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ANNUAL REPORT

OF THE

DIRECTOR

OF THE

CINCINNATI OBSERVATORY.

JUNE, 1870.



Cincinnati University Observatory
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The Annual Meeting of the stock-holders of the Cincinnati
Astronomical Society was held at the Observatory, on Mt.
Adams, on the fourth of June, 1870.

The following officers were elected for the year ending June,
1871 :

President,

ROBERT BUCHANAN.

Secretary,

WILLIAM HOOPER.

Treasurer,

WILLIAM GOODMAN.

Directors,

J. B. WALKER,

EDMUND DEXTER,

RUFUS KING,

JOHN SHILLITO,

L. E. MILLS,

HORATIO WOOD,

MILES GREENWOOD,

J. M. EDWARDS.

At a meeting of the Board of Directors, held a few days
subsequently, JULIUS DEXTER was elected to the vacancy
caused by the resignation of EDMUND DEXTER.

The accompanying report of the Director was read at the
meeting.

ANNUAL REPORT
OF THE
DIRECTOR OF THE CINCINNATI OBSERVATORY,
JUNE, 1870.

To the Board of Control of the Cincinnati Observatory:

GENTLEMEN — The present report covers the thirteen months embraced between May 1, 1869, and June 1, 1870. It is with peculiar pleasure that, in presenting this report, I welcome you to inspect the Observatory, its instruments, and its works; for, during the whole period of the two years of my residence here, this is the first occasion on which I have had the honor of receiving a visit from any member of the Board of Control.

PERSONAL.

The need of assistance, in order properly to conduct the work undertaken at this Observatory, has caused me to make every exertion to supply this deficiency, by inviting young men to reside here as astronomical students. The positions thus offered have been filled as follows:

Mr. Thomas Russell, of Hughes High School, 1869, July, to 1870, May.

Mr. J. W. Haines, of Chickering's Academy, 1869, October, to 1870, January.

Mr. A. E. Wade, of Farmer's College, 1870, February, to 1870, May.

At least one of these young men is worthy of being kept here as a permanent paid assistant; all these have been boarded by myself during their residence, somewhat as is done with young apprentices in the trades.

BUILDINGS AND GROUNDS.

The expectation of being able to remove to a more appropriate site was not relinquished until in the latter part of December, I was informed that the Committee on Endowment had given up their attempt. Up to that time as little as was any way possible had been spent upon the buildings and grounds. When, however, it then became probable that we must, for several years, occupy the present ill-adapted site and building, it seemed necessary at once to spend enough upon the fences and buildings to ameliorate the neglected appearance of the property.

The fences have required additional repairs, but will not stand many years longer.

The cottage has been unlet for several months; it is now empty, and will need repairing before being again used.

The carriage-house has been torn down.

Three small rough sheds for small instruments have been erected to the north and east of the main building.

In the Observatory proper, the principal change has been the roofing of the west extension over the transit room, and the dispensing with the rolling roof of the equatorial room. The latter troublesome and unsatisfactory arrangement would have been replaced by a rolling dome had not the expense forbidden. For the present we have adopted large meridian shutters as less expensive and troublesome, and as allowing

us with ease to observe the stars when they are in the most advantageous position. The first observations since the completion of the new arrangement were made on April 6.

The main building may now be conveniently divided into two portions—the Observatory proper, comprising the northern, central and eastern sections, and my own dwelling, comprised in the three rooms in the southern section of the building.

INSTRUMENTS.

The instruments, mentioned in my former report, have been well cared for, and are in good condition.

The Equatorial has been, during the past few weeks, more accurately adjusted to its proper position, in respect to the meridian.

The Meridian Transit loaned us by the Federal Government, insufficient as it is for the needs of an Observatory, has continued to be my only reliance for time determinations. The pier on which this instrument is mounted is wholly unfit for such a purpose.

The Robinson Anemometer has been mounted on the top of a large tube on the west side of the roof of the Equatorial room. A large wind-vane and a rain-gauge occupy a corresponding position on the east side of the room. The positions of these instruments are not unobjectionable, but are evidently the best available.

