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THE DOUBLY OBSERVED METEOR OF NOV. 4TH, 1889.
THE SHEEP STAMPEDE OF NOVEMBER 3RD, 1888.

We adopt this double title for a reason which will be stated at the end of the following notes upon the meteor.

The meteor appears to have been observed at several places, one as far North as Corbridge-on-Tyne, 250 miles from London, where Mr. White Wallis saw it. We append all the accounts which we have been able to collect, they are not sufficient to fix its path accurately, but seem to indicate a first appearance over Gloucestershire at an elevation of about 50 miles, and a disappearance over Northamptonshire at a lower level. The following notes are arranged from S. to N :—

As to the meteor on the 4th inst., I was walking home that night in a N.W. direction, at a spot about 51° 20½ N. and 0° 35½ W. On the road I halted to notice a little to my right (looking about due north) a light in the sky, like a small moon with a following equally luminous "tail;" its direction was from left to right it's highest limit I should say was about 45°, and it made a *slightly* descending arc of about 60°, commencing a *little* W. of N. This would be a few minutes before 8 o'clock. The atmosphere was thick and foggy, so that all brilliancy was lost—in fact the meteor was dull—the motion did not seem very rapid, but the diameter of the meteor appeared much larger than any I previously recollect to have seen; the fog no doubt to some extent caused this appearance.

Chobham, Woking. HY. HORNCASTLE.

On Monday, November 4th, 1889, a brilliant meteor passed to the S.W. of Rose Hill, from W. or S.W. to E., as far as could be seen over the Berkshire Downs. Some few days after I saw an account in the *Standard* of a stampede of sheep on the Berkshire Downs. Had the meteor anything to do with it, or did it frighten them?—EDWARD COBB.

Rose Hill, Iffley, Oxon.

I saw the meteor on the 4th November; the finest I ever saw. I thought that it was a vivid flash of lightning until I looked up and saw the object, I should say travelling from W. to E.—W. LUCAS.

Hitchin.

Yesterday evening, November 4th, at 7.55 p.m., I was fortunate enough to observe a very brilliant meteor. It became visible almost exactly at the zenith, or a little west of it, and moved, as nearly as I could judge, due east (magnetic); it remained visible for about from one to two seconds, disappearing finally, rather low down on the eastern horizon. For the first half of its journey it was of a dazzling white brightness, and then it suddenly became a dull red spark. The light emitted from it, when brightest reminded me of the light from an arc lamp, and was very much brighter than any of the fixed stars. As it was so short a time in view, and there were no stars visible, I could only approximately estimate its point of appaarance and path. There were a few clouds about, mostly in the west, and the moon was behind them.—PAUL A. COBBOLD.

Warwick School, November 5th.

Was not the meteor seen from Warwick School on November 4th, the same as that mentioned in the following from my daughter, written from the school at Brookfield, Wigton, Cumberland.

"On Monday night (November 4th) at 7.55 p.m., when out on the playground viewing the stars, I saw a most beautiful meteor. It seemed to be very near, and was in sight for quite a long time. It appeared just over Skiddaw—that is to say, due South—and went towards the South East. It had a long tail of light, and burst, and sent out beautiful colours, and disappeared near the horizon."

Ackworth, Yorks, November 16th. WM. SCARNELL LEAN.

November 4th.—About 8 p.m., a brilliant meteor as large and as bright as Venus, passed from W. to E. 10° or 15° above S. horizon, with a bright train of sparks behind it. Motion slow, apparently horizontal. Only seen for one or two seconds. Probably the meteor mentioned in the November number of the *Meteorological Magazine*.—JOHN COPPIN.

Bingfield, Corbridge-on-Tyne.

THE SHEEP STAMPEDE.

We come now, and with some satisfaction, to the question which was left unanswered last year—Why did so many hundred sheep in the South Midland Counties break out of their folds on the night of November 3rd, 1888. Readers who will turn to our numbers for November and December of 1888, will find the facts there, and they

will find that we then hinted at an explanation which now seems probable. On p. 154, at the foot of the first letter upon the subject we said, "It is curiously near the locality where the bolide of November 20th, 1887, is supposed to have burst." In our second article we did not further press the appearance of a meteor as an explanation, because there was no record of one having been seen. But we now go back to it because we have—

November 2nd, 1886.—Meteor bursting over North Cornwall.

November 20th, 1887.—Meteor bursting in the neighbourhood of Oxford.

November 3rd, 1888.—Unexplained panic among sheep in Oxford and Berks.

November 4th, 1889.—Meteor passing Gloucestershire to Northamptonshire, and stampede of sheep on Berkshire Downs. (See Mr. Cobb's note, *ante* p. 161.

ON THE BLACK BULB THERMOMETER IN VACUO,

By Prof. Herbert McLeod, F.R.S.

[The following useful paper was read at the British Association Meeting at Newcastle. It was briefly mentioned in our last, but by the courtesy of Prof. McLeod we have now the pleasure of giving it *in extenso*.—Ed.]

This instrument which is generally employed for measuring solar radiation does not appear to give universal satisfaction, for it is said that no two instruments give the same result when placed side by side. No doubt the imperfection of the vacuum may account for this in a great measure, but besides this there appear to be other causes.

