

1889.
VICTORIA.

TWENTY-FOURTH REPORT

OF THE

BOARD OF VISITORS

TO

THE OBSERVATORY;

TOGETHER WITH THE

Annual Report of the Government Astronomer.

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

By Authority:

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TWENTY-FOURTH REPORT

OF THE

BOARD OF VISITORS TO THE OBSERVATORY.

TO HIS EXCELLENCY SIR WILLIAM CLEAVER FRANCIS ROBINSON, *Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Administrator of the Government of the Colony of Victoria and its Dependencies, &c., &c., &c.*

We have the honour to report to Your Excellency that we visited the Observatory for our annual inspection on the 3rd instant.

We found the buildings, instruments, and records of the establishment in good order, and the work proceeding with its accustomed regularity and efficiency.

The polishing of the mirrors of the Great Telescope has been in progress for some time; and although some important preliminary difficulties have been overcome, it remains to be seen whether the work can be satisfactorily completed; for while it has been found possible to obtain both figure and polish sufficient for many of the ordinary uses of the instrument, it is admitted on all hands that to procure results at all adequate to the higher purposes to which telescopes of the first order are now applied is a matter of extreme difficulty and uncertainty.

Although we still hope that the arduous task Mr. Ellery has undertaken may be accomplished, it must be confessed that complete success is very problematical. In this opinion Sir Howard Grubb, who has been consulted, fully concurs, and has stated his reluctance to undertake it. The fact that repolishing the mirrors will become more frequently necessary henceforward, and that the climatic extremes of temperature render it specially difficult in this country, almost forces us to the conclusion—already adopted elsewhere—that for astronomical purposes a refracting telescope is to be preferred to a reflector. The great success which has lately attended the production of object glasses of large diameter confirms this view, and we would suggest that the expediency of replacing the mirror of the Great Melbourne Telescope with a refracting objective be considered. Such a glass could be adapted to the mounting of the present instrument at a comparatively moderate cost, and we believe that will prove to be the best course to take.

The introduction of electric lighting in the Observatories of Europe and America has been found so advantageous in obviating the inconveniences of gas that we recommend its immediate adoption here. We ascertained on inspection that a small steam engine which has been used for polishing the mirrors would be suitable for the electric lighting, so that the cost of its adoption would be very moderate.

We regret to learn from the Astronomer's Report that Mr. Pringle, who has been for eight years an assistant in the Observatory, and has been a very valuable and efficient officer, is about to leave the service. We think that the necessity for providing for vacancies in all ranks of the Observatory staff should be seriously considered. It has been our duty on more than one occasion to point out that it would be most difficult to fill any of the three principal offices, and we find that there is not at present sufficient inducement to young men of ability and education to join this branch of the service. We strongly recommend that the emoluments of the Observatory staff, especially of the junior officers, be reviewed, in order that this serious obstacle to the maintenance of its efficiency may be removed.

We are glad to see that the new quarters for the Government Astronomer within the Observatory grounds are progressing satisfactorily, and that new approaches from the St. Kilda-road are nearly completed.

We have to record our deep regret at the death of two of our colleagues, Sir William Stawell and Dr. Bromby. The latter was for many years the honorary secretary of the Board, and we desire to express our appreciation of the valuable services which he rendered to science in that and other capacities.

GEORGE VERDON, F.R.S.,

M. H. IRVING, M.A.,

W. C. KERNOT, M.A.,

JAMES MOORE, M.A.,

F. STANLEY DOBSON, M.A., LL.D., Q.C., F.L.S.,

G. V. SMITH, Hon. Sec.

Melbourne, 12th September, 1889.

REPORT OF THE GOVERNMENT ASTRONOMER TO THE BOARD OF VISITORS TO THE OBSERVATORY.

The Report now presented refers to the year ending 30th June, 1889, and sets forth the state of the Observatory at that date. My last Report was read before the Board at their visitation on 4th October, 1888.

I.—PERSONAL ESTABLISHMENT.

The personal establishment on the 30th June was as follows:—

Government Astronomer	...	...	...	Mr. ELLERY.
Chief Assistant	...	...	...	Mr. WHITE.
Assistant	...	...	...	Mr. MOERLIN.
”	...	...	...	Mr. BARACCHI.
”	...	...	...	Mr. SWAN.
”	...	...	...	Mr. PRINGLE.
”	...	...	...	Mr. KEMP.
”	...	...	...	Mr. INGAMELLS.
Pupil Computer and Observer	...	...	...	Mr. WALLACE.
Mechanic	...	...	...	G. SWANSON.
Mechanical Attendant	...	...	...	J. BURLEY.
Messenger and Attendant	...	...	...	W. J. HALION.

Messenger A. E. Hale was transferred to the General Post Office in January last, and was succeeded by W. J. Halion in March following.

I regret to report that Mr. Pringle, who has been an assistant in the Observatory for nearly eight years, has informed me that he intends to leave both the Observatory and the Public Service early next year. Mr. Pringle has become so very useful and so thoroughly efficient in several of the branches of Observatory work, that his departure will be severely felt. It will be necessary very shortly to make arrangements for filling his place.