Additions to the apparatus have been made as follows :

A Magnetic Theodolite, or Declinometer, by Gambey, of Paris, has been purchased from the heirs of the late Prof. A. D. Bache. This instrument is well known among scientific men, from having been used in the Magnetic Survey of Penn-

sylvania; it is now placed in one of the three small sheds above alluded to.

Photographs and other materials, for illustrating a few popular lectures on Astronomy (delivered last December), have been purchased.

The elaborate system of meteorological observations, maintained here during the past year, having attracted the notice of the Surgeon-general of the army, he has supplied the Observatory with a set of instruments such as are furnished to the army surgeons, on condition that we furnish the Medical Department with a copy of our record of observations.

Of smaller apparatus, there have been purchased a Field-glass, for observations of variable stars, meteor-tracks, etc.; also, such portions of a Polariscope and Stereoscope as were needed in the observations of the Solar Eclipse of last August.

The Astro-photometer, as invented by Dr. Zöllner, of Leipzig, for observing the brightness of the stars, etc., seemed such a desirable appendage to the Equatorial, that such an one was ordered last spring, after consultation with a majority of the members of the Board. This instrument is now finished and awaiting our order.

In pursuance of the policy of developing chiefly the use of the Equatorial, several minor changes have been made in it and its accessories.

THE LIBRARY.

This important part of our apparatus has received large and very valuable additions, through the presentation, by numerous authors, of their own works. The following list exhibits the number of volumes or pamphlets received from each donor :

DONOR.	RESIDENCE.	VOL'S OR PAMPHLETS.
G. B. Airy,	Greenwich Observatory,	5
John Tebbutt, jr.,	Sidney, New South Wales,	1
C. Abbe,	Cincinnati,	1
H. A. Newton,	New Haven,	1
Central Physical Observt'ry,	St. Petersburg, Russia,	33
Nautical Almanac Office,	Washington,	3
Anonymous,	———,	1
Physical Cabinet,	Dorpat University,	1
W. Huggins,	London,	4
Smithsonian Institution,	Washington,	164
British Admiralty,	London,	1
Royal Meteorological Inst.,	Amsterdam,	3
H. D. Gowey,	Ohio,	1
Royal Observatory,	Greenwich,	34
G. T. Kingston,	Toronto	1
American Phil. Society,	Philadelphia,	3
Society Natural History,	New Albany, Ind.,	1
Peabody Academy,	Salem, Mass.,	1
Angelo Secchi,	Observatory of Rome,	64
M. F. Maury,	Virginia,	1
Meteorological Observatory,	Montsouris (Paris),	53
A. M. Meyer,	Bethlehem, Penn.,	2
Meteorological Office,	London,	4
Board of Trade,	London,	4
Robert Clarke,	Cincinnati,	2
Radcliffe Observatory,	Oxford,	1
Astronomical Association,	Leipzig,	2
C. W. Goutier,	Marseilles,	1
Balfour Stewart,	London,	1

DONOR.	RESIDENCE.	VOL'S OR PAMPHLETS.
Royal Observatory,	Vienna,	1
Geographical Institute,	Lisbon,	10
Meteorological Association,	Geneva,	15
C. Settemanni,	Florence,	2
Royal Observatory,	Munich,	43
Naval Observatory,	San Fernando (Cadiz),	17
University Observatory,	Cracow,	15
University Observatory,	Prague,	1
Central Meteorological Inst.	Berne,	2
Meteorological Observatory,	Manilla,	10
Magnetic Observatory,	Toronto,	3
University of Toronto,	Toronto,	1
Brera Observatory,	Milan,	6
Ed's Chemical News,	London,	2
The Observatory,	Breslaw,	15
Centr'l Magnetic & Met. Inst.	Vienna,	18
C. B. Boyle,	London,	1
Natural History Society,	Boston,	1
Dudley Observatory,	Albany,	2
Imperial Observatory,	Poulkova,	5
Royal Astronomical Society,	London,	5
Harvard College Observt'ry,	Cambridge,	1
Meteorological Institute,	Christiana,	1
The University,	Christiana,	3
The Observatory,	Santiago (Chili),	5
C. Piazzi Smyth,	Edinburgh,	1
J. W. Hartnup,	Liverpool,	1
University Observatory,	Turin,	5
Geo. Neumayer,	Vienna,	1

