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THE BRITISH ASSOCIATION AT BRIGHTON.

IN accordance with precedent we give a list of some of those persons more or less connected with Meteorology, who were present at the recent meeting :—

Banks, J. .....Hastings.
Birt, W. R. .....Walthamstow.
Cholmeley, Rev. Dr. Findon.
Curley, T. .....Hereford.
De Fonvielle, W .....Paris
Dines, G. .....London.
Evans, J. .....Hemelhempstead.
Everett, Prof. J. D...Belfast.
Galton, F., F.R.S. ...London.
Glaisher, J., F.R.S...Blackheath.
Harris, W. J. .....Worthing.
Harrison, J. P. .....Ewhurst.
Healey, G. .....Windermere.
Herschel, Prof. .....Newcastle-on-Tyne.
Howlett, Rev. F.....Alton.
Hudson, H., M.D....Cork.
Jansen, M. J. .....Paris.
Kebbell, Dr. .....Brighton.
Lemoine, G. .....Paris.
Lewis, Captn., R.N. Hastings.
McCullough, Dr.....Abergavenny.
Mann, R. J. ... .London.
Muirhead, H., M.D..Cambuslang.
Mylne, R. W. .. ... London.
Noble, Captn. .....Maresfield.
Pengelly, W., F.R.S. Torquay.
Phillips, Prof. J., F.R.S. Oxford.
Prestwich, J., F.R.S. London.
Prince, C. L. .....Uckfield.
Sawyer, F. E. .....Brighton.
Smith, B. W. .....Hampstead.
Smith, D. .....Birmingham.
Smyth, J., Jun. .....Banbridge.
Strange, Col. .....London.
Symons, G. J. .... ,,
Thomson, Sir W., F.R.S. Glasgow.
Toller, Dr. .. ..Gloucester.
Walker, C.V., F.R.S. Reigate.
Wheatstone, Sir C., F.R.S. London.
Woodd, C. H. L. .....Hampstead.

The papers bearing directly or indirectly upon Meteorology were :—

Glaisher, J., Report of Committee on Luminous Meteors.
Moffatt, Dr. T., On the Tube Ozonometer.
Everett, Prof. J. D., On Mirage.
,, ,, Report of Committee on Underground Temperature.
Symons, G. J., Report of Rainfall Committee.
Macneill, T., Description of the New Mariotti Barometer.
Dines, G., On a new Hygrometer.
Phillips, Prof. J., On the Temperature Correction of the Aneroid.
Meldrum, C., On a Periodicity in the Frequency of Cyclones.
Boys, Rev. H. A., Meteorological Observations in Greece.
Sawyer, F. E., Rainfall of Sussex.
Fonvielle, W. De, On Thunderstorms.
Strachey, Gen., On the Scope of Scientific Geography, illustrated by Remarks on the Climate of British India.
Lemoine, Mons. G., Sur les forêts dans leur rapports avec l'Hydrologie.

Brandis, Dr., Geographical distribution of Forests in India.
Janssen, Dr., On a new form of Thermometer for measuring the temperatures of River and Sea Water.
Buchan, A., Temperature of Lake Waters.
Easton, E., The Brighton Waterworks.

LUMINOUS METEORS.

The report was read by Mr. Glaisher, and set forth that more August meteors than usual had been observed, and that the heights of twenty of them had been calculated. The August meteors were very bright; they usually came one at a time and not in a shower, so they were comparatively easy to observe. The November meteors were not so well seen because of unfavourable weather. Much of the report was devoted to the work which had been done in determining the radiant points of the meteors. Only two aërolites had been seen to fall during the year—one in the United States, and the other in France.

The president, in moving a vote of thanks, said that the late Mr. Baden Powell and Mr. Glaisher first began the work of making systematic observations of meteors; afterward Professor A. Herschel entered the same field, and had given the closest attention to the work; more especially, to the determination of the radiant points of meteors, which was the most important part of the subject.

Mr. Symons seconded the vote of thanks.

Professor Herschel said that most meteors were too small to come through the earth's atmosphere without destroying themselves by friction in the upper air; now and then one would come through to the ground, and sometimes fatal accidents had been caused thereby. The "shower" meteors appear to move in the same elliptical orbits as certain comets, but the theory of aërolites which at present best met all the known facts connected with them, was that they were projected from the sun.

The Rev. Mr. Howlett said that he thought that constantly bending back the head to watch for meteors tended to injure the brain, and that couches should be procured, on which observers could watch for meteors with comfort.

A NEW FORM OF THERMOMETER.

M. Janssen exhibited a thermometer for taking the temperature of surface-water in rivers or wells. It may be described as a mop with the thermometer-bulb in its centre. The fibres opened out when the thermometer was lowered into the water, but closed round the bulb as it was raised through the air, and thus prevented its temperature from changing.

TUBE OZONOMETER.

Dr. Russell read a paper prepared by Dr. Moffat on the tube ozonometer, which elicited some discussion as to the value of ozonometric observations conducted by means of iodide of potassium papers. The use of such papers was generally condemned by the members of the Section; but the meeting arrived at no definite conclusion respecting any other way in which the liberation of iodine may be utilized as a measure of ozone.

MIRAGE.

Professor Everett read a paper on Mirage, in the course of which he described an interesting experiment devised by Professor Clerk Maxwell, F.R.S. In this experiment the beautiful effects of Mirage were obtained by means of three liquids, in a cubical vessel with plate glass sides, six inches square, the lowest liquid being a saturated solution of alum, the highest pure water, and between them a thickness of about a quarter of an inch of Scotch whiskey, containing enough sugar to make its specific gravity intermediate between those of the other two liquids. It is much more refractive than either of them. Triple images were obtained, with great distinctness, of all the objects in an extensive landscape, the middle image being inverted, and either elevated or depressed according to the position of the eye. The range of triple vision extended to objects as far as 10° from the horizontal direction, either above or below, and all three images were sufficiently distinct to show whether white blinds were up, down, or half way down in a row of houses at the distance of 700 yards.

Mr. B. H. Babbage (son of the inventor of the calculating machine) described several kinds of mirage which he had seen in Australia. In one instance, the Surveyor-General reported the existence of a large inland lake, which turned out to be mirage. The site in this instance was a swamp.

UNDERGROUND TEMPERATURES.