When such an instrument is exposed to the rays of the sun, a large proportion of the radiation passes through the enclosing case, also traversing the opposite side of the globe. Some, however, is absorbed by the blackened thermometer bulb, and this then begins to radiate heat of low refrangibility which is incapable of passing through the enclosing case; as a consequence the latter becomes heated, so that the thermometer bulb is in a warmer enclosure than at first. The quantity of heat thus radiated will be diminished the smaller the bulb of the thermometer, and some years ago I suggested to Mr. Hicks to make a thermometer with a very small bulb; such a one was made, and I am informed that it gave readings ten degrees *higher* than any other instrument; as this was exactly opposite to my expectation, perhaps I may be excused for not attempting any explanation. Some months ago I ordered two instruments with very small bulbs, one to be in a thick case and the other in a thin one. When the instruments came I found that one of the bulbs which appeared the thicker was devitrified and rough, and produced a very

marked shadow when held before a screen exposed to sunshine, so I was not surprised to find that this thermometer always indicated a slightly lower temperature than the one with the clear glass; it was returned to the maker, and I was then informed that the bulb was a thin one, and the devitrification was caused by blowing the bulb before the lamp. These thermometers were in use from May 20th to June 6th, and the means of the readings of the thermometer with the thick case was 119·2, while the mean of the readings of the other instrument was 116·8. This, therefore, supported the theory that I had formed on the subject. I then had one of the thermometers enclosed in a case of very thick glass. The thermometers were then tested with a thermopile to determine the quantity of radiant heat that would pass through the enclosing cases. The source of heat was an albo-carbon flame, and the cases of the thermometers were interposed in succession between the flame and the cone of the thermopile.

Case of thermometer with large bulb transmitted... about 26 per cent. of the
Thin case of thermometer with small bulb..... ,, 23 [radiant heat.
Thick case of thermometer with small bulb ..... ,, 11¼ ,, ,,

These thermometers were exposed to the sun's rays for the first 27 days of August, and the means of readings are as follows :—

Large bulb instrument	125°·7
Small bulb with thin case..	119 ·9
Small bulb with thick case	118 ·3

Although the case of the instrument with the large bulb allowed a larger percentage of the rays from a low temperature source to pass through, yet the amount of heat radiated from the large bulb was so great that the case was warmed sufficiently to cause the instrument to read, on the average, nearly 6° F. higher than the small bulb instrument.

According to the theory enunciated above, the thermometer with the thick case should have read higher than the one with the thin case; it however, gave readings 1·6° F. lower, but it must be remembered that the thick case transmitted less than half as much of the radiation from the gas flame as passed through the thin case, so it must have stopped more of the radiation from the sun than the thin case, and notwithstanding this the temperature registered is very little less than that indicated by the other instrument.

The small bulb instrument has another advantage over the large bulb one inasmuch as it is much more sensitive, and so reaches the maximum more quickly than when a large bulb is used. This is shown by the readings on August 4th, when there were only some occasional gleams of sunshine, the large bulb registering 98·2° F., and the small bulb 101·8° F.

It seems to follow from these experiments that the black bulb should be as small as possible, have a dead black surface, and very little of the stem blackened; and also that the case should be as thin as is consistent with strength.

A series of experiments should be carried out with instruments of different sizes, and with cases of different thicknesses in order to set the matter at rest. Some investigations on this subject have been carried on at the Kew Observatory, but I believe they have been only partially published. An accident to our old instruments gave me the opportunity of having fresh ones constructed, and it seemed advisable to put the above results on record.

REVIEWS.

Étude sur la synthèse de la Repartition des Pressions à la surface du Globe. Par M. LEON TEISSERENC DE BORT. Paris: Gauthier-Villars, 1889. 4to, 23 pages and 4 double plates.

IN some of M. Teisserenc de Bort's earlier papers he has pointed out the relations between the distribution of air pressure and of air temperature—between isobars and isotherms. The present work is a step further in the same direction, but one which we despair of making clear to all our readers in much less space than the author has given to it, viz., the whole of three numbers of this magazine. We cannot do that, but we shall at the same time bring his work to the notice of experts in all parts of the world, and give our less advanced readers a general idea of its scope, by translating the author's own summary.

Summary.—We see then by this essay that the principal isobaric lines are explainable, and can be reproduced, by the following considerations :—

(1). Originally the temperature of the whole atmosphere is assumed to have been equal at all parts of the earth's surface, decreasing gradually upwards, and its pressure on every part of the surface about 30 inches.

(2). When the atmosphere had become sufficiently transparent for the heating effect of the sun to become sensible, a difference of temperature between the equator and the poles was produced, and hence resulted upper air currents from the equator towards the poles.

(3). By virtue of the relative movement of the air due to inertia, the winds going towards the poles have a tendency to curve towards the E., and this tends to produce a gradient towards the poles. The surfaces of equal pressure thus approach the earth in proportion as the latitude increases, and more rapidly than the variation in density alone would produce. This prevents the principal barometric maxima occurring at the poles. There are thus formed in certain latitudes barometric maxima at places where the product of the height (comprised between the surfaces of

equal pressure of the higher regions and the earth), multiplied by the density of the air, is at its maximum. These maxima occur before reaching the Polar regions, because there the surfaces of equal pressure are too low. We find then between the equator and the poles, a sort of pad of air which is further increased by the retardation of the upper anti-trade, and the effects of the relative motion of the lower air which forms the trades and the west winds of middle latitudes.

