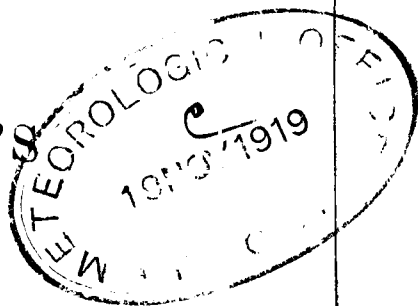


SYMONS'S

MONTHLY



# METEOROLOGICAL MAGAZINE

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VOLUME THE THIRTY-THIRD.

~~~~~  
1898.  
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LONDON:  
EDWARD STANFORD, COCKSPUR STREET, S.W.

—  
1899.

Manuel  
Berthiaume



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# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

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### METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE, LONDON, N.W.

Lat.  $51^{\circ} 32' 40''$  N. ; Lon.  $0^{\circ} 8' 0''$  W. Altitude 111 ft.

I WOULD always rather refer to the work of someone else than to my own, but there are few records of meteorological observations day and night for forty years without a break, absolutely uniform in system, nearly so as to instruments and locality, and mostly made by one person. Moreover, rightly or wrongly, special interest attaches to the climate of the million-peopled metropolis, and there is no station with suitable exposure in or near London which has been at work nearly so long as that at Camden Square.

For these reasons I have had the records worked up, and intend to give during the present year a series of tables for each month similar to that for January on p. 4.

In this long period there have, of course, been more than 14,000 days, giving considerably more than 500,000 entries, and to compress the results of one-twelfth of these into a single-page table has not been easy ; hence considerable care must be used in quoting from the table, and the following explanations, which will apply to all the series, should be read carefully.

#### EXPLANATIONS.

Each table refers to the 40 months of that *name*, and is entirely independent of any other month or months.

The values refer to the 40 years beginning with January 1st, 1858, *except as under* :—

Grass minimum (38 years) ... ..	begun Jan. 1st, 1860
Solar Radiation, Black Bulb (28 years)...	„ „ „ 1870
Temp. of Soil at 1 foot (27 years) ...	„ „ „ 1871
Solar Radiation, Bright Bulb (20 years)	„ „ „ 1878

The barometer has always been within a few feet of 110 ft. above

mean sea level (111 ft. from 1868-97), but all readings have been corrected for index error and temperature and reduced to sea level.

The shade thermometers have always been on a Glaisher pattern (*Met. Mag.*, Vol. III., p. 155) thermometer stand, duly turned so as to keep the thermometers in perfect shade.

The solar radiation thermometers have been on a post 4 ft. above ground.

The rain gauge quoted has always been an 8-inch one, with its rim 1 foot (or a little less) above the ground.

As regards rainfall, it will be understood that though the word at the top of column is "means," the values in columns 1, 2, 3, 5, 6, 8 are totals.

Col. 1 gives the mean of all the readings in the whole period; twice a day as regards barometer, shade temp., cloud and rainfall, the other elements once a day. For instance, 29.982, 38.1 and 7.0 are the means of the corresponding two entries in Col. 5, and 2.02 is the sum of the two entries in that column.

Col. 2 gives the highest mean for any one of the 40 Januaries and the year in which it occurred. This must not be confused with the absolute highest, which will be found in Cols. 10 and 11.

Col. 3 gives the lowest mean for any one of the 40 Januaries and the year in which it occurred.

Col. 4 gives the hours of observation.

Col. 5 gives the mean at each hour of observation for the 40 years. As regards rainfall, the rainfall values show the mean of the total amount measured at 9 a.m. having fallen during the 12 previous (night) hours; and the total measured at 9 p.m. having fallen during the 12 previous (day) hours.

Col. 6 gives the highest mean at each hour of observation.

Col. 7 gives the date of ditto.

Col. 8 gives the lowest mean at each hour of observation.

Col. 9 gives the date of ditto.

Beyond the double rule the table deals with extremes.

Col. 10 gives the actual highest reading for each element at each hour of observation.

Col. 11 gives the date of ditto. The name of the month is not given, because, as already explained, each table deals with only the month named at the top; therefore, in Col. 11 the second entry, which does not look clear, states that the 30.934 mentioned in Col. 10 occurred on the 17th and 18th of January, 1882, and on the 9th of January, 1896.

Col. 12 gives the actual lowest reading for each element at each hour of observation.

Col. 13 gives the date of ditto.

Col. 14 gives the mean of the highest readings in each of the 40 months.

Col. 15 gives the mean of the lowest readings in each of the 40 months.

# REMARKS.

I do not intend to offer any comments upon the tables ; the facts are there, and I leave them for the consideration of my readers. But there is one item, to which attention is often given, which does not appear in the table, and it may be well to explain why it is not given. It is mean temperature, and I do not give it because meteorologists are not in complete accord as to how it is to be determined ; and probably the method depends somewhat on the pattern of thermometer stand adopted. I do not intend to refer to this subject again, so shall consider it fully now, using the January values to show the different results obtainable according to the method adopted.

Mean temperature is often taken (where a Stevenson pattern thermometer screen is used) as the mean of the mean maximum and of the mean minimum ; if so, we should have :—

$$\frac{43\cdot0 + 33\cdot3}{2} = 38^{\circ}\cdot15$$

Sometimes the mean of the 9 a.m. and 9 p.m. dry is incorporated with it ; then we should have :—

$$\frac{43\cdot0 + 33\cdot3 + 37\cdot7 + 38\cdot4}{4} = 38\cdot10$$

But, as already stated, the thermometer readings used in these tables are from thermometers mounted on a Glaisher pattern stand, and then, perhaps, the corrections given in Mr. Glaisher's *Diurnal Range Tables* (4th ed., Taylor & Francis, 1867) should be used, and they would give :—

		Correction.	True mean.	
Max. 43·0	} Mean 38·15	—0·2	...	37·95
Min. 33·3				
9 a.m. 37·7		+1·2	...	38·9
9 p.m. 38·4		+0·5	...	38·9
				} = 38°·43

However, their applicability and other subjects must be considered when the tables are all published.

## RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858-97.

## JANUARY.

ELEMENTS.	MONTHLY MEANS OR TOTALS.							ABSOLUTE READINGS.							
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	MEANS 9 A.M. AND 9 P.M.				EXTREMES AT 9 A.M. AND 9 P.M.				Mean of all Highest Lowest.			
				Mean.	Highest Month.		Lowest Month.		Value.	Highest.			Value.	Date.	
					Value.	Date.	Value.	Date.		Value.	Date.				
Barometer ..... (cor. & red.)	1 29.982	2 30.378 1880	3 29.573 1865	4 29.983 9 a.m. 29.981 9 p.m.	5 29.983 30.378 30.378	6 30.378 1880 1880	7 1880 1880	8 29.583 29.564 1865	9 1865 1865	10 30.950 30.934 30.934	11 18th, 1882 17, 18 '82; 9, '96 18th, 1883	12 28.528 28.476 28.476	13 20th, 1873 20th, 1873 20th, 1873	14 30.533 30.525 30.525	15 29.163 29.246 29.246
(Dry Bulb.....)	38.1	43.8 1884	31.2 1881	9 a.m. 9 p.m.	37.7 38.4	43.4 44.3 1884	1875 1884	30.2 31.8 1879	1881 1879	53.9 54.6 56.4	1st, 1883 1st, 1883 19th, 1877	7.2 12.8 16.9	4th, 1867 4th, 1867 4th, 1867	50.2 50.3 53.1	25.0 27.4 31.7
Max. ....	43.0	..	...	...	...	48.9 1890	1879	35.8 1879	1879	52.3 1881	1st, 1860	6.7 1867	4th, 1867	45.8 1867	21.8 1867
Min. ....	33.3	...	...	...	...	39.2 '75, '84	26.1 1881	29.6 1881	1881	53.0 1883	1st, 1883	7.2 1867	4th, 1867	48.8 1867	24.6 1867
(Wet Bulb.....)	36.9	42.8 1875	30.6 1881	9 a.m. 9 p.m.	36.6 37.3	42.4 43.1 1875	1875	30.9 1879	1879	52.8 1884	9th, 1862	12.8 1867	4th, 1867	49.3 1867	26.6 1867
Solar Rad., black ...	53.7	...	...	...	...	61.8 1877	44.1 1879	35.4 1881	1881	87.3 60.3	30th, 1877 29th, 1884	26.5 22.5	2, '71; 1, '87 15th, 1881	75.5 55.5	34.7 31.6
Solar Rad., bright..	43.9	...	...	...	...	52.1 1890	35.4 1881	21.9 1881	1881	50.9 47.6	1st, 1860 2nd, 1883	0.5 32.0	5th, 1867 29th, 31st, '80	43.3 42.4	17.0 35.1
Grass Minimum ...	30.1	...	...	...	...	36.4 1875	33.8 1891	5.7 1860	1860	10 10	Every year Every year	0 0	Various Various	10.0 10.0	0.6 0.2
Soil, 1 foot .....	38.3	...	...	...	...	42.8 1873	3.7 1858	3.7 1858	1858	1.20 .85	11th, 1866 18th, 1881	.00 .00	Every year Every year	.33 .31	.00 .00
Cloud .....	7.0	8.4 1871	4.8 1858	9 a.m. 9 p.m.	7.1 6.8	8.9 8.6 '68, '71	5.7 3.7 1858	.01 '09 1880 1864	1880 1864	1.20 .85	11th, 1866 18th, 1881	.00 .00	Every year Every year	.33 .31	.00 .00
Rainfall .....	2.02	4.74 1877	.31 1880	9 a.m. 9 p.m.	1.12 '90	2.59 2.81 1879	.01 '09 1880 1864	1880 1864	1880 1864	1.20 .85	11th, 1866 18th, 1881	.00 .00	Every year Every year	.33 .31	.00 .00

Max. Rainfall in 24 hours, 1.20 in., 10th, 1866. Mean max. daily fall, .47 in.

# WARMTH, DRYNESS AND HIGH BAROMETER IN JAN., 1898.

WE have been favoured with so many notes upon the above subjects, that we have to insert only a selection—preferably those with long averages.

*Camden Square, London.*—Compared with the table on page 4, the features of 1898 are : barometer almost unprecedentedly high ; mean temperature by dry bulb  $0^{\circ}\cdot05$  above 1884, and therefore the highest on record ; min. in air and min. on grass  $0^{\circ}\cdot6$  and  $0^{\circ}\cdot5$  respectively above the highest previous records, which were in 1875 and in 1884 ; rain only about a third of the average, but more than twice that of 1880.

*To the Editor of the Meteorological Magazine.*

SIR,—I enclose you a bean in blossom, one of many self-sown, in a field about 470 feet above the sea-level near my house. I have never before seen anything so early. It is a thermometric reading of Nature's, worthy perhaps of note.—Yours truly,

W. C. PLENDERLEATH.

*Mamhead Rectory, Exeter, Jan. 24th, 1898.*

SIR,—We must go back a great many years to find such a minimum as we recorded last week, viz.,  $51^{\circ}$  ; in 1852, on December 27th, we recoded  $52^{\circ}$ , and in 1851, on January 2nd,  $51^{\circ}$ . This time last year our roads were all blocked with snow, and they were literally quarrying it out.—Yours very truly,

W. LUCAS.

*The Firs, Hitchen, Jan. 24th, 1898.*

SIR,—January has here been remarkable as regards both dryness and warmth ; an unusual coincidence. Less rain has fallen in Herefordshire than in any previous January as far back as 1818. The following are the instances in which less than an inch has fallen during 81 years. (*My own register covers the 40 years, 1859–98.*)

	in.		in.		in.
1822 .....	·72	1848 .....	·54	1888 .....	·69
1824 .....	·45	1855 .....	·29	1889 .....	·84
1825 .....	·94	1858 .....	·44	1896 .....	·37
1829 .....	·74	1861 .....	·75	1898 .....	·28
1833 .....	·67	1880 .....	·66		

It will be seen that 1855 closely approximates to 1898, but the temperature was some eight degrees lower in the former year. In other years, too, such as 1829, 1861 and 1880, the month of January was very severe. Almost the whole of the rain in the past month fell in one day, viz., the 4th ; the rest being a mere sprinkle.

Taking the month of January by itself, that of 1884 is a shade

warmer than 1898 ; but the following comparison shows that for the 38 days ending Feb. 1st, 1898 has the highest mean temperature :—

	Max.		Min.		Combined.		Rainfall. in.
Dec. 26, 1897, to Feb. 1, 1898	48·7	...	39·4	...	44·0	.....	1·55
„ „ 1883, „ „ „ 1884	48·1	...	39·7	...	43·9	.....	3·58
„ „ 1876, „ „ „ 1877	49·6	...	37·5	...	43·6	.....	7·20

For the three months of November, December and January :—

	Max.		Min.		Combined.	
1876-7	49·4	...	38·1	...	43·8	} 7 warmest winters, 1859-1898.
1897-8	48·4	...	38·5	...	43·5	
1881-2	48·2	...	38·2	...	43·2	
1883-4	48·0	...	37·8	...	42·9	
1877-8	48·5	...	37·2	...	42·9	
1868-9	48·4	...	37·3	...	42·9	
1889-90	48·1	...	36·6	...	42·4	

By way of contrast :—

1878-9	...	39·3	...	28·3	...	33·8
--------	-----	------	-----	------	-----	------

Vegetation is more forward than I remember it at the same time, notwithstanding that the sky was covered with clouds, mean 8·0. The barometer was nearly as high as in 1880 and in 1882.—Yours, &c.,

H. SOUTHALL.

*The Graig, Ross, Herefordshire, Feb. 2nd, 1898.*

SIR,—In case you should deal with the high temperature of January, 1898, I send you the following, viz. :—

*Mean of Max. and Min.*

		Old Stand.		Stevenson Screen.
1898	.....	42·9	.....	43·0

And for comparison :—

1890	.....	40·9		
1884	.....	42·0		
1882	.....	39·7		
Maximum temp.	.....	on	30th Jan.	..... 55·0
Minimum „	.....	„	17th „	..... 28·7
Highest Minimum temp.	.....	„	20th „	..... 50·0

Only two days with frost in the screen at 4 ft.

This January was most like 1882, being fine in the middle of the month, with high barometer, and wet at the beginning and end ; but 1882 was decidedly colder. All thermometers are verified.

I am, yours truly,

CHARLES L. BROOK.

*Harewood Lodge, Meltham, Huddersfield, Feb. 4th, 1898.*

P.S.—Snowdrops out on Jan. 20th, the earliest by far since and including 1885.

SIR,—The following may interest your readers :—

1890, Jan. 5th..... Max. recorded Temp..... 63°

			Means.	
Max....	49°·0	Min....	37°·2	Mean of Means ... 43°·1

1898, Jan. 20th and 30th..... Max. Temp. .... 56°

			Means.	
Max....	48°·1	Min....	34°·3	Mean of Means ... 41°·2

3 nights over 50°  
 14 „ „ 40°  
 9 „ „ under 32° or upon it.

Averages for previous ten years.

Max...	42°·8	Min....	31°·7	Mean of Means ... 37°·2
--------	-------	---------	-------	-------------------------

I found geraniums in blossom out of doors in the Conway Valley last month, also hydrangea 600 ft. above sea.

Yours faithfully,

R. J. ROBERTS.

*Pool Quay Vicarage, Welshpool, Feb. 2nd, 1898.*

## REVIEWS.

*The Meteorology of Edinburgh.* Parts I. and II., by R. C. MOSSMAN, F.R.S.E., F.R.Met.Soc. [Excerpts *Trans. Roy. Soc. Edin.*] 4to, 1896 and 1897, 224 pages and 7 plates.

IF asked to name the man who in the British Isles is working the hardest at meteorology, we think that we should name Mr. Mossman. It does not seem to matter whether it be taking duty on Ben Nevis, working up the non-instrumental meteorology of London, or—as in the work before us—dealing with the climate of his own beautiful city, Mr. Mossman is always ready ; and what he does, he does well, regardless of the work it may entail. We may illustrate this, which we know to be a fact, by quoting the first line which we read in his paper, after we had written the preceding words :—“The tables which accompany the text have been derived by immense condensation from over one million observations, the re-tabulation of which was required as a necessary preliminary.”

What a pæan of triumph would have announced the completion of such a work by the combined strength of a Government department !—but Mr. Mossman is only an amateur.

It is quite impossible to give in a notice like this a complete account of these memoirs. We cut from a Glasgow newspaper the opening paragraph of its notice of Mr. Mossman's work, and it puts the matter so clearly that we reprint it, instead of saying anything ourselves on that part of the subject :—

### EDINBURGH WEATHER.

Edinburgh deserves credit for having presented to the world so full and accurate an account of her weather as that which is given in the elaborate statistics and charts just published from the Transactions of the Royal Society

of Edinburgh. Mr. Mossman, the compiler of the statistics, has spared no pains to make his record perfect. Every possible source of information from 1731, when there is the first known record of weather at Edinburgh, down to the present year, has been carefully examined; and as from 1764 onwards there are almost continuous records of weather from more than one observer, we may take it that the essential facts are known continuously for the long period of 132 years.—*North British Daily Mail*, Nov. 16th, 1896.

Having expressed, but certainly not too strongly, our great admiration of the work as a whole, we may as well mention points in which we should not have done as Mr. Mossman has. (It does not follow that Mr. M. was wrong.)

We do not believe in  $\frac{1}{100}$ ths of a degree Fahrenheit, and in all the temperature tables in Part I. we should have given one place of decimals, not two, and this we see that the author has done in Part II.

Table XVII., Daily Rainfall.—We should have divided the entries by the number of years, so as to give the mean daily fall, instead of the total in the 88 years.

These are the only criticisms which we have to make; their triviality is perhaps the strongest praise that we could give.

We do not see that Mr. Mossman has anywhere thrown together the principal results which he has obtained, we therefore have tried to do so:—

*Data respecting the Climate of Edinburgh.*

Column ...	1	2	3	4	5	6	7	8	9	10	11	12
	Mean Pressure at Sea Level	TEMPERATURE.					Humid-ity.	RAIN.				
		Mean	Highest.		Lowest.		Mean.	Mean	Greatest.	Least.		
	in.	°	°	Date.	°	Date.	per cent	in.	in.	Date	in.	Date.
Jan.	29·818	36·8	59·0	30 '46	5·0	{ 31 '45 29 '48 }	{ 87	1·95	5·62	1867	·14	1787
Feb.	·813	38·3	64·0	28 '46	11·9	8 '95	86	1·70	6·38	1894	·13	1891
Mar.	·864	40·3	68·0	31 '44	15·0	2 '81	84	1·53	4·84	1827	·03	1781
April	·895	44·8	76·0	28 '40	23·0	17 '49	81	1·49	4·55	1871	·15	1842
May	·940	49·9	79·2	31 '81	26·0	9 '50	78	1·90	4·77	1847	·15	1844
June	·932	55·7	85·9	18 '93	32·0	4 '51	77	2·17	6·90	1853	·20	{ 1801 1806 }
July	·876	58·6	86·7	16 '76	38·0	{ 16 '45 2 '48 4 '51 }	{ 79	2·81	6·57	1830	·15	1825
Aug.	·875	57·8	87·7	5 '68	35·0	30 '69	82	2·80	8·33	1877	·40	1880
Sept.	·874	53·6	81·7	6 '68	31·0	{ 22 '44 23 '45 27 '47 }	{ 83	2·40	10·69	1785	·22	1810
Oct.	·810	47·2	71·0	14 '45	24·3	20 '80	86	2·52	6·90	1864	·16	1830
Nov.	·801	40·9	62·0	17 '44	19·8	18 '85	87	2·38	6·78	1770	·38	1805
Dec.	·800	38·3	62·0	25 '43	6·4	15 '82	86	2·21	8·42	1787	·34	1843
Year	29·858	46·8	87·7	...	5·0	...	83·0	25·86	38·96	1872	15·27	1826

In the foregoing table the values in the several columns are based upon the following number of years :—

Col. 1	...	127 years,	1770-1896		Col. 7	...	35 years,	1862-1896
„ 2	...	133	„ 1764-1896		„ 8 to 12	120	„ 1770-1896	
„ 3 to 6	57	„	1840-1896					

The entries in columns 4 and 6 being rather abbreviated, it may be well to explain that the first is the day of the month on which the extreme occurred, and the latter the year, the figures 18 being omitted; therefore, the first entry shows that the highest temperature recorded in Edinburgh in January between 1840 and 1896 was 59°·0, on January 30th, 1846.

Of course, there are endless interesting details which we have not given; for instance, the extremes of barometric pressure at sea level—highest, 31·071 inches on January 9th, 1896; and lowest, 27·451 inches on January 26th, 1884. Maximum rainfall in one day, 4·20 inches, on December 9th, 1787. Then Mr. Mossman gives the mean values of pressure, temperature, &c., for each day of the year, the comparison of which with similar data for other stations offers a tempting field for study; so do the long sets of annual means, which afford excellent material for those devoted to cycles—not the two-wheeled ones, but those of  $x$  years—in more senses than one.

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*Ueber Moorausbrüche*, von JAKOB FRÜH. [Excerpt *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zurich*. Zurich, 1897, 8vo, 34 pages.]

OUR readers will remember that about five square miles of bog in Killarney slipped away in December, 1896, considerable damage being caused, and several lives lost. The paper before us is not merely an epitome of the facts, but it quotes 30 other instances of a somewhat similar nature in the previous 350 years, giving, as far as practicable, localities, dates and authorities.

Herr Früh concludes his paper by stating his views as to the cause of these occurrences, and illustrating them by reference to the thirty instances of which he has given details. He discusses the subject thoroughly, and his paper is well worth reading; but it seems to us that a little further consideration as to the *daily* rainfall, rather than its total amount, and to season of the year as affecting the proportion evaporating and that penetrating, would have been desirable; and we feel nearly sure that a watchful man would always know *when* a bog was likely to “slide,” and that very little engineering knowledge or expenditure would be required to prevent such an occurrence. Whether the risk is sufficiently great to justify any regular expenditure for this object is, we think, extremely doubtful, seeing that all over the world there seems to be only about one instance in six years.

