

REPORT

OF THE

THIRTY-SIXTH MEETING

OF THE



BRITISH ASSOCIATION

FOR THE

ADVANCEMENT OF SCIENCE;

HELD AT

NOTTINGHAM IN AUGUST 1866.

LONDON:

JOHN MURRAY, ALBEMARLE STREET.

1867.

Report of the Council of the British Association, presented to the General Committee, Wednesday, August 22, 1866.

The Council have the honour to report as follows:—

The Council have received a Report from the Treasurer at each of their Meetings, and a Report for the year will be presented to the General Committee this day.

The Report of the Parliamentary Committee has been received for presentation to the General Committee.

The Kew Committee have presented to the Council a Report for the year 1865–66, which will be laid before the General Committee this day.

The Council have added to the list of Corresponding Members the names of the following Foreign Men of Science who attended the Birmingham Meeting, viz.:—

Capt. Belavenetz.	Prof. Kiepert.
Geheimrath von Dechen.	Prof. F. Römer.
M. Gaudry.	Chev. C. Negri.
Prof. Grube.	Prof. Steenstrup.

The Council recommend that the names of Mr. J. Hind, F.R.S., and Mr. T. Close, be added to the list of Vice-Presidents of the Meeting.

In consequence of the resignation of Mr. Hopkins as Joint General Secretary, announced last year, the Council appointed a Committee, consisting of the General Secretaries and the Gentlemen who had formerly filled that office, for the purpose of taking into consideration and reporting to the Council on the advisability of nominating a Joint General Secretary. The Council have received the following Report, viz.:—

“That Thomas Archer Hirst, Esq., Ph.D., F.R.S., Professor of Mathematical Physics in University College, London, be recommended as highly qualified for Election as Joint General Secretary of the Association.”

The Council recommend that Mr. Hirst, F.R.S., be elected Joint General Secretary.

The Council have been informed that invitations for future Meetings of the Association have been received from Dundee, Norwich, Plymouth, and Exeter.

Report of the Kew Committee of the British Association for the Advancement of Science for 1865–66.

The Committee of the Kew Observatory submit to the Council of the British Association the following statement of their proceedings during the past year:—

A Unifilar and Dip Circle for Captain J. Belavenetz, of the Russian Navy, Director of the Compass Observatory at Cronstadt, have been verified at Kew Observatory and forwarded to Russia.

Three Unifilars and three Dip Circles, ordered by Colonel Strange for the Indian Survey, have been verified.

Dr. Kirk, who has gone out to Zanzibar on the African coast, has received instruction at Kew Observatory; and a Dip Circle, a Unifilar, and an Azimuth Compass have been verified for him, and await his directions.

In consequence of a representation from Mr. C. Chambers, Acting Superintendent of the Observatory, Bombay, a correspondence has taken place between the Director of the India Store Department and the Chairman of

the Kew Committee, the result of which is that the Committee have superintended the construction of an Anemometer, a Dip Circle, and a Unifilar for the Bombay Observatory. These instruments have been verified, and are now in the hands of the India Board for transmission to their destination.

The Admiralty have ordered a Unifilar and a Dip Circle for Captain Mayne, of Her Majesty's ship 'Nassau,' who is about to proceed to the Straits of Magellan; these instruments have been verified at Kew Observatory, where Captain Mayne and several of his officers have likewise received instruction in magnetism.

Dr. Buys-Ballot has ordered a Declination Magnetograph, which has been constructed by Mr. Adie, and forwarded to Utrecht, where it has safely arrived.

A set of Self-recording Magnetographs and also a Barograph have been ordered by the Stonyhurst Observatory; and the Rev. Walter Sidgreaves has been at the Observatory receiving instruction in magnetism. The Self-recording Magnetographs for Stonyhurst have been verified and dispatched to their destination.

The set of self-recording instruments ordered by Mr. Meldrum of the Mauritius Observatory, are at present at Kew; Mr. Meldrum intends to visit the Kew Observatory for the purpose of making himself further acquainted with the process of observing and deducing results previous to his return to the Mauritius.

Mr. Ellery, of Melbourne Observatory, has likewise ordered a set of Self-recording magnetographs. These have been constructed by Mr. Adie, and will be taken to Kew for verification when the set for Mauritius have been removed.

Professor Smirnow (from Kasan) has received instruction in magnetism at the Observatory.

