1891.

VICTORIA.

TWENTY-SIXTH 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.

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TWENTY-SIXTH REPORT

OF THE

BOARD OF VISITORS TO THE OBSERVATORY.

To His Excellency the Right Honorable John Adrian Louis, *Earl of Hopetoun, Viscount Aithrie, and Baron Hope, in the Peerage of Scotland; Baron Hopetoun of Hopetoun, and Baron Niddry of Niddry Castle, in the Peerage of the United Kingdom; Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George; Governor and Commander-in-Chief in and over the Colony of Victoria and its Dependencies, &c., &c., &c.*

We have the honour to inform Your Excellency that we visited the Observatory for our annual inspection of the buildings, instruments, and records on the 2nd of September, and found everything in excellent order and condition.

We append the report of the Government Astronomer, in which the details of the year's operations are fully stated.

In view of the fact that the Astronomer and his principal assistants are approaching the age of retirement from active service, the Board recommended that inquiries should be made in England as to the possibility of obtaining the services of qualified persons from British Observatories. Mr. Ellery's correspondents are of opinion that this may be done if it should be found necessary.

The Board regrets to find that the approaches to the Observatory have not yet been lighted, and that the new computing room—for which provision was made on the Estimates of last year—has not been built. These additions are urgently required, and it is hoped that they may not be long deferred.

The rain charts which used to be issued from the Observatory have been discontinued, and the Board considers it of great importance that the publication of the annual charts at least should be resumed. The public demand for the information they contained is very general and is increasing, and the cost, which would be inconsiderable, might be met by a small charge on the sale of the charts.

We have referred in previous reports to the desirability of converting the Great Melbourne Telescope into a refractor. The Government Astronomer has been in recent communication with the maker, Sir Howard Grubb, and we are now disposed to think that it would be better to have a separate instrument. It is hoped that this object may be attained whenever the funds can be spared for the purpose.

Two members of the Board who attended the inspection have since left the colony, or their signatures would have been attached to this report.

GEORGE VERDON, F.R.S., Chairman.
ALEXANDER BLACK, S.G.

Melbourne, 12th October, 1891.

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

I have the honour to present to the Board of Visitors my Annual Report for the year ending 30th June, 1891, in which I give an account of the past year's work of the Observatory, and state of the establishment at the latter date.

I.—Personal Establishment.

The staff of the Observatory on 30th June was as follows:—

Government Astronomer	Mr. Ellery.
Chief Assistant	Mr. White.
Assistant	Mr. Moerlin.
„	Mr. Baracchi.
„	Mr. Swan.
„	Mr. Quayle.
„	Mr. Kemp.
„	Mr. Ingamells.
Weather Telegraph Clerk	Mr. Hodge.
Pupil Computer and Observer ...	Mr. Wallace.
Mechanic	G. Swanson.
Mechanical Attendant	J. Byrne.
Junior Messenger	J. Mannix.

The only changes in the personal establishment were the transfer of Mr. D. Hodge, from the Telegraph Branch of the General Post Office, to perform the duties of Weather Telegraph Clerk, the resignation of J. Burley, mechanical attendant, and the appointment in his place of James Byrne, also transferred from the Telegraph Branch of the General Post Office.

The duties allotted to the several members of the staff, with very trifling exceptions, remain the same as at the date of my last Report, and may be summarized as follows:—Mr. White has charge of all meridian astronomical work and distribution of time; Mr. Moerlin, meteorological and terrestrial magnetic work; Mr Baracchi, Great Telescope and general extra-meridian and spectroscopic work; Mr. Swan assists Mr. White in the meridian work, in observing, computing, and preparing work for the press; Mr. Quayle assists in the transit work, in computing, in correspondence, and in the library; Mr. Kemp assists Mr. Moerlin in the meteorological duties, and does the photographic work; Mr. Ingamells acts as accountant, assists in transit observing, and, assisted by Mr. Swan, prepares the daily weather charts.

II.—Buildings and Grounds.

Some much needed repairs have been carried out in the buildings. The Great Telescope house exhibited signs of weakness in the S.W. corner, which had apparently commenced to sink; this has been stopped by underpinning the foundation of the west wall for about 12 feet. The north dome has been re-covered with canvas and painted, as the old covering, which had been on for 28 years, commenced to leak slightly in heavy rains. The floor of the photoheliograph room was found to be seriously attacked with dry rot, and was taken up and replaced by a fine asphalt floor. The fencing around the grounds has been thoroughly repaired and repainted, and is now in a good substantial condition.