(4). In high latitudes the convergence of the meridians, by diminishing the breadth of the currents, compels them to increase their height, as their increase of velocity is rarely alone sufficient, hence the pressure becomes small between the middle and polar latitudes. These minima vary in their latitude according to variations in the gradients, and consequently in the velocity of the currents.

(5). The differences in temperature which exist even in contiguous districts, and those also which in equal latitudes exist over land and sea, by changing the density of the lower strata of the atmosphere, destroy the regularity of the isobars, and lead to the formation between them of cyclonic and anti-cyclonic areas.

Thus are produced those grand centres of atmospheric action which give its true character to the general circulation of the atmosphere.

A WET TIME IN WEST AUSTRALIA.

We have been favoured with the following extract from a letter lately received, describing the exceptional winter of 1889 in West Australia: —

"Certainly the rainfall is most extraordinary, and is now beginning to be highly inconvenient. The squatters are wondering how and when they are going to get the wool off the sheep's backs into London market, for it seems wool spoils and heats if shorn wet. and we have not had three consecutive fine days since May last, The hay and crops are splendid, but the grapes will be a failure as the blossom has been washed off the vines.

"A plague of caterpillars has also set in, attracted by the luxuriant vegetation.

"No living person has ever seen Australia so green as it now is, or the live stock so fat.

"It is *pouring* now, yesterday having been our only fine day for a week."

Perth, Western Australia, October 23*rd*, 1889.

FLUCTUATION OF ANNUAL RAINFALL.

To the Editor of the Meteorological Magazine.

SIR,—In *British Rainfall* for 1886 you gave a table of the comparative rainfall for many years back, at the same time leaving spaces for three more years. Will you kindly inform your readers by what figure the rainfall for 1888 should be represented in the table? It does not seem to be explicitly stated in the last volume of *British Rainfall.* Perhaps 89 would be correct.

Yours faithfully,

G. VON. U. SEARLE.

30, *Edith Road, West Kensington*

[The calculations for the years 1882 to 86 are set out in full on p. 27 of *British Rainfall,* 1886, and we have pleasure in complying with Mr. Searle's request by giving the similar calculations for 1887 and 1888.—ED.]

		Chilgrove.	NashMills	Oxford.	Exeter.	Orleton.	Pode Hole	Boston.	Bolton.	Kendal.	Mean.
Mean.	1830–79 ..	33·61	26·82	23·40	30·33	30·00	25·57	22·66	47·39	51·48	—
Rain-fall.	1887	25·31	20·44	18·98	22·18	21·07	15·13	14·67	27·92	32·37	—
	1888	35·33	27·76	26·84	32·12	28·80	21·46	22·25	36·59	43·04	—
Ratios	1887	75	76	81	73	70	59	65	59	63	69
	1888	105	104	115	106	96	84	98	77	84	97

THE FLOATING ISLAND IN DERWENTWATER.

To the Editor of the Meteorological Magazine.

SIR,—With reference to the remarks by Prof. Meldola in your last number, I would call attention to the fact that at page 11, you state that the poles "could not resist the current setting northwards from the Lodore falls and from the Derwent," so I have little doubt that these currents bring from these streams quantities of leaves, branches and brushwood, which get lodged partly underneath and partly against the island and its loose rooting. The island being anchored to the shore and bottom is prevented from being carried hither and thither as most floating islands are.

In hot summers the accumulated organic materials get more largely decomposed than at other times, and the gases evolved are carried by the current further underneath, and into the bowels of the island, so that when they accumulate enough to buoy up the island, it shows its top above the surface of the lake.

I do not think that without this reinforcement of decomposable matter, the island (*per se*) could have furnished sufficient material to insure upheaval for such a prolonged period.

Yours truly,

HENRY MUIRHEAD, M.D.

Cumbuslang, 21st November, 1889.

EXPLANATION BY DR. NEUMAYER.

To the Editor of the Meteorological Magazine.

SIR,—In your monthly Meteorological Journal for November of this year, you had, on page 155, the kindness to mention the recent publication of the Seewarte, "Ergebnisse der Meteorologischen Beobachtungen im Systeme der Deutschen Seewarte für die Lustren 1876-1880 and 1881-85, sowie das Decennium 1876-1885," and while giving due credit to the value of the observations and the publication generally, you criticised the mode of publishing the monthly results, placing December at the beginning of the series of the months for the year.

From the stipulations of the Vienna Congress it is evident that the mean values for the various meteorological elements should be compiled for periods from the 1st of January to the 31st of December, and for the single calendar months respectively. No special reference has been made to the single seasons of the year, leaving it to the option of the various directors to deal with them according to the means at disposal in each case. Stress must only be put on the fact, that the mean values are computed according to the stipulations of the Congress, and that the International scheme of publication is adhered to.

In explanation of the arrangement, placing the month of December first in the series instead of at the end of it, whereas the order is in other respects not disturbed, I may be allowed to refer to the fifth paragraph of the introductory remarks of the said work.

According to the explanation there given, the means for the period stated are to be invariably understood to be for the time from 1st of January 1876 to the 31st of December 1880, the 1st of January 1881 to the 31st of December 1885, and so on. The months of December invariably belong to the said respective periods for which the means are given, and the month of December was placed at the beginning merely for convenience sake, in order to have the winter months placed together in this series.

For climatological purposes it appeared to me advisable to adhere to the seasonal arrangement, if such could be carried out without offending the rules of the Congress, and without impairing the value of the work generally.