The usual monthly absolute determinations of the magnetic elements continue to be made by Mr. Whipple, Magnetical Assistant, and the self-recording magnetographs are in constant operation as heretofore, also under Mr. Whipple, who has displayed his usual care and assiduity in the discharge of his duties.

The photographic department connected with the self-recording instruments is under the charge of Mr. Page, who performs his duties very satisfactorily.

A stoneware stove free from iron has been erected in the room containing the Kew magnetographs, and by its means this room has been heated through a range of 20° Fahr., in order to determine the temperature correction of the horizontal and vertical force magnetographs. The observations for this purpose are being reduced.

The meteorological work of the Observatory continues in charge of Mr. Baker, who executes his duties very satisfactorily.

Since the Birmingham Meeting 126 barometers have been verified. 395 thermometers have likewise been verified, and 8 standard thermometers constructed at the Observatory.

The Self-recording Barograph continues in constant operation; and traces in duplicate are obtained, one set of which is regularly forwarded to the meteorological department of the Board of Trade.

An arrangement for a Self-recording Thermograph has been devised by the Superintendent and by Mr. Beckley, and, as a preliminary experiment, gave a very satisfactory curve; the instrument is now being arranged in a suitable site.

The instruments used by the late Mr. Appold for regulating the tempera-

ture and moisture of his apartments have been forwarded by the Royal Society to the Kew Observatory.

The Indian pendulum observations are in active progress. Both Colonel Walker and Captain Basevi are in correspondence with the Observatory in discussing questions relating to this work.

The Superintendent has received £100 from the Government Grant Committee of the Royal Society for preliminary observation with Captain Kater's pendulum. These preliminary observations are in progress under the charge of Mr. Loewy as observer, and have the following points in view:—

(1) To see by the general agreement or non-agreement of the observations with each other whether Captain Kater's pendulum is still in a state to justify its adoption as an instrument to give a correct determination of the length of the seconds' pendulum.

(2) To determine the true temperature correction of the pendulum.

(3) To use Kater's pendulum, and also the Royal Society's invariable pendulum No. 8, for the purpose of determining a curve of correction for atmospheric pressure, from inch to inch, at low pressures.

The Superintendent has received £50 from the Government Grant Fund of the Royal Society, to pursue the experiments on a rotating disk.

The Kew Heliograph, in charge of Mr. De la Rue, continues to be worked in a very satisfactory manner. During the past year 282 negatives have been taken on 158 days, and the usual number of positives have been printed from them.

Since the last Meeting of the Association, the first set of the results obtained by this instrument have been published at the expense of Mr. De la Rue, under the following title:—"Researches on Solar Physics, by Warren De la Rue, B. Stewart, and B. Loewy; first series; On the Nature of Sun-spots."

The present progress of the work of reduction will best be seen from the following letter, written by Mr. De la Rue, in answer to a request made through the Astronomer Royal by Padre Secchi, to know what was doing in this country in the subject of Heliography.

"110 Bunhill Row, August 8th, 1866.

"MY DEAR SIR,—In reference to the extract from Padre Secchi's letter, I beg to supply the following information.

"The pictures taken by means of the Kew Heliograph are all measured by means of my Micrometer; the positions of the spots are then reduced to distances in terms (fractional parts) of the sun's radius, and the angles of position corrected for any error in the position of the wires.

"Pictures of the Pagoda are taken from time to time, and the measurements of the various galleries of the Pagoda serve to determine the optical distortion of the Sun's image, and the corrections to be applied to the Sun-pictures.

"The heliocentric latitudes and longitudes of the spots are then calculated.

"The areas of the spots and the penumbra are also measured, and the areas corrected for perspective are tabulated in terms (fractional parts) of the area of the sun's disk.

"The areas of the spots &c. on all of Carrington's original pictures have recently been measured, and an account of these measurements will be shortly published.

"Padre Secchi will be able to judge, from the foregoing statement, whether it will be worth while to undertake the work he proposes.

“The measurements obtainable from photographs are much more reliable than those from projected images.

“I am,

“Yours very truly,

(Signed)

“WARREN DE LA RUE.”

“E. J. Stone, Esq.”

The Association will regret to learn the deaths of Dr. Sabler and M. Gussew, in consequence of which the Wilna Heliograph is not at work.

M. Smysloff of the Pulkowa Observatory has been appointed Director of the Wilna Observatory, by the Imperial Academy of Sciences of St. Petersburg. M. O. Struve having asked for information respecting the working of the Heliograph, it has been suggested to him by the Kew Committee that it would be advisable for M. Smysloff to visit the Kew Observatory, to see the instrument in operation.

