

1880-81.  
VICTORIA.

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FIFTEENTH REPORT

OF THE

BOARD OF VISITORS

TO

THE OBSERVATORY;

TOGETHER WITH THE

*Annual Report of the Government Astronomer.*

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

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By Authority :

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FIFTEENTH REPORT OF THE BOARD OF VISITORS TO THE OBSERVATORY.

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TO HIS EXCELLENCY THE MOST HONORABLE THE MARQUIS OF NORMANBY,  
G.C.M.G., *Governor and Commander-in-Chief of the Colony of  
Victoria, &c., &c., &c.*

We have the honor to inform Your Excellency that we visited the Observatory on the 24th instant, and inspected the building, instruments, and the work completed since our last visitation as well as that now in progress.

The details of the establishment and of the duties performed by the Astronomer and his assistants will be found in his report, which we now beg leave to submit.

We are very glad to find that the Government has determined that a new Transit Circle shall be obtained, and we venture to hope that this great want of the Observatory may soon be supplied, seeing that without it it is impossible that we can fulfil the duties we have undertaken in conjunction with other national Observatories.

We are much gratified to learn from Mr. Ellery that effect is to be given to the recommendation of the Meteorological Conference held in Sydney last year, and we trust that the Government may be pleased to use its influence in securing the co-operation of Tasmania, which is necessary for the completion of the system of observations adopted by the Conference. We learn from the Government Astronomer with much satisfaction that immediate provision is to be made for the mountain station forming an important part of this work.

It is intended by Mr. Ellery that copies of lunar photographs and star charts arranged as planispheres shall be distributed among the public schools of the colony. We highly approve of this intention, and consider it of great importance that the usefulness of the Observatory should be extended to the utmost, and especially that it should be made available for the purposes of public instruction.

We understand that a demand has been made upon the Observatory for assistance to the jury of the Melbourne International Exhibition upon horology. It is of more than local importance that the judgment of the jurors shall be aided by such scientific tests of the chronometers exhibited as shall secure general satisfaction and acceptance. The appliances for these tests can be most conveniently provided at the Observatory, and we gladly support any request which the Government Astronomer may find it necessary to prefer to this end.

In conclusion we desire again to testify to the efficient manner in which the duties of the Observatory are conducted by the Government Astronomer and his staff, and to express the satisfaction it affords us to know that the work done continues to deserve the commendation of all those in various parts of the world who are most competent to judge of its quality.

GEORGE VERDON, F.R.S.,  
G. V. SMITH,  
M. H. IRVING, M.A.,  
J. W. STEPHEN, M.A.,  
J. E. BROMBY, M.A., Hon. Sec.

24th November 1880.



REPORT OF THE GOVERNMENT ASTRONOMER TO THE BOARD OF VISITORS  
TO THE OBSERVATORY, NOVEMBER 1880.

GENTLEMEN,

The report which I have now the honor to submit to the Board of Visitors has reference to the period between 30th June 1879 and 30th June of the present year, and will furnish an outline of the work done at the Observatory, or in connection with it, during that time, and also of the state of the establishment at the latter date.

PERSONAL ESTABLISHMENT.

With the exception of the retirement on pension of the messenger, J. Rough, through infirmity, and the appointment of Joseph Burley in his place, no change has taken place in the *personnel* of the department since the last visitation, and the staff therefore consists of the following :—

Mr. ELLERY, Director, Government Astronomer,  
Mr. WHITE, Chief Assistant,  
Mr. MOERLIN, Assistant,  
Mr. TURNER, „  
Mr. GILBERT, „  
J. BURLEY, Messenger.

Messrs. Lilly and Kemp still continue to hold their positions on the temporary staff—the first as mathematical, and the second as clerical and photographic assistant ; there are also a mechanic and a workman—the latter principally occupied in connection with the great telescope.

The duties of the Observatory have been allotted as in former years, with scarcely any change. The general direction and supervision, correspondence, and special observational work devolve upon me ; while the chief assistant, Mr. White, has charge of all work in connection with the transit circle and meridional observations, with all the ordinary and most of the special astronomical computations, in which he has been assisted by Mr. Moerlin and Mr. Gilbert. The more special duty devolving on Mr. Moerlin is charge of the meteorological and magnetic work of the Observatory and of the photography and records connected therewith, in which he is assisted by Mr. Kemp. Mr. Turner has been principally occupied with the great telescope and with the drawings and photographic work connected with it. Mr. Gilbert has charge of the time signals, distribution of time, ships' chronometers, and like matters ; he assists Mr. White in meridional observations, and also acts as accountant and storekeeper. Mr. Lilly assists in special mathematical work and observation, and has charge of the library of the establishment, and the acknowledgment of donations to it. Mr. Kemp, besides assisting Mr. Moerlin in the photographic and clerical part of the duties devolving on him, acts also as telegraph clerk, for the Observatory is connected by wire with the central telegraph office, and receives and sends all weather telegrams and other telegraphic communications, as in the case of a branch telegraph office.

GROUNDS AND BUILDINGS.