In the tables which contain the values for the single elements for the whole decennium in question 1876-1885, no reference was made to the single seasons, and to the mean values for them, in consequence of which, the order of the months was the usual one, and a comparison of the mean values in them, with those of the respective months in the tables of the single lustra, shows at a glance that they are identical and derived according to the same principle.

After this explanation I do not suppose that you still believe that in publishing these results I have transgressed the stipulations

of the Vienna Congress; on the contrary, I have invariably been most anxious to adhere to them.

Yours very sincerely,

DR. G. NEUMAYER,

Hamburg, 30th November, 1889.

[We are always glad to be favoured with communications from meteorologists of such high standing as Dr. Neumayer, and we are especially glad that he has made it perfectly clear that he not only has not broken the rule of the Congress, but is a warm supporter of it. We had noticed the paragraph to which he refers, and were aware that the values were the proper ones. We thought that the Congress had gone further, and had advised that monthly values should always be printed in their normal sequence, but it is evident that there is no such rule, which we much regret. Nothing is more liable to lead to mistakes than having annual tables, some beginning with December and some with January.—ED.].

SALT HAIL.

To the Editor of the Meteorological Magazine.

SIR,—At page 137 Mr. Slatter says, "I allow that rain might be saline, but not hail." One day, six or seven years ago, a misty west wind blew against a window of mine, and deposited on it a thin crust, some of which I scraped off, and tasting found it salt. My niece also tasted, and agreed with me as to its saltness. The nearest sea to my house is about twenty-five miles off, in the Firth of Clyde, above Greenock. If wind can carry salt moisture thus far, surely it may happen that in some cases it may be elevated enough to encounter circumstances that will transform the moisture into hail.

HENRY MUIRHEAD.

Cambuslang, 17th October, 1889.

A LUNAR RAINBOW.

To the Editor of the Meteorological Magazine.

SIR,—On the 9th instant my father and I were walking in the country about a couple of miles from Newquay, Cornwall, when we noticed a distinct lunar rainbow. The time was 7.15 p.m. and the rainbow was, as far as we could judge, due west. The sky was fairly clear, except for one very black cloud. It had just ceased raining when we observed the rainbow against the dark cloud. The moon was shining very brightly at the time. I did not notice for how long the rainbow was visible. My father did not observe any colour in the bow, but I fancy I did—faintly, but of this I am not quite sure.—Yours sincerely,

JNO. B. SNELL.

The Chestnuts, Chislehurst, 12th October, 1889.

ROYAL METEOROLOGICAL SOCIETY.

THE first Meeting of this Society for the present Session was held on Wednesday evening, Nov. 20th, at the Institution of Civil Engineers; Dr. W. Marcet, F.R.S., President. in the chair.

Nine new Fellows were elected.

The following Papers were read :—

(1.) "Second Report of the Thunderstorm Committee." This is a discussion by Mr. Marriott on "The Distribution of Thunderstorms over England and Wales, 1871-1887," a period of 17 years prior to the appointment of the society's committee. The information used has been derived from various sources, the observers in communication with the Meteorological Office, Mr. Symons, and the Registrar General, and the Society's own climatological stations. By this means the average annual number of reporters for the 17 years was brought up to 143, and these were fairly distributed throughout the country. The stations were arranged according to the divisions adopted by the Registrar-General in the quarterly returns of births and deaths, but these divisions, 11 in number, are very unequal in area, Middlesex alone forming one division, while Herts, Buckingham, Oxford, Northampton, Huntingdon, Bedford, and Cambridge form another, and Monmouth and Wales make one division between them. The data have been tabulated for each month and year in the separate districts; 1880, 1882, 1884, and 1872 were the years of greatest frequency, and 1887, 1874, 1879, and 1871 those of least frequency, the most striking feature in the frequency diagram being the sea-saw nature of the curves, years of greater and less frequency alternating regularly throughout nearly the whole period. The Welsh division has the greatest number of thunderstorms in the month of August, but in the other 10 divisions, July is the month of maximum frequency. February and December have the least number in all localities. The average yearly number of storms for the 11 divisions is 39, the division comprising Surrey, Kent, Sussex, Hampshire, and Berks having the highest average 58·4, and Wilts, Dorset, Devon, Cornwall, and Somerset next highest with 52·3. Middlesex is lowest with 17·9 per annum, Cheshire and Lancashire next with 28·6, and Yorkshire third lowest with 32·7. The southern counties, therefore, are most liable to thunderstorms, and, curiously enough, the four northern counties, Durham, Northumberland, Cumberland, and Westmoreland, follow with 50·1 per annum. The report further shows the summer and winter distribution in each district, the order of maximum and minimum frequency agreeing very nearly with the annual.

(2.) On "The change of temperature which accompanies Thunderstorms in Southern England," by Mr. G. M. Whipple, B.Sc., F.R.Met.Soc.

(3.) "Note on the appearance of St. Elmo's Fire at Walton-on-the-Naze, September 3rd, 1889, by Mr. W. H. Dines, B.A., F.R.Met.Soc.

(4.) "Notes on Cirrus formation:" by Mr. H. Helm Clayton. The author, who has made a special study of cloud forms and their changes, gives a number of notes and drawings on the formation of cirrus under various conditions, *e.g.*, in a previously cloudless sky; cirrus bands with cross fibres; cirrus from cirro-cumulus clouds; cirrus drawn out from cumulus clouds; 'mares-tail' cirrus, &c. Curved cirrus clouds, when accompanied by decreasing barometric pressure frequently indicate that a storm of increasing energy is approaching.