The sun-spots continue to be observed after the method of Hofrath Schwabe, of Dessau, and the valuable collection of drawings lent by this eminent observer remains at the Observatory. These have been supplemented by the beautiful series of detailed drawings of spots made by the Rev. F. Howlett, which that gentleman has deposited at Kew.

The apparatus for verifying sextants alluded to in the last Report has now been constructed by Mr. Cooke, and is being erected at the Observatory.

About three-fourths of the region of the solar spectrum between E and F has been mapped by the spectroscope belonging to the Chairman. The spectroscope is now in London, the work appertaining to the staff at the Observatory not permitting sufficient time for further observation with this instrument.

The instrument devised by Mr. Broun for the purpose of estimating the magnetic dip by means of soft iron, remains at present at the Observatory, awaiting Mr. Broun's return to England.

The Superintendent has received grants from the Royal Society for special experiments; and when these are completed, an account will be rendered to that Society.

The Report of a Committee appointed to consider certain questions relating to the Meteorological Department of the Board of Trade, and presented to both Houses of Parliament by command of Her Majesty, has been communicated to the Members of the Kew Committee, and has been otherwise widely circulated among the meteorologists of the British Association: the object of the Report is expressed in the following terms:—

“Upon the death of the late Admiral FitzRoy, a correspondence took place between the Board of Trade and the Royal Society with respect to the Meteorological Department of the Board of Trade. The result of that correspondence was the appointment of a Committee, consisting of the following gentlemen, viz. Francis Galton, Esq., F.R.S., General Secretary of the British Association for the Advancement of Science, nominated by the President and Council of the Royal Society; Staff Commander Evans, R.N., F.R.S., Chief Naval Assistant to the Hydrographer of the Admiralty, by the Admiralty; T. H. Farrer, Esq., one of the Secretaries to the Board of Trade, by the Board of Trade,—to consider and report upon the following questions:—

“1. What are the data, especially as regards Meteorological Observations at sea, already collected by and now existing in the Meteorological Department of the Board of Trade?”

“ 2. Whether any, and what steps should be taken for arranging, tabulating, publishing, or otherwise making use of such data.

“ 3. Whether it is desirable to continue Meteorological Observations at sea, and if so, to what extent, and in what manner.

“ 4. Assuming that the system of Weather Telegraphy is to be continued, can the mode of carrying it on and publishing the results be improved?

“ 5. What staff will be necessary for the above purposes?”

The authors of the Report arrive at the following conclusions in respect to the ocean statistics, weather telegraphy, foretelling weather, and observations affecting weather in the British Isles.

“ The collection of observations from the captains of ships is a function which can probably best be performed through the medium of such agencies as a Government Office can command, and which was in fact well performed by the Meteorological Department before its attention was devoted to the practice of foretelling weather. We assume, therefore, that this function will remain with the Board of Trade.

“ The digesting and tabulating results of observations is, on the other hand, a function which requires a large knowledge of what the state of the science for the time being requires, as well as exact scientific method.

“ This function is one that has not been satisfactorily performed by the Meteorological department. And we believe that it would be much better, as well as more economically performed, under the direction of a scientific body—such as a Committee of the Royal Society, or of the British Association, if furnished with the requisite funds by the Government—than it will be if left to a Government Department. The establishment already existing at Kew might probably be easily developed, so as to carry into effect such a purpose. It would in that case become a meteorological centre, to which all observations of value (by British observers), whether made on land or at sea, and whether within the British Isles or not, would be sent for discussion and reduction. We have therefore in the following estimates, assumed that all meteorological observations made on land, whether at the stations recommended by the Royal Society, or at the lighthouses or coast guard stations, as well as all observations at sea, shall be referred to and discussed under the direction of such a scientific body as we have mentioned; and we have also assumed that the aid afforded by Government would be in the shape of an annual vote, so made as to leave the Royal Society, or other scientific body charged with the duty, perfectly free in their method and in their choice of labour, but upon the condition that an account shall be rendered to Parliament of the money spent, and of the results effected in each year.”

The Kew Committee have examined this Report, and, speaking in general terms, they cordially acquiesce in the conclusions of its authors. They consider the proposed arrangement to fall within the competence of the Kew Observatory.

In the last Kew Report it was stated that many experiments and observations of a nature to advance science are made by the Committee under the sanction of the Association, the cost of each being defrayed by the promoters.