These works have been presented with the expectation that this Observatory will publish, and in return, present its own works to the above societies and individuals. The additions of the past year are almost exclusively the result of the publication and gratuitous distribution conjointly, by myself and the Observatory, of the Reports for 1868 and 1869.

The Observatory has purchased but one astronomical work during the past year; but I have added to my own private library such books as were needed, in order to carry on my work. My own and the Observatory libraries, comprising, together, about 2,500 books and pamphlets, are so arranged as to be equally accessible to all persons.

PUBLICATIONS.

In June last, there was published, at the joint expense of the Observatory and myself, an edition of 750 copies of the Inaugural and Annual Reports of the previous year. This was the first publication of such a nature since 1845, and served to awaken a wide interest in the resuscitation of the Observatory. The following are the publications that have emanated from the Observatory during the past year; the numbers are a continuation of those adopted in my last Report:

XXXVI. The Inaugural Report, June, 1868, and the Annual Report, July, 1869.

XXXVII. Fort Ancient, Ohio: Past and Present.

XXXVIII. Eclipse Expedition — Preliminary Report.

XXXIX. The Comet.

XL. The Total Eclipse of 1869.

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- XXI. The Weather Bulletin of the Cincinnati Observatory; published daily for three months.
 - XLII. Meteorology and Temperature of Cincinnati, for the Secretary of State.
 - XLIII. Storm Predictions.
 - XLIV. Weekly Reports on the Activity of the Observatory; published weekly in the city papers.
 - XLV. Daily Weather Report of the Western Union Telegraph Company; published for six months.
 - XLVI. The Royal Observatory, Greenwich.

The following reports, or essays, are still in manuscript :

1. Translation of Döllén's Method of Determining Time.
2. The Examination of the Pivots of Transit Instruments.
3. Astronomical Mythology.
4. Report on the Distribution to the Public of Standard Time.

The following computations are in progress :

1. Hourly, Daily, and Annual Means of Barometer Observations at Johnstown, Pennsylvania.
2. Hourly and Annual Means of Temperature Observations at Cincinnati.
3. Hourly and Annual Means of Barometer Observations at Cincinnati.
4. Hourly and Annual Means of Humidity Observations at Cincinnati.
5. Hourly and Annual Means of Velocity of Wind Observations at Cincinnati.
6. Reduction of Observations of the Total Eclipse of 1869.
7. Discussion of Observations of Alpha Lyrae made at Washington.
8. Investigation of the Rates of three Chronometers, and of the Observatory Clock.

ARCHIVES.

The books of observation are kept in uniform series with those of last year. The correspondence, computations, etc., are systematically arranged, labeled, and filed away.

I have previously called the attention of the Board to the deplorable condition in which I find the earlier records of observations made here.

The stock of copies of early publications is larger than will ever be disposed of by sale or gift. No copy of Burnet's Address and the Annual Report for 1844 has yet been found; a copy of this is very much desired. Of last year's Annual Report but four copies remain on hand.

ASTRONOMICAL OBSERVATIONS.

The portable Meridian Transit, loaned me by the Federal Government, has been used regularly for time determinations. The portable Zenith Telescope, also loaned by the U. S. Government, has been used since its establishment six weeks ago in its appropriate house, in observations for determining its own errors preparatory to determining the latitude of the Observatory.

The three Chronometers, loaned me by the U. S. Government, have been compared together daily for the purpose of determining the dependence of their rates upon their temperature.