(5.) "A comparison between the Jordan and the Campbell-Stokes Sunshine Recorder:" by Mr. F. C. Bayard, F.R.Met.Soc. As a result of a year's comparison between these two instruments, the author found that the Jordan Photographic recorder registered 30 per cent. more sunshine than the Campbell burning recorder.

(6.) "Sunshine:" by Mr. A. B. MacDowall. This is a discussion of the hours of sunshine recorded at the stations of the Royal Meteorological Society.

(7.) "On Climatological Observations at Ballyboley, co. Antrim:" by Prof. S. A. Hill, B.Sc., F.R.Met.Soc. This is the result of observations made during the five years 1884-88.

BERMUDA AS A STORM-WARNING STATION FOR THE ATLANTIC.

It is proposed that a meteorological station shall be established at the Bermuda Islands after the completion of the telegraph service between them and Nova Scotia. Many vessels leaving Halifax, the masters being unaware of the approach of storms from the West Indies, are dismantled before they have been out three days. The establishment of the proposed meteorological station would, therefore, be of great value, and the Canadian Government has willingly consented to bear half the cost.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1889.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	TotalRain. Depth.	TotalRain. Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		0–10
England, London	81·2	24	42·7	2	66·2	49·3	49·5	79	125·9	32·8	3·22	14	6·3
Malta	85·4	26	54·2	5	71·7	59·0	56·7	79	136·3	48·4	·58	4	4·2
Cape of Good Hope.	81·8	13	44·0	9	65·9	52·1	...	...	...	...	5·35	12	7·8
Mauritius	80·6	2	60·0	25	78·1	66·3	64·7	79	129·6	52·0	1·51	13	4·4
Calcutta	101·8	2	70·4	22	94·9	79·2	77·9	74	161·2	68·9	3·53	8	3·4
Bombay	93·7	23	74·9	26	91·6	81·3	77·4	75	146·8	68·9	·67	1	3·2
Ceylon, Colombo	90 1	2	72·8	...	87·5	77·7	74·1	80	149·0	70·5	15·60	28	8·0
Melbourne	78·1	1	39·4	8	62·1	48·9	48·4	77	124·0	29·0	·94	11	6·5
Adelaide	75·5	1	37·5	26	63·7	50·3	48·9	74	134·9	29·6	4·09	14	5·8
Wellington	67·0	3, 5	36·0	18	59·3	46·6	45·3	76	135·0	26·0	·92	13	4·1
Auckland	68·0	7	42·5	18	62·3	51·3	49·7	74	124·0	35·0	5·41	17	6·8
Jamaica, Kingston	93·8	11	71·4	7	90·4	74·6	72·4	71	...	...	1·47	...	...
Trinidad	96·0	10	68·0	14	91·8	72·0	72·0	68	161·5	59·0	6·34	11	...
Toronto	80·8	18	30·7	29	63·2	44·6	45·5	70	...	22·5	3·14	15	6·5
New Brunswick, Fredericton	91·7	19	32·0	12	68·9	43·8	47·5	68	...	...	3·45	14	5·1
Manitoba, Winnipeg	81·1	6	19·3	1	64·9	34·1	36·1	61	...	...	1·72	11	5·2
British Columbia, Victoria	79·0	11	37·0	22	65·3	46·5	...	...	...	...	1·01	7	...

REMARKS, MAY, 1889.

MALTA.—Mean temp. 63°·6; mean hourly velocity of wind 11·1 miles. Sea temp. rose from 60°·6 to 70°·2. TS on 25th. J. SCOLES.

Mauritius.—Mean temp. of air 1°·0 below, mean dew point 0°·4 below, and R 3·06 in. below their respective averages. Mean hourly velocity of wind 6·9 miles, or 3·3 below the average; extremes 18·6 on 8th and 0·0 on 21st. Prevailing direction S.E. by E. to E.S.E. C. MELDRUM, F.R.S.

COLOMBO.—TSS occurred on 12 days; L was seen on 4 other days.
J. C. H. CLARKE, LT.-COL. R.A.

Melbourne.—Mean temp. of air 2°·4, of dew point 2°·3 above the average; humidity 1, cloud 0·1, and R 1·19 in. below average. Prevailing winds N. and S.E.; strong on 10 days. Heavy dews on 14 days; hoar frost on 2 days; fogs on 4 days. Hail on 13th and L on 2 days. R. L. J. ELLERY, F.R.S.

Adelaide.—Pressure ·047 in. above and temp. slightly below the average; R an inch in excess. Weather generally mild, with light showers but heavy general rains on 19th and 30th. C. TODD, F.R.S.

Wellington.—Fine up to the 9th, with N.W. winds, strong on 6th; from 10th to 19th light showers, with moderate S. winds. The remainder of the month generally fine, with winds from N.W. and S. towards the end. Fog on two days. Total R 3·49 in. below the average; temp. 0°·9 above average. R. B. GORE.

Auckland.—A rainy, unsettled month, the R being quite 1·25 in. above the average. Mean temp. slightly below the average. T. F. CHEESEMAN.