The new astrographic dome is found to be generally very satisfactory, but, owing to the construction of the chase and shutter, some fears were entertained as to its being weather-tight in driving rains, and extra weathering pieces were fitted around the chase in June, since which heavy storms have occurred, and only once during the exceptionally heavy gale of 12th July a little wet found its way in during the fierce squalls, when the rain was driven in horizontal spray.

The roof of the Great Telescope house has worked satisfactorily since the alterations made last year and now gives no trouble whatever.

In my last report I referred to the addition of a new computing room, which was very much required, and for which Parliament had voted the money. I regret to say however that it has been found necessary to delay this in common with many other Public Works.

I am able to report that the Observatory buildings are now in good repair. The grounds are in good order; some little extra planting was done during the year, but no new plantations were made nor is it intended to establish any further shrubberies for the present.

The electric light service was extended into the Observatory in February last, forming a branch of the service supplied to Government House, and lighting first commenced on the 17th of that month. Although it is still necessary to use gas in some parts of the Observatory, the facilities and conveniences afforded by the electric light system are very great, especially in connexion with the illumination of the instruments.

I regret to say that the recommendations regarding lighting the approaches to the Observatory have not yet been carried out.

III.—Instruments.

The new telescope for stellar photography arrived at the end of December; it was mounted in position in the building prepared for it in January last, and the first experimental photographs taken in the beginning of February. The instrument was made by Sir Howard Grubb, and is similar to others made for Greenwich, Cape of Good Hope, and one or two other observatories taking part in the charting of the heavens. It consists of a double telescope mounted equatorially in what is known as the German type. One telescope has a photographic object glass of 13·0 inches diameter and 134·5 inches focal length; the other, or guider telescope, has a 10·1 inch objective of 130 inches focal length. The mounting is very solid and substantial, well designed and made. The *chef-d'œuvre* of the whole instrument is the driving clock mechanism, with its automatic electric governor, which is not only almost perfect in its performance, but a triumph in ingenuity, and the admiration of all who understand the importance of perfect machinery for the purpose it is applied to. There is one fault in the instrument however which is important, but which the maker, Sir Howard Grubb, is now engaged in rectifying. The object glass of the guider telescope is defective, not in the workmanship, but in the physical condition of the glass of which it has been made. There is evidently some strain in the glass producing irregular refraction, which seriously interferes with definition, especially under the high powers one is obliged to use in the work for which the telescope is intended. When this matter is remedied and one or two minor conveniences added, I think I may confidently state that this instrument will admirably fulfil all the requirements for the work.

The new transit circle, with which all the meridian work has been done, continues in good working order, and has required no special attention during the year. The old transit has been kept in working order and occasionally used for special observations.

Both the north and south equatorials are also in satisfactory condition; the latter has been thoroughly overhauled, cleaned, and ironwork painted.

The Great Telescope.—The great reflector has been in good order throughout the year. Mirror *A*, the successful polishing of which I referred to in my last year's report, has been the only one in use. Mirror *B* was repolished last November, but it is not quite satisfactory. The combination of *A* with *a* (the large with small mirror) gives very good definition. Great trouble is experienced in keeping the mirrors free from deposition of moisture in the winter months; and when a dusty day is followed by a damp, dewy night, they get covered with a film, which rapidly sets up tarnish if not quickly removed. From this cause the large mirror had to be carefully cleaned twice during the past winter. The clock and mechanism throughout is in excellent condition.

Some important alterations have been made to the photoheliograph. It has never worked quite satisfactorily; the adjustments for focus, especially since the secondary magnifier for the large pictures was adopted, were very unstable and frequently going wrong. Moreover, the front lens of the secondary magnifier being so close to the principal focus, every minute particle of dust on it appeared as a blur on the sun's photograph, and this rendered it necessary to frequently take out and clean the lens. To get over these difficulties a new central piece, carrying the sliding shutter cross wires and secondary magnifier, was constructed, and provision made for rigidly securing the secondary magnifier and as far as possible excluding dust; at the same time access to every part that requires cleaning is made easy. Since these alterations the instrument has worked thoroughly satisfactorily.