The "Report of the Committee on Underground Temperature" was then read by Prof. Everett. Father Secchi has undertaken to conduct observations of temperature in the Mont Cenis Tunnel. Thermometers have also been supplied to the Smithsonian Institution, for observations in the great tunnel under the Hoosac Mountain in America, as well as to observers at Ballarat, Moscow, St. Petersburg, and Paris, and to the conductors of the Sub-Wealden Exploration. Observations of great value have already been received from Paris, where Messrs. Mauget and Lippmann, who are sinking for the Municipality of Paris an artesian well, which is already 2,000 feet deep, have taken two series of observations at every 100 mètres of depth. The temperatures observed in the two series are almost identical; but the rate of increase between the depth of 600 mètres and the bottom (660 mètres) is four times more rapid than in the rest of the well. Messrs. Mauget and Lippmann attribute this circumstance to the heat generated by boring, though the tool had not been at work for five weeks previous to the observations. The temperatures at 100 mètres, 600 mètres, and 660 mètres, are respectively 58°·0, 75°·4, and 83°·25 Fahr. Successful observations have also been made in a bore at the bottom of South Hetton Colliery.

Prof. Phillips remarked that the thermometers of his own pattern (Phillips's maximum), to which reference had been made, could be carried round the world without derangement of their indications by shaking down, provided their bore was made sufficiently small, as in the case of some which he constructed long ago, and which were still in his possession. But there would be difficulty in using such instruments where the light was bad, and he thought the instrument exhibited by Prof. Everett (the upright Negretti) was better adapted to the purposes of the Committee.

Mr. Glaisher having stated that the ordinary Negretti thermometer was a result of the Exhibition of 1851,

Prof. Phillips stated that his own thermometer was invented twenty years earlier.

RAINFALL.

Mr. G. J. Symons, Secretary of the Rainfall Committee, produced the report of that committee, which was as follows :—

Your committee have the honour of reporting that every branch of rainfall work continues efficiently maintained, and that, notwithstanding the very limited funds at our disposal, and the long illness of our secretary during the winter, all arrears have been overtaken, and, owing to the completeness of the organization, no hitch or interruption has occurred. At the meeting of the British Association in Edinburgh very strong representations were made to your committee respecting the desirability of establishing additional rain-gauge stations in different parts of the Highlands, and as your committee had long been aware of the necessity which existed for these stations, and, moreover, as somewhat larger funds than usual were at their disposal, they resolved on taking every means in their power to secure the efficient establishment of these stations. In addition to ordinary correspondence, our secretary took two special steps to secure the most promising distribution of the new gauges. In the first place, he wrote to Mr. Buchan, the secretary to the Scottish Meteorological Society, acquainted him with the assent of the committee, and requested him to state for what number of gauges he could provide good observers. On receipt of his reply, ten gauges were sent to him, which he was kind enough to distribute. The other step was to send a letter to the secretary of the Highland Railway Company, whose line, as is probably generally known, traverses much of the most thinly inhabited part of Scotland, asking that their station-masters might be directed to make the requisite observations. To this letter a very favourable reply was received. The result of sub-

sequent correspondence was the establishment of a chain of stations over the entire system of the Highland, and Dingwall and Skye railways. Fifty gauges with pegs for fixing, instructions, and blank observation forms were sent to Inverness and distributed, and erected by the officials of the company at various selected stations, with the exception of a few which are retained in store until the northern extension of the line will enable them to be placed in Sutherland and Caithness. It only remains to add that the station agents, with scarcely an exception, understand their work, and do it punctually and well. Another district in which additional stations are urgently required is that traversed by the Caledonian Canal, and, therefore, a letter similar to the one already quoted, was addressed to the gentleman who, our secretary was informed, was in charge of the canal. As, however, the letter has not been acknowledged, our efforts in that direction have been futile. It is generally the case that expenditure on the part of this Association leads to equal or greater expenditure for similar objects by other persons. This has been specially the case with rainfall work, and an illustration may be quoted from the events of last year. Simultaneously with the above action of the Committee, the Earl of Breadalbane (through his agent, Mr. J. P. Smith, C.E.) has undertaken to supply returns from a series of stations between Aberfeldy and Tyndrum, and other important localities in the watershed of the Tay, and Rannoch. Several of the gauges were fixed by our secretary, and the sites for others selected by him, and if the observations are regularly taken, they will be of great utility. A very limited number of gauges have also been supplied to remote districts of England and Wales, but the price of rain gauges is now so low, that there can be but few persons who are able and willing to take charge of a gauge, to whom the cost can be prohibitory. Your Committee are fully aware that in many parts of the country additional observations are desirable, but there are so many expenses incidental to the collection of the observations and their discussion, that they do not feel justified, considering the very limited means at their disposal, in lending gauges except to very isolated stations. Their secretary will, however, be happy to render any information or assistance in his power, to persons who may be willing to set up gauges, and it is hoped that by the maintenance and development of the present organization, these vacant spaces may gradually be occupied. Owing to the illness of our secretary, the forms of enquiry respecting the positions, &c., of all the rain gauges in the country (not only those belonging to this Association, but also the much more numerous private ones) were not issued so soon as was originally intended. About 1,000 are, however, now circulated, and the rest will follow in less than a month. Those which have been returned have nearly all been filled up in a very complete and satisfactory manner, auguring well for the success of the proposal. Another step taken with the same object, viz., the attainment of precise knowledge respecting the gauges in use, their errors, and position, has been taken during the past year. Our secretary has long possessed a travelling case containing the standard measures necessary for verifying any rain gauge without removing it from its position, and in previous reports we have given the results of several hundred examinations of rain gauges *in situ* made with this apparatus. Owing, however, to our small funds, this examination has necessarily been limited, and as a partial counterpoise to this curtailment, we have caused to be constructed a precisely similar testing case, and have presented it to the Scottish Meteorological Society, whose secretary will in future use it in his inspections of the stations of that Society, and will communicate the results to us. We shall thus obtain a large amount of very valuable information at the mere original cost of the apparatus. We regret that, owing to the cause already referred to, the discussion of the monthly per-centages during 1860-69 is not quite ready for publication ; the means are all taken, and the whole of the per-centages (some 4000) are worked out ; the subsequent discussion, will, we hope, be completed long before it is required for our next report. The only remaining subjects to which we have to direct attention are the biennial tables for 1870-71, which are given in the appendix ; and the results of a comparison of the fall in each of those years with the averages at the same stations and with the same instruments during the ten years, 1860-69, given in our last report. This is given in Table I., and an abstract of the same in Table II.