SUPPLEMENTARY TABLE OF RAINFALL, NOVEMBER, 1889.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in			in.
II.	Dorking, Abinger Hall.	1·24	XI.	Castle Malgwyn	3·21
,,	Margate, Birchington...	·71	,,	Rhayader, Nantgwillt..	2·62
,,	Littlehampton	·77	,,	Carno, Tybrith	2·46
,,	Hailsham	1·30	,,	Corwen, Rhug	2·04
,,	Ryde, Thornbrough	1·75	,,	Port Madoc	3·67
,,	Alton, Ashdell.....	1·48	,,	I. of Man, Douglas	2·67
III.	Oxford, Magdalen Col...	·88	XII.	Stoneykirk, Ardwell Ho.	1·94
,,	Banbury, Bloxham	1·38	,,	New Galloway, Glenlee	4·26
,,	Northampton	·76	,,	Melrose, Abbey Gate...	·82
,,	Cambridge, Beech Ho...	1·17	XIII.	N. Esk Res. [Penicuick]	1·00
,,	Wisbech, Bank House..	1·10	XIV.	Ballantrae, Glendrishaig	3·22
IV.	Southend	·84	,,	Glasgow, Queen's Park.	1·75
,,	Harlow, Sheering	·93	XV.	Islay, Gruinart School..	4·21
,,	Rendlesham Hall	1·15	XVI.	Dollar.....	1·07
,,	Diss	1·63	,,	St. Andrews, Pilmour Cot	·70
,,	Swaffham	1·43	,,	Balquhidder, Stronvar..	3·31
V.	Salisbury, Alderbury...	1·12	,,	Dunkeld, Inver Braan..	·95
,,	Warminster	1·63	,,	Dalnaspidal H.R.S. ...	2·99
,,	Bishop's Cannings	1·10	XVII.	Keith H.R.S.	2·33
,,	Ashburton, Holne Vic....	3·36	,,	Forres H.R.S.	1·54
,,	Hatherleigh, Winsford.	1·01	XVIII.	Strome Ferry H.R.S....	4·96
,,	Lynmouth, Glenthorne.	1·85	,,	Fearn, Lower Pitkerrie.	1·21
,,	Probus, Lamellyn	3·71	,,	Loch Shiel, Glenaladale	7·71
,,	Launceston, S. Petherwin	2·27	,,	N. Uist. Loch Maddy ...	3·12
,,	Wincanton, Stowell Rec.	1·38	,,	Invergarry	4·88
,,	Taunton, Lydeard Ho...	1·30	,,	Loch Ness, Drumnadrochit	2·89
,,	Wells, Westbury	1·89	XIX.	Lairg H.R.S.	2·21
VI.	Bristol, Clifton	1·22	,,	Forsinard H.R.S.	...
,,	Ross	1·09	,,	Watten H.R.S.	1·71
,,	Wem, Clive Vicarage ...	1·23	XX.	Dunmanway, Coolkelure	5·63
,,	Cheadle, The Heath Ho.	1·25	,,	Fermoy, Gas Works ...	2·12
,,	Worcester, Diglis Lock	·98	,,	Tipperary, Henry Street	2·12
,,	Coventry, Coundon	1·18	,,	Limerick, Kilcornan ...	2·07
VII.	Ketton Hall [Stamford]	·76	,,	Miltown Malbay..	3·62
,,	Grantham, Stainby	·52	XXI.	Gorey, Courtown House	1·25
,,	Horncastle, Bucknall ...	·65	,,	Navan, Balrath	1·56
,,	Mansfield, St. John's St.	·69	,,	Mullingar, Belvedere ...	1·69
VIII.	Neston, Hinderton	2·66	,,	Athlone, Twyford	1·68
,,	Knutsford, Heathside ...	2·35	,,	Longford, Currygrane...	2·05
,,	Lancaster, South Road.	2·29	XXII.	Galway, Queen's Coll...	1·77
,,	Broughton-in-Furness ..	3·51	,,	Clifden, Kylemore	6·49
IX.	Wakefield Prison	·83	,,	Crossmolina, Enniscoe..	2·22
,,	Ripon, Mickley	·79	,,	Collooney, Markree Obs.	2·54
,,	Scarborough, West Bank	2·20	,,	Ballinamore, Lawderdale	...
,,	East Layton [Darlington]	1·05	XXIII.	Warrenpoint	1·82
,,	Middleton, Mickleton..	1·26	,,	Seaforde	1·47
X.	Haltwhistle, Unthank..	1·21	,,	Belfast, New Barnsley..	2·26
,,	Shap, Copy Hill	2·78	,,	Bushmills, Dundarave...	2·57
XI.	Llanfrechfa Grange	1·67	,,	Stewartstown	2·13
,,	Llandovery	2·52	,,	Buncrana	1·98