There has been no change with regard to the distribution of duties during the year. The charge of all meridian work, maintenance and distribution of time is taken by the Chief Assistant, Mr. White; Mr. Moerlin still has charge of the meteorological and magnetic work; and Mr. Baracchi of the Great Telescope and extra-meridian observations; Mr. Swan is chiefly occupied assisting Mr. White in the meridian work, observing and computing, and preparing and revising work for the press; Mr. Pringle assists in Transit Circle observations, has charge of the Library, and assists in the correspondence, &c.; Mr. Kemp has the care of the Photoheliograph, and assists Mr. Moerlin in his meteorological duties; Mr. Ingamells keeps the Observatory accounts, and, assisted by Mr. Swan, prepares the daily weather chart, and also assists in observing with the Transit Circle.

In May, 1888, I wrote to the Honorable the Chief Secretary, pointing out the difficulties experienced in obtaining the services of gentlemen in any way fitted for Observatory work, and suggested the desirability of training young men having the requisite qualifications for observing and computing, and willing to enter upon such occupation, so as to fit them for any vacancy that might occur. This suggestion was adopted, and a regulation gazetted providing for the appointment of “pupil computers and observers” at the Melbourne Observatory. The following is the gazetted notice referred to:—

[From the “Victoria Government Gazette” of 24th August, 1888, No. 78.]

CHIEF SECRETARY'S DEPARTMENT.—REGULATIONS FOR PUPIL COMPUTERS AND OBSERVERS AT THE MELBOURNE OBSERVATORY.

Conditions.

An applicant for appointment must not be more than twenty years nor less than sixteen years of age. He will be required to produce a medical certificate that he is of sound constitution, and not affected with any physical infirmity which would interfere with the proper discharge of his duty. He will also be required to produce satisfactory evidence of having received a fair general education, including a good knowledge of euclid, algebra, and arithmetic, and to furnish a specimen of his drawing, either plain or freehand.

Competitive Examination.

Having duly complied with the foregoing requirements, the applicant will be required to undergo a competitive examination, on a date of which he will be duly notified. The subjects of such examination will be arithmetical and plane trigonometrical computation, and the use of logarithms. The competitors to whom shall be awarded a sufficient number of points by the Board of Examiners will be recommended for appointment in the order of merit. If any candidate shall have already passed as a pupil surveyor he will be eligible without further examination, for appointment, according to the position he may have attained at such examination.

Term of Service.

The pupil's service in the Observatory shall be for a term of four years, during which time he will be trained in computing, observing, astronomical surveying, and Observatory work generally. Should the pupil, however, be found unfit for such work, or his progress in the same be unsatisfactory, his services may be dispensed with at a month's notice. Pupils continuing the full four years, if their service shall have been satisfactory, and if they pass the examination under the regulations of the Public Service Board for appointment to the Clerical Division, will be eligible for appointment as Junior Computers and Observers of the 5th class of the Chief Secretary's Department, in the order of their merit, and in accordance with the provisions of the regulations aforesaid.

Remuneration.

He will receive the following remuneration during the term of his pupilage:—1st year, £52; 2nd year, £58; 3rd year, £66; 4th year, £72.

Subject to Regulations.

During the whole term of his pupilage and service in the Observatory, he shall be subject to the regulations for the Public Service of Victoria, dated 31st December, 1884, or any subsequent substituted or additional regulations made under *The Public Service Act 1883*.

ALFRED DEAKIN,
Chief Secretary.

Chief Secretary's Office,
Melbourne, 24th August, 1888.

Under this arrangement Mr. Wallace, who had passed with credit the pupil surveyors' examination in May, 1888, applied for the post and was appointed. So far I am thoroughly satisfied with the result, both of the experiment and the selection of Mr. Wallace, for he has already proved himself a very capable, careful, and painstaking officer, and promises to thoroughly fit himself for a permanent position in the Observatory.

II.—BUILDINGS AND GROUNDS.

The buildings generally are in good repair. Some little painting and renovation has been carried out during the year, especially in the case of the Great Telescope House, where some alterations have been made to facilitate the repolishing and testing the 4-foot mirrors. Formerly the testing of the mirrors was done by means of a distant watch dial and an eyepiece placed near the conjugate focus; but Foucault's method of testing being now preferred, the polishing machine has been shifted, so as to obtain the necessary testing distance (64 feet) under cover of the roof. To get the full distance, however, it was necessary to open the north wall of the Telescope House, and build a small chamber under the north platform in which to place the small testing apparatus. The engine which has hitherto been in the polishing room was found to increase the temperature of the air so much after a few hours' work that it has been moved into the boiler-room adjoining.

The recommendation made by the Board in its Report of 1887 that quarters for the Government Astronomer be built within the Observatory grounds has been adopted by the Government, and plans and specifications of a commodious residence have been prepared by the Public Works Department, and I am informed it will probably be completed by about the end of this year.

Plans for a new Telescope House for the reception of the telescope for star photography now being completed by Sir Howard Grubb, of Dublin, are also prepared, and the building itself is expected to be ready before October, some time before the instrument is likely to reach Melbourne. This building will be placed on the south side of the main building, close to the laboratory.