The meteorological and magnetical instruments, both self-registering and others, as well as the clock chronographs, &c., continue in satisfactory working condition, and have required but very little attention or repair during the past year.

A parabolic pendulum chronograph, made in the Observatory work-shop for the Indian and Colonial Exhibition in London, in 1886, was returned in December last, and put up in the old transit room.

IV.—The Library.

The library has been increased during the year by 314 volumes, 301 of which have been presented and 13 purchased.

V.—The Work of the Observatory.

Preparation for the photographic charting of the heavens has added considerably to the astronomical work of the establishment during the past nine months, more especially as regards the transit circle observations. An important part of the astro-photographic work is the determination of the positions of a large number of stars to be used as guide or reference stars. It has been arranged by the Paris Congress that near the centre of every photographic plate used in the charting shall be a star, whose place is either well known or must be determined. Melbourne will have 1,440 plates to cover its portion of sky, and this involves selecting a list of at least as many stars, most of which we find will have to be observed three times with the transit circle. Besides guide stars for the Melbourne zones, which extend from 65° South declination to the pole, we have been asked to observe guide stars for the zones 11° to 14° South, a work now in progress, involving the determination of the positions of about 940 stars. This work has almost monopolized our meridian observing staff since January last, and other meridian observations have been almost entirely confined to the usual clock and azimuth stars.

The following are the numbers of observations of the several kinds obtained with the transit circle:—

R.A. Observations	4,059
N.P.D. „	2,284
Observations for Instrumental Errors—	
Collimation	138
Level	217
Nadir	210
Runs	48
Flexure	11

The Great Telescope has not been very much used during the period under review. Since repolishing operations were stopped in November last, a considerable amount of experimental work with the spectroscope was done, with the view of determining the best form of spectroscope to use for stellar work, but, on the whole, the results were not satisfactory, owiug to the impossibility, with present arrangements, of getting sufficiently steady motion. Among other observations may be mentioned observation and sketching of Jupiter, for conjunction of red spot with other known spots, in September, 1890; observations of Denning's and D'Arrest's comet, in October, and some trials in photographing stars.

Since the mounting of the astrographic telescope, Mr. Baracchi has had to give most of his time to that instrument, and the Great Telescope has been comparatively idle.

Thirty-seven clear nights were given up to visitors, of which 600 availed themselves of the privilege afforded.

Sun Photographs.—In consequence of the alterations to the photoheliograph, only 126 pictures were obtained during the year, and only since 1st May have photographs been obtained regularly on every fine day.

Terrestrial Magnetism.—The photographic records of variations of magnetic force have been uninterrupted throughout the year, and the usual monthly determinations of abosolute force have been regularly made.

Meteorology and Intercolonial Weather Service.—No important alteration or extension in this branch of our work has taken place during the past year. The number of rainfall stations within the colony has been increased by eleven. The various secondary stations, numbering 472, have continued in satisfactory operation. The Intercolonial Telegraphic Weather Service has worked smoothly and well, and every year becomes more complete and satisfactory. The only derangements during the past year have been caused by storms temporarily breaking telegraphic communication; such occasious, however, have been rare. The daily weather maps for all Australia have been issued regularly as usual.

Time Distribution and Clock Control Service—Time Ball, Williamstown.—During the year there have been thirteen failures out of 300 days upon which signals were sent for dropping the ball. The Clock Control Service from the Observatory has been continued, and is satisfactory. An hourly signal is now transmitted on a special line, and is used by watchmakers and others for getting the time every hour, and is being made use of to set clocks right periodically.

The Post Office clock has been re-erected, but the old system of getting its error daily from a signal sent by it to the Observatory at five minutes past one has not yet been restored, so that we have no knowledge of its present performance.

The tide-gauge at Williamstown is kept going, and the tide-sheets tabulated as usual. Both the time-ball and the tide-gauge are looked after by an attendant at Williamstown, who is in the Naval Forces, and receives a small daily allowance for the service.

Instruments Tested.—The following is a list of instruments of various kinds tested or rated at the Observatory during the year:—

Marine Chronometers	67
Thermometers	15
Surveyor's Chains	4
Aneroid Barometers	15
Prismatic Compass	1

VI.—Publications.