NOVEMBER, 1889.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average. 1870–9	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.	London (Camden Square) ...	·89	— 1·55	·38	24	8	60·3	8	27·8	28	4	10
II.		Maidstone (Hunton Court)...	·89	— 2·01	·38	23	7	...	...	...	...	...	...
,,		Strathfield Turgiss	·64	— 2·11	·36	24	8	59·3	15	26·2	29	7	12
III.		Hitchin	·97	— 1·64	·39	3	10	55·0	8, 9	27·0	27*f*	6	...
,,		Winslow (Addington)	1·00	— 1·50	·40	24	8	57·0	8	25·0	29	7	10
IV.		Bury St. Edmunds (Westley)	1·64	— 1·10	·45	3	9	...	...	...	...	...	...
,,		Norwich (Cossey)	1·51	— 1·80	·40	27	9	...	...	26·0	13*a*	1	10
V.		Weymouth(LangtonHerring)	1·48	...	·41	24	10	58·0	15*d*	28·0	28	3	...
,,		Barnstaple	2·81	— 1·34	·53	2	15	59·0	23	28·0	29	...	...
,,		Bodmin (Fore Street)	3·30	— 2·03	·82	24	20	...	...	...	...	...	...
VI.		Stroud (Upfield)	1·12	— 1·82	·44	24	8	58·0	8	24·0	27	7	...
,,		ChurchStretton(Woolstaston)	1·35	— 2·09	·37	22	12	58·5	8	27·0	28	4	9
,,		Tenbury (Orleton)	1·02	— 1·84	·29	24	11	62·0	7	25·2	29	6	9
VII.		Leicester (Barkby)	·86	— 1·47	·20	24	13	59·0	8	20·0	28	9	16
,,		Boston	·59	— 1·78	·30	27	7	65·0	10	23·0	29	7	...
,,		Hesley Hall [Tickhill].....	·41	...	·08	2*a*	12	63·0	7	27·0	28	7	...
VIII.		Manchester(PlymouthGrove)	1·89	— 1·19	·40	14	16	61·0	7	28·0	26*g*	5	8
IX.		Wetherby (Ribston Hall) ...	·67	— 2·09	·36	15	7	...	...	...	...	...	...
,,		Skipton (Arncliffe)	2·39	— 3·36	·56	1	14	56·0	9	24·0	27	9	...
,,		Hull (People's Park)	·56	— 2·61	·10	24*b*	13	...	...	...	...	...	...
X.		North Shields	1·02	— 2·43	·29	14	10	61·0	7	25·5	27	9	10
,,		Borrowdale (Seathwaite).....	6·82	— 5·00	1·15	24	17	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	2·12	— 2·08	·76	23	12	...	...	...	...	...	...
,,		Haverfordwest	3·34	— 2·00	·81	2	21	56·0	6	28·3	28	4	7
,,		Plinlimmon (Cwmsymlog) ...	3·43	...	1·02	24	14	..	...	...	...	...	...
,,		Llandudno.....	1·38	— 2·53	·77	22	15	62·0	22	33·8	27	0	...
XII.		Cargen [Dumfries]	2·06	— 1·85	·66	1	13	58·6	10	22·6	27*h*	7	...
,,		Jedburgh (Sunnyside).....	·64	— 2·37	·14	21	7	60·0	10	26·0	27	8	...
XIV.		Old Cumnock	3·75	+ ·28	1·16	1	18	56·0	7	...	...	6	...
XV.		Lochgilphead (Kilmory)	4·09	— 1·27	·70	1	21	...	...	..	...	...	...
,,		Oban (Craigvarren)	3·26	...	·62	24	25	54·8	7	30·0	27	2	...
,,		Mull (Quinish).....	4·78	...	1·18	30	21	...	...	...	...	...	...
XVI.	SCOTLAND.	Loch Leven Sluices	1·10	— 2·45	·30	5*c*	7	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	·70	— 2·43	·35	22	6	60·9	10	23·9	26	6	...
XVII.		Braemar	2·28	— 1·49	1·33	1	12	59·8	9	25·3	26	11	19
,,		Aberdeen (Cranford)	1·08	...	·22	24	14	62·0	7	29·0	26	7	...
XVIII		Lochbroom	6·81	...	2·75	1	19	...	...	...	...	...	...
,,		Culloden	1·86	— ·84	...	...	...	58·0	7	28·0	26*i*	3	18
XIX.		Dunrobin	2·10	...	·54	1	11	60·2	9	27·0	27	7	...
,,		S. Ronaldsay (Roeberry).....	1·92	— 2·16	·37	1	20	54·0	6	17·0	27	3	...
XX.		Cork (Blackrock).....	2·49	— 2·12	·56	24	16	60·0	8	27·0	28	3	5
,,		Dromore Castle	4·13	...	·75	24	17	69·0	17	30·0	28	...	...
,,		Waterford (Brook Lodge) ...	1·92	...	·49	24	15	55·5	8	24·0	29	5	..
,,	IRELAND.	O'Briensbridge (Ross)	2·30	...	·73	24	19	58·0	12*e*	30·0	28	1	...
XXI.		Carlow (Browne's Hill)	1·83	— 1·09	·57	22	18	...	...	...	..	...	...
,,		Dublin (FitzWilliam Square)	·93	— 1·35	·36	22	9	59·7	7	29·6	28	2	11
XXII.		Ballinasloe	1·55	— 1·45	·47	24	16	54·0	8	26·0	27*h*	8	...
XXIII		Waringstown	2·18	— ·53	·36	17	18	57·0	7, 18	26·0	27	7	12
,,		Londonderry (Creggan Res.).	2·77	...	·58	26	19	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·00	— 1·05	·50	26	18	55·0	7	26·0	28	4	8

a And 14. *b* And 26, 27. *c* And 23. *d* And 16. *e* And 13, 14. *f* And 30. *g* And 27. *h* And 28. *i* And 27, 28.

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

METEOROLOGICAL NOTES ON NOVEMBER, 1889.

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

ENGLAND.