Considerable difficulty has been experienced with the gas supply during and since the summer, through obstructions in the pipes due to the condensation of parts of the gas. Over 400 feet of piping had to be lifted and replaced by new. Examination showed that the trouble was due partly to the deposit of naphthaline, but chiefly to the formation of carbonate of zinc in the galvanized iron pipe through the presence in excess of free ammonia; this formation, in many places, completely filling the pipes. In relaying the pipes, black iron instead of galvanized has been used.

The grounds are in a fairly good condition; the shrubberies are now well grown, and afford most useful shelter during the dusty days in summer time, while they much improve the appearance and add to the pleasantness of the surroundings of the Observatory. Some additional planting is done every season.

The new road into the Domain entering close to the Government House gates is now nearly complete, and will afford very convenient access for vehicles to the Observatory.

III.—INSTRUMENTS.

With the exception of the Great Telescope the instruments and apparatus are all in good working order. Among these are the new and old transit circles, the 8" and 4½" equatorials, the photoheliograph, the magnetographs, and other apparatus pertaining to magnetical and meteorological observations, the various clocks, chronographs, chronometers, &c. In order to carry out some timing tests of watches, &c., sent to the Observatory for trial from the late Exhibition, a new thermostatic chamber was constructed in the basement, which has proved very effective; watches, &c., can be kept at any desired temperature above 50° for any time with a variation of less than 1° Fahr.

I stated in my last Report that the Great Telescope had been dismantled preparatory to repolishing the large mirrors. A large amount of experimental work both in grinding, polishing, and testing mirrors had to be gone through before venturing on the 4-foot surfaces, and it was October before polishing them was commenced, numerous delays having occurred through necessary alterations in the polishing machinery as well as in the polishing room already referred to. Very hot summer weather then supervened, and further operations had to be suspended until the autumn, when one mirror was partly repolished and placed in the telescope. It was found, however, that the figure was not satisfactory, although quite fit for some work. The second mirror was so deeply tarnished that before polishing fine grinding with emery had first to be resorted to. This was done in March, and polishing commenced and carried on for two weeks, when it was found that the increase of temperature, due to the presence of the engine at one end of the polishing-room, interfered so mischievously with the process that it was determined to remove the engine before proceeding. This has been done, and operations will be resumed immediately the coldest weather of the

winter is over. This difficult undertaking, so far, has not been very encouraging, but this is the usual experience, and it will be very fortunate if a good polish combined with a satisfactory figure of the mirrors be obtained with less than many months of patient trials. In the meantime the mirror already partially repolished will be used for certain work in stellar spectroscopy which has been commenced with the 8" equatorial.

The photoheliograph was not in regular use until June. In my last Report I referred to certain alterations that had been made to obviate the appearance on the photographs of images of seeds in the front lens of the secondary magnifier which might be mistaken for sunspots; it was subsequently found that the alterations for getting rid of these images introduced another difficulty, and I had to revert to the original condition. I propose ordering a new secondary magnifier from Dallmeyer, with lenses free from these defects.

IV.—THE LIBRARY.

During the year 260 volumes, exclusive of periodicals, have been added to the Library by donation and purchase.

More library room has been added by fitting up the old messenger's room as a book store room. This gives shelf space for about 2,000 volumes.

V.—THE WORK OF THE OBSERVATORY.

The observations with the Transit Circle during the year include, beside the ordinary standard stars of the Nautical Almanac and the Berlin Jahrbuch, observations of close circumpolar stars, the planet Iris and comparison stars selected for heliometer observations, and stars required for determining the places of comets observed with the Equatorial.

These observations may be arranged as follows:—

R. A. Observations	...	...	...	...	...	2,931
Polar Distance Observations	...	...	...	...	...	1,396
Observations for Instrumental Errors:—						
Collimation	...	...	...	...	...	122
Level	...	...	...	...	...	203
Nadir	...	...	...	...	...	193
Runs of Microscopes	...	...	...	...	...	51
Flexure	...	...	...	...	...	12

All these are reduced to date.

No observations were made with the Great Telescope during the year in consequence of the repolishing operations.

Extra-meridian observations were therefore confined to the South Equatorial (8") of which the following are the principal:—

Comets, Encke (return 1888)	...	...	...	...	4 nights.
„ Barnard (1888 v.)	...	...	...	...	2 „
„ Barnard (1889 i.)	...	...	...	...	3 „
Miscellaneous:—					
Iris	...	...	...	...	1 „
α Centauri	...	...	...	...	6 measures.

Spectroscopic examination and classification of 132 southern stars.

Photoheliograph.—Photographs of the Sun were only obtained on 156 days in consequence of experimental alterations to the telescope.

Terrestrial Magnetism.—Monthly determinations of absolute force and the continuous photographic registration of variations have been carried on uninterruptedly during the year.

Meteorology and Intercolonial Weather Service.—The work in this branch of the Observatory has been carried on systematically as usual. Several new Australian reporting stations have been added to the intercolonial service during the year, chiefly in Queensland and North-western Australia.

There has been increased interest in rainfall statistics, and supplying public requirements in this direction constitutes a substantial part of the work of the Observatory. We have distributed 55 rain-gauges for new localities, and now receive monthly records from 424 stations, distributed over the whole colony.