The only new publications issued, besides the ordinary daily weather bulletins, &c., have been the Monthly Record in Meteorology and Terrestrial Magnetism, and the Monthly Rainfall Record. Both are issued up to March last, April and May being in the printer's hands.

VII.—General.

The work of the year is clearly before us. The Melbourne portion of the photographic charting of the heavens, with its collateral work, will use up nearly all our available working power. The meridian work will largely monoplize the Meridian Observing and Computing Staff, while obtaining photographs, developing and otherwise dealing with the plates, will take up the whole attention of two or three members of the staff both night and day. I propose, therefore, to confine the astronomical work for the present at least to the routine meridian observations, coupled with the special observations for guide stars, and to the special photographic work with the astrograph, undertaking only such occasional extra-meridian work as may from time to time demand attention.

Up to the present I am unable to actually commence the chart work, as the final decisions of the Congress have not yet reached me, nor, indeed, as already stated, has some of the necessary apparatus. But both these requirements may be fulfilled any day, and everything is therefore ready to make a start.

It is proposed to continue the other work of the Observatory in meteorology and magnetism, &c., as usual, without any change.

Many years ago (in 1881) some very successful star photographs were obtained by the Great Telescope, with one to three minutes exposure, with plates very much inferior in sensitiveness to those we are now using. The chief difficulty encountered then was to keep the telescope steady on the star. I propose, if time permits, to make some further trials with the present very sensitive plates, and I think it possible, with some slight mechanical additions to the telescope, to obtain sufficiently accurate motion and steadiness of the mounting to get exposures of from five to ten minutes in calm weather.

2nd September, 1891.

R. L. J. ELLERY,
Government Astronomer.

APPENDIX.

BOOKS, ETC., PRESENTED TO THE OBSERVATORY.