The grounds are in as good condition as the means at disposal will allow. The main drive, however, requires re-gravelling, and the fencing which surrounds the reserve has been decaying rapidly for the last few years, and the question of a new one or very extensive repairs will shortly claim attention.

The main building is now requiring the ordinary periodical repairs, painting, &c. ; otherwise it is in excellent order. The great telescope house is in a satisfactory state throughout. The machinery for moving the roof on and off the telescope has, since the alterations referred to in my last report, worked quite satisfactorily, and now gives no trouble whatever. The magnet house and other smaller buildings are in capital order ; the ventilation of the former is much improved, and is now moderately satisfactory.

The new thermometer shed, described in my last report, has turned out a success, and there can be no doubt that our thermometric results more nearly approach the true shade temperature than was the case with any of the screens or stands formerly in use. At the request of the director of the meteorological department of Great Britain, a sketch and description of this shed has been forwarded to him.

INSTRUMENTS.

One or two new minor instruments have been added to the appurtenances of the establishment during the period under review. A barograph, somewhat after the style known as King's barograph, has been made, for the most part in our own workshop, and mounted in the lobby. It records the fluctuations of atmospheric pressure magnified about five times—that is, for a fall of one inch of the barometer the barograph registers five inches. The record is made on paper with colored ink, the time scale being about one inch per hour. Such instruments, although they can scarcely pretend to the precise accuracy of the photographic barograph, are extremely useful, inasmuch as they show at once every variation of pressure and the time of its occurrence, while the photographic record can only be consulted after development of the curves, which is done every second day.

All the principal instruments are in capital order. The transit circle, although its limited aperture is becoming each year a matter of vexation and disappointment whenever we undertake

co-operative work with European and American observatories, continues still to perform excellently, and affords every satisfaction within the limits of its capabilities. The weekly examination of its errors of flexure and collimation, and the more frequent determination of those of level and azimuth, indicate a general stability of both the instrument and its piers scarcely to be surpassed.

The great telescope continues in good working order, and although a slight diminution of the reflective power of the mirrors is apparent from year to year, it is remarkable in what good condition the surfaces have kept. A slight greyness may be discerned by looking obliquely on the mirrors, but no loss of light arising from this cause is perceptible in the instrument when used on the faintest objects, and some photographs of the moon lately taken were obtained with less exposure than any former ones, although the same kind of plates and process was used.

The mechanism of the telescope has continued to work well; it has had one overhaul, about two months ago, as there was found to be too much play in R.A., owing to slight wear in the sector; a little readjustment, however, set everything right.

Both of the equatorial refractors are in a satisfactory condition. The photoheliograph was readjusted some months ago, with the result that it is now driven steadily by its clock, and the focalization on the sensitive plate is nearly perfect.

The clocks, chronographs, and time-distributing appliances, as well as most of the meteorological and magnetic instruments, have continued to do their work satisfactorily, but, as mentioned in my last report, the anemograph is now so far worn out by nearly twenty years' work that the construction of a new one was determined on in June last.

A thorough re-arrangement of the electric service within the Observatory was completed early in the year now under review, which has simplified and made much more convenient than formerly all the operations for time signals, time comparisons, clock controlling, and chronography.

The photographically recording instruments—namely, the three magnetometers, the barograph, the wet and dry bulb thermographs, and the electrograph—have been in continual and satisfactory operation throughout the year, and are all of them in excellent condition.

#### THE LIBRARY.

Our library has been again so largely added to during the past year, chiefly by exchanges and liberal donations from scientific societies and kindred establishments in other parts of the world, that increased library accommodation has now become a pressing necessity.

Appended to this report is a list of donations received during the year.

#### PUBLICATIONS.

The fifth volume of Melbourne Astronomical Observations, containing the results of the observations made with the transit circle from 1871 to 1875, was received from the Government Printer in October 1879, and has been duly distributed. The separate results in R.A. and N.P.D., and the annual catalogues for 1876 and 1877, are reduced and ready for the printer, but it is intended not to publish them until the results for 1878, 1879, and 1880 are also ready. The monthly record of meteorology and terrestrial magnetism has been issued up to June last. Volume V. of the Annual Results in Meteorology and Magnetism for 1876 has been published since my last report, and the volume for 1877 is nearly ready for the printer. The daily issue of the weather bulletin to various public places and offices in Melbourne, as well as to the daily press, has been continued throughout the year.

Most of the drawings of the southern nebulae obtained with the great telescope have at last been lithographed, and are ready for publication; but unusual pressure on my time during the last three months has hitherto prevented me from preparing the necessary descriptions to accompany them. I hope to get a portion of the work in the printer's hands before the close of the year.

#### THE WORK OF THE OBSERVATORY.

*Meridian Observations.*—The fundamental astronomical work of this Observatory is that done with the transit circle; this has been carried on unremittingly by Mr. White, assisted by Mr. Gilbert. The objects selected for this work during the year have consisted of the usual fundamental clock and circumpolar stars,—stars culminating near the zenith of Melbourne, for use in the colonial geodetic surveys,—stars that have been observed occulted by or culminating with the moon,—stars which have not yet been observed sufficiently often to appear in our next ten years' catalogue,—and stars which have been used in differential comet comparisons with the equatorials.