The daily weather chart is issued and distributed as hitherto.

Telegraph, Time, and Clock Control Service.—This has continued in satisfactory operation throughout the year. The absence of the Post Office clock during the building the new tower has evidently been of great inconvenience to part of the community, for applications for the correct time by telegraph, telephone, and messenger have been very numerous since its removal. This fact indicates the great value to the public of so accurate a timekeeper as the old Post Office clock.

The time-ball at Williamstown got out of order in May, and in June the signals had to be discontinued for necessary repairs to the mechanism.

During the year time signals for dropping the ball were sent on 295 occasions, the signals failed 24 times, 17 of which were due to faults on the telegraph line, and seven to defects in time-ball mechanism. Wrong signals were sent on two occasions; on one, the signals were sent one minute too early, and on the other, one second late.

Instruments Tested or Rated.—

Marine chronometers	...	...	...	...	...	35
Pocket watches	...	...	...	...	...	18
Aneroid barometers	...	...	...	...	...	62
Thermometers	...	...	...	...	...	10
Surveyors' chains	...	...	...	...	...	5
Prismatic compasses	...	...	...	...	...	4

VI.—PREPARATION FOR THE PRESS AND PUBLICATION.

The Melbourne Second General Catalogue is still in the printers' hands, although now nearly complete. Volume VII. of the yearly astronomical results 1880-5 has been printed, and is now being issued.

The Monthly Record of Meteorology and Terrestrial Magnetism has been issued up to March last, and the Rainfall Record to the end of May.

A catalogue of the southern nebulae discovered up to 1886, with the latest information from Dreyer's Catalogue and all other available sources, with places computed up to 1890, has been completed.

A series of tables of meteorological and climatic statistics have also been completed, for embodying in a small work now in preparation on the meteorology and climate of Victoria.

VII.—GENERAL.

I expect that early next year a start will be made with the stellar photographic work. The instrument will probably arrive towards the end of the year. The last news I heard from Sir Howard Grubb, who is constructing the telescopes, leads me to believe that they will be completed immediately after a conference, to be held in Paris early in September, for deciding on certain minor details of the instruments and distribution of the work, has been concluded. It is probable everything will be ready for its reception some time before its arrival, and I look for a commencement of the work early in the year.

As soon as one of the mirrors of the Great Telescope is satisfactorily polished, it is intended to commence a spectroscopic examination of the southern stars with the Great Telescope, for which purpose a preliminary spectroscopic survey has already been commenced with the South (8") Equatorial, so as to form a working list. Beyond this I do not propose to make any change in the order and character of the work for the current year.

ROBT. L. J. ELLERY.

3rd September, 1889.

APPENDIX.

BOOKS, ETC., PRESENTED TO THE OBSERVATORY.