Title and Author.	By whom Presented.	
Greenwich Observations, 1887–8	Royal Observatory, Greenwich	England.
Greenwich Astronomical Results, 1887–8	Ditto	„
Greenwich Magnetical and Meteorological Results, 1887–8	Ditto	„
Reduction of Greenwich Meteorological Observations. Part II. ...	Ditto	„
Recomputation of the Position of the Ecliptic and Corrections to Refraction of Stars, Sun, Moon, and Planets. Appendix III.	Ditto	„
Greenwich Ten-year Catalogue of 4,059 Stars for 1880	Ditto	„
Report of the Astronomer Royal to the Board of Visitors, Greenwich, 1890	Ditto	„
Measures of Positions and Areas of Spots and Faculæ upon the Sun's Disc	Ditto	„
Assumed Mean Right Ascensions of Clock and Circumpolar Stars, with the corrections to the Right Ascensions of the Nautical Almanac	Ditto	„
Spectroscopic Observations of Stars and Comets made at Greenwich, 1887–8	Ditto	„
Spectroscopic and Photographic Results, 1888–9	Ditto	„
Radcliffe Observations, 1886. Vol. XLIV.	Radcliffe Observatory, Oxford	„
Memoirs of the Royal Astronomical Society. Vol. XLIX., Part II., 1887–9	Royal Astronomical Society ...	„
Monthly Notices. Vol. L., Nos. 7–9; Vol. LI., Nos. 1–4	Ditto	„
Daily Weather Reports, 1st July to 30th September, 1889	The Meteorological Office ...	„
Daily Weather Reports, 1st January to 30th June, 1890	Ditto	„
The Variability of the Temperature of the British Isles, 1869–83 ...	Ditto	„
Meteorological Observations made at Sanchez, Samana Bay, St. Domingo, 1886–8	Ditto	„
Meteorological Observations of the Second Order, 1886	Ditto	„
Report of the Meteorological Council to the Royal Society for the year ending 31st March, 1890	Ditto	„
Weekly Weather Report	Ditto	„
Library Catalogue, Royal Meteorological Society	Royal Meteorological Society	„
The Meteorological Record. Vol. IX., Nos. 35–36	Ditto	„
The Meteorological Record. Vol. X., Nos. 37–38	Ditto	„
The Journal of the British Astronomical Association. Vol. I., No. I. ...	British Astronomical Association	„
Markee Observations of Double Stars	Royal Irish Academy, Dublin	Ireland.
Scientific Proceedings of the Royal Dublin Society. Vol. VI. (N.S.) Parts 7–9	Royal Dublin Society ...	„
Proceedings of the Philosophical Society of Glasgow, 1889–90. Vol. XXI.	Philosophical Society of Glasgow	Scotland.
Journal of the Scottish Meteorological Society, 1889. Third Series. No. 7.	Scottish Meteorological Society	„
Transactions of the Royal Society of Edinburgh. Vol. I., Part I., No. 6	Astronomer Royal for Scotland	„
Catalogue of the Crawford Library of the Royal Observatory, Edinburgh	Ditto	„
Brief Sketch of the Meteorology of the Bombay Presidency in 1888–9 and 1889–90	Meteorological Office, Bombay	India.
On the Occasional Inversion of the Temperature Relations between the Hills and Plains of Northern India. John Elliott	Meteorological Office, Calcutta	„
Memorandum on the Snowfall in the Mountain Districts of Northern India, Afghanistan, &c., January to May, 1890	Ditto	„
Summary of the Meteorology in Bengal, 1889	Ditto	„
Report of the Administration of the Meteorological Department of the Government of India, 1889–90	Ditto	„
Cyclone Memoirs. Part III.	Ditto	„
Results of Meteorological Observations in Bengal, from 23rd March, 1890, to 18th April, 1891	Ditto	„
Abstract of Thermometrical Observations at Chowringhee and Alipore, from March, 1890, to March, 1891, inclusive	Ditto	„
Rainfall in Bengal, from March, 1890, to March, 1891	Meteorological Office, Calcutta	„
Results of Meteorological Observations at the G. V. Juggarow Observatory, 1889	G. V. Juggarow Observatory, Vizagapatam	„
Great Trigonometrical Survey of India, Vols. XI., XII., XIII. ...	Surveyor-General of India ...	„
Magnetical and Meteorological Observations made at the Government Observatory, Bombay, 1888–9	Bombay Observatory ...	„
Proceedings of the Royal Society of Victoria. Vols. II. and III. (New Series)	Royal Society of Victoria ...	Victoria.
Annual Report of the Secretary for Mines, 1889	Secretary for Mines ...	„
Reports of the Mining Department for the Quarter ended 31st March, 1890, 30th September, 1890, 31st December, 1890, and 31st March, 1891	Ditto	„
Suitability of the River Yarra for the Irrigation of the Botanical Gardens. Blackett and Pearson	Ditto	„
Victorian Year-Book, 1888–9, Vol. II.; 1889–90, Vols. I. and II. ...	Government Statist ...	„
Her Majesty's Colonial Possessions, Nos. 82, 92, 95, 96, 98, 100, 106, 107, 108, and 118	Chief Secretary	„
Statistical Abstract for the Several Colonial and Other Possessions from 1875–89	Ditto	„
Report on the State Forests of Victoria. G. S. Perrin	Conservator of Forests ...	„
Report of the Select Committee of the Legislative Council on the Melbourne Hospital	... ...	„
The School of Mines and Industries. Annual Report for the Year ended 30th June, 1890	School of Mines, Sandhurst ...	„
Official Record of the Centennial International Exhibition, Melbourne, 1888–9	Executive Commissioners ...	„