*Neudrucke von Schriften und Karten . . . . .* von PROF. DR. HELLMANN. No. 10, *Rara Magnetica*, 1269–1599. No. 11, Winkler, Franklin, Dalibard, LeMonnier. *Ueber Luftelektricität 1746–1753*. 4to Asher & Co., Berlin, 1898.

DR. HELLMANN is going steadily on with his splendid series of reprints, and is by their publication conferring a lasting benefit upon all who care anything about the early history of Meteorology and Terrestrial Magnetism. The "Introduction" and "Remarks" to the above parts are of the same high class as in all the previous ones, and those persons who possess the complete set have facsimiles so good that we would rather have them (*with* Dr. Hellmann's notes) than the originals, practically unattainable as they nearly all are. Some idea of the scarcity may be gathered from the fact that, as Dr. Hellmann points out, the title of No. 10 might very well have been "*Rara Magnetica ante Gilbertiana*."

No. 11 is the more interesting to Meteorologists, and indeed it is intensely so. There is Winkler's paper (1746) on how far the sparks from electrical apparatus are to be considered analogous to lightning and thunder; this is followed by Franklin's note (1749), "Opinions and Conjectures concerning the Properties and Effects of the Electrical Matter," the account of his kite, lightning conductors, &c. —Next we expected to find Barberet's Dijon Prize Essay (1750), but Dr. Hellmann evidently considers the reference to it on page 6 sufficient, for he passes on to (1752) Dalibard's experiments at Marly-la-Ville, near Paris, and Le Monnier's (1752) *Observations sur l'Electricité de l'Air*.

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## ROYAL METEOROLOGICAL SOCIETY.

AN Ordinary Meeting of this Society was held on Wednesday the 19th January at the Institution of Civil Engineers. Mr. E. Mawley, F.R.H.S., President in the chair, at which the following Fellows were elected.

Samuel Barker, F.R.A.S., 9, Hanover Terrace, Regent's Park, N.W.  
 Robert Thomas Ford, Sunbeam, Windermere.  
 Leon Franklin, 19, Gower Street, W.C.  
 George Gout, Mem. San Inst. Beilby House, Cleethorpes.  
 Tom G. Longstaff, B.A. Christchurch College, Oxford.  
 Mrs. E. Rylands, Longford Hall, Stretford, Manchester.

At the Annual Meeting (which immediately followed) the Secretary read the Report of the Council for the year 1897, showing that there had been an increase in the number of Fellows and that the finances were satisfactory, the total income having been £1465, and the expenditure £1180.

The President, Mr. Edward Mawley, then gave an address on "Weather influences on farm and garden crops" in which he pointed out the intimate connection between Meteorology, Agriculture and

Horticulture. He explained the special characteristics of the Climate of the British Isles as regards temperature, rainfall, &c. Of all the influences brought to bear on vegetable life by the atmosphere, he considered temperature to be the most powerful and far reaching, and only second to this came rainfall. The leading effects of snow, wind, and sunshine, as well as of prolonged droughts, severe frosts and persistent rains, also were described. He then dealt with the influence of different important weather changes on such farm crops as wheat, roots, grass, &c., as well as on fruit trees, vegetables, and flowering plants in the garden. In his concluding remarks he called attention to the great want of experimental farms in conjunction with meteorological stations being established in this and other countries in Europe. For it was only by the examination of meteorological observations, together with weekly records of the extent and character of the growth made by our leading crops, that the close connection existing between weather changes and their influences on such crops could be clearly traced.

The President was accorded a hearty vote of thanks for his address and for his services during the year.

The scrutineers (Major King and Major Lamorock Flower) announced that as the result of the ballot the council for the ensuing year would be :—

*President.*

F. CAMPBELL BAYARD, LL.M.

*Vice-Presidents.*

G. CHATTERTON, M.A. M.Inst.C.E.		W. H. DINES, B.A.
R. H. CURTIS		H. R. MILL, D.Sc., F.R.S.E., F.R.G.S.

*Treasurer.*

H. PERIGAL, F.R.A.S., F.R.M.S.

*Secretaries.*

E. MAWLEY, F.R.H.S.		G. J. SYMONS, F.R.S.
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*Foreign Secretary.*

R. H. SCOTT, M.A., F.R.S.

*Council.*

R. BENTLEY, F.L.S., F.R.G.S.		R. INWARDS, F.R.A.S.
F. J. BRODIE		BALDWIN LATHAM, M.Inst. CE., FGS.
Capt. A. CARPENTER, R.N., D.S.O., FZS.		Vice-Adml. J. P. MACLEAR, R.N., FRGS
O. CHADWICK, CMG., Assoc. M.InstCE.		C. THEODORE WILLIAMS, M.A., M.D.
H. N. DICKSON, F.R.S.E.		F.R.C.P.
W. ELLIS, F.R.S., F.R.A.S.		Capt. D. WILSON-BARKER, F.R.S.E.,
W. B. HEBERDEN, C.B.		F.R.G.S.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1897.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
England, London .....	88·4	5	48·1	13	73·6	54·8	54·1	73	130·1	42·4	2·92	16	5·3
Malta.....	90·2	25	66·2	2c	86·3	70·5	67·2	73	157·9	61·8	...	...	1·2
<i>Mauritius</i> .....	78·0	21a	59·0	2	76·4	65·1	60·1	73	124·6	52·1	1·72	20	5·8
Calcutta.....	89·4	10	74·2	21a	86·3	78·0	77·7	89	155·9	73·4	11·74	22	8·9
Bombay.....	87·4	24	76·1	11	85·3	77·8	76·7	85	137·7	72·8	13·82	28	8·7
Ceylon, Colombo ...	88·2	...	74·2	10	86·1	78·0	74·1	82	142·0	71·0	9·09	25	7·2
<i>Melbourne</i> .....	68·1	12	34·0	10	56·0	41·8	42·9	80	116·3	24·0	2·03	15	6·7
<i>Adelaide</i> .....	66·4	27	37·7	23	60·2	44·9	44·6	76	130·4	28·4	3·45	20	6·0
<i>Sydney</i> .....	72·0	31	42·3	5	60·7	48·3	45·2	78	119·0	30·2	3·97	17	4·2
<i>Wellington</i> .....	61·5	31	35·0	13	53·5	42·7	39·6	73	115·0	24·0	4·01	21	5·0
<i>Auckland</i> .....	63·0	7	42·5	13	58·2	46·3	42·9	71	118·0	38·0	4·61	18	6·3
Jamaica, Kingston.....	94·0	8	71·0	26	89·5	74·0	71·7	73	...	...	2·13	8	1·9
Trinidad .....	92·0	3b	68·0	6	88·0	71·6	74·3	83	166·0	67·0	7·90	21	...
Grenada.....	88·2	15	72·0	11	84·0	75·4	71·5	78	157·4	...	8·16	23	3·4
Toronto .....	82·8	14	44·2	21	74·5	55·2	56·2	76	101·5	41·0	2·26	8	4·0
New Brunswick, Fredericton .....	83·2	8	42·0	24	73·1	52·2	52·9	64	...	...	3·16	9	5·0
Manitoba, Winnipeg }	84·4	12	35·8	30	73·4	49·8	...	...	...	...	1·00	11	4·6
British Columbia, } Esquimalt.....	85·5	3	45·2	1	71·9	51·7	52·8	79	...	...	·29	3	5·1

a—and 22. b—and 4, 8. c—and 31.

## REMARKS.

MALTA.—Adopted mean temp. 77°·0, or 1°·2 below the average. Mean hourly velocity of wind 6·9 miles. Average sea temp. 80°·0. L on 4th, 16th and 20th.

J. F. DOBSON.

*Mauritius*.—Mean temp. of air 1°·0 above, of dew point 0°·9 above, and rainfall ·52 in. below, their respective averages. Mean hourly velocity of wind 14·2 miles, or 1·8 above average; extremes, 28·1 on 11th and 17th, and 2·7 on 2nd; prevailing direction E.S.E.

T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 81°·1, or 0°·6 above, of dew point 74°·1, or 1°·1 above, and rainfall 9·09 in., or 5·41 in. above, their respective averages. Mean hourly velocity of wind 11·5 miles; prevailing direction S.W. TSS on 9 days.

H. O. BARNARD.

*Adelaide*.—Mean temp. 1°·4 below, rainfall 1·11 in. in excess of, the average.

C. TODD, F.R.S.

*Wellington*.—Generally showery, with pleasant intervals. Prevailing S.E. winds, and at times cold weather. Rainfall 1·19 in. below, and mean temp. 0°·1 above, the average. Slight earthquake on 30th.

R. B. GORE.

*Auckland*.—The early part was fine and dry, but from the 15th to the close stormy, wet and disagreeable. Rainfall about half-an-inch over the average of 30 years. Mean temp. close to the average.

T. F. CHEESEMAN.

TRINIDAD.—Rainfall 2·42 in. below the average of 30 years.

J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,  
JANUARY, 1898.

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.
I.	Uxbridge (Harefield Pk.)	·84	XI.	Builth, Abergwesyn Vic.	4·84
II.	Dorking, Abinger Hall	·77	„	Rhayader, Nantgwilt	3·31
„	Birchington, Thor	·67	„	Lake Vyrnwy	6·17
„	Hailsham	·84	„	Corwen, Rhug	2·12
„	Ryde, Thornbrough	·59	„	Criccieth, Talarvor	5·04
„	Emsworth, Redlands	·72	„	I. of Man, Douglas	2·90
„	Alton, Ashdell	·57	XII.	Stoneykirk, Ardwell Ho.	1·58
III.	Oxford, Magdalen Col.	·52	„	New Galloway, Glenlee	4·81
„	Banbury, Bloxham	·71	„	Moniaive, Maxwelton Ho.	3·25
„	Northampton, Sedgebrook	1·05	„	Lilliesleaf, Riddell	1·10
„	Duddington [Stamford]	·88	XIII.	N. Esk Res. [Penicuik]	2·05
„	Alconbury	·82	XIV.	Glasgow, Queen's Park	2·42
„	Wisbech, Bank House	1·29	XV.	Inverary, Newtown	8·48
IV.	Southend	·50	„	Oban, The Corran	...
„	Harlow, Sheering	·89	„	Islay, Gruinart School	2·15
„	Colchester, Lexden	·72	XVI.	Dollar	2·81
„	Rendlesham Hall	·80	„	Balquhiddy, Stronvar	7·64
„	Rushall Vicarage	1·29	„	Ballinluig	1·37
„	Swaffham	1·26	„	Dalnaspidal H.R.S.	5·86
V.	Salisbury, Alderbury	·39	XVII.	Keith H.R.S.	1·72
„	Bishop's Cannings	·49	„	Forres H.R.S.	1·65
„	Blandford, Whatcombe	·74	XVIII.	Fearn, Lower Pitkerrie	1·55
„	Ashburton, Holne Vic	1·50	„	N. Uist, Loch Maddy	5·42
„	Okehampton, Oaklands	1·46	„	Invergarry	11·86
„	Hartland Abbey	2·05	„	Aviemore H.R.S.	2·37
„	Lynton, Glenthorne	1·03	„	Loch Ness, Drumnadrochit	3·07
„	Probus, Lamellyn	1·04	XIX.	Invershin	2·81
„	Wellington, The Avenue	·64	„	Durness	6·67
„	North Cadbury Rectory	1·23	„	Watten H.R.S.	1·43
VI.	Clifton, Pembroke Road	1·03	XX.	Dunmanway, Coolkelure	7·56
„	Ross, The Graig	·28	„	Cork, Wellesley Terrace	2·27
„	Wem, Clive Vicarage	·71	„	Killarney, Woodlawn	2·91
„	Wolverhampton, Tettenhall	1·16	„	Caher, Duneske	3·10
„	Cheadle, The Heath Ho.	1·65	„	Ballingarry, Hazelfort	1·97
„	Coventry, Priory Row	·89	„	Limerick, Kilcornan	1·96
VII.	Grantham, Stainby	·90	„	Broadford, Hurdlestown	2·01
„	Horncastle, Bucknall	1·03	„	Miltown Malbay	4·30
„	Worksop, Hodsock Priory	·45	XI.	Gorey, Courtown House	3·12
VIII.	Neston, Hinderton	1·18	„	Athlone, Twyford	2·96
„	Southport, Hesketh Park	2·62	„	Mullingar, B-lvedere	2·80
„	Chatburn, Middlewood	5·11	„	Longford, Currygrane	2·13
IX.	Melmerby, Baldersby	·52	XXII.	Woodlawn	3·68
„	Scarborough, Observat'y	·62	„	Crossmolina, Enniscooe	3·53
„	Middleton, Mickleton	2·87	„	Collooney, Markree Obs.	2·64
X.	Haltwhistle, Unthank	2·36	„	Ballinamore, Lawderdale	6·55
„	Bamburgh	·49	XXIII.	Warrenpoint	2·13
„	Duddon Valley, Ulpha School	7·89	„	Seaforde	1·32
„	Keswick, The Bank	4·48	„	Belfast, Springfield	2·24
XI.	Llanfrehfa Grange	·79	„	Bushmills, Dundarave	1·43
„	Llandovery	4·18	„	Stewartstown	2·07
„	Castle Malgwyn	2·72	„	Killybegs	4·24
„	Brecknock, The Barracks	·96	„	Horn Head	2·55

## JANUARY, 1898.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which -01 or more fell.	TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours	Dpth	Date		Max.		Min.			
								Deg.	Date	Deg.	Date		
		inches.	inches.	in.								In shade.	On grass.
I.	London (Camden Square) ...	·73	—	·89	·30	5	9	55·0	30	29·2	11	2	8
II.	Tenterden ...	·69	—	1·21	·22	5	13	54·0	30	29·0	11	2	7
	Hartley Wintney ...	·73	...	...	·17	5	10	58·0	30	22·0	11	13	16
III.	Hitchin ...	·54	—	1·00	·17	4	10	54·0	20	26·0	10	8	...
	Winslow (Addington) ...	·68	—	1·13	·31	5	8	55·0	6, 21	28·0	11	c	9 11
IV.	Bury St. Edmunds (Westley) ...	1·14	—	·33	·40	4	8	55·0	30	32·0	11	1	...
	Norwich (Brundall) ...	1·07	...	...	·35	4	14	56·0	5b	29·0	11	4	13
V.	Winterbourne Steepleton ...	1·06	...	...	·55	5	9	53·1	21	26·6	8	5	8
"	Torquay (Cary Green) ...	·88	...	...	·35	20	6	55·9	21	35·6	8	0	2
	Polapit Tamar [Launceston]..	·90	—	2·12	·34	5	14	55·0	19c	24·4	14	4	7
VI.	Stroud (Upfield) ...	·32	—	1·88	·16	4	7	53·0	22	32·0	7g	3	...
"	Churchstretton (Woolstaston) ...	·69	—	1·47	·23	4	11	56·0	20	30·0	17	3	11
"	Worcester (Diglis Lock) ...	·54	—	1·26	·25	4	11	...	...	...	...	...	...
VII.	Leicester (Rotherby Hall) ...	·97	...	...	·41	4	15	57·0	19	26·0	4h	7	18
"	Boston ...	1·05	—	·34	·45	4	7	55·0	20	30·0	10	6	...
"	Hesley Hall [Tickhill] .....	·47	—	1·30	·21	4	7	57·0	30	29·0	10	5	...
VIII.	Manchester (Plymouth Grove) ...	1·84	—	·62	·50	4	11	55·0	20d	32·0	29	1	4
IX.	Wetherby (Ribston Hall) ...	·52	—	1·37	·20	2, 5	5	...	...	...	...	...	...
"	Skipton (Arnccliffe) ...	7·66	+	2·02	1·26	30	16	...	...	...	...	...	...
"	Hull (Pearson Park) ...	·73	—	1·04	·25	4	8	56·0	30a	29·0	10	6	10
X.	Newcastle (Town Moor) ...	·87	—	·94	·24	3	8	...	...	...	...	...	...
	Borrowdale (Seathwaite) ...	16·08	+	3·90	2·09	30	20	...	...	...	...	...	...
XI.	Cardiff (Ely) .....	2·07	—	1·22	·60	5	15	...	...	...	...	...	...
"	Haverfordwest ...	3·69	—	·73	·83	4	20	53·4	31	28·8	10	1	11
"	Aberystwith (Gogerddan) ...	6·36	+	2·83	2·04	5	12	50·0	12d	...	...	...	...
	Llandudno ...	2·32	+	·04	·61	29	13	57·0	30	33·0	15	0	...
XII.	Cargen [Dumfries] ...	3·99	+	·22	·56	18	16	55·0	19	29·0	23	2	...
XIII.	Edinburgh (Blacket Place) ...	·84	...	...	·19	5	13	56·5	19	32·3	5	0	8
XIV.	Colmonell ...	2·51	...	...	·60	3	13	55·0	18e	32·0	1i	3	...
XV.	Lochgilthead (Kilmory) .....	...	...	...	...	...	...	...	...	...	...	...	...
	Mull (Quinish) ...	5·41	—	·26	·65	7	22	...	...	...	...	...	...
XVI.	Loch Leven Sluices ...	1·90	—	1·00	·60	22	9	...	...	...	...	...	...
"	Dundee (Eastern Necropolis) ...	·70	—	1·27	·30	21	15	57·0	19	29·1	5	5	...
XVII.	Braemar ...	1·76	—	·93	·54	21a	14	54·2	19	23·3	5	9	21
"	Aberdeen (Cranford) ...	1·07	...	...	·56	21	17	59·0	19	28·0	4, 9	9	...
"	Cawdor (Budgate) ...	2·28	+	·11	·78	21	18	...	...	...	...	...	...
XVIII.	Strathconan [Beauly] ...	4·72	—	·16	·92	22	14	...	...	...	...	...	...
"	Glencarron Lodge .....	12·97	...	1·44	·26	29	29	53·6	19	29·0	5	4	...
XIX.	Dunrobin ...	1·90	—	·56	·30	21	13	57·0	19	30·0	3	7	...
"	S. Ronaldshay (Roeberry) ...	4·03	+	1·08	·50	27	23	53·0	19	34·0	3, 5f	0	...
XX.	Darrynane Abbey ...	4·58	...	...	1·80	4	20	...	...	...	...	...	...
"	Waterford (Brook Lodge) ...	3·35	—	·21	·98	2	15	54·5	12f	28·0	10	3	...
"	O'Briensbridge (Ross) ...	3·85	...	1·33	·4	12	...	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill) ...	3·04	+	·14	1·12	2	12	...	...	...	...	...	...
"	Dublin (Fitz William Square) ...	1·79	—	·07	·50	2	14	60·8	30	31·9	1	1	3
XXII.	Ballinasloe ...	3·52	+	·44	·59	4	19	54·0	30	32·0	2, 5	2	...
"	Clifden (Kylemore) ...	6·67	...	...	·94	7	19	...	...	...	...	...	...
XXIII.	Waringstown ...	1·70	—	·95	·34	4	14	56·0	19	33·0	1	0	7
"	Londonderry (Creggan Res.) ...	1·95	—	1·47	·23	4	20	...	...	...	...	...	...
"	Omagh (Edenfel) ...	2·64	—	·38	·40	3	20	55·0	30	30·0	1	2	6

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

a—and 31. b—and 6, 19. c—and 23. d—and 30. e—and 19. f—and 21.  
g—and 9, 28. h—and 8, 23. i—and 3, 22.

# METEOROLOGICAL NOTES ON JANUARY, 1898.

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.

TENTERDEN.—Wells lower than ever, January having only twice been drier since 1864 ( $\cdot 31$  in. in 1880 and  $\cdot 59$  in. in 1892). No snow and fewer frosts than even in 1884. Nine days with temp. over  $50^{\circ}$ . Mean max.  $46^{\circ}\cdot 6$ , or  $2^{\circ}\cdot 8$  higher than in the similar mild, dry January of 1896; mean grass min.  $36^{\circ}\cdot 1$ , or  $5^{\circ}\cdot 8$  higher. A remarkably calm month, with high barometer after 2nd and especially so from 10th to 30th. W. and N.W. gale on 30th and 31st. Duration of sunshine 37 hours 40 minutes; 15 days having none, and four more only a few minutes. Fog on 16th and 17th.

HARTLEY WINTNEY.—Remarkable for abnormal mildness, dryness and absence of rough weather. Mean max. temp.  $47^{\circ}\cdot 2$ . So mild was the month that the early spring flowers were in full bloom. Ozone registered on 12 days. Rainfall  $1\cdot 72$  in. below the average.

ADDINGTON.—With the exception of January, 1880, when only  $\cdot 45$  in. fell, the least January fall in 28 years. The temp. rose to, or above,  $50^{\circ}$  on ten days; no severe frost occurred, and there was no snow. On the 16th very thick fog all day and an intensely dark night. Vegetation in a very advanced state.

BURY ST. EDMUNDS, WESTLEY.—Very mild, but little sunshine. Vegetation very forward. High barometer from the 10th to 29th.

NORWICH, BRUNDALL.—Mean temp.  $43^{\circ}\cdot 1$ , being the highest recorded in January;  $56^{\circ}$  was reached three times and  $55^{\circ}\cdot 8$  once, which value had only once before been recorded in January, viz., in 1884. Practically no R fell between the 5th and 29th. Garden flowers very forward. Foggy on 7 days. Gale from N.W. on 31st. Lunar halo on 31st.

WINTERBOURNE STEEPLTON.—Bar. very high from the 10th to the end of the month. Temp. also unusually high, the mean for the month,  $44^{\circ}\cdot 1$ , being the highest in six years. Mean relative humidity at 9 a.m., 92. Average amount of cloud at the same hour, 9.7. Fog on 6 days.

POLAPIT TAMAR.—Remarkable for extreme mildness and general absence of sunshine, rain and wind. The driest January recorded in 18 years. Fog on 13th and 14th.

WOOLSTASTON.—A month of most unusual mildness, with very little rain and not much frost. Many spring flowers blooming. Mean temp.  $42^{\circ}\cdot 6$ .