Title and Author.	By whom Presented.	
Report of the Astronomer Royal to the Board of Visitors to the Royal Observatory Greenwich, June, 1888	The Royal Observatory, Greenwich	England.
Greenwich Spectroscopic and Photographic Results, 1886-7	Ditto	"
Greenwich Magnetical and Meteorological Observations, 1886... ..	Ditto	"
Greenwich Astronomical Observations, 1886	Ditto	"
Greenwich Observations, 1886	Ditto	"
Spectroscopic Results for the Motions of Stars, in line of sight obtained at the Royal Observatory, Greenwich, in the year 1888, No. XII.	Ditto	"
Proceedings. Vol. XLII., Nos. 256-7; Vol. XLIII., Nos. 258-65; Vol. XLIV., Nos. 266-70	Royal Society	"
Monthly Notices. Vol. XLVIII., Nos. 8-9; Vol. XLIX., Nos. 3-5 ...	Royal Astronomical Society ...	"
Charts of Mean Barometric Pressure over the Atlantic, Indian, and Pacific Oceans. Official. No. 76, Parts II, III, and IV.	The Meteorological Office ...	"
Contributions to our knowledge of the Meteorology of the Arctic Regions. Part V.	Ditto	"
Meteorological Observations at Stations of the Second Order for the year 1884	Ditto	"
Daily Weather Reports, January to June, 1888	Ditto	"
Report of the Meteorological Council for the year ending 31st March, 1888	Ditto	"
Appendix No. III. Report on Hygrometric Methods, 1st Part, by W. N. Shaw, M.A.	Ditto	"
Hourly Readings, 1886, Part I.	Ditto	"
Quarterly Journal, October 1887 to July 1888	Royal Meteorological Society	"
Meteorological Record, Nos. 28-30	Ditto	"
The Nautical Almanac for 1892	The Lords Commissioners of the Admiralty	"
List of Signals established in various parts of the World	The Hydrographer to the Admiralty	"
Diplomatic and Consular Reports on Trade and Finance. France ...	Foreign Office	"
Foreign Office, 1888. Miscellaneous Series, No. 88; Annual Series, 337-342	Ditto	"
A Table of the Positions of Observatories, with Constants useful in Correcting Extra-Meridian Observations for Parallax	Lt.-General Tennant	"
Report of the University Observatory, Oxford, 6th June, 1888	Professor Pritchard... ..	"
Results of Meteorological and Magnetical Observations, 1887	Stonyhurst College	"
The Scientific Transactions of the Royal Dublin Society, Series II., Vol. III., Nos. 3, 14; Vol. IV., No. 1; Vol. V., Nos. 7 and 8; Vol. VI., Nos. 1 and 2	Royal Dublin Society	Ireland.
Proceedings, 1885-6, 1887-8	Philosophical Society of Glasgow	Scotland.
Journal, 3rd Series, No. 5	Scottish Meteorological Society	"
Account of the Operations of the Great Trigonometrical Survey of India, Vol. X.	Surveyor-General	India.
Indian Meteorological Memoirs. Vol. III., Parts 3 and 4; Vol. IV, Part 5; Vol. IV, Part 6, No. 9	Meteorological Office, Calcutta	"
Report on the Administration of the Meteorological Department of the Government of India, 1887-8	Ditto	"
Report on the Meteorology of India in 1887. 13th year	Ditto	"
Results of Meteorological Observations in Bengal, 28th May, 1888, to 23rd March, 1889	Ditto	"
Abstract of Thermometrical Observations at Chowringhee and Alipore, June, 1888, to February, 1889	Ditto	"
Rainfall in Bengal, June, 1888, to February, 1889	Ditto	"
Results of Meteorological Observations at Six Stations in India, May, 1888, to January, 1889	Ditto	"
Magnetical and Meteorological Observations made at the Government Observatory, Bombay, 1886	Bombay Observatory	"
Results of Meteorological Observations, 1887	G. V. Juggarow Observatory	"
The Cause of Magnetism, and the Cause of Terrestrial Magnetism. G. T. Carruthers	G. T. Carruthers, Subathu, Benares	"
The Planets upon Cardioides. G. T. Carruthers	Ditto	"
The Cause of Electricity, with Remarks upon Chemical Equivalents ...	Ditto	"
The Cause of Light. G. T. Carruthers	Ditto	"
Ueber die jährliche Schwankung des Barometers in Indien, von S. A. Hill, in Allahabad	S. A. Hill	"
Gold-fields of Victoria. Quarterly Reports of the Mining Registrars, 1888	Mining Department... ..	Victoria.
Annual Report of the Mining Department	Ditto	"
Mineral Statistics of the Colony of Victoria for the year 1887	Ditto	"
Reports of the Mining Department (Circular)	Ditto	"
Transactions and Proceedings of the Royal Society of Victoria, Vol. XXIV., Part II.	Royal Society of Victoria	"
Transactions (new series) Vol. I., Part I.	Ditto	"
The Victorian Year-Book for 1887-8, Vols. I., II, and III.	Government Statist... ..	"
Select Extra-tropical Plants readily eligible for Industrial Culture or Naturalization	Public Library	"
Report of the Harbour Trust Commissioners for the year 1887	Harbour Trust Commissioners	"
Report of the Department for Neglected Children and Reformatory Schools	Industrial and Reformatory School Department	"
On the Increasing Magnitude of η Argus	H. C. Russell	New South Wales.

APPENDIX—continued.