The following list gives the number of recorded observations of this class obtained, as well as those made for determination of instrumental errors, between 1st July 1879 and 30th June 1880:—

Right Ascension Observations	...	...	...	1920
Polar Distance ditto	...	...	...	742
Observations for Collimation Error	...	...	...	143
Ditto for Level and Nadir	...	...	...	147
Ditto for Micrometer Runs	...	...	...	50
Ditto for Flexure of Telescope	...	...	...	12

Of these, 424 polar distance observations are completely reduced to the end of 1879, and 318 to apparent places only.

The zone observations have now been completely reduced, and a beginning has been made of forming them into a catalogue in the order of the right ascension of the stars.

*Great Telescope Observations.*—During the year there have been 65 nights only on which successful observations could be made; about 140 nights were cloudy or unfit for using the telescope, 58 nights were occupied with visitors, while on 28 nights bright moonlight interfered with nebular work.

Fifty-six of the smaller nebulae and clusters contained in Sir John Herschel's catalogue have been observed and compared with his descriptions. The great majority of these were found to present exactly the same aspect as described by him; eight differ considerably; while one does not appear to agree in any respect with Herschel's description.

Two small nebulae, Nos. 834 and 867, as well as one small cluster of 11th to 16th magnitude stars, No. 891, could not be found; one small nebula not mentioned by Herschel, and in the same field with his Nos. 3234 and 3237, has been observed.

Observations of the Trifid nebula, Herschel 4355, were made on three nights, so as to compare it with the drawings and observations of Messrs. Holden and Trouvelot obtained with the great refractor at Washington.

The nebula surrounding  $\eta$  Argus has, on three evenings, been again compared with the drawing made in March 1875, and found still to be in the same condition as described in the last report.

Amongst the other work of the great telescope during the year may be mentioned the occultation of 64 Aquarii by Jupiter, and various special examinations of the lunar surface, search for and observation of comets, search for the satellites of Mars, &c.

*Magnetic and Meteorological Observation* has been continued as in former years, with scarcely any change in routine or process. The magnetographs, Thomson's electrometer, barograph, and thermographs have furnished their curves without any interruption beyond an occasional break of an hour or so, caused by temporary failure of the gas supply. The other self-recording instruments, such as the wind-pressure gauge, Robinson's anemometer, and the new recording rain gauge or ombrograph, have also furnished almost unbroken records. The country meteorological stations are in an efficient condition, and continue to furnish regular and satisfactory returns. The rain-gauge stations have now been increased to 114, and monthly reports are received with great regularity from them, a synoptical table of which is published in the daily and weekly papers under the title of "The Rainfall of Victoria."

*Occasional Observations.*—The principal astronomical event of the year was the apparition in February last of a large comet, which, it now appears probable, was identical with the celebrated one of 1843. Unfortunately during the earlier dates of its apparition it set so soon after the sun, and was therefore so low in the western horizon that the summer haze prevalent at that time entirely prevented any accurate measures of position; a good series was, however, afterwards secured, and the results, combined with others obtained at the Cape of Good Hope and at Córdoba, in the Argentine Republic, have enabled very close calculations of its orbit to be made; this orbit appears so similar to that of the 1843 comet as to leave little doubt of its identity with that body.

Another somewhat interesting astronomical event occurred on 14th September 1879, namely, the occultation of a small star known as 64 Aquarii by the planet Jupiter. Such a phenomenon is somewhat rare, and therefore interesting; but it was also of value as likely to furnish evidence of the transparency of the outer envelope of the planet, a condition which modern speculations assume to be very probable, and which recent observations of its satellites have seemed to indicate. The weather was unusually propitious here, and very good and critical observations with our three principal telescopes were obtained, the most prominent result being that the manner in which the disappearance of the star occurred suggested the existence of a thin outer envelope through which the star's light could be seen for some moments after true occultation.

During the opposition of Mars in September and October 1879 a careful search for the newly discovered satellites was made with the great telescope, and the outer one, Deimos, was observed on five nights during November.

*Special Work for the Public.*—That portion of the work of the Observatory which consists in testing, regulating, and giving certificates of accuracy or quality to scientific instruments—such as chronometers, barometers, thermometers, surveying instruments, lineal measuring apparatus, &c.—is increasing every year, and it has become necessary that further facilities for meeting such requirements shall be added to the appliances of the establishment; more especially a chamber where the time-keeping qualities of chronometers and watches under varying temperatures and in different positions may be tested, and a vacuum chamber for testing the better class of mercurial barometers, the manufacture of which in the colony has already commenced.

During the year under review thirty-three chronometers have been rated and thirty aneroid barometers tested in vacuo, and tables of corrections for them given. Several mercurial barometers, thermometers, and other instruments have also been submitted for comparison, test, or correction. The weekly publication in the Melbourne newspapers of "Notes from the Observatory," alluded to in my last report, has met with general approval, and there can be little doubt that by this means the public will gradually become familiar with the place a national observatory occupies in the community, as well as with many of its "doings"; in fact, I trust it may help to popularize the sciences of which it is the chief exponent, and to throw light upon investigations which have often been regarded as mysterious and unutilitarian.