ROTHERBY HALL.—There has been no other January since 1888 with a rainfall of less than one inch. The mean temp. of the month ( $43^{\circ}$ ) is exceedingly high for January, and the greater part of the month was dull and foggy, with very little sunshine. What little wind there was was from the S.W., but on the evening of 30th there was almost a gale. A slight flood on the 5th.

BOSTON.—Mean temp.  $5^{\circ}\cdot 7$  above the average for 30 years.

MANCHESTER, PLYMOUTH GROVE.—Mean temp.  $43^{\circ}\cdot 4$ , the highest January temp. in the last 31 years. No snow, and slight frost on 4 days only. The weather very mild for the season.

## WALES.

HAVERFORDWEST.—January was remarkable for persistent damp foggy air, gloom and mildness, and remarkably high bar. readings. On December 31st

the bar. corrected stood at 29·139 in., it then rather rapidly rose, and although it varied, undulating like an ocean swell, it always kept at a great height, reaching its maximum, 30·647 in., on January 23rd. During the whole time R or mist and excessive damp prevailed. Primroses and other spring flowers in bloom. Prevailing wind S.W.

ABERYSTWITH, GOGERDDAN.—Very damp and mild throughout, with very little sunshine.

LLANDUDNO.—Lunar halos on 9th and 31st. Hoar frost on 10th and 15th. Stormy on 18th.

## SCOTLAND.

CARGEN [DUMFRIES].—The exceptional mildness of the winter continued through January, the mean temp., 44°·5, being the highest ever recorded at this station; on only two days did the temp. fall below freezing-point, while the maximum exceeded 50° on 14; 55°, the highest ever reached here in January, being registered on 19th. The mildest Januaries during 39 years are—1866, 41°·2; 1874, 42°·1; 1875, 41°·5; 1882, 43°·1; 1884, 42°·6; 1890 42°·0; January, 1898, exceeding the highest previously recorded by 1°·4. The bar. pressure was very high; only in five years has the mean been higher since 1860. Notwithstanding this, the month was unusually gloomy, only 30 hours of sunshine being recorded, while 18 days were sunless. Light westerly winds prevailed on 20 days. Vegetation is unusually forward.

EDINBURGH, BLACKET PLACE.—Mean temp. 44°·6, being the highest January mean recorded since the commencement of temp. observations in 1764. The previous mildest January was in 1796, mean temp. 43°·8. The shade temp. never descended to 32°, which is absolutely unprecedented, while the mean on 30th, 52°·0, is the highest during 100 years. No snow fell. Mean pressure 29·0 in. above average. Rainfall barely one-third of the mean. Rather strong winds during the second half of the month; S.W. gale on the 18th.

COLMONELL.—Rain 2·05 in. below, and mean temp. 8°·5 above, the average of 22 years.

S. RONALDSHAY, ROEBERRY.—A wet, mild month. Mean temp. 43°·0, or 5°·4 above the average.

## IRELAND.

DARRYNANE ABBEY.—A very mild month, and on the whole dry.

WATERFORD, BROOK LODGE.—Mean temp. 8°·3 above that of January, 1897.

O'BRIENSBRIDGE, ROSS.—No frost. Mean temp. unusually high. Premature vegetation and March flowers in bloom at the end.

DUBLIN, FITZWILLIAM SQUARE.—January, 1898, establishes a record for high temperature; the mean, 47°·8, being 1°·2 above the value for the warm January of 1875, and 6°·4 above the average. The atmosphere was foggy on 8 days. High winds occurred on 8 days, reaching the force of a gale on 4. There was no snow, sleet, or hail. Temp. exceeded 50° in the screen on 21 days; while it fell to or below 32° on only one night, compared with 13 nights in 1897, 3 in 1896, 18 in 1895, 7 in 1894, 4 in 1893, 15 in 1892, 7 in 1891, 1 in 1890, and 3 in 1889. Solar halos were seen on the 1st and 2nd; lunar halos on the 1st, 3rd, 9th and 31st.

WARINGSTOWN.—The mildest January remembered, but, strange to say, snowdrops, crocuses, &c., were not as early as usual.

# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CCCLXXXVI.]

MARCH, 1898.

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## WEST OF ENGLAND SNOW STORM, FEBRUARY 21st.

AFTER a winter which had been such chiefly in name, the residents in parts of Hampshire, Dorset, Devon and Somerset found themselves on the morning of February 22nd surrounded by S of unusual depth.

Speaking roughly, the fall may be said to have commenced about 5 p.m. on the 21st, and to have lasted until noon on the 22nd, but in most districts by far the greater part occurred before 9 a.m. on the 22nd, and, therefore, in the rainfall "day" of February 21st.

We have extracted (1) from the notes of correspondents the principal facts recorded by them, and (2) from the local and other newspapers their reports as to the depth of the S, and as to damage, and (3) we give a summary of what appears to us to have been the general depth and distribution.

### EPITOME OF OBSERVERS' NOTES.

*Ryde (Thornbrough), R, S and T, total 0·82 in.*

*Emsworth (Redlands), R, S and T, total 0·58 in.*

*Hartley Wintney, S, total 0·03 in.*

*Salisbury (West Dean), S, total 0·31 in.*

*Bishop's Cannings, S, total 0·27 in.*

*Marlborough (Mildenhall), S, about 4 or 5 in., total 0·27 in.*

*Winterbourne Steepleton.*—A heavy fall of S between noon of 21st, and midday of 22nd. It was not accompanied by much wind, therefore the drifts were not great, but roads between walls were stopped by S, and postal arrangements much delayed. (S began between 3 and 4 p.m., and by 10 p.m. the fall had been heavy, the total fall by noon on 22nd had been about 18 in.), measured 1·61 in. for 21st, and ·11 in. for 22nd.

*Poole (Parkstone).*—At 9 a.m. on 22nd there was 18½ in. of S round the rain gauges, and it was still falling, so I delayed digging them out until 11 a.m. when it ceased, and the total depth was 19½ in. This was by far the heaviest S since the celebrated fall of January, 1881, but the character was quite different; in 1881 it was very fine and dry, the present fall has been large-flaked and wet, and the damage to trees and shrubs has, consequently, been excessive. Total 1·98 in.

*Blandford (Whatcombe).*—Heavy S storm on night of 21st-22nd, total 1·62 in.

*Ashburton (Druid).*—Heavy S afternoon and evening of 21st, depth at 5 p.m., 8 in. ; morning of 22nd deep S yielding 1·02 in.

*Tavistock (Statsford).*—S at 9 a.m. on 22nd, 6½ in. deep, yielded 0·57 in. On Dartmoor there were drifts 15 ft. deep.

*Polapit Tamar [Launceston].*—Thick S yielded 0·32 in.

*Honiton (Otterhead).*—The total depth of S varied from 1 ft. 9 in. to 1 ft. 11 in., and the yield was 1·75 in., of which about 1·40 in. would belong to the 21st.

*Wellington.*—Exceptional S during the night of the 21st, the S at 9 a.m. on 22nd was about 18 in. deep, and yielded 1·04 in. Much damage done to evergreens.

*Taunton (Halse).*—S quite 2 ft. deep.

*N. Cadbury.*—Heavy S from about 5 p.m. on 21st to noon on 22nd, total depth, 7 or 8 in., yield up to 9 a.m. on 22nd, 0·52 in. It seems evident that though the S was so heavy at Taunton, very little fell round Bridgwater or to the N. thereof.

*Lechlade.*—Slight S yielded 0·12 in.

*Campden (Hidcote).*—S yielded ·02 in.

#### EPITOME OF PRESS NOTICES.

##### HANTS.

*Cowes.*—TS in evening, and S at night, which melted early on 22nd.

*Bournemouth.*—This is considered to be the heaviest S for 17 years, and more disastrous than even that of 1881. Owing to the wetness of the S it clung to the telegraph and telephone wires, and not merely broke them, but in many cases, by the great weight, pulled over the wrought-iron pillars which carried them. In the morning of the 22nd, not one wire could be worked. Many thoroughfares were blocked by fallen trees and by wires.

##### DORSET.

*Blandford.*—S fell for 18 hours, and there are drifts many feet deep. Between Blandford and Bournemouth nearly all the telegraph wires are broken.

*Bridport.*—This town has been quite isolated, the Lyme Regis omnibus could not get here for two days, and our telegrams have been sent by train to Weymouth and wired from there.

*Dorchester.*—Telegraph and telephone posts are down in all directions, the S drifts vary from 8 ft. to 12 ft., and one man overtaken by the storm, died in it. The mail carts could not leave.

*Hawkchurch.*—The average depth of S (2 ft.) was greater than in 1891, but the drifts this year were not so great; although quite sufficient to block the roads until they were cut through.

*North Curry.*—S stopped telegraphic communication, and the mails were several hours late.

*Poole.*—Even before midnight of 21st, some of the telegraph and telephone wires and posts had been broken by the weight of the S; but in the morning the wreckage proved to be general, and in

several cases the wires had carried away tiles and portions of chimneys. Glass and iron roofs also gave way under the load.

*Shaftesbury*.—The road to Sembley entirely blocked by S.

*Weymouth*.—Unusually heavy S; great damage to telegraph and telephone wires and posts, and the railway between Upwey and Abbotshbury so blocked that a snow plough had to be fetched.

*Wimborne*.—All telegraphic communication stopped; and the roads blocked with S and by broken trees.

*Wrantage*.—The mail cart from Taunton stuck in a snow drift, and had to be dug out.

*Yetminster*.—Railway blocked.

# DEVON.

*Ashburton*.—S twelve inches deep.

*Brixham*.—Most of the S melted as it fell, but on the hills it was a foot deep, and there were drifts of 3 ft.

*Chagford*.—S more than 1 ft. deep, but not much drifted.

*Dartmouth*.—S many inches deep. Trees, telegraph and telephone wires down, and traffic deranged.

*Dawlish*.—S nearly 6 in. deep.

*Exeter*.—Many telephone wires broken by heavy S.

*Exmouth*.—S about 4 in. deep.

*Honiton*.—S quite 14 in. deep, and traffic stopped, the roads being impassable. The heaviest S since March, 1891.

*Ivybridge*.—The 8.30 a.m. mail train from Plymouth ran into a drift near Wrangaton, and had to stop for an hour until a gang of men had dug it out.

*Kingsbridge*.—S in places two or three feet deep. Traffic stopped, and some tradesmen did not take down their shutters.

*Moretonhampstead*.—S about 1 ft. deep.

*Newton Abbot*.—The average depth of S here was 8 in.

*Plympton*.—A man lost his way in the S, and died from exposure.

*Plymouth*.—In the town the average depth was 3 in. or 4 in., and in drifts 1 ft. to 1 ft. 6 in.

*Princetown*.—In intensity this S has equalled 1891, but it did not last so long, and, except by telegraph, we have been isolated from the world for two days. Four locomotives with two ploughs were many hours trying to clear the railway. From Stenlake to Goatstone Hill the S on the roadway was 18 ft. deep; near the prison gates the S was 15 ft. deep.

*Sidmouth*.—S several inches deep, which broke telegraph and telephone wires. Man found dead in the S.

*South Brent*.—Drifts of S from 6 ft. to 7 ft. Mail cart stuck, so the driver left it, and rode on with the letter bags.

*Starcross*.—S about 6 in. deep.

*Tiverton*.—S 1 ft. deep, and no railway open except the Exe Valley.

*Torquay*.—Total depth on ground 3 in. or 4 in.

*Totnes (Broadhempston)*.—S generally about 1 ft. deep, but in drifts quite 4 ft., the greatest since 1891.

## CORNWALL.

*Bude*.—No S to lie, except upon the hills.

*Camelford (St. Tudy)*.—S about  $2\frac{1}{2}$  in. deep, but a thaw followed.

*Fowey*.—In the early morning the hills were white with S, but the sun soon melted it.

*Fowey (Polperro)*.—S at times covered the ground, but soon melted.

*Lostwithiel*.—Some S, but it soon melted.

## SOMERSET.

*Bath*.—S 3 in. or 4 in. deep; traffic interrupted, 150 men and 120 carts employed to clear it away.

*Castle Cary*.—Drifts from 3 ft. to 6 ft. deep.

*Chard*.—S drifts 10 ft. to 12 ft. deep; great damage to fine trees.

*Cranmore*.—The first up train on the E. Somerset line stuck in a drift and had to be dug out.

*Ilchester*.—The mail cart with two horses stuck in a S drift. Eventually the bags were sent on on one horse, and the cart was dug out and sent on with the other.

*Ilminster*.—S considerably over 1 ft. deep.

*Langport*.—S quite 5 in. deep.

*Taunton*.—Very heavy S, at least 2 ft. deep, and much more where drifted. Roads blocked, and nearly all the telephone wires broken.

*Wellington*.—S 2 to 3 ft. deep, railway to Burlescombe blocked, and considerable damage done to trees and roofs.

*Wiveliscombe*.—Excessive S, in places 3 or 4 feet deep, and on the Brendon Hills the roads are full up level with the hedges.

*Yeovil*.—Very heavy S, fully a foot deep, and much more in places. It was very heavy, and damaged wires, roofs and skylights.

## SUMMARY.

By plotting the above statements upon a large scale map they are seen to agree remarkably well.

The S was quite unimportant, except in the Counties which we named on a previous page, viz., Hants, Dorset, Devon and Somerset.

Devonshire requires separate mention because, apparently, the depth of the S in two parts of that county was due to different causes. In N.E. Devon the fall was part of the exceptional fall of which we are going to speak further, but the heaviness of the fall on Dartmoor, and on its eastern edge, was, we believe, chiefly due to the chilling effect of that mass of high land.

Omitting that area, the facts, according to all information yet received, seem clearly marked, and any map (Bradshaw's, for instance) will enable them to be realized.

The fall reached, or exceeded, 12 inches over the area contained between two lines, the northernly one running about E.S.E. from Watchet, through Yeovil to Lymington, and the southernly one from Porlock, through Tiverton to Bridport; say, 60 miles by 20 miles.

The greatest depth, about 24 inches, occurred nearly centrally in this belt, say, between Milverton and Crewkerne.

# RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858-97.

## FEBRUARY.

ELEMENTS.	MONTHLY MEANS OR TOTALS.										ABSOLUTE READINGS.							
	Mean, 40 years	Highest Month Date.	Lowest Month and Date.	MEANS 9 A.M. AND 9 P.M.						EXTREMES AT 9 A.M. AND 9 P.M.				Mean of all Highest	Mean of all Lowest.			
				Mean.	Highest Month.		Lowest Month.		Highest.	Lowest.								
					Value.	Date.	Value.	Date.		Value.	Date.							
												Value.	Date.			Value.	Date.	
Barometer ..... { (cor. & red.)	1 30.003	2 30.480 1891	3 29.537 1879	4 9 a.m. 9 p.m.	5 30.004 30.003	6 30.481 30.478	7 1891 1891	8 29.538 29.536	9 1879 1879	10 30.854 30.770	11 23rd, 1883 23rd, 1883	12 28.761 28.767	13 21st, 1893 21st, 1893	14 30.520 30.498	15 29.313 29.324			
Dry Bulb..... { Temp	39.5	45.6 1869	28.8 1895	9 a.m. 9 p.m.	39.2 39.7	45.8 45.5	1869 1869	28.1 29.6	1895 1895	54.0 54.0	11th, 1869 6th, 1866	15.2 17.2	9th, 1895 7th, 1895	49.6 49.6	28.4 29.4			
Max. ....	45.5	..	...	...	...	51.7	1869	36.1	1895	62.5	25th, 1868	24.2	8th, 1895	55.2	35.3			
Min. ....	34.7	...	...	...	...	40.6	1869	22.5	1895	51.2	1st, 1869	7.3	8th, 1895	45.4	24.1			
Wet Bulb ..... { Shade Temp	38.0	43.8 1867	27.8 1895	9 a.m. 9 p.m.	37.8 38.3	43.8 43.7	1869 1867	26.9 28.6	1895 1895	53.6 52.0	11th, 1869 28th, 1878	14.8 17.0	8th & 9th, '95 7th, 1895	48.0 48.0	27.6 28.4			
Solar Rad., black ...	63.2	...	...	...	...	74.1	1877	51.9	1886	102.4	23rd, 1871	29.8	11th, 1876	89.0	39.9			
Solar Rad., bright..	49.2	...	...	...	...	54.2	1885	41.2	1895	69.8	28th, 1883	30.0	7th, 1895	62.4	36.9			
Grass Minimum ...	31.5	...	...	...	...	38.3	1869	19.0	1895	49.9	11th, 1869	5.0	9th, 1895	43.2	20.0			
Soil, 1 foot .....	38.9	...	...	...	...	43.1	1872	32.3	1895	46.0	15th, 1877	30.9	18th, 1895	42.3	35.6			
Cloud .....	6.8	8.9 1873	5.2 1858	9 a.m. 9 p.m.	7.1 6.5	8.7 9.1	1873 1873	5.3 4.4	1859 1866	10 10	Every year Every year	0 0	Various Various	10.0 10.0	0.6 0.3			
Rainfall .....	1.61	3.77 1879	.01 1891	9 a.m. 9 p.m.	.87 .74	2.28 1.75	1883 1879	.00 .01	1891 1891	.62 .60	15th, 1890 10th, 1879	.00 .00	Every year Every year	.29 .24	.00 .00			

Max. Rainfall in 24 hours, .76 in., 10th, 1879      Mean max. daily fall, .40 in.

## ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday, February 16th, at the Institution of Civil Engineers, Westminster, Mr. F. Campbell Bayard, LL.M, President, in the chair.

The following candidates were elected Fellows of the Society :— Charles Henry Gatty, M.A., LL.D., F.R.S.E. ; Rev. G. T. Laycock, F.R.H.S. ; Joe Harry Webb, C.E. *Honorary Members* :—Walter G. Davis, Director of the Oficina Meteorologica Argentina, Cordoba, Argentina ; Dr. J. P. Van Der Stok, Director of the Magnetical and Meteorological Observatory, Batavia.

Mr. E. Mawley, F.R.H.S., read his report on the Phenological Observations for 1897, from which it appeared that there had been a marked absence of very exceptional weather during the past year, the most noteworthy features affecting vegetation being the persistent rains in March, and the three dry periods of May, July and October. Until about the middle of May wild plants appeared in blossom in advance of their usual time, but throughout the rest of the season they were all somewhat behind their average dates in coming into bloom.

The heavy rainfall in the early spring favoured the hay (which proved the only really abundant farm crop of the year), but it greatly impeded the sowing of spring corn. The cereals were, however, much benefited later on by the warm, dry and brilliant weather of the summer. Taking the country as a whole, oats proved a good crop, barley an average one, while the yield of wheat was somewhat under average. There were also fair crops of roots and potatoes. It was owing more to the dry spring and summer, and the sunless autumn of the previous year than to the moderate frosts and cold winds of the spring of 1897 that the fruit crop was so very light. Apples, pears and plums, especially the latter, yielded badly, while the small fruits were in most districts only average crops.

In the discussion which followed, the President suggested that the observations of the habits of insects would yield a very interesting diagram similar to those based on the records concerning birds ; he also spoke of the weather of Jubilee year (1887) as being similar to that of 1897.

Mr. Curtis referred to the heavy gale in the south-western counties on Ash Wednesday, and quoted the record of the Dines' anemometer at Rousdon, showing a velocity of 100 miles an hour, the greatest ever recorded in the British Isles.

Mr. Symons hoped that some reference to the storms of March 3rd and June 24th would appear in the publications of the Society, and spoke of the destruction of trees round Salisbury in the former gale, which died out about Alton in Hampshire.

Mr. Marriott exhibited lantern photographs of damage wrought by the Essex storm, and said that the wind was the more remarkable feature of the storm than the hailstones.

Mr. J. Hopkinson, F.L.S., F.G.S., read a paper on "Monthly and Annual Rainfall in the British Empire, 1877-1896."

From the Climatological Tables which appeared at first in *The Colonies*, and subsequently in the *Met. Mag.* the author had tabulated the rainfall at London, Mauritius, Calcutta, Bombay, Colombo, Adelaide, Melbourne, Wellington, Toronto and Winnipeg for the 20 years 1877-96, and at Malta and Jamaica for the 10 years 1887-96.

Tables I.-XII. give the mean monthly and annual rainfall, and the number of days on which at least 0·01 in. of rain fell at these 12 stations, and also the maximum and minimum monthly and annual rainfall, and the number of days of rain.

A summary of the yearly rainfall at the whole of the 12 stations is given in Table XIV., which we reproduce.

TABLE XIV.—*Mean and Extreme Yearly Rainfall, and Number of Days of Rain at 10 Stations in the British Empire for Twenty Years, and at 2 for Ten Years.*

MONTHS.	MEAN.		MAXIMUM.		MINIMUM.	
	in.	Days.	in.	Days.	in.	Days.
1877-96.						
London .....	25·76	164	34·09	195	19·21	137
Mauritius .....	50·38	203	68·17	241	29·74	174
Calcutta .....	59·20	116	85·23	143	39·38	74
Bombay .....	76·71	111	111·93	124	57·82	102
Colombo .....	91·82	179	139·70	215	60·55	128
Adelaide.....	20·56	135	30·87	164	14·01	113
Melbourne .....	24·52	132	32·39	153	17·06	116
Wellington .....	51·22	170	67·68	191	31·37	137
Toronto .....	31·49	177	48·51	206	24·83	143
Winnipeg .....	21·22	127	29·33	159	14·64	88
1887-96.						
Malta .....	20·50	79	26·04	90	11·38	59
Jamaica .....	29·16	85	40·81	97	19·01	78

Mr. Baldwin Latham remarked that the results for the stations in the paper agreed very closely with the rule recognised for this country, that one-third added to the mean annual rainfall gives the maximum yearly fall, and one-third taken from the mean gives the minimum.

Mr. Chadwick referred to the variation of fall in the different countries, and to the precise location of some of the Observatories, urging the caution that the falls given for many of the stations must not be assumed to apply to any very extended area.