Among the many points of interest brought out by this mode of treatment perhaps the only one to which we need call special attention is the general distribution of rain during 1870 and 1871. And first respecting 1870. The accompanying sketch-map shows that there were two areas in which great deficiency of rain occurred, and that there was no division in which the fall reached the average. The areas of deficiency were the south-west of England and the west of Scotland, and on reference to Table I. it will be found that several stations in those divisions had less than two-thirds of their average fall. The divisions in which the fall most nearly approached the average were the north-east of Scotland and Yorkshire; the latter, owing to a very heavy local fall in North Lincolnshire in October, 1870, having partially extended into the former county. In 1871 the fall was not very much below the average (only five per cent.), and the chart does not reveal such prominent features as in 1870. The greatest differences are found in the two sides of the north of Scotland, no other division differing more than six per cent. from the mean of the whole, and even this is mainly due to a belt of excess running north-eastward across the centre of England. This belt, moreover, is due to a single rain, that of September 6th, which in south-east Yorkshire amounted to nearly 4 in., and to between 1 in. and 2 in. at nearly all stations thence south-westward to Devonshire. The area of that rain it may be as well to state (including only those parts at which upwards of an inch fell) was about 14,000 square miles, and taking the fall at the low average of 1½in., not less than 1,357,000,000 (thirteen hundred and fifty-seven million) tons of water fell during the twenty-four hours.

A brief discussion ensued, and at its close the President remarked that when it was known to all that the results embodied in the report were obtained mainly through the untiring energy of the secretary, it would be readily admitted that the thanks of the Section were due to Mr. Symons. (Applause.) He regarded the report as of the most reassuring character. (Hear.)

Mr. Symons, in acknowledging the compliment, said that it had been suggested that the committee should apply for government aid, but he deprecated such an idea, and thought it preferable to depend solely upon private enterprise, as otherwise they might, between two stools, find themselves in the traditional position. (Laughter.)

ON A PERIODICITY IN THE FREQUENCY OF CYCLONES IN THE INDIAN OCEAN SOUTH OF THE EQUATOR.

The following paper by Mr. Meldrum was read:—

One of the objects for which the Meteorological Society of Mauritius was established in 1851, was to obtain extracts from the meteorological registers of vessels visiting the harbour of Port Louis, especially of such vessels as had experienced bad weather in the Indian Ocean.

Accordingly, clerks were employed to copy all the log-books that could be procured.

In 1853 the system of registration was remodelled. Instead of having the observations contained in each log-book recorded separately, all the observations in all the log-books for the same day were recorded on the same page.

As this system has been conducted without interruption to the present time, the Society has now a large collection of observations showing more or less the state of the winds and weather over the frequented parts of the Indian Ocean, in the form of a daily journal, during the last nineteen years; so that a person may find at once what weather prevailed on any day or in any year during that period.

Together with the years 1851–2, therefore, during which the registers were differently kept, we have 21 years' continuous observation, from the meridian of Greenwich to 120° E., and from 23° N. to 45° S.

Adding to the information obtained by the Society throughout these 21 years numerous observations collected by several persons for the previous four years (1847–50), we have a more or less complete record of all, or very nearly all, the cyclones which have taken place in the Southern Indian Ocean during the last 25 years; for Mauritius is so much in the track of these cyclones, and so much

visited by vessels in distress, and by others trading between the colony and England, India, and Australia, that it is scarcely possible for any violent hurricane to pass without being noticed.

Taking now, for the present, the area comprised between the equator and the parallel of 25° S., and the meridians of 40° and 110° E., and examining a table of the cyclones that have occurred there from 1847 to 1872, it is found that some years have been remarkable for a frequency and others for a comparative absence of cyclones.

The five years, 1847-51, were characterised by cyclone frequency; then came a period of comparative calm (1852-57), which was followed by six years (1858-63) remarkable for cyclones. The next five years (1864-68) showed a considerable decrease; and since 1869 there has been an increase, until, for the present year (1872), the number of cyclones is already (28th June) greater than in any year since 1861.

What has now been said is not only borne out by the records of the Meteorological Society, which give detailed accounts of the hurricanes, but also, I have little doubt, by the books of the docks and marine establishments.

Especially in 1847-48, and again in 1860-63, the harbour of Port Louis was at times crowded with disabled ships; whereas in the years 1855-57 and 1866-68 there were very few.

It will be seen that these years correspond pretty closely with the maxima and minima epochs of sun-spots.

For the present I wish merely to call attention to the subject, in order that the connection which I think exists between sun-spot frequency and cyclone frequency may be either verified or refuted by past or future observation.

It appears to me that there is more than a mere coninicidence as to time. There are three maxima and two minima epochs of cyclone frequency, corresponding nearly, if not entirely, with similar sun-spot epochs.

To examine the matter fully it would be necessary not only to know the number of cyclones in each year, but also the extent and duration of each, and the force of the wind. If we could thus get an expression for the annual amount of cyclonic energy, and could show that it varied directly as the amount of sun-spots, a connection would be established. One violent hurricane, which lasted ten days, and passed over thousands of miles, might have more value than half-a-dozen smaller and short lived ones. However, having traced a large number of the cyclones in question, I have no doubt that the years of greatest cyclone frequency were generally, if not always, the years of greatest cyclone energy; and that the number of cyclones in a year is a fair expression of cyclonic activity for that year.

Now, taking the maxima and minima epochs of the sun-spot period, and one year on each side of them, and comparing the number of cyclones in these three-year periods, we get the following results :—

	Years.	Number of Cyclones in each Year.	Total number of Cyclones.
Max.	1847	4	
	1848	6	... 15
	1849	5	
Min.	1855	4	
	1856	1	... 8
	1857	3	
Max.	1859	5	
	1860	8	... 21
	1861	8	
Min.	1866	5	
	1867	2	... 9
	1868	2	
Max.	1870	3	
	1871	4	... 14
	1872	7	

Taking two years on each side of the solar-spot epochs, we get :—

	Years.	Number of Cyclones.	Total number.
Min.	1854	3	
	1855	4	
	1856	1	... 15
	1857	3	
	1858	4	
Max.	1858	4	
	1859	5	
	1860	8	... 32
	1861	8	
	1862	7	
Min.	1865	3	
	1866	5	
	1867	2	... 15
	1868	2	
	1869	3	

Assuming that we have got a close approximation to the actual number of cyclones, and that the numbers fairly represent cyclonic energy, it is difficult to avoid the conclusion that the above tables point to a definite law; and that meteorology, magnetism, and solar physics are closely connected. For what holds good with regard to a large tract of the Indian Ocean probably holds good with regard to other portions of the earth's surface.