*Time Signals and Distribution of Time.*—I have referred in former reports to the wearing out of the apparatus of the Williamstown time-ball, and I am now glad to be able to report to the Board that the erection of an entirely new ball and apparatus, according to plans prepared under

my direction, was approved of by Government, and commenced before the end of June. The new apparatus, although on a similar principle to the old one, is almost entirely of metal, and modified in parts where experience showed improvements could be made. The mast is of tubular iron, and the ball itself of copper; the hoisting, detaining trigger, and break apparatus are on the same plan as formerly, and, from preliminary trials made in the contractor's workshops, I believe it will be found to work very satisfactorily, and prove very durable.

During the year, out of 299 times the ball was hoisted, it dropped correctly 290 times. Four times it failed on account of interruption on the telegraph line, once through defective signals from the Observatory, and four times in consequence of derangement of the time-ball apparatus itself.

*The Post Office Clock.*—This has been compared every day, as usual, with Observatory mean time, and it has maintained its character for excellent time-keeping, its error having ranged between twelve seconds fast and fifteen seconds slow during the twelve months.

The clock control system has continued to work very satisfactorily so long as the conducting wires have been right, but an occasional *cross*, *break*, or other interruption has occurred, when of course the control ceased. By means of *tell-tale* galvanometers in the lobby of the Observatory any interruption is at once detected, and is seldom allowed to go many hours unremedied. The change in the distribution of the clock-controlling wires, referred to at the last visitation, was carried out by the Telegraph Department in August 1879 with very satisfactory results, only about half as many interruptions having occurred since the division of the circuit into two distinct lines as before.

*Tide Gauge of Hobson's Bay.*—This instrument, which has been in charge of the Observatory since 1873, has been regularly attended to, and has furnished unbroken records of the tides at Williamstown throughout the year. These records are filed away for reference after the times and heights of high and low water have been tabulated in the tide ledger.

#### INTERCOLONIAL METEOROLOGICAL CONFERENCE.

In October 1879 the meteorologists of the various colonies were invited by the Government of New South Wales to Sydney to hold a conference on intercolonial meteorological matters, and the first meeting took place on 11th November at the Sydney Observatory. The representatives present were:—For New South Wales, H. C. Russell, Esq., B.A., F.R.A.S.; for New Zealand, Dr. Hector, M.D., F.R.S.; for South Australia, Chas. Todd, Esq., C.M.G., F.R.A.S.; and for Victoria, myself. The chief objects of the conference were to devise a scheme for meteorological co-operation throughout the colonies to secure as far as possible similarity of observation and procedure, to arrange for regular exchange of weather telegrams, and to establish a system of investigation of the movement of storms over the Australian continent and New Zealand, and a code of telegraph warnings between the various observers.

The conference sat on three days, and drew up a report, embodying several recommendations, a copy of which is on the table.

On the part of this colony I undertook to try to get Tasmania to join in the scheme, to adopt the methods of observation, &c., agreed upon, and also to endeavor to establish a meteorological station at a considerable altitude on the coast range, Mount Macedon having been selected as the best site. I beg now to inform the Board that means for carrying out the latter suggestion, as well as to provide for cable telegrams, have been liberally placed on the Estimates by the Government, and that as soon as the money becomes available the mountain station will be established; and further, that although preliminary steps have been taken to secure the co-operation of Tasmania, no definite arrangement has yet been come to to carry out this recommendation of the conference. I have no doubt, however, that this will be done, and in the meantime I have obtained the concession of half rates for weather telegrams passing over the submarine cables of the Eastern Extension Telegraph Company.

In conclusion, I beg to report to the Board that, since the termination of the period with which this report deals, steps have been taken to provide means for testing chronometers for time-keeping under various temperatures, that a new instrument known as a sunshine recorder has been received from England, and placed in operation. This instrument, which is very simple, furnishes a daily record of the times at which the sun shines by the charring of a graduated slip of card, placed beneath a glass sphere, and I submit both the apparatus and the card records for the inspection of the Board.

A planisphere of the southern stars, with movable time circle and horizon, by which the rising, setting, and meridian passage of stars can be readily found, and many simple astronomical problems performed, has been prepared at the Observatory, and is in course of engraving. It is intended to publish this for the use of State and other schools.

I also propose to ask authority from the Government to get cheap heliotype copies of our series of lunar photographs, showing the moon in all her phases, for the same purpose.

Although a sum of money appeared on the first Estimates of the current financial year to cover half the cost of the much required new transit circle, it was considered desirable to withdraw it on account of the present pressure on the revenue; but the Government quite accede to the proposition of supplying this requirement of the Observatory at an early date.