Title and Author.	By whom Presented.	
Physical Geography and Climate of New South Wales	H. C. Russell	New South Wales.
Egeson's Weather System, by C. Egeson	C. Egeson	"
Journal for 1887. Vol. XXI., Vol. XXII., Parts 1 and 2	Royal Society of New South Wales	"
Meteorological Report for 1887. (Two copies)	Meteorological Recorder	Tasmania.
Statistics of the Colony of Tasmania for the Year 1887	Government Statist	"
The Meteorological Society of Australasia. Minutes of Proceeding. Vol. II.	Meteorological Society of Australasia	South Australia.
Weather Charts of Australia for the Year 1887-8	Adelaide Observatory	"
Weather Charts of Australia for the Year 1887-8	Government Meteorologist	Queensland.
Inspection Report on the Queensland Meteorological System, and proposals for new organization	The Government Meteorologist	"
Preliminary Report of the Government Meteorologist for the year 1887	Ditto	"
Meteorological Report, 1885	Meteorological Superintendent	New Zealand.
Report of the Survey Department for the year 1887 to 1888	Survey Department	"
Meteorological Report for the year 1887	Meteorological Reporter	Western Australia.
Report of the Superintendent, 1887	Natal Observatory	Natal.
Report of the Meteorological Commission for the year 1887	Meteorological Commission	Cape Colony.
Annals of the Cape Observatory. Vol. II., Part 2	Royal Observatory	"
The Transactions of the South African Philosophical Society. Vol. I., Parts 1 and 2; Vol. II., Parts 1, 2, and 3; Vol. III.; Vol. IV., Parts 1 and 2; Vol. V.	The South African Philosophical Society	"
Toronto General Meteorological Register for the year 1887	Meteorological Office, Toronto	Canada.
Report on the Meteorological Service of the Dominion of Canada, by Charles Carpmael, M.A., Superintendent	Ditto	"
Monthly Weather Review. May to November, 1888	Ditto	"
A Treatise on Time and its Notation, for the Use of Schools in the Dominion of Canada	C. Carpmael, Esq., President of the Canadian Institute, Toronto	"
Annual Report of the Chief Signal Officer, 1887	Chief Signal Officer	United States of America.
Contributions to the Natural History of Alaska	Ditto	"
General Subject Indexes to the Monthly Weather Review and Annual Reports	Ditto	"
Annual Report and Appendixes for the year 1885	Ditto	"
Treatise on Meteorological Apparatus and Methods. C. Abbe	Ditto	"
List of books and articles on Meteorology and Climatology, in the library of the Surgeon-General's Office, in the United States Army	Ditto	"
Bibliography of Meteorology. Part I.	Ditto	"
Report upon the Natural History Collections made in Alaska, 1877-81. Arctic Series of publications. No. 3.	Ditto	"
Monthly Weather Review. June, 1888, to January, 1889	Ditto	"
Daily Weather Charts	Ditto	"
The Cornell University Register	Cornell University	"
Bulletin. XX., No. 3; XXI., No. 1; XX., Supplement	American Geographical Society	"
Fifth Annual Report of the Ohio Meteorological Bureau for the year 1887	Ohio Meteorological Bureau	"
Report for the month of January, month of February	Ditto	"
Observations. July to December, 1889	New York Meteorological Observatory	"
Henry Draper Memorial. Second Annual Report of the Photographic Study of Stellar Spectra	Harvard College Observatory	"
Detection of new Nebulæ by Photography	Ditto	"
Annals. Vol. I., Nos. 1-14; Vol. II., Nos. 1-11, 13; Vol. IV., Nos. 3-8	New York Academy of Sciences	"
Proceedings of the American Academy of Arts and Sciences. New Series. Vol. XV., Part 1.	American Academy of Arts and Sciences	"
Catalogue of Variable Stars, by S. C. Chandler	S. C. Chandler, Harvard College Observatory	"
Contributions to Meteorology. Chapter III.	Professor E. Loomis	"
Nautical Monographs. No. 5. The Great Storm off the Atlantic Coast of the United States. March 11-14, 1888	Hydrographer, United States Navy	"
Reports for the year 1886-7, 1887-8	Yale College Observatory	"
Reports of the Superintendent of the United States Naval Observatory for the years ending 30th June, 1887, 30th June, 1888	United States Naval Observatory	"
On the Colour Correction of Achromatic Telescopes. W. Harkness	W. Harkness, United States Naval Observatory	"
Refraction in the principal Meridians of a Triaxial Ellipsoid, with remarks on the Correction of Astigmatism by Cylindrical Glasses; and an historical note on Corneal Astigmatism	Ditto	"
On the progress of Science as exemplified in the art of Weighing and Measuring	Ditto	"
Report of the Superintendent 1887... ..	American Nautical Almanac Office, Washington	"
The American Ephemeris and Nautical Almanac for 1891	Ditto	"
Proceedings of the American Association for the Advancement of Science. 36th meeting; New York	American Association for the Advancement of Science	"
Annual Report of the Board of Regents to July, 1885. Part II.	Smithsonian Institute	"
Bibliography of Astronomy for 1887	Ditto	"
Anuario del Observatorio Astronomico Nacional de Tacubaya para el año de 1889	Tacubaya Observatory	Mexico.
Boletín de Estadística. Tomo I., 42-47; Tomo II., 1, 2	Meteorological Department	"
Memorias de la Sociedad Científica Antonio Alzate. Tomo I., No. 12; Tomo II., Nos. 1-6	Ditto	"
Boletín Mensual. Tomo I., Nos. 1-10	Ditto	"
Boletín trimestral del instituto meteorologica Nacional. Nos. 1, 2. January to June, 1888	National Meteorological Institute, San Jose	Costa Rica.
Boletín mensaes do 1º observatorio meteorologico da repartição do telegraphos do Brazil. Vols. I. and II.	Telegraph Department	Brazil.