APPENDIX—*continued.*

Title and Author.	By whom Presented.	
Journal and Proceedings of the Royal Society of New South Wales. Vol. XXIV., Part II.	Royal Society of New South Wales	New South Wales.
President's Address, 1891, Royal Society of New South Wales ...	Ditto	,,
Results of Meteorological Observations made in New South Wales during 1888	Sydney Observatory ...	,,
Results of Rain, River, and Evaporation Observations made in New South Wales, 1889	Ditto	,,
Meteorological Observations at Sydney, 1865-9, 1870, 1873, 1874, and 1877	Ditto	,,
On some Photographs of the Milky Way recently taken at the Sydney Observatory. H. C. Russell	Ditto	,,
Report of the Meteorological Observer for the Year 1889	Meteorological Department, Hobart	Tasmania.
Statistics of the Colony of Tasmania for the Year 1889	Government Statistician ...	,,
Rainfall in South Australia and the Northern Territory in 1887 ...	Government Astronomer, Adelaide	South Australia.
Meteorological Observations made at the Adelaide Observatory, 1883 and 1888	Ditto	,,
A Record of the Mines of South Australia	Hon. Commissioner of Crown Lands and Immigration, South Australia	,,
Transactions of the Royal Society of South Australia. Vol. XIII., Part II.	Royal Society of South Australia	,,
Report of the Board of Governors of the Public Library, Museum, and Art Gallery of South Australia, 1889-90	Board of Governors ...	,,
Report of the Hydraulic Engineer on Water Supply, Queensland ...	Secretary of Water Supply Department, Brisbane	Queensland.
Report of the Survey Department, New Zealand, 1889-90	Surveyor-General, Wellington	New Zealand.
Meteorological Report for 1888, Western Australia	Meteorological Reporter, Perth	Western Australia.
Annual Report of the Government Astronomer for 1889, Natal Observatory	Natal Observatory	Natal.
On the Probable Errors of Transit Observing. W. H. Finlay ...	W. H. Finlay, M.A., Royal Observatory, Cape of Good Hope	Cape Colony.
On Star-correction Tables. W. H. Finlay	Ditto	,,
On an Error in Brünnow's Formulæ for Differential Refraction in Distance and Position Angle. W. H. Finlay	Ditto	,,
Mauritius Meteorological Results for 1889	Royal Alfred Observatory ...	Mauritius.
Annual Report of the Director of the Royal Alfred Observatory for the Year 1888	Ditto	,,
Report of the Chief Signal Officer of the War Department for 1889, Parts I. and II., and 1890	Chief Signal Officer ...	United States, America.
Instructions to Voluntary Observers of the Signal Service, Extract No. 26. Report Chief Signal Officer	Ditto	,,
Tri-daily Meteorological Record, July to December, 1890	Ditto	,,
Meteorological Tables. H. A. Hazen	H. A. Hazen, Chief Signal Office, Washington	,,
Anemometer Comparisons. H. A. Hazen	Ditto	,,
Cloud Formation. H. A. Hazen	Ditto	,,
Storms and a Central Ascending Current. H. A. Hazen	Ditto	,,
Tornadoes. H. A. Hazen	Ditto	,,
Pressure and Temperature in Low and High. H. A. Hazen	Ditto	,,
Thermometer Exposure. H. A. Hazen	Ditto	,,
Determination of Prevailing Wind Direction. H. A. Hazen	Ditto	,,
Reduction of Air Pressure to Sea Level. H. A. Hazen	Ditto	,,
On Vertical Currents in Cyclones. M. Dechevrens, Zi-ka-wei Observatory	Ditto	,,
The Relation between Wind Velocity and Pressure	Ditto	,,
Determination of Air Temperature and Humidity	Ditto	,,
On the Determination of the True Air Temperature	Ditto	,,
The Temperature of the Moon. Langley and Very	Ditto	,,
Meridian Circle Observations of Stars near the South Pole	Harvard College Observatory	,,
Bulletin of the New England Meteorological Society	Ditto	,,
An Investigation of the Sea-breeze. Schultz and Ward	Ditto	,,
Report of the Superintendent of the United States Naval Observatory for the years ending 30th June, 1889, and 30th June, 1890	United States Naval Observatory	,,
Catalogue of Stars U. S. Naval Observatory. Yarnall. Catalogue 1860. Frisby	Ditto	,,
Washington Observations, 1884-5. Appendix I. and II.	Ditto	,,
The Solar Parallax and its Related Constants. Appendix III. Washington Observations, 1885. Wm. Harkness	Ditto	,,
Publications of the Astronomical Society of the Pacific. Vol. II., Nos. 9, 10, 12. Vol. III., Nos. 13, 14, 15	Astronomical Society of the Pacific	,,
Memoirs of the National Academy of Sciences. Vol. IV., Part II. ...	National Academy of Sciences	,,
The Temperature of the Surface of the Moon. Memoir IX., Vol. IV.	Ditto	,,
Annals of the New York Academy of Sciences. Vol. IV., No. 12; Vol. V., Nos. 1, 2, 3	New York Academy of Sciences	,,
Publications of the Leander McCormick Observatory. Vol. I., Part IV.	University of Virginia ...	,,
Seventh Annual Report of the Ohio Meteorological Bureau, 1889 ...	Ohio Meteorological Bureau ...	,,
Report of the Ohio Weather Bureau for June, September, and December, 1890	Ditto	,,
On the Motions of the Planetary Nebulæ in the Line of Sight. James E. Keeler	Lick Observatory	,,
Publications of the Washburn Observatory. Vol. VI., Parts I., II. ...	Washburn Observatory ...	,,
Proceedings of the American Association for the Advancement of Science. Thirty-eighth meeting, Toronto	American Association for the Advancement of Science	,,
Catalogue of 644 Comparison Stars	Charlton College Observatory	,