## APPENDIX.

## BOOKS, ETC., PRESENTED TO THE OBSERVATORY.

Name and Author of Book.	By whom Presented.			
Greenwich Observations; Astronomical, Magnetic, and Meteorological; 1877	Greenwich Observatory ...	...	...	England.
Greenwich Astronomical Results; 1877 ... ..	Ditto ... ..	...	...	"
Greenwich Meteorological and Magnetic Results; 1877 ... ..	Ditto ... ..	...	...	"
Report of the Astronomer Royal to the Board of Visitors, Greenwich; 1879	Ditto ... ..	...	...	"
Greenwich Nautical Almanac for 1883 ... ..	Ditto ... ..	...	...	"
Greenwich Nautical Almanac Corrections of Clock and Circumpolar Stars for 1880	Ditto ... ..	...	...	"
Cape of Good Hope Astronomical Results for 1876 ... ..	Ditto ... ..	...	...	"
Daily Weather Reports of the Meteorological Office, June 1878 to June 1879	Meteorological Office, London	...	...	"
Contributions to the Knowledge of the Meteorology of the Arctic Regions	Ditto ... ..	...	...	"
Contributions to the Knowledge of the Meteorology of the Pacific; No. 3	Ditto ... ..	...	...	"
Report on the Meteorology of Kerguelen Island ... ..	Ditto ... ..	...	...	"
Report of the Meteorological Council to the Royal Society for the Year 1878-79	Ditto ... ..	...	...	"
Discours du Président du Comité Permanent du Congrès Météorologique de Vienne	Ditto ... ..	...	...	"
Reports of Dr. Wild, Dr. Mohr, Dr. Hann, Dr. Liburnan, and Professor Ebermayer, at the Meteorological Congress at Rome	Ditto ... ..	...	...	"
Deuxième Congrès International des Météorologistes à Rome...	Ditto ... ..	...	...	"
Rapport au Deuxième Congrès Météorologique International de Rome (Dr. C. Pittei)	Ditto ... ..	...	...	"
Report of the Proceedings of the Second International Meteorological Conference at Rome, 1879	Ditto ... ..	...	...	"
Memoirs of the Royal Astronomical Society, Vol. XLIV. (1877 to 1879)	Royal Astronomical Society	...	...	"
Monthly Notices of the Royal Astronomical Society, April 1879 to April 1880	Ditto ... ..	...	...	"
Proceedings of the Royal Society; Nos. 184 to 196 ... ..	Royal Society, London	...	...	"
Cambridge Observatory Astronomical Publications; Vol. XXI. (1861-65)	Cambridge Observatory	...	...	"
Reports of the Cambridge Observatory Syndicate for the Years 1867-79	Ditto ... ..	...	...	"
Reports of the British Association for the Advancement of Science; 1877-78-79	British Association	...	...	"
Quarterly Journal of the Meteorological Society; Nos. 31, 32	Meteorological Society	...	...	"
Report on the Meteorology of England for 1878 ... ..	Ditto ... ..	...	...	"
List of Fellows of the Meteorological Society; January 1880...	Ditto ... ..	...	...	"
Report of the Kew Committee of the Royal Society for the Year 1879	Kew Observatory	...	...	"
Observations of the Duration of Sunshine and Amount of Cloud at Kew Observatory	Ditto ... ..	...	...	"
Stonyhurst Observatory Meteorological and Magnetic Results; 1878	Stonyhurst Observatory...	...	...	"
The Selenographical Journal for 1879 ... ..	Herbert Sadler, Esq.	...	...	"
Journal of the Scottish Meteorological Society; LVII., LVIII., LIX.	Scottish Meteorological Society	...	...	Scotland.
The Scientific Transactions of the Royal Dublin Society; Vol. I.	Royal Dublin Society	...	...	Ireland.
Dunsink Observatory Astronomical Observations and Researches; Part III.	Dunsink Observatory	...	...	"
The Great Trigonometrical Survey of India; Vols. II., III., IV.	India Office	...	...	India.
Indian Daily Meteorological Observations, April 1879 to April 1880	Indian Meteorological Department	...	...	"
Reports of the Administration of the Meteorological Department of the Government of India; 1877-79.	Ditto ... ..	...	...	"
Indian Meteorological Memoirs; Vol. I., Part III. By H. F. Blanford	Ditto ... ..	...	...	"
Registers of Original Indian Observations in 1879, reduced and corrected	Ditto ... ..	...	...	"
Variations of Rainfall in Northern India. By S. A. Hill ...	Ditto ... ..	...	...	"
Report of the Madras Cyclone of May 1877. By J. Eliot ...	Ditto ... ..	...	...	"
Report of the Meteorology of India in 1877. By J. Eliot ...	Ditto ... ..	...	...	"
Brief Sketch of the Meteorology of the Bombay Presidency in 1877 and 1878. By F. Chambers	Bombay Meteorological Department	...	...	"
Report of the Administration of the Meteorological Department in Western India for the Year 1878-79	Ditto ... ..	...	...	"
Results of the Meteorological Observations at the Vizagapatam Observatory, 1878	Vizagapatam Observatory	...	...	"
Victorian Patents and Patentees; Vol. X., 1875 ... ..	Registrar-General	...	...	Victoria.
The Melbourne University Calendar, 1878-80 ... ..	Melbourne University	...	...	"
The Victorian Year Book for 1878-79 ... ..	Government Statist	...	...	"
Diagrams of Telegraph Circuits in Victoria ... ..	Postal Department	...	...	"
The Geological Survey of Victoria. Report of Progress; 1880	Mining Department	...	...	"
Transactions and Proceedings of the Royal Society of Victoria. Vol. XVI.	Royal Society of Victoria	...	...	"
Annual Report of the Mining Department of New South Wales; 1877	Mining Department	...	...	New South Wales.
Journal of the Royal Society of New South Wales; 1878. Vol. XII.	Royal Society of New South Wales	...	...	"