Is it not probable, also, that if there is such a connection as is here suggested between the sun-spots, or sun-cyclones (as they have sometimes been called), and earth-cyclones, there is a similar connection between the sun-spots and cyclones in the other planets?

NEW MARIOTTI BAROMETER.

Mr. G. J. Symons next read a paper on Mr. Telford Macneill's new Mariotti Barometer. It was a little mercurial instrument about a foot long, and in accuracy he considered it to occupy a middle position between the standard barometer and the aneroid.

(To be continued.)

BOOKS RECEIVED.

Observations made at the Magnetical and Meteorological Observatory at Batavia. By DR. BERGSMA. Vol. I. Large 4to.

Quarterly Weather Report. Part IV. Oct.–Dec., 1870. 4to.

Discussion of the Anemometrical Results, furnished by the Anemometer at Sandwick Manse. [From *Quarterly Weather Report*, 1871.] 4to.

Routes for Steamers from Aden to the Straits of Sunda. [Met. Com., non-official, No. 4.] 8vo. Stanford.

Winds, &c., of the North Atlantic. [Met. Com., non-official, No. 5.] 8vo. Stanford.

Scottish Meteorology, 1856—1871. By C. PIAZZI SMYTH. [From *Edinburgh Astronomical Observations*, Vol. XIII.] 4to.

Meteorological Observations at Port Louis, Mauritius, 1868, 1869 *and* 1870. By C. MELDRUM. Foolscap folio.

Monthly Notices of the Meteorological Society of Mauritius, March to November, 1871. Foolscap folio.

Meteorological Observations in New Zealand, 1869 *and* 1870. Foolscap folio.

Monthly Abstracts of Meteorological Observations, New Zealand, to December, 1871. Edited by DR. HECTOR, F.R.S. Foolscap folio.

New Zealand Meteorological Report, 1870, including returns for 1869, and abstracts for previous years. By DR. HECTOR, F.R.S. Large 8vo.

On Ocean Currents. By J. CROLL. Parts I., II. and III. [From the *Phil. Mag.*] 3 Parts. 8vo.

Sussex Meteorology, 1871. By F. E. SAWYER, F.M.S. Sm. 8vo. Robinson, Brighton.

Rain, with special reference to the Rainfall of Sussex. By F. E. SAWYER, F.M.S.

Determination of Heights by means of the Thermo-barometer. By F. F. TUCKETT. [Reprint from the *Alpine Journal.*] 8vo.

REVIEWS.

A Key to the Seasons and Weather, the result of Forty-two Years' Observations. By JAMES WYATT, F.G.S. 8vo, cloth, 22 pages, 2 plates. London: Arthur Hall & Co.

IF this key really would unlock all the intricacies, and remove all the uncertainties which surround coming weather, it would indeed be a golden key—nay more, it would be invaluable. Considering the more than national benefit which would accrue from the discovery of the laws which regulate or indicate coming seasons, it has always struck us as very remarkable that it is not more generally sought. We suppose the reason is to be found in the wide-spread disgust at the presumption and condign failures of the quacks and charlatans who have made impudent asseveration take the place of careful study, and whose failures simply led them on to greater recklessness. Chemistry has, however, risen from the ashes of alchemy, and astronomy has shaken off the trammels of astrology, and we hope that genuine predictive meteorology will before long take an equally firm position.

As we have already intimated, there are very few who have attacked this problem in a legitimate manner—viz., by careful and honest analysis of long-continued weather records. We think that they might all be counted upon the fingers. In fact, only four occur to us at the present moment—Lieut. George Mackenzie, of Perth, a prolific but by no means lucid writer; Mr. F. W. Doggett, F.M.S., who wrote several papers on the influence of the seasons on the various crops, which were published in the Reports and Proceedings of the Meteorological Society; Mr. G. D. Brumham, F.M.S., who has also contributed some papers to that society, and some to our own pages; and lastly Mr. Wyatt, whose work is now before us.

Irrespective altogether of the value of the rules for coming weather, this little work is acceptable, firstly, because it contains a table of the monthly rainfall in Carnarvonshire since 1825, which is superior to any other in north-west Wales, and of the highest utility in connection with Major Mathew's work in that district; and secondly, because it contains a condensed epitome of the weather during the same long period.

The foregoing remarks will show that our opinion is entirely different from that expressed by Mr. Wyatt in the following paragraph:—

"The author, in giving the result of his forty-two years' observations of the weather, has endeavoured to do it faithfully and correctly, with the view if possible of eliciting any useful and practical information as regards the seasons and the weather that may be serviceable. If it should be thought that he has not succeeded in doing so, then his labours and attention for so many years have been thrown away, and there would appear little use in keeping a diary of the weather at all; but he flatters himself that some useful information may be obtained, and that to withhold it would be doing wrong to himself and the public."

Having thus indicated our opinion that, apart altogether from its predictive portion, the work is a useful one, we must leave the rules laid down to the examination of our readers, merely offering a few passing remarks.

One fundamental rule appears to be that the summer generally will have the same characteristics as the weather between May 20th and June 20th. We are surprised, however, to find the summer of 1852 classed as fine, while according to the author's own table, the rainfall in both June and August was above the average, and July by no means exceptionally dry. Possibly the excess was due to thunderstorms and the intervening weather was fine, but if so, one would have almost expected to find it classed under changeable. Similarly, 1864 would by most meteorologists be entered as a fine summer; Mr. Wyatt has it down as variable, and judged by the amount of rainfall at his station, he might have entered it as wet. From this, two conclusions may be drawn—(1) that the rules most probably should in fairness be compared with the weather of the locality of which the future weather has to be determined, and (2) that the weather in N. Wales often differs widely from that in other parts of England.

One remark to which we are rather inclined to demur is—"Hard winters generally set in at or about Christmas or early in January." If this is true for N. Wales it scarcely holds good for the S.E. of England, and severe frosts usually extend over the whole of Great Britain. According to Mr. Glaisher's paper in the *Philosophical Transactions*, the most severe winters were 1783-4, 1784-5, 1794-5, 1796-7, 1813-14, and 1829-30, of which three began in November or early in December, and the other three later.

On the whole, the work is decidedly useful; the remarks on the character of the weather, as indicated by the movements of the barometer and the wind, are excellent. Many exceedingly valuable hints are given, which must, if carefully attended to, be productive of much practical good to the farmer, &c.