APPENDIX—*continued.*

Title and Author.	By whom Presented.	
Proceedings of the American Academy of Arts and Sciences, Vol. XVI., N. S.	American Academy of Arts and Sciences	United States, America.
Publications of the Cincinnati Observatory, 1882–6	Observatory of Cincinnati University	,,
Smithsonian Report, 1886, Part II., and 1887, National Museum ...	Smithsonian Institute ...	,,
Smithsonian Report, 1887	Ditto	,,
Annual Report of the Director of the Dearborn Observatory, 1890 ...	Dearborn Observatory ...	,,
Report for the Year 1890 presented by the Board of Managers of the Observatory of Yale University	Observatory of Yale University	,,
Abstract of Registers of Self-recording Instruments, May to November, 1890	New York Meteorological Observatory	,,
Bulletin of the American Geographical Society. Vol. XXII., Nos. 2, 3, 4; Vol. XXIII., No. 1	American Geographical Society	,,
Anuario del Observatorio Astronomico Nacional de Tacubaya, 1891 ...	Observatorio Ast. Nacional de Tacubaya	Mexico.
Boletin del Observatorio Astronomico Nacional de Tacubaya ...	Ditto	,,
Boletin Mensual—Resumen del año de 1889...	Obs. Meteorologico-Magnetico Central de Mexico	,,
Boletin Mensual Tomo II., Nos. 7, 8, 9, 10, 11, 12	Ditto	,,
Memorias de la Sociedad Cientifica, Tomo III., Nos. 7–12, Tomo IV., Nos. 1–4	Ditto	,,
Resumen Correspondiente a Cada dia, April to June, 1890, August, 1890—March, 1891	Observatorio Met°. del Colegio del Estado de Puebla	,,
Anales del Instituto Fisico-Geografico Nacional	Instituto Fisico-Geografico Nacional, San Jose	Costa Rica.
Observaciones Meteorolôgicas hechas en el Instituto Nacional del Salvador, 1889, and January, 1890	Instituto Nacional Central ...	San Salvador.
Anales de l'Observatoire Imperial de Rio Janeiro, Tomo IV., Part 1 and 2	L'Observatoire Imperial de Rio Janeiro	Brazil.
Revista do Observatorio, Tomo V., Nos. 5–12, Tomo VI., Nos. 1–4 ...	Ditto	,,
Annuario Publicado pelo Imperial Observatorio do Rio de Janeiro, 1888, 1889, 1890	Ditto	,,
Observaciones Magneticas y Meteorologicas del Real Colegio de Belen	Real Colegio de Belen ...	Cuba.
Anales de la Oficina Meteorológica Argentina, Tomo VII.	Oficina Meteorologica Argentina, Cordoba	Argentine Republic.
Resultados del Observatorio Nacional Argentino, Vol. XII.	Observatorio Nacional Argentino	,,
Anuario del Observatorio de la Plata	Observatorio de la Plata ...	,,
Observaciones Meteorológicas Santiago, 1882–4; 1885–7	Observatorio Nacional Santiago	Chili.
Boletin Mensuel del Observatorio del Colegio Pio del Villa Colon ...	Observatorio del Colegio Pio del Villa Colon	Uruguay.
Deuxième Bulletin Chronométrique de l'Observatoire de Besançon ...	Observatoire de Besançon ...	France.
Annales de l'Observatoire de Nice. Tome III.	L'Observatoire de Nice ...	,,
Annuare de l'Observatoire Municipal de Montsouris, 1890	L'Observatoire de Montsouris	,,
Annales de l'Observatoire de Bordeaux	L'Observatoire de Bordeaux ...	,,
Description du Service Horaire de la Ville de Lyon	L'Observatoire de Lyon ...	,,
Elements Magnétiques à Lyon	Ditto	,,
Influence de l'Altitude sur la Marche Diurne du Baromètre	Ditto	,,
Sur le Ligament Lumineux des Passages et Occultation des Satellites de Jupiter. M. Ch. André	Ditto	,,
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