## APPENDIX—continued.

Name and Author of Book.	By whom Presented.			
Results of Meteorological Observations made in New South Wales during 1875	Sydney Observatory	...	...	New South Wales.
Results of Rain and River Observations made in New South Wales during 1879	Ditto	...	...	"
Sydney Meteorological Observations, in monthly parts, for 1879	Ditto	...	...	"
Adelaide Meteorological Observations, in monthly parts, for 1879	Adelaide Observatory	...	...	South Australia.
Meteorological Observations made at the Adelaide Observatory during the Year 1878	Ditto	...	...	"
Rainfall in South Australia during the Year 1878	Ditto	...	...	"
Report of the Queensland Lands Department for the Year 1878	Queensland Lands Department	...	...	Queensland.
Meteorological Report of Western Australia for the Year 1879	Surveyor-General	...	...	Western Australia.
Wellington Meteorological Observations for the Year 1879	Dr. Hector	...	...	New Zealand.
Monthly Notices of the Meteorological Society of Mauritius; June 1879	Meteorological Society of Mauritius	...	...	Mauritius.
Daily Bulletin of International Meteorological Observations; August 1878 to August 1879. Washington, U.S.	General A. J. Myer, Chief Signal Officer, U.S. Army Department	...	...	United States.
Monthly Weather Review; March 1879 to March 1880. Washington, U.S.	Ditto	...	...	"
Daily Bulletin of Weather Reports, with Synopses, Probabilities, and Facts, for November and December 1874, January 1875, and January, February, and March 1877	Ditto	...	...	"
Catalogue of Stars observed at the United States Naval Observatory. Washington, 1845-77.	Washington Naval Observatory	...	...	"
Washington Zones of Stars; 1846-47-48-49. Three volumes...	Ditto	...	...	"
Tables of Instrumental Constants and Corrections for the Reduction of Transit Observations	Ditto	...	...	"
On the Right Ascensions of the Equatorial Fundamental Stars. By Professor Newcomb	Ditto	...	...	"
Researches on the Motion of the Moon. Part I. Observations before 1750. By Professor Newcomb	Ditto	...	...	"
Report on the Telescopic Observations of the Transit of Mercury (May 5-6, 1878)	Ditto	...	...	"
Washington Astronomical and Meteorological Observations for 1875	Ditto	...	...	"
American Ephemeris and Nautical Almanac for 1881 and 1882	Ditto	...	...	"
Astronomical Papers prepared for use of the American Ephemeris and Nautical Almanac; Vol. I., Part I. Tables of Eclipses	Ditto	...	...	"
Report on the Difference of Longitude between Washington and St. Louis. By Professor Harkness	Ditto	...	...	"
Report on the Difference of Longitude between Washington, Detroit, Michigan, and Carlin. By Professor Eastman	Ditto	...	...	"
Report on the Telegraphic Determination of the Difference of Longitude in the West Indies and Central America	Ditto	...	...	"
Catalogue of 1963 Stars and 290 Double Stars, observed by U.S. Naval Astronomical Expedition to the Southern Hemisphere during 1850-1-2	Ditto	...	...	"
Annals of the Astronomical Observatory of Harvard College, Cambridge, U.S. Vol. XI.	Harvard College Observatory	...	...	"
Photometric Researches by W. H. Pickering, Cambridge Observatory, U.S.	Ditto	...	...	"
Publications of the Cincinnati Observatory; Micrometrical Measurements of 517 Double Stars. By Ormond Stone	Cincinnati Observatory	...	...	"
Micrometrical Measurements of 1054 Double Stars. By Ormond Stone	Ditto	...	...	"
Report of the Central Park Meteorological Observatory for 1878. By Dr. Draper	Central Park Meteorological Observatory, New York	...	...	"
Smithsonian Report for 1877	Smithsonian Institution, Washington	...	...	"
Transactions of the Connecticut Academy of Arts and Sciences; Vol. III., Part II., and Vol. IV., Part I.	Connecticut Academy of Arts and Sciences	...	...	"
Bulletins of the American Geographical Society, Nos. 5 and 6, Session of 1878, and Nos. 1, 2, 3, Session of 1879	American Geographical Society	...	...	"
Journal of the American Geographical Society of New York; 1875-76-77; Vols. VII., VIII., IX.	Ditto	...	...	"
Geographical Surveys of the 100th Meridian; Astronomy and Barometric Hypsometry. By Lieut. Wheeler	Lieut. G. M. Wheeler	...	...	"
The Boston Science Observer. Vol. III.	Boston Scientific Society	...	...	"
Boletín del Ministerio de Fomento, Mexico, April 1879 to April 1880. M. Bárcena	Central Meteorological Observatory	...	...	Mexico.
Mexican Meteorological Resumé for 1878. By M. Bárcena	Ditto	...	...	"
Estudio del Terremoto; Mexico; 17 Mai 1879. By M. Bárcena	Ditto	...	...	"
Determinacion de la Longitud del Péndulo de Segundos y de la Gravedad en México; 1878-79. By Francisco Timenez	Ditto	...	...	"
Memoria Sobre el Departamento Magnetico del Observatorio Central de México. By V. Reyes	Ditto	...	...	"
Revista Científica Mexicana; January to April 1880	Ditto	...	...	"
Observaciones Meteorológicas en el Instituto Nacional de Guatemala; April 1879 to April 1880	Guatemala Meteorological Observatory.	...	...	Guatemala.
Instituto Nacional de Guatemala, Memoria	Ditto	...	...	"
Uranometria Argentina; the Brightness and Position of the Fixed Stars. With 14 Star Charts. By Dr. B. A. Gould	Cordoba Observatory	...	...	Argentine Republic,
Uranometria Argentina; the Brightness and Position of the Fixed Stars. With 14 Star Charts. By Dr. B. A. Gould	Sir G. F. Verdon, F.R.S., C.B.	...	...	"
Détermination de la Différence des Longitudes entre Paris et Alger	M. Loewy	...	...	France.
Nouvelle Méthode pour déterminer la Flexion des Lunettes	Ditto	...	...	"
Éphémérides des Étoiles de Culmination Lunaire et de Longitude pour 1879	Ditto	...	...	"