The difficulty of using the Equatorial having been more and more seriously felt, but few observations of importance were taken with it until after the completion of the changes previously referred to. Since the middle of March observations have been made for determining the errors arising from the position of the instrument, the flexure of the tube, axis, etc.

The long promised observations of the double stars in the southern portion of the heavens can now be made with great convenience. In the prosecution of such a work, the simultaneous co-operation of three persons is necessary to its proper execution.

MAGNETICAL OBSERVATIONS.

The Gambey Declinometer has been used to determine the variation of the magnetic needle for this place, and also the variation at Sioux Falls City, Dakota Territory. The latter determination was the first one of high accuracy that had ever been made in the Northwestern Territory.

The regular daily observation of this important phenomenon has been delayed until the close of our first year of meteorological observations.

METEOROLOGICAL OBSERVATIONS.

When, a year ago, the removal of the Observatory seemed probable, it at once became evident that the remaining time spent on Mt. Adams could be best improved by paying special attention to Meteorology.

In July an hourly record was begun of all important atmospheric phenomena. The observations have been taken at the beginning of each hour, day and night, for five days in each week. An unbroken record of this character is a very important contribution to science, and should be maintained, if possible, for three or five consecutive years. These laborious observations would not have been begun could I have anticipated the improvements that have been made in the roof of the Equatorial room. The astronomical labors will now de-

mand so much time as to render it difficult, without assistance to maintain this hourly meteorological record.

Monthly reports of meteorological observations have been received from several observers in other cities.

A continuous register of the height of the barometer is received daily from Mr. David A. Peelor, of Johnstown, Pennsylvania.

WEATHER BULLETIN.

The importance of anticipating the changes in the weather, especially storms or droughts, was alluded to in my Report of June, 1868. This subject having been brought, by myself, to the attention of the Chamber of Commerce of this city, that body, in June last, authorized me to organize a system of daily weather reports and storm predictions. Experienced observers at distant points offered their gratuitous co-operation. The Western Union Telegraph Company offered the use of their line at a nominal price. The Bulletin began to be issued September 1st, in manuscript form, for the special use of the Chamber of Commerce, and began to be printed a week later as an independent publication.

This Bulletin was supported for three months, as at first agreed on, by the Chamber of Commerce; its conduct then passed entirely into the hands of the Observatory, and has thus continued until the past month. The independent publication of the Bulletin was, however, discontinued, and it has, since December 1st, only appeared in the morning papers. The daily compilation of this Bulletin for the newspapers was undertaken two weeks ago by the Cincinnati Office of the Western Union Telegraph Company, and will so continue, thus relieving the Observatory of all further responsibility.

In February the Manager of the Cincinnati office undertook the publication of a daily weather chart, and the favor that this has met with insures its continuation in the future. The Daily Weather Bulletin and Chart are, therefore, now supported solely by the Western Union Telegraph Company, and must be considered as a very important contribution to meteorology. It would have been highly to the credit of the Observatory could these publications have been maintained in its own name; but this was impossible owing to the want of funds and assistants.

STORM SIGNALS.

The interest excited by our Weather Bulletin, and the correspondence incident thereto, served to draw attention towards this matter. The President of our Chamber of Commerce and the Secretary of our Astronomical Society, being present as delegates to the Richmond meeting of the National Board of Trade, united with others in a memorial to Congress, and in other proceedings that have brought about the passage of a resolution authorizing the Secretary of War to establish a national system of storm signals for the benefit of the Commerce of important sea and lake ports. I have the assurance of the officer in charge of this signal system, that Cincinnati will be included among the cities to be benefitted by this act.

STANDARD PUBLIC TIME.

Nothing seems ever to have been accomplished toward perfect uniformity in the municipal time until, in October last, I secured the union of the five principal jewelers of the city in adopting the Observatory mean time as their standard. The correct time is given to these persons on the first Saturday in

each month. The "Regulators," so called, of the clockmakers seem, however, to need checking weekly rather than monthly.