Mr. Symons spoke of the paper as a plucky attempt at an impossibility; he reckoned very roughly that there were more than 25,000 rain gauges at work in the world, and it is impossible for one man to give a great *résumé* of all the records. He would like to see the many good local rainfall maps that exist, reduced to a uniform scale, and all brought together in one atlas.

Mr. Hopkinson, in reply, said he had not attempted to give the mean rainfall of each country, but simply to summarise the tables on which the paper was based, and to give the records for a long concurrent period for as many stations as possible.

## R E V I E W.

*Der Tägliche Wärmeumsatz im Boden, und die Wärmestrahlung zwischen Himmel und Erde* von DR. THEODOR HOMÉN. 4to., Leipzig Wilhelm Engelmann, 1897, 148 pages and 10 plates.

WE had the pleasure of calling attention to Dr. Homén's work upon "Earth Temperature" on page 45 of the *Met. Mag.*, vol. xxx. In the book before us he carries it farther and endeavours to measure, not merely the penetration of solar heat into soils of several varieties, but also to establish a sort of Debtor and Creditor account between the heat imparted by the sun, and that dissipated into space by radiation.

We pointed out on the previous occasion, that "A sketch of one or two of his thermometers in position, a process photo of one of his experimental groups, and an outline plan showing the sites of the observations, would have made it more easy to appreciate fully the conditions of the experiments." Dr. Homén has given us the third, but not either the first or the second—and perhaps it is our own fault for not more forcibly dwelling upon their necessity—but we still do not clearly understand the precise mounting of his thermometers, especially as to the precautions taken to ensure that the penetration of rain to the point occupied by the thermometer bulb is neither less nor more than that penetrating to the same depth in other places. Dr. Homén takes so much pains to ensure accuracy in other respects that doubtless he has done so in this, but the difficulty is an old one, and full details as to how he has conquered it would be useful to many observers.

Again, with regard to the thermometers, if we understand correctly they are, in order to facilitate reading, set at an angle with the vertical, but with their bulbs at the true vertical depth, the plan adopted at the Royal Botanic Gardens, Regents Park, (See engraving, *Met. Mag.*, vol. v, p. 102,) but this brings the weight of the observer's body many times a day as a compressing influence upon the soil almost over the bulbs, and we are not sure that this does not affect its permeability. Another point upon which an engraving would have given more information than half a page of text is the extent to which the temperature of the buried bulb could have been affected by the scale exposed above ground. Dr. Homén shows the pains which he took to correct the long thermometers for the temperature through which their stems passed, but he does not enable us to see clearly the details of his work, which would doubtless have been very instructive.

It is the province rather of a skilled physicist than of an ordinary meteorologist to follow the latter portions of Dr. Homén's work in which he determines the number of Calorics received by, and dissipated from, the earth, but one is constantly coming upon facts and data of interest. For instance, on pages 93 to 95 there are the results of a series of readings, day and night, of an hygrometer with an Assmann aspirator, read at the level of the ground, and at 3, 7, 16 and 33

feet above it, showing very well the increased range of temperature experienced near the ground.

The observations were made on several days, but those of one day will show the general features better than a long description.

		AIR TEMPERATURE.					DEW POINT TEMPERATURE.				
		0 ft.	3 ft.	7 ft.	16 ft.	33 ft.	0 ft.	3 ft.	7 ft.	16 ft.	33 ft.
Aug. 11,	3.0 a.m.	41°0	45°0	46°4	48°0	50°5	40°5	44°6	46°0	47°5	49°6
	4.15 "	35°2	40°3	42°8	45°9	49°6	34°9	39°2	42°1	45°1	49°1
	5.15 "	41°9	41°5	44°1	46°4	49°5	41°7	41°0	43°5	46°0	48°7
	6.15 "	53°6	52°5	50°9	51°4	51°8	50°9	49°5	48°9	48°9	49°6
	7.30 "	62°4	59°0	58°5	57°2	56°8	55°4	52°2	51°6	50°9	50°9
	8.15 "	66°2	61°3	61°2	60°3	59°4	59°2	53°6	52°3	51°8	51°1
	10.15 "	70°0	65°8	64°9	64°4	64°0	61°2	51°4	50°4	49°5	49°1
	0.15p.m.	69°4	67°3	66°9	66°2	66°2	58°1	46°4	46°0	45°7	45°7
	2.15 "	73°2	68°5	67°8	67°5	67°5	59°4	46°8	45°5	46°0	45°1
	4.15 "	70°5	68°7	68°0	67°8	67°6	55°0	47°5	47°1	47°1	46°4
	6.15 "	63°0	65°7	65°8	65°5	65°5	50°9	45°1	44°2	44°6	44°2
	7.15 "	55°4	60°3	62°4	63°7	64°2	51°3	47°5	47°5	46°4	46°8
	8.15 "	47°7	53°6	55°0	60°1	61°9	45°7	46°4	47°5	47°1	46°8
	9.15 "	43°2	47°3	50°0	54°7	58°6	42°1	46°0	46°8	45°4	45°1
	10.15 "	40°8	45°1	45°9	50°5	54°7	39°2	43°9	44°2	46°8	46°8
Aug. 12,	0.15a.m.	37°2	40°5	41°4	44°1	48°9	36°5	39°2	40°1	42°8	46°0
Max. ....		73°2	68°7	68°0	67°8	67°6	61°2	53°6	52°3	51°8	51°1
Min. ....		35°2	40°3	42°8	45°9	49°6	34°9	39°2	42°1	44°6	44°2
Range .....		38°0	28°4	25°2	21°9	18°0	26°3	14°4	10°2	7°2	6°9

Many things, often forgotten, are illustrated by this little table, *e.g.*, the enormous effect of the soil upon the temperature of the air.

We see that shortly before sunrise the temperature is nearly the same at all elevations, but that as the sun gets power the surface temperature rushes *above* all the others and remains so till about sunset, then terrestrial radiation becomes preponderant, and in the early morning hours the temperature near the surface is from 10° to 14° *below* that at 33 feet.

Most of this difference is very close to the earth's surface. If we take out the range of temperature at each elevation, and then take the differences for each interval the result is very marked.

		Difference.	Difference for each foot.
Range at the surface .....	38°0	0	0
" " 3 feet .....	28°4	9°6	3°2
" " 7 " .....	25°2	3°2	°8
" " 16 " .....	21°9	3°3	°4
" " 33 " .....	18°0	3°9	°2

Another very marked feature is the dryness of the air at 16 feet, and especially at 33 feet, during the evening and early night hours,

the humidity being from 20 to 30 per cent less than near the surface. Well may persons speak of the "mists rising" when we see the humidity at the surface from 8.15 p.m. to 10.15 p.m. averaged 94, whereas at 7 feet it averaged 84, at 16 feet 73, and at 33 feet only 65 per cent, 29 per cent less.

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### BUYS-BALLOT.

ON page 119 of our last volume we mentioned the desire of the successors of Dr. Buys Ballot that a bust of him should be erected at the New Meteorological Institute at Utrecht, and that it should be erected mainly by International Subscription. We concluded by saying that "Our personal view of the matter is that no very large sum is required, but that the greater the number of contributors, the more would it be evidence of the esteem in which the deceased was held."

*We did not receive a single shilling.*

Dr. Snellen has sent us circulars which we shall be happy to forward to anyone interested, but they do not contain much more information than is given above, and in the previous notice.

All desiring to take part in this testimonial are requested to send their contributions during the month of March (as the list is to close on April 1st,) either to Dr. Snellen, de Bilt, Utrecht, or to G. J. Symons, 62, Camden Square, N.W.

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### THE AUSTRALASIAN SOCIETY FOR THE ADVANCEMENT OF SCIENCE.

THE seventh session of the Australasian Society for the Advancement of Science was opened at Sydney on January 6th, 1898, when Prof. A. Liversidge, M.A., LL.D., F.R.S., who is both President and Secretary, delivered the inaugural address to a large audience. The *Daily Telegraph* (Sydney) has devoted much space to the proceedings of the meeting, and from that paper we are able to cull some items of interest. Among the most important of the papers read were the following:—

#### SEISMOLOGICAL COMMITTEE.

This report was presented by the secretary, Mr. George Hogben, M.A., of Timaru, New Zealand, and stated that the most interesting result of the labours of the observers was the fact, based upon rough calculations, that the great South Australian earthquake of May 10th, 1897, proceeded from a line parallel to the coast near Beachport and Kingston, and was possibly due to a sliding of one part of the crust upon another, such as forms what is called in geology a "fault." This was probably deep, but the later and slighter shocks were surface ones, caused by readjustments of the immediate crust. The subject was still under investigation by the secretary. But Mr. Hogben pointed out that it was as part of a world-system of seismological observations that the work of the committee might be most useful. An international seismological committee had been set up, embracing all the ablest workers in every part of the world, and in co-operation with that committee were committees of the

British Association and of the Royal Society. They desire especially to be able to track the microseismic vibrations or minute earthquake waves, which travelled from the sources of disturbance all round the earth's surface, or it might be right through the solid mass of our world (if it is solid). The speed of these finer waves was many times greater than that of the larger waves felt by us, reaching a velocity as great as 12 miles per second, or even more. For the purpose of observing them the international committee had agreed upon a certain type of instrument—the horizontal pendulum—to be used by all stations alike, as it was important that instruments of the same kind and of the same degree of sensitiveness should be employed for purposes of comparison.

#### PERIODIC WAVES.

Mr. H. C. Russell, F.R.S., the Government Astronomer of New South Wales, read a paper on "The Source of the Periodic Waves, sometimes called Earthquake Waves, which reach Sydney from time to time." The author stated that these waves were recorded very frequently in Sydney, and had the same period as the waves known to be caused by earthquakes—that was about 26 minutes from crest to crest; but it was shown that only about 1 per cent. of them originated in earth movements, and that 60 per cent. originated in Bass' Straits, when the meteorological condition known as a low pressure arrived at that part of Australia. The effect of low barometers was to cause a rise in the sea level, to provide for which currents set in along the south and east coasts of Australia, which, meeting in Bass' Straits, produced waves, and set them going in Tasman Sea, whence they were recorded on the Sydney and Newcastle tide gauges. It was also shown that at least another 10 per cent. of these waves originated in the Tasman Sea by the action of heavy gales. That was, in all 70 per cent. of the periodic waves originated from meteorological disturbances, and probably the remainder were due to these causes, although the connection had not yet been actually traced. Reference was made to Lake George, where somewhat similar periodic waves were frequent, and all were traced to meteorological causes.

#### CLOUD HEIGHTS AND VELOCITY.

A paper on "The Measurements of Cloud Heights and Velocity" was read by Mr. P. Baracchi, F.R.A.S., Government Astronomer in Victoria. The year 1897 had been called by some writers on meteorological subjects "the cloud year," on account of the systematic observations of clouds which were carried on in nearly all the civilised countries during that period, under a scheme laid out and finally agreed upon in all its detail by the International Meteorological Committee at its Upsala meeting of 1894. The object of the scheme was to obtain more uniform and comprehensive data to serve as the basis for the further study of atmospheric conditions, as indicated by the forms and movements of clouds. After a brief reference to the methods adopted in Victoria for securing results anticipated by the scheme, Mr. Baracchi said there were now some 20,000 observations ready. For the determination of absolute height and velocity two stations for simultaneous observations were established, one being on the grounds of the Melbourne Observatory, and the other on the roof of Parliament House at a distance of 6,820 ft. After consideration he adopted the photographic method which had been successfully employed at the Kew Observatory some years ago.

*(To be concluded in our next.)*

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPTEMBER, 1897.

STATIONS.  (Those in <i>italics</i> are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London .....	70·6	29	38·1	19	64·0	48·5	48·1	0-100 77	115·0	34·0	inches 2·75	13	6·4
Malta.....	97·8	14	62·2	19	84·3	69·5	64·1	71	156·4	56·7	·05	1	2·4
<i>Cape of Good Hope</i> ...	79·9	25	39·5	8	63·8	48·3	49·2	82	...	...	2·52	14	6·1
<i>Mauritius</i> .....	79·2	22	61·0	5	76·9	64·8	58·9	69	127·3	53·6	1·77	16	5·8
Calcutta.....	90·7	28	72·9	13	88·1	78·2	77·6	85	159·0	74·1	5·94	13	7·9
Bombay.....	90·1	22	75·0	11	85·6	77·1	76·6	85	150·6	72·1	20·60	23	7·5
Ceylon, Colombo .....	89·2	23	72·5	2	86·7	77·8	73·8	80	146·8	72·8	4·58	24	7·6
<i>Melbourne</i> .....	80·7	17	36·5	4	64·2	45·8	45·0	71	130·3	28·2	2·40	10	5·3
<i>Adelaide</i> .....	87·6	16	39·2	3	67·2	48·4	45·3	63	145·8	29·5	1·67	9	5·1
<i>Sydney</i> .....	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Wellington</i> .....	65·0	19a	39·0	18	58·9	46·3	43·4	71	130·0	27·0	6·16	18	4·8
<i>Auckland</i> .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Jamaica, Kingston.....	91·3	2	70·7	27	88·8	73·9	72·0	80	...	...	8·84	11	5·8
Trinidad .....	91·0	7, 29	69·0	29	87·0	71·5	74·0	86	170·0	68·0	9·83	23	...
Grenada.....	87·4	8	71·8	24	84·2	75·6	71·6	74	157·4	...	11·55	23	3·1
Toronto .....	93·2	10	35·4	28	71·0	50·4	51·2	70	110·0	29·0	·40	5	3·5
New Brunswick, Fredericton.....	87·7	10	31·0	19	65·7	43·5	44·1	64	...	...	·91	7	4·7
Manitoba, Winnipeg.....	92·7	8	31·5	16	76·1	46·1	...	...	...	...	·34	2	3·3
British Columbia, Esquimalt.....	71·5	17	37·2	28	62·4	46·9	50·4	89	...	...	1·80	11	5·4

a—and 29.

## REMARKS.

MALTA.—Adopted mean temp. 75°·1, or exactly the average. Mean hourly velocity of wind 9·5 miles, or 1·8 miles above the average. Thunderstorms on 20th and 28th; lightning on 5 days. J. F. DOBSON.

*Mauritius*.—Mean temp. of the air 0°·4 above, of dew point 0°·9 below, and rainfall ·33 in. above, their respective averages. Mean hourly velocity of wind 14·7 miles, or 2·7 above average; extremes, 34·0 on 4th and 3·5 on 12th; prevailing direction E.S.E. and E. by S. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 81°·5, or 0°·8 above, of dew point 73°·8, or 0°·6 above, and rainfall ·50 in. below, their respective averages. Thunderstorms on 4 days. H. O. BARNARD.

*Adelaide*.—Mean temp. 0°·7 above, and rainfall ·09 in. below, the average. C. TODD, F.R.S.

*Wellington*.—Generally showery weather, the total rainfall being 1·90 in. above the average. Prevailing winds from N.W. and S.E.; stormy on four days. Mean temp. 52°·6, or 1°·7 above average. Earthquakes on 13th and 21st. R. B. GORE.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 3·1 miles. Rainfall of Kingston twice the average, the island rainfall being 24 per cent. above the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 2·30 in. above the 30 years' average J. H. HART.

# SUPPLEMENTARY TABLE OF RAINFALL, FEBRUARY, 1898.

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.
I.	Uxbridge (Harefield Pk.)	1·30	XI.	Builth, Abergwesyn Vic.	5·76
II.	Dorking, Abinger Hall	1·54		Rhayader, Nantgwillt ...	4·80
	Birchington, Thor	·88		Lake Vyrnwy	6·57
	Hailsham	1·38		Corwen, Rhug	3·25
	Ryde, Thornbrough	2·13		Criccieth, Talarvor	2·45
	Emsworth, Redlands	1·92		I. of Man, Douglas	2·48
	Alton, Ashdell	1·53	XII.	Stoneykirk, Ardwell Ho.	2·06
III.	Oxford, Magdalen Col.	1·21		New Galloway, Glenlee	6·48
	Banbury, Bloxham	1·13		Moniaive, Maxwellton Ho.	4·45
	Northampton, Sedgebrook	·97		Lilliesleaf, Riddell	1·50
	Duddington [Stamford]	·57	XIII.	N. Esk Res. [Penicuik]	3·20
	Alconbury	·52	XIV.	Glasgow, Queen's Park..	3·52
	Wisbech, Bank House...	·78	XV.	Inverary, Newtown	9·34
IV.	Southend	·83		Oban, The Corran	...
	Harlow, Sheering	1·11		Islay, Gruinart School	3·82
	Colchester, Lexden	·71	XVI.	Dollar	2·36
	Rendlesham Hall	·74		Balquhiddy, Stronvar...	8·70
	Rushall Vicarage	1·00		Ballinluig	2·40
	Swaffham	·74		Dalnaspidal H.R.S.	7·88
V.	Salisbury, Alderbury	1·65	XVII.	Keith H.R.S.	2·80
	Bishop's Cannings	2·00		Forres H.R.S.	2·66
	Blandford, Whatcombe	2·93	XVIII.	Fearn, Lower Pitkerrie..	3·35
	Ashburton, Bolne Vic...	3·99		N. Uist, Loch Maddy	6·15
	Okehampton, Oaklands.	3·67		Invergarry	4·49
	Hartland Abbey	1·87		Aviemore H.R.S.	3·97
	Lynton, Glenthorne	2·69		Loch Ness, Drumnadrochit	5·88
	Probus, Lamellyn	1·82	XIX.	Invershin	5·78
	Wellington, The Avenue	2·64		Durness	9·52
	North Cadbury Rectory	2·01		Watten H.R.S.	3·81
VI.	Clifton, Pembroke Road	1·80	XX.	Dunmanway, Coolkelure	3·73
	Ross, The Graig	1·19		Cork, Wellesley Terrace	1·62
	Wem, Clive Vicarage	1·65		Killarney, Woodlawn	5·41
	Wolverhampton, Tettenhall	1·53		Caher, Duneske	2·00
	Cheadle, The Heath Ho.	2·19		Ballingarry, Hazelfort...	2·00
	Coventry, Priory Row	1·22		Limerick, Kilcornan	3·36
VII.	Grantham, Stainby	·53		Broadford, Hurdlestown	1·91
	Horncastle, Bucknall	·63		Miltown Malbay	3·46
	Workshop, Hodsock Priory	·68	XXI.	Gorey, Courtown House	1·20
VIII.	Neston, Hinderton	1·83		Athlone, Twyford	1·85
	Southport, Hesketh Park	2·18		Mullingar, Belvedere	2·81
	Chatburn, Middlewood.	4·34		Longford, Currygrane...	2·93
IX.	Melmerby, Baldersby	·98	XXII.	Woodlawn	2·81
	Scarborough, Observat'y	1·41		Crossmolina, Enniscoe	6·74
	Middleton, Mickleton	3·40		Collooney, Markree Obs.	4·96
X.	Haltwhistle, Unthank...	3·39		Ballinamore, Lawderdale	4·33
	Bamburgh	·86	XXIII.	Warrenpoint	2·67
	Duddon Valley, Ulpha School	6·25		Seaforde	2·54
	Keswick, The Bank	5·37		Belfast, Springfield	3·93
XI.	Llanfrehfa Grange	1·71		Bushmills, Dundarave..	4·32
	Llandovery	3·69		Stewartstown	2·96
	Castle Malgwyn	2·49		Killybegs	8·32
	Brecknock, The Barracks	2·90		Horn Head	5·15

## FEBRUARY, 1898.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.						TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		Days on which -01 or more fell.	Max.		Min.				
				Dpth	Date		Deg.	Date	Deg.	Date	In shade.	On grass.	