## APPENDIX—continued.

Name and Author of Book.	By whom Presented.		
Procès-Verbaux des Séances de 1878 et 1879 de Comité International des Poids et Mesures	Comité International	... ..	France.
Annuaire de l'Observatoire de Montsouris pour l'An 1880. Météorologie	Paris Observatory	... ..	"
Astronomie Géométrique; ou Brèves Considérations sur la nouvelle théorie des Ovhélites	M. L. Hugo	... ..	"
Bullettino Meteorologico dell' Osservatorio del R. Collegio Carlo Alberto in Moncalieri. Vol. XIV. (1879)	Moncalieri Observatory, Turin	... ..	Italy.
Bollettino dell' Osservatorio della Regia Università di Torino for 1878	Turin Observatory	... ..	"
Applicazione del Principii della Meccanica Analitica a Problemi. By Alessandro Dorna.	Ditto	... ..	"
Sullo Strumento dei Pasaggi Tascabile di Steger. By Alessandro Dorna.	Ditto	... ..	"
Determinazione del Tempo; Nota di Alessandro Dorna ...	Ditto	... ..	"
Effemeridi del Sole, della Luna, e dei Principali Pianeti; per l'Anno 1879	Ditto	... ..	"
Resoconto dell' Operazioni fatte a Milano ed a Padova nel 1875 per determinare le Differenze di Longitudine. By G. Celoria	Milan Observatory	... ..	"
Sugli Eclissi Solari Totali (3 June 1239 and 6 October 1241). Memoria di G. Celoria.	Ditto	... ..	"
Sugli Eclisse Solare Totale (3 June 1239). Memoria di G. Celoria Su Alcuni Temporalmente osservati nell' Italia Superiore. By Professor Frisiani	Ditto	... ..	"
Le Sfere Omocentriche. By Professor Schiaparelli ...	Ditto	... ..	"
Osservazioni Astronomiche e Fisiche del Pianeta Marte. By Professor Schiaparelli	Ditto	... ..	"
Osservazioni Astronomiche e Fisiche e Sulla Topografia del Pianeta Marte durante Opposizione del 1877. By Professor Schiaparelli	Ditto	... ..	"
Corrispondenza Astronomica fra G. Piazzi e Barnaba Oriani ...	Ditto	... ..	"
Meteorological Records of the Pesaro Observatory, with Graphic Curves; March 1878 to March 1879	Pesaro Observatory	... ..	"
Anuario del Observatorio de Madrid; 1879 ...	Madrid Observatory	... ..	Spain.
Observatorio Meteorologico del Ateneo Municipal de Manila; Observaciones el Año 1878 y 1879	Manila Observatory	... ..	"
Brussels Meteorological Observations, in monthly parts, for 1879	Brussels Observatory	... ..	Belgium.
Annales de l'Observatoire Royal de Bruxelles, 1878-79. (Vols. I. and II. of the new series.)	Ditto	... ..	"
Annuaire de l'Observatoire Royal de Bruxelles, 1878-79 ...	Ditto	... ..	"
Recherches sur les Couleurs des Étoiles Doubles. By M. L. Niesten	Ditto	... ..	"
Observations sur l'Aspect Physique de la Planète Mars pendant l'Opposition de 1877. By M. L. Niesten	Ditto	... ..	"
Catalogue des Ouvrages d'Astronomie et de Météorologie de la Belgique	Ditto	... ..	"
Bulletin de la Société de Géographie d'Anvers. Vol. IV. (6 Nos.)	Société de Géographie d'Anvers	... ..	"
Nederlandsch Meteorologisch Jaarboek voor 1878 ...	Netherlands Meteorological Institute, Utrecht	... ..	Holland.
Le Télé-météorographe d'Olland décrit par M. Snellen ...	Utrecht Meteorological Observatory	... ..	"
Bepaling van de Helling der Ecliptica. By E. F. Van de Sande Bakhuyzen	Leyden Observatory	... ..	"
Magnetical and Meteorological Observations of Batavia. Vols. II. and III. By Dr. P. A. Bergsma	Dr. P. A. Bergsma	... ..	"
Verslag Magnetische Opneming van den Indischen Archipel. By Dr. Rijkevorsel	Koninklijke Academie de Amsterdam	... ..	"
Bulletin Meteorologique Mensuel de l'Observatoire de l'Université d'Upsal. Vols. IX. and X. 1878 and 1879. By Dr. Hildebrandssen	Upsala Observatory	... ..	Sweden.
J. B. Biot's Tafeln zur Berechnung Barometrischer Höhenmessungen. By Dr. Kiefer	Tiflis Observatory	... ..	Caucasus.
Inhaltsverzeichnis zum Bibliotheks Katalog des Tiflischen Observatoriums	Ditto	... ..	"
Meteorologische Beobachtungen angestellt im Tifliser Observatorium. 1878	Ditto	... ..	"
Tabulæ Quantitatum Besselianarum; 1880 to 1884. By Dr. Otto Struve	Pulkowa Observatory	... ..	Russia.
Mesures Micrométriques Corrigées des Étoiles Doubles. By Dr. Otto Struve	Ditto	... ..	"
Annalen des Physikalischen Central-Observatoriums, 1878. By Dr. Wild	St. Petersburg Observatory	... ..	"
Repertorium für Meteorologie. Band VI. Heft II. By Dr. H. Wild	Ditto	... ..	"
Annales de l'Observatoire de Moscou. Vols. V. and VI. By Professor Bredichin	Moscow Observatory	... ..	"
Circular zum Berliner Astronomischen Jahrbuch. Nos. 113 to 136	Berlin Observatory	... ..	Germany.
Vierteljahrsschrift der Astronomischen Gesellschaft, 1879. 14 Jahrgang	Astronomische Gesellschaft	... ..	"
Fundamental-Catalog für die Zonen-Beobachtungen am Nördlichen Himmel. By Von A. Auwers	Ditto	... ..	"
Catalog der Bibliothek der Astronomischen Gesellschaft; 1880	Ditto	... ..	"
Meteorologische Beobachtungen in Deutschland; 1877. By Dr. Bruhns	Leipzig Observatory	... ..	"
Längendifferenz zwischen den Leipzig und den Wien. No. IV. By Dr. Bruhns	Ditto	... ..	"
Monatliche Berichte über die Resultate aus den Meteorologischen Beobachtungen; 1878. By Dr. Bruhns	Ditto	... ..	"