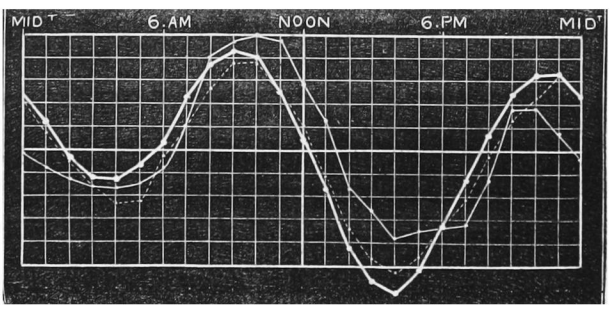
Observations made at the Magnetical and Meteorological Observatory at Batavia. Published by order of the Government of Netherlands India. Vol. I. Printed at the Government Printing Office, Batavia, 1871. Large 4to, 458 pages, 12 plates.

THIS handsome volume reflects credit on all parties concerned in its production, primarily on Dr. P. A. Bergsma, the director of the observatory, and author of the work before us; on his Javanese assistants, of whom Dr. Bergsma has reason to speak favourably; on the lithographers and printers of Batavia for the excellence of the printing, and though last, not least, on the Dutch Government for their establishment and maintenance of the observatory. As it would be altogether beyond the limits of a review minutely to analyze its contents, we must confine our attention to a few points. One of the most remarkable features is the large daily range of the barometer. The instrument

is a syphon standard by J. G. Greiner, jun., of Berlin, its internal diameter is 0·4 inch, and by two microscopes and a vernier it reads to 0·0008 in. (less than $\frac{1}{1000}$th of an inch); it was read hourly during the years 1866, 1867, and 1868, all the readings have been reduced to 32°, and every calculation has been made twice. The mercury in the short leg of the syphon is 26 feet above the level of the sea. The mean annual pressure, deduced from some 20,000 readings reduced to sea level, is 29·909 in., and the mean at each hour differed from that value by the undernoted amounts :—

Midnight	+·024 in.	6 a.m.	+·006 in.	Noon	+·005 in.	6 p.m.	—·033 in.
1 a.m.	+·011 ,,	7 ,,	+·023 ,,	1 p.m.	—·019 ,,	7 ,,	—·013 ,,
2 ,,	—·003 ,,	8 ,,	+·038 ,,	2 ,,	—·042 ,,	8 ,,	+·007 ,,
3 ,,	—·011 ,,	9 ,,	+·044 ,,	3 ,,	—·059 ,,	9 ,,	+·024 ,,
4 ,,	—·013 ,,	10 ,,	+·040 ,,	4 ,,	—·062 ,,	10 ,,	+·032 ,,
5 ,,	—·006 ,,	11 ,,	+·026 ,,	5 ,,	—·051 ,,	11 ,,	+·032 ,,

These values show a larger daily range than has been found at any of the stations of which the curves were given in our May number. We therefore annex a diagram of them, superimposing for comparison the two curves which they most nearly resemble. The thick line is for Batavia, the thin one for Calcutta, and the dotted line for Cumana.



The range at Java amounts to 0·106 in., while at Calcutta and Cumana it is only 0·090 in. The first min. at all three stations occurs a little before 4 a.m., the first max. at Java at 9 a.m., at Cumana between 9 and 10, and at Calcutta at 10 a.m. The second min. is a little before 4 p.m. at all stations, but the second max. occurs at Calcutta at 10 p.m., at Java at 10.26, and at Cumana not till 11 p.m. Thus we see that at Calcutta the max. and min. follow at regular intervals of six hours each, but that at Cumana and at Java the max. do not fall intermediately between the minima, the morning max. falling earlier and the evening ones later than the intermediate hours of 10 a.m. and 10 p.m., and therefore the interval between the morning and evening max. is 13½ hours, while between the evening and morning max. it is only 10½. These results are in close accordance with those obtained during 1846 and 1847 at Batavia and other stations in the Eastern Archipelago by Capt. C. M. Elliot,* upon whose work we may

* Magnetic Survey of the Eastern Archipelago. *Phil. Trans.* 1851, part I.

just remark that it seems probable that at Borneo the daily range is even greater than at Batavia.

Dr. Bergsma has carefully discussed his observations with a view to determining the amount of variation in the barometer due to the moon's position with respect to the meridian, and finds a double tide similar to that of the sun, but of which the amount is less than one-twentieth of the ordinary solar tide. Reckoning from the time of the moon's upper transit (or southing, as many persons would call it,) the following are the results :—

	in.	h.		Variation. in.		Interval. h.
1st maximum	= 29·885 at	1.04	.....	—·005	.....	6.08
1st minimum	= 29·880 ,,	7.12	.....	+·004	.....	5.53
2nd maximum	= 29·884 ,,	12.65	.....	—·005	.....	5.97
2nd minimum	= 29·879 ,,	18.62	.....	+·006	.....	6.42

These values are very similar to those deduced by General Sabine* for St. Helena, the differences being that the variation is slightly greater at Java than at St. Helena, and that Dr. Bergsma has computed the precise epochs of maximum and minimum by Bessel's formula, while General Sabine, merely taking the nearest whole hour, assigned the max. and min. to the following lunar hours, 0, 6, 12, 18. It will be noticed that at Java the epochs are all later, and it will be interesting to know which is most usual, and whether the retardation is the same all over the globe.

We must now turn to another subject. Dr. Bergsma evidently intends to make his work as perfect as possible, and is quite prodigal with his labour; all honour to one who sins in this direction, but in one respect he must excuse us for saying that he has mistaken extreme precision for extreme accuracy. This at first sight looks like a paradox or blundering expression on our part, but we know not how else to characterize the following facts. Dr. Bergsma sets a good example to many directors of observatories by describing briefly (more details would have been better) the construction and position of his instruments. His rain gauge has an area of about 248 inches (whether round, in which case diam. = 18 in., or square, when side = 16 in., is not stated,) and is on the top of the principal building of the observatory, 3 ft. 4 in. above the highest point of the roof, and about 33 ft. above the ground. Now table CIV. "contains the number of rainy days in every month and in the whole year; every day on which 0·1^{mm} of rain fell, has been taken as a rainy day."