I.	London (Camden Square) ...	inches. 1·08	inches. — '80	in. '15	3e	14	56·2	1	24·3	21	7	17	
II.	Tenterden .....	1·08	— 1·04	'16	18a	13	56·0	1	22·0	21	9	16	
III.	Hartley Wintney .....	1·33	—	'28	19	16	56·0	17	18·0	21	17	19	
IV.	Hitchin .....	1·11	— '64	'26	27	17	53·0	1	23·0	20	9	...	
V.	Winslow (Addington) .....	'95	— 1·21	'20	3	15	53·0	1	23·0	21	13	15	
VI.	Bury St. Edmunds (Westley) .....	'95	— '61	'20	3	13	56·0	1	25·0	22	...	...	
VII.	Norwich (Brundall) .....	1·22	—	'39	3	17	60·2	1	22·4	22	6	20	
VIII.	Winterbourne Steepleton ...	2·99	—	1·61	21	20	52·2	1	18·1	25	11	17	
IX.	Torquay (Cary Green) .....	2·24	—	1·20	21	15	56·1	1, 18	29·5	24	6	13	
X.	Polapit Tamar [Launceston]..	2·83	— '44	'39	3	23	53·4	11	22·1	24	7	10	
XI.	Stroud (Upfield) .....	1·36	— 1·20	'25	18	16	52·0	15b	27·0	24	13	...	
XII.	Churchstretton (Woolstaston) ..	2·26	— '19	'45	3	20	54·0	1	23·5	21	10	19	
XIII.	Worcester (Diglis Lock) .....	1·35	— '62	'22	17	19	...	...	...	...	...	...	
XIV.	Leicester (Rotherby Hall) ...	1·11	—	'17	3	19	56·0	16	19·0	21c	12	21	
XV.	Boston .....	'46	— 1·22	'12	3	11	52·0	1	24·0	21	...	16	
XVI.	Hesley Hall [Tickhill].....	'59	— '91	'26	28	11	57·0	1	22·0	21a	9	...	
XVII.	Manchester (Plymouth Grove) ..	2·17	+ '12	'30	28	21	58·0	1	21·0	20	10	12	
XVIII.	Wetherby (Ribston Hall) ...	1·04	— '54	'33	28	13	...	...	...	...	...	...	
XIX.	Skipton (Arnccliffe) .....	8·32	+ 3·63	'91	1	21	...	...	...	...	...	...	
XX.	Hull (Pearson Park) .....	1·52	— '28	'45	3	15	56·0	1	24·0	21	15	21	
XXI.	Newcastle (Town Moor) .....	1·06	— '34	'24	4	11	...	...	...	...	...	...	
XXII.	Borrowdale (Seathwaite).....	16·48	+ 3·84	1·55	9	23	...	...	...	...	...	...	
XXIII.	Cardiff (Ely).....	2·37	— '82	'31	20	20	...	...	...	...	...	...	
XXIV.	Haverfordwest .....	1·91	— 2·21	'36	25	21	53·1	1	23·2	24	4	15	
XXV.	Aberystwith (Gogerddan) ...	3·15	— '11	'64	5	16	51·0	10	...	...	...	...	
XXVI.	Llandudno .....	2·28	+ '36	'37	3	21	57·5	1	28·0	21	2	...	
XXVII.	Cargen [Dumfries] .....	4·67	+ 1·02	'61	6	18	54·6	1	23·0	24	10	...	
XXVIII.	Edinburgh (Blacket Place)...	1·02	—	'21	1	13	55·5	1	24·0	21	8	19	
XXIX.	Colmonell .....	6·39	—	1·06	25	21	53·0	10	21·0	20	...	...	
XXX.	Tighnabruach .....	7·59	—	1·10	26	22	50·0	2	28·0	20d	10	...	
XXXI.	Mull (Quinish) .....	6·80	+ 1·33	1·40	26	21	...	...	...	...	...	...	
XXXII.	Loch Leven Sluices .....	2·00	— '75	'40	2	10	...	...	...	...	...	...	
XXXIII.	Dundee (Eastern Necropolis) ..	'75	— 1·35	'35	25	11	55·2	15	22·4	24	14	...	
XXXIV.	Braemar .....	2·38	— '98	'47	21	20	51·8	1	2·5	24	20	25	
XXXV.	Aberdeen (Cranford) .....	1·60	—	'51	25	17	58·0	15	20·0	28	19	...	
XXXVI.	Cawdor (Budgate) .....	3·35	+ 1·12	'33	12	23	...	...	...	...	...	...	
XXXVII.	Strathconan [Beaully] .....	10·91	+ 6·20	1·90	2	15	...	...	...	...	...	...	
XXXVIII.	Glencarron Lodge .....	11·30	—	1·22	14	25	50·4	1	23·0	4	13	...	
XXXIX.	Dunrobin .....	4·81	+ 2·72	'52	1	23	53·0	1	27·0	20	12	...	
XL.	S. Ronaldshay (Roeberry) ...	5·20	+ 2·56	'81	25	25	50·0	15	27·0	3	13	...	
XLI.	Darrynane Abbey .....	3·72	—	'53	20	25	...	...	...	...	...	...	
XLII.	Waterford (Brook Lodge) ...	1·31	— 2·77	'28	25	20	53·5	17	22·0	24	8	...	
XLIII.	O'Briensbridge (Ross) .....	4·07	—	'52	4	22	...	...	...	...	...	...	
XLIV.	Carlow (Browne's Hill) .....	1·54	— 1·54	'25	25	20	...	...	...	...	...	...	
XLV.	Dublin (Fitz William Square) ..	1·74	— '61	'58	17	18	59·0	1	28·1	24	7	10	
XLVI.	Ballinasloe .....	2·14	— '64	'32	12	19	53·0	1	26·0	23	7	...	
XLVII.	Clifden (Kylemore) .....	10·05	—	'93	24	24	...	...	...	...	...	...	
XLVIII.	Waringstown .....	2·50	+ '05	'46	25	16	56·0	3	23·0	20	8	19	
XLIX.	Londonderry (Creggan Res.) ..	5·48	+ 2·45	'45	13	26	...	...	...	...	...	...	
L.	Omagh (Edenfel) .....	4·18	+ 1·49	'59	17	24	54·0	1	25·0	21	9	18	

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

a—and 25. b—and 16. c—and 22. d—and 21, 23, 24. e—and 5, 18.

# METEOROLOGICAL NOTES ON FEBRUARY, 1898.

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.

TENTERDEN.—Extraordinary deficiency of rainfall continued, the total for the five months ending February being only 6·36 in. A very similar month to February, 1896, the temp. almost identical, but more rain and the bar. not so high. Much colder and drier than 1897, with half the rainfall and nearly double the sunshine; total duration 91 hours.

HARTLEY WINTNEY.—The abnormal mildness which characterised the preceding month continued to the 18th of February, when a sudden fall of temp. and bar. pressure was followed by slight falls of S, which continued for about a week. Lesser celandine in flower on the 7th; brimstone butterfly on wing on the 9th. Ozone registered on 27 days. Rainfall half the average.

ADDINGTON.—Weather unsettled, but a small rainfall. Frost on a good many nights, but of no intensity. The temp. rose to or above 50° on 7 days; bar. very low on the 20th, 21st and 22nd. On the 18th S and sleet fell to the amount of ·11 in.

BURY ST. EDMUNDS, WESTLEY.—Much colder than January. R fell on only 13 days in very small quantities, and ponds and rivers are very low. TS on 27th.

NORWICH, BRUNDALL.—Mean temp. of the month 40°·7; mean temp. of the three winter months (December to February) 41°·3, the highest since 1876-7. Wind nearly continuously W. and N.W., and rough at times. Although generally very mild, a less genial month than January. Floods on the marshes, caused by N.W. winds, on 3rd. Lawn white with S on 4th. T, L, H and S on 5th; W.N.W. gale on 16th; H storms and a very bright rainbow on 20th.

WINTERBOURNE STEEPLETON.—The temp. up to the 18th was unusually high, with a high bar. A sudden change occurred on the 19th, followed by frosts and a heavy fall of S between noon of 21st and 22nd. Sunshine on 23rd and 24th began to melt the S, and the rain later rapidly reduced it. Squalls of sleet and S on 2nd; squally N.W. wind with sleet and R on 4th; sharp frost at night on 18th.

TORQUAY, CARY GREEN.—Rainfall 0·30 in. below the average of 22 years. Mean temp. 0°·7 above the average. Duration of sunshine 102 hours 45 mins., being 27 hours above the average; two sunless days.

POLAPIT TAMAR.—Generally mild and damp. The only period of really wintry weather for the season was in the last 8 days. The min. on grass on 24th fell to 18°. Stormy, with frequent H on 2nd; N.W. gale on 4th; H on 5th, 6th, 7th and 20th; S on 20th, 21st and 22nd.

STROUD, UPFIELD.—Gale from N.W. in evening of 2nd; slight S on 4th; S all day on the 18th, covering the hills, and about an inch on the ground on 20th.

WOOLSTASTON.—The early and latter parts of the month were cold and stormy, S falling lightly on several days, with a good deal of frost at night. Mean temp. 39°·0. S on 2nd, 3rd, 6th and 18th.

MANCHESTER, PLYMOUTH GROVE.—S and sleet on the 4th; H showers on 6th; S on 21st; dense fog on 22nd; thick fog on 24th. The last week or nine days very winterly. Mean temp. 39°·4.

## WALES.

HAVERFORDWEST.—February commenced stormy, a gale beginning about 11 p.m. on the 1st and lasting until the night of the 4th, varying in force from fresh to strong. On the 5th the Precelly Range was snow-capped, and colder weather prevailed to the 8th, after which, up to the 18th, it was very mild, with continual damp. S fell on the 20th and 21st, followed by three days of hard frost, and then stormy, wet weather to the end of the month.

Although the rainfall was small, the weather, generally, was very damp, but there was not much fog. Daffodils in bloom, and brambles in leaf, on the 4th, and vegetation generally very advanced.

ABERYSTWTH, GOGERDDAN.—Sharp snowstorm on the 20th, melting as it fell.

LLANDUDNO.—Stormy on 2nd, 3rd, 4th and 19th; T, L and H on 2nd; S and H on 20th.

### SCOTLAND.

CARGEN [DUMFRIES].—The mild weather experienced in January continued for only the first two days in this month, the mean temp. falling from  $49^{\circ}$  on the 1st to  $39^{\circ}$  on the 3rd. Exceptionally low temp. prevailed during the latter part of the month; the mean for the last 12 days being only  $37^{\circ}$ , while for the first 16 days it was  $42^{\circ}\cdot5$ . More sunshine was registered than in any other February since 1876; the total duration being 111 hours, against an average for 39 years of 84. Slight S fell on 7th, 21st, and 28th. Westerly winds prevailed on 14 days. The district entirely escaped the very severe gale experienced at no great distance to N. and S. on the 2nd. Primroses and blackthorn were in bloom in the early part of the month, and the blossom of lilac and pear was bursting from the bud; birds were to be found sitting, and an instance of eggs having been actually hatched is recorded. The forward state of vegetation received a seasonable check towards the end of the month.

EDINBURGH, BLACKET PLACE.—Mean temp.  $1^{\circ}\cdot2$  above the average. Rain-fall only half the normal, while the bright sunshine recorded—90 hours—is the greatest in February since 1880. S.W. gale on 1st, W. gale, with H, on 12th. TS, with heavy H and S, 3.30 p.m., on 6th. S on 21st and 26th.

COLMONELL.—Rain  $2\cdot70$  in. above, and mean temp.  $1^{\circ}\cdot2$  above, the average of 22 years.

TIGHNABRUACH.—An uncommonly wet month, embracing all the features—B, H, S, Sleet, T, etc.

ABERDEEN, CRANFORD.—The month was colder and less spring-like than January. The highest min. temp. being  $40^{\circ}$  on the 1st, 10th, and 14th. Wind W. and N.W., and often high.

S. RONALDSHAY, ROEBERRY.—A very wet cold month. The wettest February recorded in 31 years. Mean temp.  $37^{\circ}\cdot8$ , or  $0^{\circ}\cdot8$  below the average.

### IRELAND.

DARRYNANE ABBEY.—On the whole a mild month, but colder towards the end. Strong gale, with heavy squalls, on the 4th. S and sleet on 20th.

WATERFORD, BROOK LODGE.—H and S showers on 2nd. One of the heaviest gales this winter from N.W. on 4th. H on 20th, S on 21st. Large flocks of starlings seen on 15th.

O'BRIENSBRIDGE, ROSS.—Mild up to 20th, when S fell, followed by very rough and cold weather.

DUBLIN, FITZWILLIAM SQUARE.—Of average mean temp., this month was no less than  $5^{\circ}$  colder than January. It was a rainy month, for there were only 10 days on which there was no registerable rainfall; but the downpours were not heavy, except on 17th. Prevailing winds W. and N.W., and the force often considerable. On the whole the month was a fairly average February. Mean temp.  $42^{\circ}\cdot9$ , or  $0^{\circ}\cdot1$  above the average. Foggy on 3 days. The amount of cloud,  $5\cdot0$ , is  $1\cdot6$  below the average. High winds occurred on 18 days, reaching the force of a gale on 5. Solar halo on the 5th, lunar halos on 4th and 6th.

CLIFDEN, KYLEMORE.—A very wet and cold month throughout. Gales from N.W. on 3rd and 4th, and from S. on 7th, stormy on 1st, 5th, 8th, 10th, and 28th. H on 1st, 26th, and 27th.

OMAGH, EDENFEL.—February was raw, wet, and unsettled throughout, with frequent, but transitory falls of S, and spells of frost. The mean temp., although almost exactly the average, was  $4^{\circ}\cdot1$  lower than that of January, causing it to be felt with unusual severity.

# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CCCLXXXVII.]

APRIL, 1898.

[PRICE FOURPENCE,  
or 5s. per ann. post free.]

## THE CLIMATE OF PARIS.

WE have just received from M. Jaubert a book\* which is we think the first of its class. It is not the epitome of the observations made at Montsouris or at any other individual station, nor is it designed chiefly for meteorologists, but rather for the general public and for such professional men as doctors, engineers and others, who from time to time require meteorological details respecting the climate of Paris. The observatory at Montsouris was not established until 1872, therefore M. Jaubert had necessarily to utilize the records obtained by MM. Becquerel, Belgrand, Lemoine, Renou, the various directors of the Observatoire National, and old writers like Mairan and Cotte; but apparently M. Jaubert not merely fully acknowledges his indebtedness to the respective authors, but throughout the work generally indicates the sources of each statement which he makes.

We have one fundamental objection to the book: the author has retained the old plan of beginning each year with the 1st of December of the previous one. How much longer will it be before all meteorologists obey the decision of the Vienna Congress?

We epitomise the principal statements, but all who are interested in the climate of Fair Lutetia should procure the work for themselves.

*Accidental barometric variations.*—A recording barometer if near the track of the centre of a whirlwind shows a sudden fall at the instant of its passage. There have been two such cases—one in, and one near, Paris. On September 10th, 1896, a whirlwind passed close to the Tour St. Jacques, and the barometer fell suddenly 0·236 in., and on June 18th, 1897, a similar occurrence at Asnières produced a fall of 0·374 in. At Little Rock, Arkansas, U.S.A., during the passage of a tornado on October 2nd, 1894, the fall was 0·354 in.

*Mean monthly pressure at Sea Level.*—This is given on the authority of M. Angot for the period 1846–90, as follows, the yearly mean being 30·005 in.:—

Jan. in.	Feb. in.	Mar. in.	Apl. in.	May. in.	June. in.	July. in.	Aug. in.	Sept. in.	Oct. in.	Nov. in.	Dec. in.
30·053	29·982	29·982	29·937	29·977	30·024	30·024	30·014	30·032	29·975	29·998	30·065

\* *Climatologie de la Région de Paris*, par Joseph Jaubert, Chef du service Physique et Météorologique de l'observatoire Municipal de Montsouris et annexe Tour St. Jacques. Baudry & Co., Paris, 1898; 8vo, 120 pages.

We have not been able to trace whence this table was copied, but evidently there is a mistake somewhere, for the mean of the monthly values is 762·13 mm. (30·005 in.), and the mean for the year is said to be 762·30 mm. (30·012 in.)

The extremes of the barometric pressure (which, by the bye, the author has not reduced to sea level, therefore we have done so approximately) have been :—

1821 ..... Feb. 6, 9 a.m. .... 31·002 inches.  
1821 ..... Dec. 24, 11.15 p.m. ... 28·314   ,,

*Temperature.*—The mean temperature at the National Observatory, which may be regarded as nearly that of central Paris, is 51°·3, but in the suburbs it is less, *e.g.*, Parc St. Maur 50°·0.

The lowest temperature recorded in the neighbourhood, probably the lowest for many years, was  $-17^{\circ}\cdot5$  ( $-27^{\circ}\cdot5$  C.) on December 19th, 1871, at Montargis, but on the same day it was only  $-12^{\circ}\cdot1$  at Aubervilliers, and  $-6^{\circ}\cdot7$  at the Observatoire National. Temperatures below zero Fahrenheit have been recorded on other days, even as lately as December 2nd, 1879, on the indisputable authority of M. Renou, it was  $-14^{\circ}\cdot1$  ( $-25^{\circ}\cdot6$  C.) at Parc St. Maur; and on the same day  $-11^{\circ}\cdot0$  at Montsouris.

The highest recorded shade temperature (in 1874 and again in 1881) was 101°·1.

*Relative Humidity.*—Winter average about 80%, spring and summer rather under 60%, yearly mean 68%.

*Fogs.*—These are rather frequent, about 40 in a year.—This is M. Jaubert's statement; we think that fogs have become much worse in Paris since coal has been largely used in the place of wood; but as M. Jaubert defines these 40 days as those "on which one cannot distinguish objects at a distance of a mile," we think that a Londoner would reject a considerable proportion of the 40. Paris now has fogs which everybody would admit to be good specimens, when it is impossible to work in the Bibliothèque National, when the steamers cease to run, and when at night the police hold burning torches at the crossings of the streets, but we think that the 40 days include some that are hardly entitled to be there.

*Rainfall.*—The mean yearly fall of rain may be taken as 22 inches, but the mean varies in different parts of the city and suburbs from 21 to 25 inches.

The following are striking instances of two consecutive wet months:—

1854 ..... June 7·69 in., and July 4·11 in. .... Total in 2 months 11·80 in.  
1896 ..... Sept. 5·87 and October 6·57 in. ....   ,,   ,,   ,, 12·44   ,,

M. Jaubert gives a table of heavy rain falling in short periods, from which we have compiled the following, which is arranged exactly like the corresponding ones in *British Rainfall*. We think that short heavy rains are more frequent in Paris than in London;

but as the following list includes records from several stations, it is not possible to speak positively. Two of these entries, marked with an \*, exceed anything in the great Camden rain of June 23rd, 1878; but all the others have been exceeded, most of them repeatedly:—

Date.	Duration.	Amnt.	Rate	Date.	Duration.	Amnt.	Rate
	hr. min.	in.	per hour in.		hr. min.	in.	per hour in.
1880, Sept. 8	0 5	·59	7·08*	1865, May 23	0 20	1·02	3·06
1889, June 9	0 6	·35	3·50	1881, Sept. 9	0 20	·98	2·94
1896, July 26	0 8	·94	7·05*	1889, May 26	0 25	1·67	4·01
1891, Sept. 3	0 8	·81	6·07	( <sup>1</sup> )1867, Sept. 20	0 30	2·21	4·42
1866, Aug. 2	0 11	·46	2·51	1866, July 16	0 30	1·26	2·52
1867, Sept. 20	0 20	1·62	4·86	( <sup>2</sup> )1849, July 8	1 0	1·77	1·77
1860, July 16	0 20	1·50	4·50	1860, July 16	1 0	1·69	1·69

(<sup>1</sup>) Given as 20 minutes on p. 27 and as 30 minutes on p. 28.

(<sup>2</sup>) Given as June on p. 27 and as July on p. 28.

*Snow.*—The total depth of snow in a year is generally between 2 and 5 inches, but occasionally it is much greater; in 1788-89 it was 2 ft. 2 in., and in 1879 1 ft. 4 in.

*Thunderstorms.*—There are about 30 thunderstorms in a year, mostly in summer, but with one or two in the winter every three or four years. Although buildings are damaged nearly every year, very few persons are killed.

*Hail.*—Very little hail falls in Paris, and the stones are seldom more than  $\frac{3}{4}$  of an inch in diameter. There are only two records of very large hail; on July 13th, 1788, one stone picked up at the end of the Faubourg Saint Antoine weighed 60 grammes (about  $2\frac{1}{4}$  oz., avoirdupois), and on July 31st, 1808, one was reported to have been found near Marly, which weighed about *une demi-livre* (about 9 oz., avoirdupois).

*Whirlwinds.*—M. Jaubert has given a very interesting chapter on this subject, with a list of instances from A.D. 1309 to 1897.

*Wind.*—Direction.—This section should be amplified in the next edition. M. Jaubert states that the prevalent direction is S.W., but that there is evidence that the direction is deflected by the presence of the city, the direction being different in the centre from that on the outskirts N. and S. We have never heard this suggestion before, and think that it should be fully investigated.

*Velocity.*—The mean velocity at Montsouris (on a mast about 40 ft. high) is 9 miles an hour. The following high velocities are reported:—

1860, Feb. 27th—	92 miles per hour	{ M. Hervé Mangon, on a mast
1869, Dec. 14th—	101 „ „ „	{ similar to that at Montsouris.
1893, Dec. 20th—	99 „ „ „	Richard fan on Eiffel Tower.

On November 12th, 1894, the anemometer on the Eiffel Tower recorded 95 miles and then failed; on the same day the records

were :—Observatoire National, 64 miles ; Montsouris, 60 miles ; Tour St. Jacques, 71 miles ; and Montmartre, 101 miles.

*Cloud.*—The yearly average amount is 6·0, the lowest mean monthly value is 5·3 in August and September, and the highest, 7·2 in December. We do not understand the entry on page 49—“Decembre, 1762 : néb. : 46,” surely it must be 1862, for the notation of cloud on the scale of 0-10 was not adopted at the earlier date. Can anyone state when it was introduced ?

*Soil Temperature.*—The author gives the mean temperatures determined by M. Becquerel at the Jardin des Plantes as under :—

	ft in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
Depth	3 3	19 8	36 1	52 6	68 11	85 4	101 9	118 1
Mean } Temp. }	52°·3	53°·4	53°·6	53°·8	53°·8	54°·3	54°·2	54°·4

We do not understand these values ; they are unlike any that we remember for any part of the world—there is more difference between 3 ft. 3 in. and 19 ft. 8 in. than in the subsequent 98 ft. 5 in., and if plotted they all (except the first) agree within 0°·2 with a line starting from the lowest depth and cutting the surface at 53°·2, whereas there is abundant evidence that the mean temperature of Paris is quite 2° lower than that.

M. Jaubert makes some statements respecting the depth of frozen soil, but does not mention how the observations were made. With reference to some articles in these pages on “Water-pipes and frost,” we should very much like to know precisely the mode in which the following observations were made :—“Aux environs de Paris, le sol dénudé a été gelé en 1879 à 0 m ·80 et en février 1895 à 0 m ·65 et seulement 0 m ·53 sous un sol gazonné, mais dans les parties basses comme à Achères il a gelé à 0 m ·80.” Were these facts ascertained by buried thermometers ? or by frozen water-pipes ? or by digging up the soil ?

There are other sections on Magnetism, Aurora, the Seine, and on Phenological phenomena, but we have said enough to show that the book, though not immaculate, is both interesting and useful.

# RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858-97.

## MARCH.

ELEMENTS.	MONTHLY MEANS OR TOTALS.										ABSOLUTE READINGS.									
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	MEANS 9 A.M. AND 9 P.M.				EXTREMES AT 9 A.M. AND 9 P.M.				Mean of all Highest	Mean of all Lowest.							
				Mean.	Highest Month.		Lowest Month.	Highest.	Lowest.											
					Value.	Date.				Value.	Date.									