Title and Author.	By whom Presented.	
Anales de l'observatoire imperial de Rio de Janeiro. Vol. III. ...	Rio de Janeiro Observatory ...	Brazil.
Boletim do observatorio. August to December, 1888... ..	Ditto	"
Observaciones magnéticas y meteorológicas del real Collegio de Belen de la Compañia de Jesus en la Habana, 3 ^{er} trimestre. Juli-Sep., 1886... ..	Havanna Observatory	Cuba.
Annuario del observatorio de la Plata para el año 1888	Observatorio de la Plata	Argentine Republic.
Ditto, 1889	Ditto	"
Anales. Tomo VI. (2 copias)	Oficina Meteorologica Argentina	"
Rapport annuel sur l'état de l'observatoire de Paris pour l'année 1887-8	Paris Observatory	France.
Catalogue. Tome I.	Ditto	"
Congrès astrophotographique international tenue a l'observatoire de Paris pour le levé de la carte du ciel (avril 1887)	Comité de la carte du ciel	"
Bulletin. Fas. 1 ^o	Ditto	"
Annuaire pour l'an 1888	Observatoire Municipal de Montsouris	"
Sur les perturbations de la planète (46). Hestia, d'après la theorie de M. Gylden; par M. Brendal	L'Academie de Sciences de Paris	"
Annales, années, 1885, II. (premier partie); 1886, I. and III.; 1884, II., seconde partie	Bureau Central Meteorologique de France	"
Résultats des comparisons de la toise du Perou au mètre international, exécutées au Bureau international des poids et mesures, par M. Benoit; M. C. Wolf	Bureau des Poids et Mésures	"
Procès-verbaux des Séances de 1887	Ditto	"
Travaux et mémoires du bureau international des poids et mesures. Tomo IV.	Ditto	"
Rapport sur les observatoires astronomiques de Province. Enquêtes et documents relatifs a l'enseignement superieur XX.-XXIV.	Bureau des Longitudes	"
Annales de l'observatoire de Bordeaux. Tome II.	Ditto	"
Bulletin annuel de la commission météorologique du département des Bouches-du-Rhone, 1882, 1 ^{re} année; 1883, 2 ^e année; 1884, 3 ^e année; 1885, 4 ^e année; 1886, 5 ^e année	Ditto	"
Connaissance des Temps pour l'an 1888	Ditto	"
Ephémérides des étoiles de culmination lunaire et de longitude pour 1887-8. Par M. Loewy	Ditto	"
Nouvelles méthodes pour la détermination de la constante de l'aberration. Par M. M. Loewy.	Ditto	"
Etude de la flexion horizontale de la lunette du cercle meridien Bischoffsheim de l'observatoire de Paris. MM. Loewy, Leveau, et Henri Renou	Ditto	"
Nouvelles méthodes pour la détermination complète de la refraction. M. Loewy	Ditto	"
Connaissance des Temps pour l'an 1889	Ditto	"
Connaissance des Temps. Extrait a l'usage des écoles d'hydrographie et des marines du commerce pour l'an 1887	Ditto	"
Annuaire pour l'ans 1887-8	Ditto	"
Résumé météorologique de l'année 1887, pour Genève et le Grand Saint Bernard	Geneva Observatory	Switzerland.
Resumen de las observaciones meteorológicas 1883 efectuadas en la peninsula	Madrid Observatory	Spain.
Observaciones meteorológicas durante los años 1884 y 1885, 1882 y 1883	Ditto	"
Almanaque Nautico para 1890	San Fernando Observatory	"
Annales del instituto y observatorio de marino de San Fernando. Sec. 2. Observaciones meteorológicas año 1887	Ditto	"
Mémoires et publications. IV ^e serie. Tome IX ^e , X ^e	La Société des Sciences des Arts et des Lettres du Hainaut	Belgium.
Mémoires de la Société Royal des Sciences de Liège deuxieme serie. Tomes XIV., XV.	La Société Royale des Sciences de Liège	"
Bulletin. Vol. XIII., 1, 2, 3	Société Royal de Geographie d'Anvers	"
Sur l'aspect physique de la planète Mars pendant l'opposition de 1888. Par L. Niesten	M. Niesten, Observatory, Brussels	"
Beobachtungen angestellt am astrophysikalischen Observatorium in O'Gyalla. 9 ^{ter} band, 10 ^{ter} band.	O'Gyalla Observatory	Austria-Hungary.
Publicationen. 1 ^{er} band	von Kuffner'she Sternwarte Wien	"
Magnetische und meteorologische Beobachtungen in Jahre 1887	Prague Observatory	"
Rapporto Annuale dell' Observatorio marittimo di Trieste, 1885. II. volume	Trieste Observatory	"
Liste der Mitglieder der österreichischen Gesellschaft für Meteorologie	Österreichischen Gesellschaft für Meteorologie	"
Jahrbücher der Königl. Ung. central Anstalt für Meteorologie und Erdmagnetismus. XVI. band. Jahrgang 1886	Buda-Pesth Observatory	"
Untersuchungen über die tägliche Oscillation des Barometers. von J. Hann	Dr. J. Hann	"
Circular. Nos. LXII., LXVII.	Vienna Observatory	"
Die Venus durchgänge, 1874 und 1882. 3 ^{ter} band	German Commission for the Transit of Venus	Germany.
Circular. 324 to 333.	Berliner astronomisches Jahrbuch	"
Berliner astronomisches Jahrbuch für 1891	Ditto	"
Beobachtungs-ergebnisse. Heft I., II., III., IV.	Kön. Sternwarte zu Berlin	"
Untersuchungen über das cometen system 1843, 1880 I., und 1882 II. 1 ^{ter} theil	Kiel Observatory	"
Das Aequinoctium für 1860-0	Ditto	"
University Publications, 1887-8	Kiel University	"
Gradmessungs-nivellement zwischen Anclam und Cuchaven	Kön. Preussischen Geodat. Institut	"
Instruktion für die Beobachter an den meteorologischen stationen II., III., und IV. ordnung	Kön. Meteorologische Institut, Berlin	"

APPENDIX—continued.