The Committee consider that the suggested observations contained in the Government Report which has been referred to, would be merely an extension of the usual practice of the Observatory; but in consideration of the magnitude of the work proposed, they suggest that the Council should bring the subject before the General Committee, with the view of the Kew Com-

mittee being authorized to discuss and make the necessary arrangements with the Board of Trade, should any proposal be made.

The Committee are also desirous of bringing under the consideration of the Council, the expediency of proceeding in the formation of a memoir on the periodic and non-periodic variations of the temperature at Kew, as a normal station of British meteorology. Similar works have for some years past occupied the attention of the most eminent amongst the continental meteorologists as being in fact the foundation of all *scientific* knowledge of the climatology of their respective countries. A memoir on the periodic and non-periodic variations of the temperature at the magnetical and meteorological observatory at Toronto in Canada has been printed in the Philosophical Transactions for 1853, but no such work has yet been systematically undertaken at Kew, although it is quite in accordance with the objects for which the Observatory was instituted, in familiarizing British meteorologists with a system of tabulation they have hitherto unduly neglected. Daily photographs taken from the thermograph constructed under Mr. Stewart's direction will supply in the most unexceptionable manner the observational basis on which the memoir would be founded.

To obtain such photographs would constitute a very small addition to the duties of the assistant by whom the daily photographs of the magnetical instruments are taken. The *tabulation* from the daily photographs of the temperature would be the only increase of any moment to the ordinary present work of the observatory, and would require, possibly, the part services of an additional young assistant.

The tabulation would supply twenty-four equidistant entries in every solar day. The tables containing these entries, together with the Photographs, after careful inspection by a proper authority, would be preserved for subsequent use. Five or, at most, six years would constitute quite a sufficient basis for the determination of the periodic variations forming the first part of the proposed work, and would require about a couple of months of superintending care on the part of the person who might be director of the Observatory, when the observations of the five or six years should have accumulated.

Nothing more than ordinary clerk's work under such general superintendence would be required.

Should the Board of Trade be disposed to avail itself of the suggestion which has been made to them in respect to the Kew Observatory, the publication which has been suggested would become one of its first important duties.

J. P. GASSIOT,

Chairman.

Kew Observatory, August 17, 1866.

RECEIPTS.

	£	s.	d.
Balance from last account	26	14	8
Received from the General Treasurer	600	0	0
" for the verification of Meteorological Instruments from the Board of Trade ...	12	15	0
" from the Admiralty.....	14	15	0
" from Opticians.....	28	0	0
" for Barograph Curves sent to the Meteorologic Office, London	26	1	5
" for the construction of standard Thermometers	1	10	0
" for the verification of portable Magnetometers	15	0	0
" for the verification of self-recording Magnetographs	30	0	0
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	128	1	5
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	£754	16	1
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PAYMENTS.

	£	s.	d.
Salaries, &c. :—			
To B. Stewart, four quarters, ending 1st October, 1866.....	200	0	0
Ditto, allowed for petty travelling expenses.....	10	0	0
G. Whipple, four quarters, ending 18th September, 1866.....	100	0	0
T. Baker, four quarters, ending 29th September, 1866	75	0	0
R. Beckley, 50 weeks, ending 20th August, 1866, at 40s. per week	100	0	0
F. Page, 30 weeks, ending 2nd April, 1866, at 12s. per week.....	18	0	0
Ditto, 2 quarters, ending 2nd October, 1866, at £40 per annum.....	20	0	0
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Apparatus, Materials, Tools, &c.	523	0	0
Ironmonger, Carpenter, and Mason	35	8	3
Printing, Stationery, Books, and Postage	18	6	3
Coals and Gas	36	15	10
House Expenses, Chandlery, &c.	49	11	6
Porterage and petty expenses	30	5	3
Rent of Land to 10th October, 1866	18	16	3
Rent of Pillars for Sextants	11	0	0
Brushwood for ditch.....	2	10	0
Balance.....	6	13	0
	22	9	9
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	£754	16	1
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I have examined the above account and compared it with the vouchers presented to me.

The Balance from the Last Year	£	26	14	8
Received from the Treasurer of the British Association	600	0	0	0
From Sundries, for the construction and verification of instruments	128	1	5	
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The total Expenditure for the year	754	16	1	
Leaving a balance in hand amounting to	26	14	8	
	732	6	4	
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	£	22	9	9
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10th August, 1866.

R. HUTTON.