														Value.	Date.	Value.	Date.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14					15		
Barometer ..... { (cor. & red.)	29.904	30.202 1874	29.574 1876	9 a.m. 9 p.m.	29.907 29.901	30.208 30.197	1874 1874	29.561 29.587	1876 1876	30.788 30.782	2nd, 1867 2nd, 1867	28.693 28.676	10th, 1876 9th, 1876	30.456 30.447	29.185 29.244					
Temp. { Dry Bulb..... { Max. ....	41.6	45.9 1859	35.9 1883	9 a.m. 9 p.m.	41.8 41.3	46.7 45.7	1859 1896	36.1 35.6	1883 1883	57.9 57.2	24th, 1858 22nd, 1896	20.4 24.7	4th, 1890 2nd, 1890	52.2 51.4	31.3 31.7					
	50.2	..	..	..	..	56.6	1893	44.9	'83, '92	70.1	24th, 1858	31.4	2nd, 1892	61.9	38.9					
Min. ....	35.5	..	..	..	..	39.9	'59, '96	30.4	1883	51.3	7th, 1881	15.6	4th, 1890	46.8	25.3					
Shade { Wet Bulb..... {	39.5	43.4 1896	34.1 1883	9 a.m. 9 p.m.	39.6 39.3	43.8 43.5	1859 1896	34.2 33.9	1883 1883	53.0 57.0	24, '58 & 29, '72 22nd, 1896	19.2 24.0	4th, 1890 2nd, 1890	49.4 49.1	29.9 30.0					
	81.3	..	..	..	..	91.4	1882	70.6	1888	128.7	20th, 1882	36.4	2nd, 1875	104.3	48.8					
Solar Rad., black ...	58.2	..	..	..	..	64.6	1893	52.1	1888	78.4	31st, 1894	33.2	2nd, 1892	72.3	41.9					
Solar Rad., bright..	31.6	..	..	..	..	35.4	1862	27.8	1883	48.4	2, '70 & 7, '81	12.8	4th, 1890	44.0	21.0					
Grass Minimum ...	40.7	..	..	..	..	44.3	1872	37.0	1886	48.0	31st, 1874	32.4	1st, 1895	44.7	36.8					
Soil, 1 foot .....	6.1	8.2 1888	3.1 1893	9 a.m. 9 p.m.	6.4 5.8	8.9 8.3	1862 1888	3.6 2.6	1893 1893	10 10	Every year Every year	0 0	Various Various	10.0 10.0	0.4 0.1					
Cloud .....	1.71	3.69 1862	.32 1893	9 a.m. 9 p.m.	.94 .77	2.09 1.84	1862 1876	.11 .11	1893 1874	.95 .73	4th, 1870 12th, 1876	.00 .00	Every year Every year	.33 .25	.00 .00					
Rainfall .....																				

Max. Rainfall in 24 hours, .95 in., 3rd, 1870. Mean max. daily fall, .43 in.

## REVIEWS.

*Observational Astronomy: a practical book for amateurs.* By ARTHUR MEE, F.R.A.S. Second and thoroughly revised edition, with numerous portraits, maps, and illustrations. "Western Mail," Cardiff and London. 1897. 4to, viii.-113-vi. pp.

THE boundary line between astronomy and meteorology is, in many parts of it, not clearly defined,—take for instance sunspots and aurora, sunspots and weather, or meteors, or solar eclipses, who can define the limits of the two sciences?

There is, therefore, every justification for our offering a few words of welcome and encouragement to the editor of this good and cheap book. It is an astronomical book which will charm non-mathematical readers, for we do not think that it contains a single mathematical expression, and, *per contra*, there must be nearly 200 engravings, some beautiful, mostly good, and only a few of the portraits bad. Some of the little portraits are extremely good, *e.g.*, Flammarion, on p. 72, and the larger one of J. C. Adams, on p. 79; but they are unequal, for instance, on pp. 80 and 81, we have Sir W. Huggins and M. Janssen, not very life-like, and Sir Norman Lockyer, as nearly perfect as any woodcut could be. On p. 81, is the only misprint which we have noticed, "Foye," for "Faye." It is a thoroughly useful book.

*Beiträge zur Geophysik. Zeitschrift für physikalische Erdkunde.* Herausgegeben von Prof. Dr. GEORG GERLAND Band III. Heft 1 and 2. 8vo. W. Engelmann, Leipzig, 1896-97, 336 pages, and 5 plates.

ALTHOUGH containing other papers, these two numbers may in some sort be regarded as an obituary notice of a very able man, Dr. Ernest L. A. v. Rebeur-Paschwitz, who in a comparatively short life (August 9, 1861—October 1, 1895), and in spite of much ill health, rendered good service both to astronomy and to terrestrial physics. Dr. Gerland gives a list of twenty-nine papers written by Rebeur-Paschwitz in the last twelve years of his life, but to our own knowledge the list might be considerably extended, because—*e.g.*, there is no reference to his work in connection with the Krakatoa twilight phenomena.

Although not the first to employ horizontal pendulums, we think that their present use in observing and recording minute movements in the crust of the earth is almost entirely due to the labours of Dr. v. Rebeur-Paschwitz, and Prof. John Milne, who is now organising a system of records with horizontal pendulums of identical construction in all quarters of the world.

When illness compelled Dr. v. Rebeur-Paschwitz to visit Teneriffe, he took his instruments with him and made observations for comparison with those made at Potsdam and at Wilhelmshaven.

Afterwards his pendulum was placed in the basement of Strasburg observatory, and in Part I. of the work under notice, Herr Reinhold Ehlert gives a full record and analysis of the observations.

Another noteworthy paper in these Journals is that by Dr. Boller, of Strasburg, upon the Aurora Australis. It is by far the best memoir upon the subject which we have seen ; it occupies 74 pages, and when we add that not only has Dr. Neumayer allowed the author the use of the library of the Seewarte at Hamburg, but also helped him in every way, and given him the use of his own MS. records, all will realise that the author's opportunities were special, and we think that we may add that he has made very good use of them. We see that the paper is described as "First Part." Perhaps in the second part the author will do that which through his work is now possible—it has long been desirable—namely, to bring together the dates of manifestation of auroral activity around the Northern and around the Southern Pole, and to study the phenomena as a whole.

## THE DRY WINTER OF 1897-98.

*To the Editor of the Meteorological Magazine.*

SIR,—The rainfall of March having been slightly above the average, we may, perhaps, consider the dry period—which began in October last—as having come to an end. The following table will show its very exceptional character :—

1853-4.		1884.		1893.		1895.		1897-8.		Mean of 40 years.	
	in.		in.		in.		in.		in.		in.
Dec.	·66	Feb.	1·05	Mar.	·22	Feb.	·22	Oct.	·61	Oct.	2·69
Jan.	1·55	Mar.	1·14	Apr.	·09	Mar.	1·30	Nov.	1·16	Nov.	2·27
Feb.	·97	Apl.	·87	May	·90	Apl.	1·02	Dec.	1·53	Dec.	1·96
Mar.	·30	May	·56	June	·54	May	·69	Jan.	·80	Jan.	2·02
Apl.	·50	June	·83	July	2·38	June	1·26	Feb.	·66	Feb.	1·52
Total		3·98		4·45		4·13		4·49		4·76	
										10·46	

These are all the instances of five consecutive months with less than 5 in. of rain since observations began here in 1851. Three of them, as might have been expected, include the spring or early summer—only one (1853-4) including the winter months ; so that I think it may safely be said that we have not had an autumn and winter so dry as the last for 44 years.—I remain, yours very truly,

HENRY S. TABOR, F.R.Met.Soc.

*Fennes, Braintree, April 7th, 1898.*

[The above sets out the facts so clearly that we insert it at once. We have been favoured with much interesting information, which we hope to be able to arrange and insert next month.—ED.]

## THE AUSTRALASIAN SOCIETY FOR THE ADVANCEMENT OF SCIENCE.

(Concluded from p. 27.)

### RED RAIN.

In a paper by Mr. Thomas Steel, F.L.S., F.C.S., on "Red Rain Dust" some interesting details were given of an analysis of a very clean sample of the dust, which was collected by Mr. W. E. Appleby, who was a resident of Moonee Ponds towards the end of 1896, when there was a very heavy fall of dust of a red colour over Melbourne and a considerable area of Victoria. The sample was dried at 110° C., and was found to contain the following :—

Organic matter .....	10·70
Sand, insoluble and undetermined.....	66·21
Soluble silica .....	·75
Ferric oxide .....	4·68
Ferrous oxide .....	·50
Alumina .....	15·16
Lime.....	1·36
Sulphuric anhydride.....	·62
	<hr/>
	99·98

The above may be regarded as a characteristic example of ordinary surface soil, such as is derived from the weathering of volcanic rocks. Both in appearance and composition it agreed closely with several samples of such soil from widely separate localities. Under the microscope, in addition to the diatoms noticed by other observers, the dust was seen to contain a few lepidopterous scales.

### BLACK RAIN.

*To the Editor of the Irish Times.*

SIR,—The area of the fall of black rain on last Wednesday extended over a surface of country about thirty miles in length, and at least sixteen in width; while the black was falling it was so dark that the lamps had to be lit in many of the shops and houses of this town. This and the area of rainfall will give some idea of the enormous quantity of foreign matter suspended in the black clouds, which slowly travelled in a north-easterly direction. The colouring matter was soot, and the presence of so enormous a quantity of soot in a country so far removed from large manufacturing towns can only be accounted for, at least in my opinion, by the following facts. For the previous week there had blown strong winds from the north-east, while the weather was very dry, with a high barometer. These breezes had evidently collected the soot from over the manufacturing towns of North England and South Scotland, and carried it at a very high altitude in a south-westerly direction, causing lovely sunsets very similar to those which followed the eruption of Krakatoa while the volcanic dust remained suspended in the lofty clouds. The soot-laden clouds travelled on till they met

a moisture-laden wind from the south-west, which began to blow on the evening of Tuesday. The soot evidently got perfectly mixed with the moisture in these clouds, and travelled slowly back again towards the N.E., getting gradually nearer and nearer to the earth, till at last it fell in black rain in this neighbourhood. The soot was thoroughly mixed with the rain and did not fall as smuts do in London after a pea-soup November fog. While the black rain was falling, birds went to roost, and many persons were greatly alarmed at the intense darkness, as no eclipse was expected, and they could not account for the strange phenomenon.—Yours, &c.,

JOHN RINGWOOD.

*Kells, Co. Meath, 31st March, 1898.*

[We are indebted for the above to our correspondent at Belvedere, Mullingar, who himself reported for "March 30th '11 Black rain."  
—ED.]

## FLOODS AND STORMS IN SOUTH AFRICA.

The *Cape Times* of February 2nd (for the copy of which we are indebted to an unknown correspondent) reports "Unprecedented Rainfall," "Houses Wrecked," "Roofs Blown Three Miles," "Many Lives Lost."

We will try to epitomise the information upon which these alarming head lines are based.

"*Unprecedented Rainfall.*"—There are very few figures given; we read that "at Johannesburg the rainfall of January 28th was reported by different observers as between 2 and 3 inches." "At Bloemfontein the rainfall up to January 27th is 10·75 inches, being the greatest for any month during the previous 18 years; previously the greatest was 9·98 inches in March, 1880." From Aliwal North the report on January 27th was "Heavy Rain, ten inches of rain have fallen in a week, and 12 inches during January."

"*Flood Levels.*"—Prieska, "A tremendous flood occurred here on the afternoon of January 29th. The Orange river grew to be two miles in width and encroached rapidly on the town, sixteen houses have been washed away, and the volume of water exceeds that in the great flood of 1881." Aliwal North, "The Orange river is in high flood, and the water is almost lapping the stone which marks the highest level of 1874."

"*Houses Wrecked,*" "*Roofs blown Three Miles.*"—Wreckage seems to have occurred not merely at Prieska (as stated above), but more severely during a violent gale and hailstorm which passed over Vosburg, near Britstown, on the night of January 23rd. "Thirty-two houses were damaged, and most of them were completely wrecked. At the location every hut and building was swept away. Some roofs are lying three miles away from the village."

## AURORA.

WE place two or three notes under this general heading, because some refer to the manifestations around the Southern, some to those around the Northern, Pole.

Reference to Aurora Australis will be found among the "Reviews" on page 39. We have just received from Mr. H. C. Russell, C.M.G., F.R.S., a short paper on the Aurora Australis of April 20th, 1897, as seen from Lat. 47° S. and Lon. 97° E.

In *Nature* of March 24th, Dr. Chree gives particulars of the disturbance of the magnetometers at Kew Observatory, which began at 8.55 p.m. on March 14th, 1898, and did not cease until 5 p.m. on the 16th. Dr. Chree describes it as by far the greatest since August, 1894.

On the evening of March 15th, there was a magnificent Aurora Borealis. The following description of the display, as observed from Wishaw, Lanarkshire, is the best that we have seen :—

## AURORAL PHENOMENA.

(Notes by the REV. ALEXANDER HARPER, M.A., *Wishaw Manse.*)

On Tuesday evening there was a succession of heavy showers, and the sky was often much overcast by cloud. It was about a quarter to 10 o'clock that I observed a notable brightness towards the north, and a rush upwards of a red streamer gave unmistakeable indications of an auroral display. There followed a partial clearing away of the clouds, and the colours of the dancers near the horizon became more vivid, and the luminosity, though irregular, was moving upwards. From 10.30 to 11 p.m. occurred the climax of a display such as I never before witnessed, not even in the November occurrence about 25 years ago, when the spectacle was beheld not only in the Northern hemisphere but in Australia. There stretched overhead across the whole canopy of heaven, as from two emanating sources, one S.W. by West, the other N.E. by North, six to eight parallel belts of parti-coloured light, each somewhat narrower than the ordinary rainbow, but distinctly separate, and each had its rushing transient gleam of light shooting through it; and though the belts appeared to break up and re-form, the successive distinctness remained and gave the idea of rotundity. But the most remarkable phenomenon was the slower rolling across these belts and at right angles, of what seemed like successive waves of white light, which not only heaved across the belts but moved occasionally to within not less than 35 degrees of the southern horizon. From half-past 10 to nearly 11 o'clock the strange appearances continued, and simultaneously with their partial breaking up there was formed in the north-east what seemed a great drapery of light, with a magnificently luminous fringe, which appeared to hang in folds and extend from about 20 degrees west of, and a little below, the pole star down to the seat of emanations in the east. This spectacle remained, however, but a few minutes, and then there followed a succession of radial circles each around a non-luminous centre, and as these broke up there was a series of flashing coruscations in cycloidal waves here, there, and everywhere overhead, like a distant display of bursting rockets. This continued for another twenty minutes. By 12 o'clock the dancers cutting impressive capers heeled away to their native north, and at 1 o'clock were still shooting out lurid gleams from the horizon, and shedding a light equal to about that of the moon in the first

quarter. Such gorgeous phenomena are hardly to be witnessed in a lifetime in our latitude, and he would be a dull soul who could ever forget the impressive grandeur. One could realise after such a spectacle what Nansen said regarding the brilliancy of the Auroræ in the Polar regions.

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### ROYAL METEOROLOGICAL SOCIETY.

At the meeting of this Society held on Wednesday evening, March 16th, at the Institution of Civil Engineers, Mr. F. C. Bayard, LL.M., President, in the chair, the following new Fellows were elected:—Robert Gray, M.R.A.C. ; Will. R. Griffith ; James E. Prichard, B.A., M.B. Oxon ; F. P. Pullar, F.R.G.S. ; William Harold Tingey, B.A.

Subsequently, a lecture on "*Photographing Meteorological Phenomena*" was delivered by Mr. A. W. Clayden, M.A., Principal of the new College at Exeter, who gave details of his experiences as Secretary of the Committee of the British Association on Meteorological Photography. After referring to the extreme value of photographic methods of recording the movements of instruments, the lecturer spoke of the real importance of preserving photographic records of all sorts of unusual meteorological phenomena ; and as regards floods, emphasized the necessity of companion photographs, showing the same scene under normal conditions. It was suggested that meteorologists throughout the country should co-operate with the Royal Meteorological Society in securing such records. The phenomena of the lightning discharge, as distinguished from those of a single flash, were next described and illustrated by a number of lantern slides. Some of the puzzles offered by lightning photographs were next alluded to ; the lecturer stated that he had repeatedly found that a single discharge lasted several seconds. Mr. Clayden then spoke of the "black" flashes shown in photographs, and described the steps by which, some years ago, he was led to the proof that they were merely a photographic phenomenon, but one which still remains unexplained. Passing on to a consideration of cloud photography, the various methods in use were explained, and a large number of lantern slides were exhibited, in some of which the clouds were shown on a background of blue sky in nearly their natural colours, a new result obtained by the employment of suitable developers on a specially prepared plate. The method employed at Exeter by the lecturer for the measurement of cloud altitudes was fully described. This differs from all other methods in using the sun as a reference point. Mr. Clayden then spoke of the difficulty in getting good pictures of cirrus clouds, and described the methods dependent on the polarization of the blue light of the sky ; but expressed a conviction that polarization had nothing to do with their efficiency, which was really due to a general lessening of brightness which enabled the exposure to be properly judged.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCTOBER, 1897.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
England, London .....	67·2	17	31·9	7	58·4	44·3	45·4	83	106·9	29·8	·56	9	5·8
Malta.....	84·2	23	53·3	13	72·3	62·0	57·1	75	151·1	47·7	2·87	9	5·2
Cape of Good Hope ...	80·9	8	42·1	3	67·8	53·6	53·0	76	...	...	1·89	8	4·9
Mauritius.....	82·8	27	59·1	20	78·5	65·5	62·0	74	131·3	50·9	1·40	16	6·4
Calcutta.....	89·3	11	63·4	27	85·8	75·1	73·8	80	154·2	57·1	8·61	10	5·8
Bombay.....	89·6	28	72·8	20	87·4	76·7	74·7	78	142·0	62·1	2·51	7	3·7
Ceylon, Colombo .....	90·7	25	73·3	...	87·8	77·1	73·6	79	148·0	70·0	4·71	16	5·2
Melbourne.....	80·2	27	33·3	4	65·4	47·0	45·1	69	133·6	27·9	1·77	11	6·4
Adelaide .....	90·7	27	41·0	9	70·4	50·5	45·1	59	145·8	30·2	·51	13	4·6
Sydney .....	87·9	25	47·3	12	72·4	55·0	49·0	60	147·3	39·2	1·36	11	4·2
Wellington .....	65·0	22	38·0	28	59·2	47·8	44·7	70	128·0	27·0	5·51	18	4·6
Auckland .....	66·0	20	45·0	19	61·9	49·7	46·0	69	129·0	41·0	3·63	22	6·0
Jamaica, Kingston.....	90·9	7	70·3	24	85·4	72·2	72·0	87	...	...	23·45	16	5·7
Trinidad .....	91·0	a	68·0	2	88·9	71·6	73·8	83	169·0	67·0	8·87	16	...
Grenada.....	89·4	21	71·2	22	84·6	75·9	73·9	73	154·2	...	5·23	16	2·1
Toronto .....	85·7	15	27·6	30	59·1	41·7	43·1	76	102·0	21·5	1·45	9	5·7
New Brunswick, } Fredericton .....	72·8	5	19·8	31	57·8	32·6	31·3	57	...	...	·62	3	3·4
Manitoba, Winnipeg }	84·8	2	14·8	9	55·2	34·0	...	...	...	...	1·33	11	6·0
British Columbia, } Esquimalt.....	65·0	5	33·5	14	55·2	42·3	46·0	94	...	...	1·26	15	6·4

a—Various.

## REMARKS.

MALTA.—Adopted mean temp. 66°·7, or 2°·7 below the average. Mean hourly velocity of wind 10·8 miles. Mean temp. of sea 67°·0, or 2°·5 below the average. TSS on 3rd and 6th; L on 9 days; H on 6th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·3 below, of dew point 0°·2 above, and rainfall ·22 in. below, their respective averages. Mean hourly velocity of wind 10·6 miles, or 0·6 below average; extremes, 28·2 on 1st and 1·7 on 16th. Prevailing direction E. by S. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 82°·2 or 2°·2 above, of dew point 73°·6 or 0°·7 above, and rainfall 4·71 in. or 10·01 in. below, their respective averages. Mean hourly velocity of wind 8·4 miles; prevailing directions W. and W.S.W. TSS on 4 days; L on 2 days. H. O. BARNARD.

Adelaide.—Mean temp. 1°·6 below, and rainfall 1·31 in. below, the average for 40 years. C. TODD, F.R.S.

Sydney.—Temp. 0°·2 above, humidity 8·9 below, and rainfall 1·46 in. below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Showery weather, except in the middle, when it was fine, but with strong N.W. wind. Prevailing wind N.W., frequently stormy. T on 27th and 28th; H on 27th. Rainfall 1·14 in. above, and mean temp. 0°·1 below, the average. Earthquakes on 14th and 18th. R. B. GORE.

Auckland.—Cold, showery and unsettled throughout. Mean temp. much below, and rainfall slightly below, the average of 30 years. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 1·4 miles. Rainfall three times the average. Island rainfall more than twice the average. Very heavy "seasons," making the fall the third highest monthly fall in 27 years. The drought of the first few months of 1897 is now counterbalanced, and the total for the year is over the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 2·20 in. above the 30 years' average

J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,  
MARCH, 1898.

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.
I.	Uxbridge (Harefield Pk.)	·85	XI.	Builth, Abergwesyn Vic.	2·85
II.	Dorking, Abinger Hall	1·65	„	Rhayader, Nantgwilt	2·47
„	Birchington, Thor	1·95	„	Lake Vyrnwy	1·71
„	Hailsham	1·57	„	Corwen, Rhug	1·35
„	Ryde, Thornbrough	·48	„	Criccieth, Talarvor	1·24
„	Emsworth, Redlands	·81	„	I. of Man, Douglas	1·97
„	Alton, Ashdell	·89	XII.	Stoneykirk, Ardwell Ho.	1·16
III.	Oxford, Magdalen Col.	·74	„	Glasgow, Queen's Park	2·06
„	Banbury, Bloxham	·50	„	Moniaive, Maxwelton Ho.	1·18
„	Northampton, Sedgbrook	1·12	„	Lilliesleaf, Riddell	1·23
„	Duddington [Stamford]	1·38	XIII.	N. Esk Res. [Penicuik]	2·40
„	Alconbury	1·15	XIV.	Glasgow, Queen's Park	1·65
„	Wisbech, Bank House	1·43	XV.	Inverary, Newtown	4·44
IV.	Southend	2·09	„	Oban, The Corran	...
„	Harlow, Sheering	1·51	„	Islay, Gruinart School	1·35
„	Colchester, Lexden	1·48	XVI.	Dollar	1·84
„	Rendlesham Hall	2·02	„	Balquhiddier, Stronvar	3·25
„	Rushall Vicarage	2·07	„	Ballinluig	...