STRATHFIELD TURGISS.—The weather has been unusually open and mild, and fogs have been rare. Roses are still in bloom out of doors, the hawthorn has bloomed again, cherry trees are full of bud, and poppies and the yellow rag-wort (Senecio Jacobæa) in full flower. Violets and primroses are in flower in gardens. Bar. exceedingly high on 19th (30·652); 23rd, anticyclone giving way and a gale from S.W. to N.W. Close of the month very cold and winterly.

HITCHIN.—A very dry month; highest bar. since January.

ADDINGTON.—One of the driest Novembers since 1871, twice only a less quantity registered, viz.: 1871 (0·87 in.), 1879 (0·76 in.) It was also unusually mild until quite the end, the 27th being the first really cold day, with a max. temp. of 35°. Bar. high during the month, particularly from 17th to 21st.

BURY ST. EDMUND'S, WESTLEY.—The month was mild and foggy till the 25th. Deep snow on the 27th, and cold for the time of year till end of month.

WEYMOUTH, LANGTON HERRING.—On the whole a very fine, mild month. The small amount of R for this month has increased the deficit for the eleven months to 23 per cent. Mean temp. 2°·6 above the average; mean min. 2°·3 above the average. There were several foggy days; on the 24th very stormy.

WOOLSTASTON.—The early part of the month was warm and sunny, the 8th being quite a summer's day. The last ten days were very cold, S falling on 25th and 26th. Mean temp. 43°·7.

ORLETON.—The weather was generally cloudy, dull, and warm, and frequently foggy, with only two frosty mornings till the 25th. The bar. was very high and steady till the 24th, when a sudden decrease of pressure took place, followed by a strong gale of wind and a low temperature till the end of the month. The mean temp. of the whole month was 2°·2 above the average of the last 28 years. R much less than the mean of the month. A light fall of S occurred early in the morning of the 27th; a solar halo on the 5th. Wind generally light till the 24th, but afterwards strong and cold.

LEICESTER, BARKBY.—The first S fell on the 26th. Mean temp. 42°·1, mean max. 48°·6, mean min. 35°·5.

MANCHESTER, PLYMOUTH GROVE.—The first three weeks the weather was mild, damp, and foggy; no dense fog during the month. A fall of S on the 26th. Last five days winterly weather and very cold.

HULL.—The weather during the month was generally fine, sometimes with fog and with a little frost and S towards the end.

WALES.

HAVERFORDWEST.—Mildness, with constant R, characterised the first week; the first two days very stormy with T and L, followed by a sharp frost at night on the 4th; shade temp. 30°·5. Mild, but generally gloomy weather generally characterised the month until the 20th, when the weather began to get cold and wet. The 26th was very cold and gloomy, with a strong easterly current of air, followed on the 27th by a heavy snowstorm, S falling to the depth of 7 in. over the whole of the Precelly range, and remaining more or less to the end of the month.

SCOTLAND.

CARGEN.—A calm, foggy month generally. Sunshine (68 hours) considerably below the average; mean temp. of the month (43°·7) 2°·2 above the average; mean bar. pressure (30·080 in.) a quarter of an inch above the average; for five days (16th to 20th inclusive) the pressure ranged from 30·548 in. to 30·590 in.

JEDBURGH.—Up to the beginning of the last week the mildness has been most unusual for the season. Primroses are in full bloom, wallflowers, &c. The frost of last week has been beneficial, as it has checked the growth of root crops.

OBAN, CRAIGVARREN.—A very general R, though less than the normal amount for the month. Growth continued throughout. A little S fell at the close, with a cold spell of weather.

ABERDEEN, CRANFORD.—Blinding snow showers on evening of 23rd; snow on the ground averaged 3 in. deep on the morning of 24th.

LOCHBROOM.—The month began with as two stormy and rainy days as ever remembered—the heaviest R for years, and ended with a very stormy and wintry week, but the rest of the month was summer-like.

INVERNESS, CULLODEN.—The weather throughout particularly fine. Temp high, and from the 1st to the 17th and 18th no R fell. Some sunsets very beautiful.

ROEBERRY.—Very fine until 24th, afterwards coarse and unsettled. S on 26th, T on 29th.

IRELAND.

CORK.—Changeable and humid, and at times foggy, with a steady high bar.

WATERFORD.—Mean temp. 46°·2; average R for the month 3·73 in., the fall was therefore 1·81 in. below the average; hail on the 26th, aurora on the 27th, lunar rainbow on the 29th.

O'BRIANSBRIDGE, ROSS.—A very mild month. Thermometer fell to or below frost only on one night. Dense fog on the 23rd.

DUBLIN.—The month was calm, dull, and comparatively mild and rainless—a contrast to November of last year, which was the wettest and most stormy November experienced in Dublin for 25 years. At the close of the month a spell of wintry weather was experienced. Mean temp. above the average. A lunar halo on the 4th, a solar halo on the 14th; high winds on 5 days; gale on the 1st; more or less foggy on 9 days. L on 25th; hail on the 1st; sleet and snow 26th and 27th. An aurora borealis was seen on the night of the 26th. At the beginning of the last week a sudden change from autumn to winter.

OMAGH, EDENFEL.—The month commenced with gales and rain, but from the 3rd to the 21st there followed a period of abnormal mildness, calmness, and humidity—stagnancy would better describe its condition—with an atmospheric saturation evidenced by an almost daily measurable quantity in the gauge. Many shrubs and plants burst into leaf and flower for the second time, and the song of the non-migratory song-birds was quite general. The fourth week, however, was a rude awakening and was winter pure and simple, with an average of six inches of S and steady night frosts.