Our readers will hardly need reminding that 0·1^{mm} equals 0·004 in., that at 33 ft. above the ground only a very rough indication of the true rainfall will be obtained, and that in a climate whose mean annual temperature is nearly 80°, the funnel of a rain gauge will generally be so hot as to evaporate the first drops of each shower. We do not know of what material the funnel of the Batavia gauge is made, but

* Magnetical and Meteorological Observations, St. Helena, 1840-43, p. 98.

we are certain that entries (of which we see many), of 0·1^{mm} are misleading; when 0·1^{mm} finds its way into the measuring glass, we have little doubt that at least three or four times that amount has fallen. We admit that when 0·1^{mm} is entered, nearly a cubic inch of water has been collected, and therefore it seems a tangible and reliable measurement—but there are generally two ways of looking at any question. Does anybody suppose that if a single drop of water fell on a piece of hot metal one inch square, any large proportion of it would run off. Do we not know that it requires a second and a third drop, coming nearly in the same place, before anything would run off. Yet a record of 0·004 in. is a record of less than one rain drop per square inch. We are not citing Dr. Bergsma as the initiator of a bad system, but he seems so zealous a worker that we desire to call his attention to the difficulty. Considering the height of the rain gauge above the ground, it seems probable that the recorded fall is not more than 80 or 90 per cent. of that which would be collected by a gauge with a receiving surface 1 ft. above the ground. We hope that Dr. Bergsma will shortly be provided with a second gauge, and will so place it that its results will be comparable with other stations.

Meanwhile, we are very glad to be able to place before our readers the monthly amounts collected by the present gauge, converted of course into English measures:—

Rainfall at Batavia, Java.

Lat. 6° 11′ 0″ S.; Lon. 106° 49′ 45″ E. Rain gauge above ground, 33 feet; above sea, 56 ft.

Year.....	1864.	1865.	1866.	1867.	1868.	MEANS.
	in.	in.	in.	in.	in.	in.
Jan.	20·16	24·61	8·47	20·67	10·16	16·81
Feb.	7·68	4·53	24·57	24·49	9·17	14·09
March....	5·63	8·66	4·68	2·24	7·09	5·66
April.....	3·58	6·89	3·42	1·85	3·86	3·92
May.....	1·81	·75	14·45	·67	·55	3·65
June.....	2·79	10·04	·24	1·38	1·14	3·12
July.....	2·60	1·57	·39	2·91	3·15	2·12
Aug.	3·03	4·88	·16	1·34	6·69	3·22
Sept.....	2·28	1·69	5·63	3·35	·24	2·64
Oct.	7·32	·20	6·81	10·31	3·58	5·64
Nov	3·23	10·20	2·83	5·83	4·02	5·22
Dec.....	4·73	9·45	17·72	21·42	7·48	12·16
Total.....	64·84	83·47	89·37	96·46	57·13	78·25

The observatory does not appear to possess max. and min. thermometers, but as both the Kew standard and the dry and wet bulb thermometers are read every hour, there is no difficulty in ascertaining the mean annual temperature, which is 78°·8. The extremes are not given, but we have not noticed a higher temperature than 92°·3, which occurred at 2 p.m. September 14th, 1868, nor a lower one than 68°·7 at 6 a.m. on August 11th, 1866.

AUGUST, 1872.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of Nights below 32° In shade	On grass.
			inches	inches.	in.								
I.	ENGLAND.	Camden Town	2·05	— ·59	·38	25	12	83·0	17	43·4	28	0	0
II.		Maidstone (Linton Park)	1·35	— 1·36	·35	5	12	84·0	17	38·0	31	...	...
,,		Selborne (The Wakes)	2·03	— 1·15	·76	21	11	73·0	18*	37·5	28	0	1?
III.		Hitchen	1·50	— ·85	·33	7	13	73·0	21†	42·0	26	0	...
,,		Banbury	2·84	+ ·71	·69	2	14	80·0	18	39·0	28	0	...
IV.		Bury St. Edmunds (Culford)	2·49	+ ·05	·90	7	11	75·0	17†	42·0	14	0	0
V.		Bridport	1·16	— 1·43	...	...	11	79·0	18	41·0	13	0	0
,,		Barnstaple	2·82	— 1·37	·62	1	14	84·5	19	45·0	9, 28	...	...
,,		Bodmin	2·22	— 1·64	·47	4	12	72·0	24	46·0	14	0	0
VI.		Cirencester	2·27	— ·57	·58	2	18	...	...	...	...	...	...
,,		Shiffnal (Haughton Hall)	4·21	+ 1·34	1·19	7	18	75·0	18	42·0	28	0	...
,,		Tenbury (Orleton)	2·57	— ·31	·75	7	13	81·7	18	41·2	28	0	...
VII.		Leicester (Wigston)	3·44	+ 1·25	1·02	5	15	85·0	17‡	43·0	27	...	...
,,		Boston	3·73	+ 1·44	·86	2	14	81·0	17	42·0	28	0	0
,,		Grimsby (Killingholme)	3·02	..	·47	26	21	74·0	17	45·0	4, 28	0	...
,,		Derby	3·34	+ ·74	·84	25	17	80·0	18	46·0	1, 28	0	0
VIII.		Manchester	2·78	— ·72	·58	7	20	83·8	18	46 0	27	0	0
IX.		York	2·81	+ ·10	·38	9	16	76·0	18	41·5	24	0	0
,,		Skipton (Arncliffe)	4·58	— 1·36	·85	10	20	78·0	20	37·0	3	...	...
X.		North Shields	3·71	+ ·86	·79	12	21	72·2	17	45·2	4	0	0
,,		Borrowdale (Seathwaite)	9·34	— 4·74	1·62	28	16	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely)	...	...	...	...	...	...	...	...	...	...	...
,,		Haverfordwest	2·02	— 2·86	·50	9	12	77·2	18	40·0	12	0	...
,,		Rhayader (Cefnfaes)	4·34	— ·32	1·20	6	20	77·0	...	41·0	...	.	...
,,		Llandudno	2·15	— 1·67	·34	10	15	86·0	18	46·8	9	...	...
XII.	SCOTLAND.	Dumfries	3·04	— ·84	·64	25	15	78·0	18	42·0	27	...	...
,,		Hawick (Silverbut Hall)	4·22	...	·69	12	19	...	...	...	.	...	...
XIV.		Ayr (Auchendrane House)	4·19	+ ·22	·77	29	16	78·0	18§	41·0	5‖	0	0
XV.		Castle Toward	6·33	+ ·03	1·83	17	15	73·5	18	...	...	...	...
XVI.		Leven (Nookton)	5·98	+ 2·99	2·16	25	21	69·0	18	40·0	1, 4	0	0
,,		Stirling (Deanston)	6·26	+ 1·64	1·27	16	22	74·0	19	40·8	31	0	0
,,		Logierait	2·88	...	·76	25	18	75·0	19*	40·0	31	...	...
XVII.		Ballater	..	...	...	...	...	...	...	..	...	...	...
,,		Aberdeen	3·37	...	·60	24	20	65·9	19	42·8	6	0	3
XVIII		Inverness (Culloden)	2·41	...	1·21	12	15	65·2	20	46·5	9	0	0
,,		Portree	3·11	— 4·34	1·02	16	11	...	...	..	...	...	...
,,		Loch Broom	2·77	...	·88	10	18	...	...	...	...	...	...
XIX.		Helmsdale	2·99	...	·80	11	17	...	...	...	...	...	...
,,		Sandwick	3·40	— ·31	·67	6	13	63·1	18	43·6	14	0	4
XX.	IRELAND.	Cork	6·83	...	1·46	9	15	...	...	...	...	...	...
,,		Waterford	4·25	+ ·30	1·05	15	16	74·0	23	45·0	13	0	...
,,		Killaloe	5·01	+ 1·06	·89	21	18	79·0	18	41·0?	13	...	...
XXI.		Portarlington	3·61	— ·89	·59	6	20	75·0	18	44·0	13	0	...
,,		Monkstown	3·83	+ ·62	1·07	5	19	...	...	...	...	...	...
XXII.		Galway	5·25	...	1·03	14	15	80·0	19	54·0	4**	0	...
,,		Bunninadden (Doo Castle)	4·28	...	...	...	...	...	...	...	...	...	...
XXIII		Bawnboy (Owendoon)	...	...	..	...	...	...	...	...	..	..	...
,,		Waringstown	4·30	...	·83	25	16	81·0	4	39·0	8	0	...
,,		Strabane (Leckpatrick)	5·66	..	1·30	6	16	...	...	..	...	...	...