## APPENDIX—continued.

Name and Author of Book.	By whom Presented.		
Resultate aus den Meteorologischen Beobachtungen angestellt au Fünfundwanzig Königlich Sächsischen Stationen in Jahre 1874 und 1875. By Dr. Bruhns	Leipzig Observatory ... ..	...	Germany.
Resultate der Meteorologischen Beobachtungen zu Kremsmunster; 1876-77. By Von P. G. Strasser	Kremsmunster Observatory	...	"
Über die Mittlere Temperatur von Kremsmunster. By Von P. G. Strasser	Ditto ... ..	...	"
Astronomische Beobachtungen zu Mannheim. By Dr. W. Valentiner	Mannheim Observatory ...	...	"
Mittheilungen der Königlichen Universitäts-Sternwarte zu Breslau. By Dr. J. G. Galle	Breslau Observatory ...	...	"
Veröffentlichungen von der Königlichen Sternwarte zu Göttingen. By Von W. Klinkerfues	Göttingen Observatory ...	...	"
Preussische Statistik Königlichen Statistischen Bureau in Berlin. Vol. XLIX. 1878	Prussian Statistical Bureau	...	"
Schriften der Universität zu Kiel; 1877-78. Vols. XXIV., XXV.	Kiel University	...	"
Untersuchungen über die Durchmesser der Planeten Venus und Mars. By E. Hartwig	Strasburg University	...	"
Separatabdruck aus dem Repertorium für Experimental-Physik für Physikalische Technik. By Dr. Ph. Carl	Dr. Ph. Carl ... ..	...	Austria.
Jahrbücher der Central Anstalt für Meteorologie und Erdmagnetismus; 1875 and 1876	Buda-Pest Observatory ...	...	"
Astronomische, Magnetische, und Meteorologische Beobachtungen au der K. K. Sternwarte zu Prag im Jahre 1878	Prag Observatory ... ..	...	"
Zeitschrift der Österreichischen Gesellschaft für Meteorologie. XIV. Band. By Dr. J. Hann	Vienna Meteorological Observatory	...	"
Jahrbücher der K. K. Central Anstalt für Meteorologie und Erdmagnetismus. Jahrgang 1877. XIV. Band. By Dr. J. Hann	Ditto ... ..	...	"