my previous Report to the Board, is proceeding, and the Magnetic Observer, Mr. Kidson, and his Assistant, have already determined the Magnetic Elements at some 142 stations over the greater part of the Australian Continent.

Arrangements are being made with the sanction of the Commonwealth Government to exchange time signals between the Melbourne Observatory and Dr. Mawson's base at Adele Land, through Macquarie Island.

It is proposed to connect this Observatory directly with the Wireless Station in the Domain so that time signals may be sent and received automatically. The main object is to enable Dr. Mawson to establish a Fundamental Longitude in the Antarctic regions, but it is hoped that the wireless method may be applied later to the re-determination of Australian longitudes.

At the request of the Comptroller-General of the Department of Trade and Customs and with the approval of my Minister I have undertaken to have official Hydrometers verified, repaired, and adjusted at the Observatory.

I have stated above that the Sydney Observatory has withdrawn from the joint Measuring Bureau which was initiated in the year 1898. I regard this event as a release from a great and unpleasant burden, which was undertaken at a time when it seemed impracticable for the Sydney Observatory to measure its own plates. And although we lose a moiety of £200 per annum, which was paid to us by the New South Wales Government, the Melbourne Observatory is decidedly the gainer.

The meteorological records of past years have been printed, and the series 1872-1907 is now complete.

The Star Catalogues for 1890 and the Summary of Results of Rainfall, Winds, and Temperature are in the hands of the printer, and will be ready before the end of the current year, the Government having granted the sum of £400 for this purpose.

P. BARACCHI.

Melbourne Observatory
January, 1913.