* And 22. † And 25. ‡ And 18. § And 19. ‖And 14, 15. **And 10, 15.

+Shows that the fall was above the average ; —that it was below it.

METEOROLOGICAL NOTES ON AUGUST.

ABBREVIATIONS.—Bar for Barometer; Ther. for Thermometer; Max. for Maximum Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

LINTON PARK.—The first 11 days dull and showery, with distant T at times; the remainder of the month fine and dry, the third week being hot. Wind (never high) mostly N.E., when it was fine, but changeable during the early part of the month. Dense fogs on the mornings of the 25th and 29th, while on low lands it is said that there was a perceptible frost on 31st, but, on the whole, the month may be regarded as a fine one.

SELBORNE.—On the whole a good harvest month; the crops got in well; wind very changeable; distant T on 2nd and 4th; bright aurora from 9 p.m. on 5th; very boisterous day on 11th; fogs on 14th and 19th.

BANBURY.—TS on 2nd, and again from 1 to 5 p.m. on 7th; R and H on 31st.

CULFORD.—Fine weather from the 10th to the 25th; the last two days very cold for the season; easterly winds prevailed during 12 days, westerly 19; the mean temp. of the month is 59°; R fell on 11 days, that of the 7th amounting to ·90 in; TS on 2nd, 7th, and 31st.

BRIDPORT.—Fine month; harvest nearly completed by the 31st; gale on the 10th.

SHIFNAL.—R every day with one exception (3rd) till the 11th; bar. very equable, never reaching 30 in. or falling below 29 in.; max. temp. only 5 days above 70°, viz., 17th, 18th, 20th, 21st, and 24th; distant T on 2nd at 1 p.m., and 6th at 3 p.m.; violent TS on 7th at 5 p.m., when most of the R (1·19) fell, but no H; harvest begun (on 10th) on light soils; crops good, better than on strong soils; nearly finished at the end of the month on light soils, and got in well; 25th, a few wasps at length appear, but the bees eat the plums, &c., nearly as badly as they.

ORLETON.—The first 10 days cold and wet, with great TSS on 2nd and 7th. On the former day about ·40 in. fell in 20 minutes, and on the 7th the storm continued stationary for nearly 3 hours, with a fall of ·75 of R; the remainder of the month was beautiful harvest weather, being fine, hot, and dry; T was heard on the 2nd, 6th, 7th, and 9th, and L seen on 21st; the mean temp. was half a degree less than the average of the month, and nearly 4° below that of last August.

WIGSTON.—The last three weeks of the month have been, upon the whole, favourable for harvest work, and the greater part of the wheat and oats has been secured in good condition; a violent TS, of short duration, occurred on the 26th, unaccompanied by much R; considerable damage done to property in Leicester by the L.

BOSTON.—Severe TSS occurred on the 2nd, 7th, and 31st; on the 8th ·25 in. of R fell in ten minutes.

GRIMSBY.—Very little fruit; the potatoe disease universal, and foot and mouth disease very general; wheat crops light, and the turnip crops on strong land very poor owing to ravages from the fly; T on 2nd; L on 4th; TS at 6 p.m., on 5th; TS at 11.40 a.m., and another at 1.30 p.m., on 26th; T and L at 7.50 p.m. on 30th.

DERBY.—An unlucky month for farming operations, only eight consecutive days without rain; the fall above the average, the temp. just the mean. Potatoes here are reported to be very bad indeed; the wind has been unusually variable, not three following days in the same direction; bar. pressure below the mean.

MANCHESTER.—May and August this year have been the only months (here) below the average, the rainfall to the end of August being 11 in. above the average of 78 years; very few shooting stars seen (here) on the 10th, the sky being overcast.

N. SHIELDS.—TS on 6th, 7th, 11th, and 12th; T on 24th; L on 10th and on 30th, with heavy R on the 10th, but merely showers on the 30th.

WALES.

HAVERFORDWEST.—On the whole a fine harvest month; much T and L at times, especially on the 7th, when there was a very heavy storm, T very loud,

L very vivid, flash and crash in the twinkling of an eye succeeding each other; two houses struck. The storm was limited in its area, and lasted about an hour; aurora fine on two or three nights towards the end of the month.

CEFNFAES.—Temp. variable, nights generally cold and inclined to frost; wind S.E. and N.W.; potatoes much diseased, and rapidly spreading; foot and mouth ailment amongst the cattle increasing; TS, and very vivid continuous L occasionally.