„	Swaffham	1·92	„	Dalnaspidal H.R.S.	3·44
V.	Salisbury, Alderbury	·69	XVII.	Keith H.R.S.	3·16
„	Bishop's Cannings	·81	„	Forres H.R.S.	2·17
„	Blandford, Whatcombe	1·12	XVIII.	Fearn, Lower Pitkerrie	1·44
„	Ashburton, Holne Vic.	2·60	„	N. Uist, Loch Maddy	...
„	Okehampton, Oaklands	2·37	„	Invergarry	3·82
„	Hartland Abbey	1·22	„	Aviemore H.R.S.	2·05
„	Lynton, Glenthorne	1·48	„	Loch Ness, Drumnadrochit	2·53
„	Probus, Lamellyn	1·79	XIX.	Invershin	3 14
„	Wellington, The Avenue	1·00	„	Durness	6·75
„	North Cadbury Rectory	1·10	„	Watten H.R.S.	2·35
VI.	Clifton, Pembroke Road	·95	XX.	Dunmanway, Coolkelure	1·75
„	Ross, The Graig	·60	„	Cork, Wellesley Terrace	·56
„	Wem, Clive Vicarage	·65	„	Killarney, Woodlawn	1·44
„	Wolverhampton, Tettenhall	·87	„	Caher, Duneske	·85
„	Cheadle, The Heath Ho.	1·19	„	Ballingarry, Hazelfort	·86
„	Coventry, Priory Row	·97	„	Limerick, Kilcornan	...
VII.	Grantham, Stainby	1·18	„	Broadford, Hurdlestown	·80
„	Horncastle, Bucknall	1·47	„	Miltown Malbay	1·75
„	Worksop, Hodsck Priory	1·49	XXI.	Gorey, Courtown House	1·10
VIII.	Neston, Hinderton	·59	„	Athlone, Twyford	1·26
„	Southport, Hesketh Park	·91	„	Mullingar, Belvedere	·91
„	Chatburn, Middlewood	2·56	„	Longford, Currygrane	·45
IX.	Melmerby, Baldersby	1·35	XXII.	Woodlawn	1·33
„	Scarborough, Observat'y	1·51	„	Crossmolina, Enniscoe	2·60
„	Middleton, Mickleton	1·19	„	Collooney, Markree Obs.	2·34
X.	Haltwhistle, Unthank	1·51	„	Ballinamore, Lawderdale	...
„	Bamburgh	1·21	XXIII.	Warrenpoint	1·13
„	Duddon Valley, Ulpha School	2·74	„	Seaford	·96
„	Keswick, The Bank	1·68	„	Belfast, Springfield	1·68
„	Llanfrehfa Grange	1·11	„	Bushmills, Dundarave	1·52
XI.	Llandovery	2·30	„	Stewartstown	1·04
„	Castle Malgwyn	1·54	„	Killybegs	3·08
„	Brecknock, The Barracks	·55	„	Horn Head	2·22

## MARCH, 1898.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which "01 or more fell.	TEMPERATURE.						No. of Nights below 32°.							
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours		Dpth		Max.		Min.		In shade.	On grass.								
				in.	Date			Deg.	Date	Deg.	Date.										
I.	London (Camden Square) ...	1.46	— .15	.32	3	10	59.1	18	25.1	13	11	24									
II.	Tenterden .....	2.31	...	.75	24	14	63.5	18	26.5	6, 13	11	23									
	Hartley Wintney .....	1.04	...	.37	26	14	62.0	18	16.0	21	26	27									
III.	Hitchin .....	1.27	— .07	.40	26	14	56.0	18	24.0	6, 7	22	...									
	Winslow (Addington) .....	1.09	— .63	.30	26	16	59.0	18	22.0	21	18	24									
IV.	Bury St. Edmunds (Westley) ..	2.11	+ .56	.52	26	13	58.0	19	20.0	7	21	...									
	Norwich (Brundall) .....	2.18	...	.70	26	16	63.4	18	22.8	6	14	26									
V.	Winterbourne Steepleton ...	1.63	...	.42	6	16	55.8	18	25.1	21	18	25									
"	Torquay (Cary Green) ...	1.87	...	.80	6	12	56.1	16	29.6	25	5	22									
	Polapit Tamar [Launceston]..	1.20	— 1.33	.26	5	13	54.7	19	24.3	12	17	21									
VI.	Stroud (Upfield) .....	.62	— 1.57	.16	19	12	55.0	18	26.0	9	20	...									
"	Churchstretton (Woolstaston) ..	.68	— 1.45	.17	1	17	57.5	17	25.0	25	21	26									
"	Worcester (Diglis Lock) .....	.37	— 1.41	.19	19	9	...	...	...	...	...	...									
VII.	Leicester (Rotherby Hall) ...	.93	...	.30	26	16	58.0	19	19.0	10	20	26									
"	Boston .....	1.37	— .17	.50	26	14	60.0	18	22.0	9	19	...									
	Hesley Hall [Tickhill] .....	.95	— .95	.25	26	12	60.0	18	21.0	6	19	...									
VIII.	Manchester (Plymouth Grove) ..	1.26	— .96	.30	17	12	55.0	17	24.0	8	15	17									
IX.	Wetherby (Ribston Hall) ...	1.04	— 1.02	.20	23	8	...	...	...	...	...	...									
"	Skipton (Arncliffe) .....	4.35	— .75	.95	15	15	...	...	...	...	...	...									
"	Hull (Pearson Park) .....	1.34	— .71	.31	26	16	58.0	18	25.0	7	18	22									
X.	Newcastle (Town Moor) .....	1.40	— 1.23	.46	26	10	...	...	...	...	...	...									
"	Borrowdale (Seathwaite) .....	6.47	— 4.03	1.91	15	17	...	...	...	...	...	...									
XI.	Cardiff (Ely) .....	1.55	— 1.43	.60	6	14	...	...	...	...	...	...									
"	Haverfordwest .....	1.24	— 2.00	.25	28	14	53.5	17	25.5	30	15	26									
"	Aberystwith (Gogerddan) ...	1.51	— 1.47	.27	6	11	53.0	31	...	...	...	...									
	Llandudno .....	1.05	— 1.03	.42	18	12	56.0	17	29.5	8	3	...									
XII.	Cargen [Dumfries] .....	1.04	— 2.26	.24	15	10	55.2	18	22.6	8	14	...									
XIII.	Edinburgh (Blacket Place) ...	1.22	...	.50	27	15	56.0	11	27.0	8	10	19									
XIV.	Colmonell .....	1.40	...	.22	13	12	58.0	24	27.0	8	...	...									
XV.	Tighnabruach .....	3.19	...	.47	19	18	...	...	...	...	10	...									
"	Mull (Quinish) .....	3.28	— .56	.41	5	21	...	...	...	...	...	...									
XVI.	Loch Leven Sluices .....	1.40	— 1.57	.20	19a	10	...	...	...	...	...	...									
	Dundee (Eastern Necropolis) ..	.45	— 1.95	.15	27	14	61.0	17	24.1	8	16	...									
XVII.	Braemar .....	1.67	— .97	.34	1	19	53.7	18	8.5	8	23	29									
"	Aberdeen (Cranford) ...	2.27	...	.38	2	18	61.0	17	25.0	7	17	...									
"	Cawdor (Budgate) .....	2.38	+ .34	.57	28	21	...	...	...	...	...	...									
XVIII.	Strathconan [Beaully] .....	4.97	+ .65	.62	12	15	...	...	...	...	...	...									
"	Glencarron Lodge .....	10.45	...	2.02	16	25	48.9	18	20.9	8	15	...									
XIX.	Dunrobin .....	...	...	...	...	...	...	...	...	...	...	...									
	S. Ronaldshay (Roseberry) ...	4.56	+ 2.02	1.18	17	24	50.0	11b	27.0	4	13	...									
XX.	Darrynane Abbey .....	1.51	...	.52	5	13	...	...	...	...	...	...									
"	Waterford (Brook Lodge) ...	.42	— 2.48	.16	18	7	60.0	17	24.0	22	14	...									
	O'Briensbridge (Ross) .....	1.04	...	.41	18	8	...	...	...	...	...	...									
XXI.	Carlow (Browne's Hill) .....	1.17	— 1.20	.24	18	14	...	...	...	...	...	...									
	Dublin (Fitz William Square) ..	1.04	— .97	.23	27	16	59.3	18	30.8	5	5	16									
XXII.	Ballinasloe .....	...	...	...	...	...	...	...	...	...	...	...									
	Clifden (Kylemore) .....	2.90	...	.57	18	16	...	...	...	...	...	...									
XXIII.	Waringstown .....	.99	— 1.36	.18	18	11	58.0	16	22.0	7	18	23									
"	Londonderry (Creggan Res.) ..	2.26	— .47	.39	1	26	...	...	...	...	...	...									
"	Omagh (Edenfel) .....	1.64	— .87	.27	18	15	54.0	17c	25.0	7	12	22									

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

a—and 28, 29, 30.

b—and 17.

c—and 18, 23.

# METEOROLOGICAL NOTES ON MARCH, 1898.

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.

HARTLEY WINTNEY.—A seasonable month. Ushered in by storms from the N.E., a spell of remarkably fine weather followed, from 13th to 23rd. The most wintry period of the year occurred from 24th to 27th. Rainfall '68 in. below the average. Ozone registered on 26 days.

ADDINGTON.—E was measured on a good many days, but in small quantities. The temp. fell to 22° on 21st and to 25° on 10th, 22nd and 23rd. Strong gales blew on 24th, 25th and 26th, with showers of snow, which formed great wreaths by the side of hedges.

BURY ST. EDMUNDS, WESTLEY.—The most winterly month of the year. 8 storms set in on 23rd and continued for 5 days, with much drifting. The snow-plough was used on the roads on 25th.

NORWICH, BRUNDALL.—A colder March than in any year since 1892. Very dry till 22nd, followed by a gale from N.E., almost continuous for nearly 72 hours, with heavy S, sleet and driving R. H on 1st and 7th; S on 7 days; L on 2nd.

WINTERBOURNE STEEPLETON.—With the exception of '64 in. of R which fell on the 5th and 6th, and '43 in. which fell in nearly the last 24 hours of the month, there was only '56 in. spread over the remainder. The temp. was low, the daily mean being only 39°·5, or 4°·0 below the average of 5 years, whereas in January and February it was respectively 44°·1 and 41°·0. The weather was stormy, with very cold wind both at the beginning and end of the month. The relative humidity was low, the mean percentage at 9 a.m. being only 81.

TORQUAY, CARY GREEN.—Rainfall '71 in. below the average of 22 years. Mean temp. 1°·9 below the average. Duration of sunshine 132 hours 40 mins., being 11 hours 45 mins. below the average; four sunless days.

POLAPIT TAMAR.—A cold and dry month; stormy at the beginning and towards the end, and practically the only real approach to winter weather for the season. H on 3 days; S on 4 days; fog on 23rd.

STROUD, UPFIELD.—S showers on 24th and 25th; N.E. gales on 25th and 26th.

WOOLSTASTON.—A cold and very dry month. S fell lightly on 3rd and 5th, and there were only 5 nights without sharp frost on the ground. A bitterly cold gale, with violent scuds of S, raged from 24th to 26th. Mean temp. 39°·0.

BOSTON.—With the exception of September, the monthly rainfall since August has been much below the average, the total for the seven months being 4'90 in. below the average of 40 years. The reservoir of the Boston Water Works at Miningsby at the end of March was deficient of its full supply 11½ inches. This has never happened previously since the reservoir was constructed about 50 years ago.

## WALES.

HAVERFORDWEST.—March commenced with a fresh gale from N.W., the air cold and bleak. Sharp frosts commenced on 3rd, and continued more or less severe up to 15th. After this, broken weather with cold R to the 19th; followed by severe frost with bitter wind to the end of the month. S covered the Precelly range from 6th to 8th. An exceptionally stormy period set in on 24th, very strong gales from the N.E., doing considerable damage; in Fishguard Bay five vessels were wrecked, but the crews were all saved. This storm lasted with unabated violence until 26th. Another heavy S storm covered the Precelly range on 29th. The coldest March since 1891. Vegetation received a

salutary check. The min. on grass fell below  $20^{\circ}$  on 15 nights, and on 8 of them to between  $10^{\circ}\cdot 5$  and  $15^{\circ}\cdot 0$ .

ABERYSTWITH, GOGERDDAN.—Strong gale, with S and sleet from N.E., from 24th to 27th.

### SCOTLAND.

CARGEN [DUMFRIES].—Except for an interval of mild weather from 17th to 19th, when the mean temp. was  $49^{\circ}\cdot 4$ , the month was exceptionally cold; the mean temp. having been lower in March only 13 times since 1860. A sharp "nip" occurred during the last 8 days, when the mean was only  $37^{\circ}\cdot 4$ . A stiff breeze blew from E. or N.E. during the whole of this period, and more bitter weather has seldom been felt in this district. The lowest temp. of the winter was  $22^{\circ}\cdot 6$  on 8th, and the mean minimum temp.,  $32^{\circ}\cdot 6$ , is without parallel in March. The rainfall is the lowest recorded in 39 years, with the exception of 1869 and 1892, when  $\cdot 86$  in. and  $1\cdot 03$  in. were registered respectively. The rainfall for the first quarter of the year is  $1\cdot 65$  in. below the average. There were 26 hours of sunshine more than the average. E. and N.E. winds prevailed on 22 days, a gale from N.E. occurring on 24th. One of the most beautiful auroræ ever seen in the district was visible on the night of 15th. The low temp. and cold winds caused a very decided check to vegetation, and the promise of an early spring has been far from realized.

EDINBURGH, BLACKET PLACE.—Mean temp.  $0^{\circ}\cdot 6$  above, and rainfall  $\cdot 76$  in. below, the mean. S on 7 days; H on 2 days; fog on 7th; brilliant aurora on 15th; N.E. gale on 24th.

COLMONELL.—R  $2\cdot 06$  in. below, and temp.  $1^{\circ}\cdot 2$  above, the average of 22 years. S on 3 days; T and L on 1st.

TIGHNABRUACH.—A model spring month. Compared with March, 1897, the rainfall is  $2\cdot 92$  in. less; the mean max. temp.  $0^{\circ}\cdot 9$  and the mean min.  $1^{\circ}\cdot 8$  lower. On 20th began the N. and N.E. winds, drying the soil for sowing time.

ABERDEEN, CRANFORD.—A very cold month, with high winds.

S. RONALDSHAY, ROEBERRY.—A very wet, cold month; mean temp.  $38^{\circ}\cdot 5$ , or  $1^{\circ}\cdot 1$  below the average of 8 years.

### IRELAND.

DARRYNANE ABBEY.—A very dry month; no R after 18th, being 13 days; so many without any rain have not occurred since the beginning of October, 1894. The last part very cold, with frost at night.

WATERFORD, BROOK LODGE.—Much easterly wind during the month. Rainfall very small. S on 5th, 25th and 26th; H on 4th.

DUBLIN, FITZWILLIAM SQUARE.—March proved the coldest month of the winter. A warm spell occurred from 15th to 19th, but from 23rd very cold weather held to the end of the month. Mean temp.  $42^{\circ}\cdot 7$ , or  $0^{\circ}\cdot 4$  below the average. Fog on 5 days; N.E. gale on 24th and 25th; S or sleet on 9 days, and H on 8 days. Solar halo on 22nd; lunar halos on 1st and 3rd; brilliant aurora on the evening of 15th.

WARINGTOWN.—A dry month. Very cold N. and N.E. winds in the last fortnight.

OMAGH, EDENFEL.—The weather of March justified its well-known character; the mean temp. was somewhat, and the rainfall considerably, below average. Polar winds blew on 18 days, and in the earlier part of the month were accompanied by S, sleet and R; but the fierce N.E. gales of the last 10 days, which were accompanied by S blizzards in England and Scotland, were here both moderate and dry and generally clear, resulting in the most favourable seed-time for many years. The mean temp. of the month was  $3^{\circ}\cdot 3$  lower than that of January.

# S Y M O N S'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

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### THE CLIMATE OF ALGERIA.

WE regret that Dr. Thevenet's interesting work\* on the climate of France's most important colony has not earlier received that notice which its importance merits.

In the early volumes of the *Met. Mag.* (V. and VI.) we dealt very fully with the rainfall of Algeria, basing our remarks almost entirely upon Prof. Raulin's works, in which he dealt with the records of the fall of rain from 1838 to 1867. We must revert to this matter after giving a general notice of the work now before us, which deals almost exclusively with observations made in and subsequently to 1875, the date at which the meteorological service of the country was re-organized.

Although the work is beautifully printed and liberally illustrated, Dr. Thevenet has not given a map showing the position of his stations. It is strange how frequently the directors of large systems omit this ; probably the facts are so indelibly imprinted upon their own minds that they do not realize, that even with a list of latitudes and longitudes, it gives strangers much trouble to prepare such a map for themselves, and that if once done in their own office (where it would be quite easy to do) it would save all their readers much trouble, or it would induce them to study the work instead of putting it aside until they "had time to find where all the places are."

*Temperature.*—The subject first dealt with is temperature ; and preceding any figures are several very interesting and clearly expressed paragraphs dealing with the physical geography of the country, and with the conditions of temperature produced by solar heat falling on deep sea, on sandy districts like the Sahara, and on various other surfaces. Then come the tables, and here we find a surprise ; Dr. Thevenet gives elaborate tables of monthly mean maxima, seasonal maxima, and extreme maxima, and corresponding details respecting the minima ; but all through the volume we cannot find the mean annual temperature at a single station. We do not

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\* *Essaie de Climatologie Algérienne*, par Dr. A. Thevenet, Directeur du Service Météorologique Algérien. Giralt, Alger, Mustapha. 1896, 4to, 120pp. and 44 plates.

see why on pages 15-16 and 19-21 the values for the year were not given, because then it would have been comparatively easy to have got out the means. We hold that in a book like this the author should work out the results completely, and not leave his readers to do so. There is another point upon which no information is given. From pages 3 to 7 it is evident that the period of observation is not identical at all stations, and with so large a number as 61 stations, covering in some cases 20 years (even at 10 years this would give more than 7,000 months), some records must be imperfect, but there is nothing to show how the missing values have been supplied.

The absolute maximum appears to have been  $122^{\circ}$  F. in the shade at Orléansville, Lon.  $1^{\circ} 19' E.$ , Lat.  $36^{\circ} 40' N.$ , altitude 387 ft.

The absolute minimum is stated as  $6^{\circ} 8' F.$  at El-Aricha, Lon.  $1^{\circ} 23' W.$ , Lat.  $34^{\circ} 16' N.$ , altitude 4,364 ft. Ten or fifteen degrees F. below freezing point is not unusual on the mountains, and sharp frost is not infrequent on the Sahara, but on the Mediterranean coast frost is rare, and at Cap Caxine, a few miles from Algiers, no frost has ever been recorded.

*Humidity.*—For humidity, as for temperature, no yearly means are given, but the air seems less extremely dry than we imagined; monthly means below 40 per cent. are very rare, except on the high plateaux and on the Sahara. There are, however, some startling figures for the Military Hospital at Ain Sefra (Lon.  $0^{\circ} 36' W.$ , Lat.  $32^{\circ} 50' N.$ , altitude 3,560 ft.) where the means for July and August are given as 13·8 and 12·2 per cent.

*Evaporation.*—As there are here also no yearly totals and the results, except at the Central Office, are from Piche's tubes, we do not quote them; but we may add that, as far as we can make out, the results at Algiers are:—

Piche.		Water Vessel in Shade.		Water Vessel in Sun.
40 inches	... ..	53 inches	.....	77 inches.

*Rainfall.*—This section is very interesting and amply illustrated by coloured maps, and we have no reason whatever to doubt the accuracy of a single statement, and yet we are not content. The author's mode of dealing with the subject affords pleasant reading, and the plates in this work bring all the facts clearly before the reader's mind. Yet the diametrically opposite mode of treatment adopted by Prof. Raulin has great merits. Prof. Raulin tells all he can respecting the rain gauges used, the positions in which they were placed, and he gives every individual monthly and annual total; so that one can see directly upon what data every mean value is based, and has ample data for studying secular variation. Nothing of the kind can be got out of the present work, except for the single city of Algiers, for which a monthly record is given from 1838 to 1895, composed of four different sets of observations; but as the overlapping portions of the records are not given, and there is no information respecting the position of any of the gauges, we cannot

tell from this book, whether the undernoted differences are due to secular change or to variety in position. The means are :—

		Inches.	Mm.
M. Don, ingénieur des dessèchements.....	1838-47	36·98	939·3
Môle de la Marine et Ponts-et-Chaussées ...	1848-70	28·39	721·1
Hôpital militaire du Dey .....	1871-83	28·74	729·9
Hôtel-de-Ville d'Alger .....	1884-95	29·39	746·5
Mean of the whole series .....		30·16	766·0*

Here we have the last 48 years in three localities agreeing very closely and giving 28·74 inches, and the 10 previous years giving 8 inches, or 29 per cent. more.

The wide divergence of the different records is easily seen by referring to Prof. Raulin's *Observations Pluriométriques faites dans l'Algérie*, Bordeaux, 1876, page 26 *et seq.*; where it will be found that during the six years 1865-70, the Mole, Arsenal, Hospital and Observatory records were all being kept simultaneously, and that the differences between them often amounted to *ten inches*! Our impression is that the true rainfall at, or near, the ground-level is 36 inches, because (1) That was about the mean at the Observatory for 1865-70; (2) It is near that given by the series 1838-47; (3) It is supported by the series for 1855-66 (35 inches) given in *Met. Mag.*, Vol. V., page 50; (4) Several of the gauges giving small totals were very high above the ground, that at the Mole was 12 ft. and those at the Arsenal and Hospital were 20 ft. above the ground; of course they recorded less.