The necessity of having a legal standard clock has led the City Council to request my views on the subject. The report that I have made in response is still in the hands of the proper Committee. I have reason to think that it will soon be acted upon. Should the Observatory undertake to provide the public time, the labor would suffice to keep one assistant constantly employed, and it would be necessary to provide a fixed transit instrument and appurtenances.

THE TOTAL ECLIPSE OF 1869.

The expedition to observe this Eclipse is the only one of importance that has been undertaken during the year — no part of its expense was borne by the Observatory. The party who went with me consisted of

PROF. A. G. COMPTON, NEW YORK CITY.

W. C. TAYLOR, PHILADELPHIA.

I. J. LONGSTRETH, CHICAGO, ILL.

J. W. HAINES, WAYNESVILLE, O.

R. B. WARDER, CHAMPAGNE, ILL.

ROBERT ABBE, NEW YORK CITY.

In accordance with the pre-arranged distribution of observers, we occupied the most north-western station of all those who were east of the Rocky Mountains, being located at Sioux Falls City, Dakotah Territory, about 100 miles north of Sioux City.

The expenses of the expedition were greatly lightened by the liberality of the various railroad and transportation companies; the general expenses of the expedition and those of the Meteorological Assistant were borne by myself; the special

personal expense, by the individual members. The instrumental equipment would have been very unsatisfactory had not this expense been defrayed by Mr. L. B. Harrison, on behalf of the Observatory.

The Eclipse was well observed in all particulars, our location being peculiarly favorable for examining the corona and the red flames. Good photographs were secured by Mr. Taylor. Magnetical and meteorological observations were taken during our stay.

The Equatorial, at the Observatory, was used during the Eclipse, by W. W. Winder, in taking a series of photographs, the negatives of which have been deposited at the Observatory.

GEODESY.

The cultivation of this important branch of applied astronomy is, I consider, of vital importance to the progress and development of this Observatory. The plan of work that two years ago received your approval, contemplated considerable activity in this department during the coming year. We have prepared the way for this by measuring the angles of a number of triangles that centre in the Observatory. This work will be extended over the neighboring country; it will become available for correcting the existing maps of this region, so soon as one or more sides of the triangles are measured by a suitable accurate apparatus.

VISITORS.

Nearly four hundred visitors have been received at the Observatory during the past year; one-third of these have been present at some time in the evening, and the frequent inquiries as to evening visits have induced me to request that such visits

be made during the three nights of each lunation, on which the moon is full or nearest the full, and when it shines the most brightly. During these nights the Observatory work is least affected by interruptions.

There seem to be but few Observatories so widely and so popularly known as this one; and, perhaps no institution in Cincinnati is more likely to receive visits from strangers passing through the city. Many of those who have honored us with their presence are men of prominence, and have not refrained from expressing their astonishment that so famous a public institution should be in such a condition.

The entertainment of these numerous visitors is a serious intrusion on my time.

CURRENT EXPENSES.

These have been heavier the past year than heretofore, and must be still heavier the coming year, if the Board of Control attempt to maintain the present establishment in a manner any way creditable to themselves.

Our fuel was donated by the Cincinnati Gas Light & Coke Company.

The cottage rent has contributed somewhat towards the defraying of expenses for repairs.

The bills, amounting to over \$300, for altering the roof of the Equatorial room, and for other changes made at the same time, were, by vote of the Board, to have been paid by a special subscription. The fact that they were paid by drawing upon next year's income has caused a deficit, that is, however, not properly chargeable to any unnecessary expenditure on my own part.

It would give me great satisfaction if the statement of miscellaneous expenses, that I have occasion to present monthly, should be audited as regularly by the Board.

In conclusion, I would remind the Board that the Observatory now possesses not only books and apparatus, but also an element of life and growth within it. This growth can not now be checked without injury to the future interests of the Observatory. We need a proper location, appropriate buildings, and good assistants — without these, we are hindered and dwarfed. The work of the Observatory can not be satisfactorily carried on in its present condition, though I shall always labor to do my best.

CLEVELAND ABBE.

4th June, 1870.

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