LLANDUDNO.—T on 5th and 7th; L on 6th and 20th; aurora on 8th, commencing at 8.30 p.m., the colours beautiful at 11.9, also on the 9th at 10 p.m., in the southern hemisphere, and on 14th; began to cut wheat on the 12th; hazy on 20th, 21st, 22nd, and 24th, but the weather fine.

SCOTLAND.

DUMFRIES.—Weather very fine for a few days at the beginning of the month; from 5th to 16th the weather wet and broken, then very fine and warm to the 24th; at the close the weather unsettled; harvest began on 9th, and general on 19th; crops above the average, but potatoes affected with disease; fruit scarce, but wild fruit, such as bramble, extraordinarily plentiful; T on 7th, 15th, and 25th.

HAWICK.—The rainfall of the month has been mostly of thunder showers; very violent TS on the 12th, when the L struck the telegraph wires, and set fire to two ferns in the conservatory; the continued rains keep back harvest operations, and is aggravating the potatoe disease; ·65 in. of rain fell in two hours (between 5 and 7 p.m.), on the 31st.

AUCHENDRANE.—With clouds plus, and solar radiation and wind both minus, the evaporation has been feeble, on the other hand the rainfall has been above the August mean, and fell on some days like thunder-plumps; the great TS of the 7th, in Glasgow, &c., scarce reached here, neither the earthquake on the 8th, near Stirling, nor the waterspout at Comrie, on the 10th, and at Ben Lomond on the 20th, were felt here. Auroræ were seen here on 11th, 15th, 25th, and 26th; L, with the aurora on the 25th. The fog, which reached from the Forth in the E. to the Clyde in the W. on the 14th, and the great gale of the 16th and 17th along the east coast, did not visit this district. The farmers have found hay-making, &c., rather difficult this August; the bad state of the potatoe crop is attributed to the excessive electrical condition of the atmosphere; the rivers have been in their average (August) condition, except when locally affected by TS, and such floods were of short duration.

CASTLE TOWARD.—The rainfall this month has exceeded that of August, 1871, by rather more than 2·00 in., but is very little in excess of the average for August; this has been a very cloudy dull month, and but little sunshine; 13th to 15th, dense fogs; 16th and 19th, great floods. Corn crops look well, and harvest operations going on fast, many fields of corn cut in this district; potatoes very much diseased; turnips very backward owing to the great rains in July; garden carrots a failure; fruit of all kinds (outside) very scarce; grass in abundance; on the whole the month has been a favourable one for outdoor employments.

NOOKTON.—Cloudy month; T on 26th and 30th.

DEANSTON.—First week sunshine and showers; distant T on 7th; on the 8th close and warm; slight earthquake at 3.30 p.m. at several places near; on 10th distant T without L; from 18th to 24th fair, except slight showers on 21st and 23rd, then much rain, and cold to the end of the month; potatoe crops generally affected with disease; harvest at a standstill, and very little grain cut.

LOGIERAIT.—Very unsettled weather; prospect of an average crop of cereals, with a late harvest; unmistakeable signs of the potatoe disease.

ABERDEEN.—A month of dull, damp, quiet weather, exceedingly unfavourable for the crops; only small patches of grain cut here and there; potatoes seriously damaged by blight, in some fields 50 per cent. destroyed; auroræ on eight nights; several large meteors seen on 4th; TS on 24th; bar. and R above the average mean temp. and force of wind below the average; N.E., S.E. and N.W. winds more frequent than the average.

CULLODEN.—Auroræ on 5th, 9th, and 15th. T on 7th and 10th. Fog on 19th, 20th, and 21st.

PORTREE.—A very fine month ; hay crops and peat were secured in fine condition ; the potatoe blight is making rapid progress in some fields ; it is feared that seed will not be got safe ; finger-and-toe is also very bad in the turnip crop, in some places one half of the crops is useless ; the island is very healthy, cattle in excellent condition, and sell well at high prices, sheep are also doing well.

LOCHBROOM.—The month has been a fine one ; some of the farmers have their crops cut and nearly housed, and, on the whole, they are further advanced here than in any district in the north ; the potatoe disease has attacked many fields, but a large quantity of plant is still free of the taint.

SANDWICK.—On 8th aurora coruscating to the zenith from 9.45 till midnight ; also on 14th and 25th. Solar halo on 15th and 18th. Large lunar halo on 25th.

IRELAND.

WATERFORD.—T on 1st, 7th, 21st and 22nd.

MONKSTOWN.—Beginning of month very wet ; on 9th a few meteors in N.E. up to midnight.

DOO CASTLE.—Beginning of month wet, but on the whole a good month for outdoor employment.

WARINGSTOWN.—The weather during the month was variable, hot sun with heavy TSS.

THE SUMMER OF 1872 COMPARED WITH ITS PREVIOUS INDICATIONS.

To the Editor of the Meteorological Magazine.

SIR,—According to the Greenwich observations, the mean temperature of the three months ending August 31, 1872, has been 61°·7, which is considerably (1°·6) above the average of 101 years. This agrees with my forecasts in your numbers for December and March last, Vol. VI. p. 196, and Vol. VII. p. 28. Really hot summer weather commenced a few days after the 9th June last, and if we reckon the three months' summer from that date to about the present time in September, the mean temperature will show a much greater excess over the average. So the summer has been decidedly hot, according to my prediction. In your magazine for May, 1869, (more than three years ago) Vol. IV. p. 58, I showed that fine weather would set in about, or a few days after, the 9th of June, 1872, and that about the 17th of August of the same year (1872) a period of deficient rainfall would occur. Now between the 11th of June and the 6th of July last, the rainfall at the Royal Observatory, Greenwich, amounted to only 0·75 in., which is about 50 per cent. below the average of 57 years, and the most remarkably dry weather of this summer occurred in the last three weeks of August, exactly in accordance with my predictions made more than three years ago. With regard to the fine weather that I predicted for June, Mr. Glaisher, in the "Meteorology of England" for the quarter ending June 30th, 1872, says, "On June 13th a warm period set in, and for some days the weather was fine, bright, and hot. . . . Under the influence of the bright sunshine and hot weather about the middle of June, everything progressed satisfactorily and rapidly." In the *Gardeners' Chronicle and Agricultural Gazette* for April 13th last, (page 508) I stated that the summer rainfall of 1872 would be above the average. At your station the rainfall has been somewhat in excess of the average, and at very many stations the summer rainfall has been excessively large.—I am, &c.,

GEORGE D. BRUMHAM.