Title and Author.	By whom Presented.	
Die Bahn des periodischen Kometen Winnecke in den Jahre 1858-86. Dr. E. Freiherr von Haerdtl	Dr. E. Freiherr von Haerdtl...	Germany
Monographie der Sternhaufen, G. C. 4460, und G. C. 1440. Lowie einer sterngruppe bei α Piscium, No. I. Bruno Peter Vierteljahrsschrift; 23 Jahrgang. Hefts, 1, 2, 4	Herr Bruno Peter	"
Jahrbuch des Kön. Sächsischen Meteorologischen Institutes, 1886 ... Bericht über die Thatigkeit im Meteorologischen Institut für das Jahr 1886	Deutsche Astronomische Ge- sellschaft Kön. Sachs. Met. Inst. Ditto	" "
Berichte der K. Sachs. Gesellschaft der Wissenschaften Mathematisch- physische classe	K. Sachs. Gesellschaft der Wissenschaften	"
Neue methode zur Bestimmung der aberrations-constante nebst unter- suchungen über die veränderlichkeit der Polhöhe von. Dr. F. Küstner Ueber die grundbedingungen mikrometischer einstellung bei teleskopen Comptes rendus de la session de la Commission permanent à Nice, en 1887	Dr. F. Küstner, Observatory, Berlin Ernst Wagner Association Geodesique Inter- nationale	" "
Comptes rendus des seances de la Commission permanent reunie du 21 au 29 Octobre, 1887, a l'Observatoire de Nice Rendiconti. Serie II., Vol. XIX.	Ditto	"
Bollettino mensuale. Serie II., Vol. VIII., Num. 8 to Vol. IX., Num. 3	Reale Istituto Lombardo di Scienze e Lettere Osservatorio Centrale del Real Collegio Carlo Alberto in Montcalieri	Italy. "
Riflessioni Geodetiche, per A. Nobile	A. Nobile	"
Ricerche numeriche Sulla latitudine del R. Osservatorio di Capo di Monte, per A. Nobile. Parte seconda, 1885	R. Osservatorio di Capo di Monte	"
Misure micrometriche di stelle doppie e multiple dal Barone Ercole Dembowski. Vols. I. and II.	Commissaires chargé de la publication de l'ouvrage	"
Osservazioni meteorologiche eseguite nell'anno 1888	R. Osservatorio di Brera in Milano	"
Publicazioni No. XXXIII. Osservazioni sulle stelle doppie serie prima Osservazioni meteorologiche fatte nell'Osservatorio Centrale di Siracusa. Anno XIII., Nos. 1-6	Ditto Osservatorio di Siracusa	Sicily.
Annales de l'institut meteorologique de Roumanie, 1886. Tome II. ...	Meteorological Institute, Bu- charest	Roumania.
Die Internationale Polar forschung, 1882-3. Beobachtungen ergebnisse der Norwegischen Polar Station Bossekop in Alten. II. theil Zonen beobachtungen der sterne zwischen, $64^{\circ} 50'$ und $70^{\circ} 10'$ nordlicher declination	Herr Aksel S. Steen, Meteorolo- gical Institute, Christiania Universitäts - Sternwarte in Christiania	Norway. "
Bulletin Mensuel. Vol. XIX., année 1887	Observatoire Meteorologique de l'Université d'Upsal	Sweden.
Angenäherte elemente und ephemeride des Encke'schen cometen für das Jahr 1888. von O. Backlund und B. Seraphimoff	Imperial Academy of Sciences	Russia.
Memoirs. Tome XXXIV., Nos. 8, 12	Ditto	"
Stern-ephemeriden auf das Jahr 1889. von W. Döllen	Ditto	"
Catalogus alphabeticus Librorum qui in Bibliotheca speculæ Imperialis Literarum Universitatis Petropolitane asservantur. (2 copies). 1888 Annalen des Physikalischen Central Observatorium. H. Wild, Jahrgang 1886, theil II.	Imperial University Observa- tory Central Physical Observatory	"
Repertorium für Meteorologie. Band XI. H. Wild	Ditto	"
The total Solar Eclipse of 18th August, 1887	Ditto	"
Normaler gang und störungen der erdmagnetischen declination. von H. Wild	Ditto	"
Jahresbericht am 31 Mai, 1887, dem Comité der Nicolai-hauptsternwarte Observations de Pulkova. Vol. XII.	Nicolai-hauptsternwarte Pulkova Observatory	"
Annals. Vol. II.	Tashkend Observatory	"
Annales. Vol. I., liv. 1. 2 ^e Serie, Vol. I., liv. 2	Moscow Observatory	"
Sur l'origine des étoiles filantes, par Th. Bredichin	Ditto	"
Meteorologische Beobachtungen des Tiflischer Physikalischen Observa- torium in Jahre 1886	Tiflis Observatory	"
Magnetische Beobachtungen des Tiflischer Physikalischen Observatorium in Jahre 1886-7	Ditto	"
Bulletin Mensuel. May, 1887, to July, 1888	Zi-ka-wei Observatory	China.
Tables and Diagrams of Meteorological Observations at Tokio, 1877 to 1886	Hydrographic Office	Japan.
Transactions. Vol. XII.	Seismological Society of Japan	"
Observations. Vol. X., 1887; Vol. VIII., 1883, 1884, 1885	Batavia Observatory	Java.
Curvas Meteorograficas durante le 2 ^o semestre del año 1883	Manila Observatory... ..	Phillippine Islands.