We have been comparing the values given in the present work with those in M. Angot's Memoir in the *Annales Bureau Central Météorologique de France*, 1881, and although M. Angot does explain how he completed imperfect records, we find in it the same absence of original data as in the work now before us. In fact Dr. Thevenet's Memoir of 1896 much resembles M. Angot's of 1883. Dr. Thevenet, however, gives some very effective diagrams of monthly rainfall, which show clearly the wetness of the Algerian winter on the coast and the very small amount at the stations in the interior. At one station, El-Goléa, 1,257 ft. above sea, the average total yearly fall is only two inches and three-quarters (2·82 in.).

In subsequent sections and chapters Dr. Thevenet deals with Hail (very interesting, but we are not sure that regelation plays so prominent a part in its formation as the author seems to attribute to it), Snow, Wind, Barometric Pressure and Weather Forecasting; but our notice is already long, and we must conclude. In doing so, we are glad to say that this book is much more readable than the majority of such works; the author frequently runs off into little disquisitions—semi-physical, semi-meteorological—which, even if one cannot in every case adopt his views, are nevertheless well worth reading, and suggestive. There is, as we have said, no map of the stations, but in all other respects the book is well illustrated.

\* Printed as 766·7, which is the sum of the mean monthly values.

# RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858-97.

## APRIL.

ELEMENTS.	MONTHLY MEANS OR TOTALS.							ABSOLUTE READINGS.							
	MEANS 9 A.M. AND 9 P.M.							EXTREMES AT 9 A.M. AND 9 P.M.							
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	Mean.	Highest Month.		Lowest Month.		Highest.	Lowest.	Mean of all Highest Lowest.	Mean of all Highest Lowest.			
					Value.	Date.	Value.	Date.					Value.	Date.	Value.
Barometer ..... (cor. & red.)	1 29.931	2 30.180 1893	3 29.658 1859	4 9 a.m. 9 p.m.	5 29.932 29.931	6 30.184 30.182	7 1893 1861	8 29.664 29.652	9 1859 1859	10 30.722 30.677	11 17th, 16th,	12 28.911 28.885	13 19th, 14th,	14 30.375 30.359	15 29.381 29.371
{ Dry Bulb..... Temp.	47.3	51.6 1865	43.2 1860	9 a.m. 9 p.m.	48.5 46.1	53.5 50.0	1865 1869	44.2 41.0	87.88 1860	68.0 63.2	20th, 11th,	33.5 31.5	1st, 11th,	58.9 56.3	38.8 36.8
	58.1	..	..	..	..	67.7	1865	52.4	1888	81.4	27th,	40.0	27th,	70.7	46.2
{ Min. Wet Bulb..... }	39.7	..	..	..	..	43.2	1867	35.3	1860	54.8	18th,	24.5	1st,	49.1	29.8
	44.2	48.1 1865	40.4 1860	9 a.m. 9 p.m.	44.9 43.4	49.3 47.0	1865 1869	40.8 38.8	1887 1860	60.0 57.5	20th, 12th,	31.4 29.8	1st, 12th,	53.5 52.4	36.2 34.5
Solar Rad., black ...	95.5	..	..	..	..	106.0	1870	87.6	1884	122.0	12th,	49.8	8th,	114.8	60.9
Solar Rad., bright..	67.2	..	..	..	..	76.1	1893	61.6	1879	88.4	25th,	45.0	3rd,	80.5	50.9
Grass Minimum ...	35.4	..	..	..	..	39.4	1867	30.2	1892	51.0	28th,	19.4	16th,	46.4	24.5
Soil, 1 foot .....	45.9	..	..	..	..	49.5	1874	42.2	1888	56.2	28th,	37.4	13th,	50.0	42.0
{ Cloud .....	5.8	7.1 1877	3.1 1893	9 a.m. 9 p.m.	6.2 5.3	8.0 7.1	1877 1869	3.4 2.7	1893	10 10	Every year Every year	0 0	Various Various	10.0 10.0	0.4 0.0
	1.66	4.97 1878	.24 1893	9 a.m. 9 p.m.	.81 .85	3.01 1.96	1878 1878	.10 .02	1863 1893	2.48 .79	11th, 25th,	.00 .00	Every year Every year	.33 .32	.00 .00

Max. Rainfall in 24 hours, 2.56 in., 10th, 1878.      Mean max. daily fall, .51 in.

# THE DRY WINTER.

WE have received so many notes upon the above subject, that we find it difficult to classify them. We have selected three for publication *in extenso* at the end of this note; partly because of their completeness, and partly because by their distance (Woburn is about 80 miles N. of Worthing) they show the wide area over which the want of water exists. Other notes we must take in abstract.

*Romney Marsh.*—We were told that the ditches in this district which usually, even in summer, are so full of water as to form fences for the sheep, were dry, and the sheep were crossing them. The rector of Old Romney (the Rev. W. Anderson) was kind enough to write as follows:—"There is no doubt that our dykes and ditches are unusually dry, for this period of the year, and in a few cases the graziers have surrounded their pastures with netting. But the sheep are not running from field to field so universally as your quotation seems to imply. . . . I hear serious apprehensions as to what great trouble there will be in the summer time if the exceptional drought continues." In another letter, he said that one of the principal farmers told him that he did not remember such dryness in March, but his father had often spoken of a great drought in March, 1835.

*Tenterden.*—The rainfall at this station for the five months September to February, both inclusive, was 6·42 in. instead of 14·07 in., or considerably under half the average. The observer (Mr. Mace) says that his well had (on March 24th) been empty for six weeks, although he had never before known it so for more than one day. Mrs. Mace, who has lived in the house for 55 years, recollects no previous instance; but had heard of one in the summer of 1835. The effect on wells is not uniform, some having water, while others near them have been dry for a long time.

*Hitchin.*—The dry period may be said to have begun with July, 1897, the following being the average, and the actual, fall month by month:—

Month	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	Total.
Average	2·67	2·33	2·17	2·71	2·29	1·84	2·02	1·47	1·46	1·63	20·59
1897-98	·80	2·07	1·90	·62	1·15	2·32	·54	1·11	1·27	1·30	13·08
Deficiency	1·87	·26	·27	2·09	1·14	+ ·48	1·48	·36	·19	·33	7·51

We can see no other period of ten months equally dry back as far as the record extends, viz., to 1850; but there is a drier *seven* months, viz.:—

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.
1879-80 .....	·61	·75	·51	·26	2·08	·86	1·50

but that succeeded a very wet time, and was followed by a dry May (·88 in.).

*To the Editor of the Meteorological Magazine.*

SIR,—I see by the *Met. Mag.* that you intend to make some mention next month of the dry time we have lately passed through. The enclosed will, I think, be worth publishing.

The dry time began on the 18th March, 1897, and continued to 22nd March, 1898. During this period the rainfall amounted to 16·87 in. This was 7·66 inches, or upwards of 31 per cent. less than the average rainfall of a year. There were 144 rain days. The average amount on each day was ·117 in., and only on 3 days did the fall exceed ·50 in. These small daily quantities, and the very deficient rainfall in October, November, and January, will tell a tale on our underground springs. Indeed, I already hear of short supply.

In the following table I have, for convenience of comparison, taken the complete calendar year April, 1897, to April, 1898. One inch of rain at the end of March, 1898, brings up the total of the year to 17·40 in. This is 7·13 inches, or rather more than 29 per cent., less than usual.

*Rainfall at Aspley Guise, Bedfordshire, from 1st April, 1897, to 31st March, 1898, inclusive, compared with the average rainfall for 25 years—1871 to 1895 :—*

Month.	Average.		1897-98.			
	Month.	From Apr. 1.	Month.	Difference.	From Apr. 1.	Difference.
IV.	1·65	1·65	1·46	— ·19	1·46	— ·19
V.	1·93	3·58	1·34	— ·59	2·80	— ·78
VI.	1·92	5·50	1·72	— ·20	4·52	— ·98
VII.	2·76	8·26	·35	—2·41	4·87	—3·39
VIII.	2·19	10·45	3·24	+1·05	8·11	—2·34
IX.	2·33	12·78	1·90	— ·43	10·01	—2·77
X.	2·62	15·40	·88	—1·74	10·89	—4·51
XI.	2·59	17·99	1·15	—1·44	12·04	—5·95
XII.	1·86	19·85	2·59	+ ·73	14·63	—5·22
I.	1·84	21·69	·66	—1·18	15·29	—6·40
II.	1·50	23·19	·86	— ·64	16·15	—7·04
III.	1·34	24·53	1·25	— ·09	17·40	—7·13

Yours truly,

EDWARD E. DYMOND.

*Oaklands, Aspley Guise, Bletchley, 1st, May, 1898.*

*To the Editor of the Meteorological Magazine.*

SIR.—It may interest you to know how we have fared for rain during the last seven months, since the amount recorded in my gauge is less than for the corresponding period in any previous year since observations commenced here in 1852 :—

	Fall in inches.	Mean Fall, 1852-96.	+ or —	Decess at end of each month. inches.
1897. October ..	0·48	3·89	—3·41	3·41
„ November ..	1·75	3·04	—1·29	4·70
„ December ..	3·35	2·55	+0·80	3·90
1898. January ..	0·81	2·55	—1·74	5·64
„ February ..	1·56	1·80	—0·24	5·88
„ March ..	0·81	1·70	—0·89	6·77
„ April ..	1·02	1·56	—0·54	7·31
Total for 7 months...	9·78	17·09	—7·31	7·31

In the first four months of 1897 there was an excess of rainfall ; but for the last twelve months, *i.e.*, from May 1st, 1897, to April 30th, 1898, there has been a decess ; which has been most marked from October 1st, 1897, until now. In this period only 18·60 in. fell, against a mean amount of 27·95 in. for the forty-five years, 1852-96.

	Fall in inches.	Mean Fall 1852-96.	Decess at end of each month in inches.
1897. May ..	1·03	1·77	0·74
„ June ..	2·40	1·95	0·29
„ July ..	0·33	2·08	2·04
„ August ..	2·76	2·34	1·62
„ September ..	2·30	2·72	2·04
„ October ..	0·48	3·89	5·45
„ November ..	1·75	3·04	6·74
„ December ..	3·35	2·55	5·94
1898. January ..	0·81	2·55	7·68
„ February ..	1·56	1·80	7·92
„ March ..	0·81	1·70	8·81
„ April ..	1·02	1·56	9·35
Total for 12 months ...	18·60	27·95	9·35

In the years 1854, 1855, 1857, 1861, 1892, and 1896, the fall of rain during the first four months of each year was low, and in three of these years it was lower than this year, but in the previous three months there had been a larger amount than in the last quarter of 1897, so that the present year is the driest I can find recorded here ; the amount registered is only two-thirds of the average for the past twelve months.

Last 3 months of	Fall. in.	First 4 months of	Fall. in.	Total Fall for 7 consecutive months. in.
1853.....	9·3	1854.....	3·9	13·2
1854.....	7·5	1855.....	3·0	10·5
1856.....	6·2	1857.....	5·0	11·2
1860.....	8·6	1861.....	5·4	14·0
1891.....	11·89	1892.....	4·08	15·97
1895.....	11·86	1896.....	4·21	16·07
1897.. ..	5·58	1898.....	4·20	9·78

There has been much scarcity of water in the county; shallow wells and springs have given a diminished yield, the ditches and small streams have never been full for some months. The subsoil, however, has remained damp, and the surface has not been dried up by hot weather; hence the meadows and pastures look green, and vegetation has done well through the period.

Yours faithfully,

C. KELLY.

Worthing, May 1st, 1898.

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*To the Editor of the Meteorological Magazine.*

SIR,—I enclose a table showing the mean rainfall of the six winter months, October to March, at five stations in Hertfordshire, for periods of 38 to 48 years, and the rainfall of the three driest winters during the longer period, and indeed for the last 60 years at least. It will be seen that last winter was the driest but one,—that of 1879-80, when the mean rainfall was about an inch and a half less than in the winter of 1897-98. The next driest winter was that of 1890-91, but it had nearly half-an-inch more rain than 1897-98. In the driest winter the fall was less than half the mean. This mean is not quite accurate, being that of varying periods, but it must be very near the true mean.

Yours truly,

JOHN HOPKINSON.

The Grange, St. Albans, May 7th, 1898.

*Rainfall of the six winter months, October to March, in Hertfordshire.*

Station.	Period.	Winter Mean.	The three driest winters.		
			1879-80.	1890-91.	1897-98.
		in.	ins.	ins.	ins.
Royston .....	47 years, 1851-98.....	11·28	5·14	7·19	6·66
Hitchin .....	48 „ 1850-98 .....	12·01	5·07	7·21	7·01
Berkhamsted.....	42 „ 1856-98.....	15·00	6·91	8·36	8·90
Rothamsted .....	45 „ 1853-98.....	13·92	7·03	8·99	8·46
Bayfordbury .....	38 „ 1860-98.....	12·87	5·40	8·34	6·84
(Hertford).					
Mean .....		13·02	5·91	8·02	7·57

(To be continued in our next.)

# THE GLOOMY SUMMERS OF 1860 AND 1879, AND THE 19 YEARS' CYCLE.

*To the Editor of the Meteorological Magazine.*

SIR,—Will you kindly print some memories of an old correspondent, which go to show that a cold, gloomy, rainy summer may be expected for 1898, at least in the midland counties?

The sunless, miserable and dripping summers of 1860 and 1879 must live in the memories of meteorologists as well as in their registers, and that, I think, over the whole of England, though my recollections here given are only of Rutland and the adjoining counties.

I would not argue from only two data that because 19 years from gloomy 1860 brought gloomy 1879, *therefore* another 19 years *must* bring us to a gloomy 1898. But there has been so obvious a parallel between most of the last few years, and those years that preceded them by 19 and 38 years respectively, that ground has been given for watching whether 1898 will not prove like 1879 and 1860.

Thus, before 1860 there came the three brilliant summers of 1856, 1857 and 1858. In my early school-boy days at Uppingham a wet day for a cricket match was a thing unknown, and when in 1860 a long bout of rain in the middle of May was followed by an edict that the cricket ground was *not to be used for some days*, it seemed an outrage on the order of nature. Alas! for some months thereafter we had to be thankfully astonished if we could get a dry wicket at all!

Now, the summers of 1895, 1896 and 1897 have been much like those three glories of 1857, 1858 and 1859; and so also, though not quite so much so, were the summers of 1876, 1877 and 1878; with this further resemblance, that in 1878 and 1897 a very brilliant summer came early to an end, and a wet August spoiled what might have been a good harvest.

Again, 1891 with its frequent floods and constant autumn rains was much like 1872, as 1894 was like 1875. The wet year 1852, with its November floods, which make the earliest of my meteorological memories, comes one year too soon to fit in with the cycle.

Further, the dry and splendid 1893 matched 1874 exactly; the quite unique heat and dryness of 1868 found a fair imitation in 1887; 1884 and 1865 go together as good summers with magnificent autumns, and my father tells me that 1846 may be put with these.

I am writing from memory *only* and away from home, so that probably other parallels could be added to the above, even if much may be said *per contra*. Unhappily, records prior to 1860 are none too many, but you, Mr. Editor, have access to most of them. Can you give us in some future number facts as to the years prior to 1857, whether to confirm or to demolish the theory of a 19 year cycle?

I am, yours truly,

H. A. BOYS,  
of North Cadbury, Somerset.

*Wing Rectory, Rutland, April 26th, 1898.*

## REVIEWS.

*Ueber das Wetterschiessen am südöstlichen Abhange des Bachergebirges nächst Windisch-Feistritz (Steiermark)*, von ALBERT STIGER. Fritz Rasch Cilli, 1898, 8vo, 12 pages, 2 plates.

ON page 141 of the last volume of the *Meteor. Mag.* will be found, under the title of "Experiments to drive away Hail," an account of the experiments made by Herr A. Stiger on the prevention of hail-storms by the discharge of vertical cannon. That note it will be seen had been furnished by the United States Consul.

Herr Stiger has received so many letters and enquiries upon the subject that he has written this little pamphlet by way of reply. He points out that it was the serious yearly losses to his vineyards which forced him to make the experiment, and he gives a map which shows that 33 stations have now been provided with mortars specially constructed for the purpose, there are also engravings of the patterns adopted, and details of cost; but he seems to ignore the meteorological side of the subject, and does not give the date of a single storm or any data whereby the success of the system can be tested.

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*Blue Hill Meteorological Observatory.* A. LAWRENCE ROTCH, Director. *Exploration of the Air by means of Kites.* [Excerpt Annals Harvard Obs., XLII., Part I.] Cambridge, U.S.A., 1897, 4to, 88 pages, 8 plates.

THIS may be regarded as the official record of the kite work of the Blue Hill Observatory up to the spring of 1897. As we have on several occasions called attention to this important work, we need now merely state that in this memoir (which is beautifully illustrated) Mr. Fergusson deals with the mechanical part of the subject, explaining fully the patterns of kite used, and the arrangements for determining the height they reach, and also the various forms of recording barographs, thermographs and hygrographs carried up by them. Mr. Helm Clayton in the third part of the memoir reports upon the results obtained. We are glad to see that care is taken to determine the height of the kite trigonometrically whenever possible.

The graphic representations of the results obtained are very well drawn, but if Americans are going to adopt the metric scale, we think that at least they might give the scale in feet, yards or miles on one side of a plate like No. 5.

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# ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, April the 20th, at the Institution of Civil Engineers; Mr. F. C. Bayard, LL.M., President, in the chair. The following new Fellows were elected :—James Tertius Collins, J.P., Francis A. Darton, Marten Llewelyn Evans, and Thomas Jordan Heighington.

Major H. E. Rawson, R.E., read a paper on “Anticyclonic Systems and their movements.” Cyclones and anticyclones have long been recognised as powerful weather controls, and their movements studied, but up to the present very little has been written in this country upon the progressive movements of the cores of the high-pressure areas, or anticyclones. The author referred to previous investigations by Abercromby, Scott, Loomis, H. C. Russell and Buchan, and then proceeded to give the results of an examination which he had made of all the available synoptic weather charts for the 11 years, 1881 to 1891. After a preliminary study of the subject, the author found that anticyclones were so frequent in certain localities that he grouped them under the names of “Atlantic,” “Greenland,” “Scandinavian,” and so on. During the period just mentioned (1881–91), there were 212 cases in which the centre or core of an anticyclonic system was over the British Isles, and of these 130 were due to the Atlantic system, 41 to the Scandinavian, and 17 to the Greenland; 22 to the Atlantic and Scandinavian systems extending and merging together, and 2 to the same thing occurring in the case of the Atlantic and Greenland systems. It is thus evident that we owe the greatest number of our anticyclones to the Atlantic system. They occur in all months, but more especially in January, June and October, and are least frequent in April and November. When such anticyclones move away from our area the direction is very much influenced by the season of the year. By far the largest number drift off in some direction between north-east, through east to south, and take the more southerly course in December, January and February. Some few between April and July move west or south-west, and still fewer north or north-west.

The Hon. F. A. Rollo Russell described the results of observations which he had made, chiefly at Haslemere, on haze and transparency during 1897. He found that the greatest clearness occurred with winds from the westward, and the least clearness with winds from the eastward. The highest mean visibility was 24 miles with west winds, and the lowest mean visibility was 10·6 miles with north-east winds.

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## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOVEMBER, 1897.

STATIONS.  (Those in <i>italics</i> are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.	
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.		
	Temp.	Date.	Temp.	Date.										
England, London .....	59·1	18	28·0	26	51·0	40·3	43·3	0·100	88	84·1	23·9	1·04	14	7·9
Malta.....	72·1	15	50·2	28	67·0	55·9	52·1	78	138·6	44·5	1·69	11	5·6	
<i>Cape of Good Hope</i> ...	86·1	22	47·1	28	70·7	53·3	52·7	71	...	...	·69	7	5·0	
<i>Mauritius</i> .....	86·6	30	64·1	1	83·3	70·1	65·6	72	134·0	56·3	1·05	9	5·9	
Calcutta.....	84·0	4	60·2	30	80·8	65·4	63·4	72	142·2	52·0	·00	0	2·6	
Bombay .....	90·6	13	69·0	20	87·0	72·0	66·4	66	136·4	57·2	·00	0	0·1	
Ceylon, Colombo .....	92·2	...	72·0	...	89·3	74·3	72·7	78	153·0	67·0	11·66	13	4·1	
<i>Melbourne</i> .....	99·0	19	43·2	9	74·8	52·1	49·8	63	144·0	33·8	·83	8	5·0	
<i>Adelaide</i> .....	106·3	10	44·7	3	82·1	57·1	47·2	46	164·6	36·5	·30	6	3·7	
<i>Sydney</i> .....	...	...	...	...	...	...	...	...	...	...	...	...	...	
<i>Wellington</i> .....	66·3	14	39·0	11	62·9	51·1	47·4	70	130·0	32·0	2·35	12	4·0	
<i>Auckland</i> .....	79·0	28	44·0	11	65·6	52·5	46·0	70	135·0	42·0	1·51	13	5·1	
Jamaica, Kingston .....	90·7	8	68·7	25a	88·3	71·3	69·4	80	...	...	·48	5	3·4	
Trinidad .....	90·0	9,16	68·0	19	86·8	70·8	72·3	83	168·6	68·0	9·39	18	...	
Grenada.....	85·4	7	71·0	24	82·7	73·4	71·7	74	151·0	...	9·01	25	3·7	
Toronto .....	59·3	5	19·6	23	44·0	31·9	33·9	81	74·0	12·0	4·18	16	7·8	
New Brunswick, Fredericton .....	54·8	27	2·7	24	39·8	23·2	24·0	74	...	...	5·97	14	6·8	
Manitoba, Winnipeg .....	58·2	2	—23·6	27	21·3	5·7	...	...	...	...	·72	6	5·3	
British Columbia, Esquimalt .....	55·9	12	27·4	28	46·1	36·4	39·2	94	...	...	7·30	25	8·5	

a and 26.

## REMARKS.

MALTA.—Adopted mean temp. 59°·4, or 2°·8 below average. Mean hourly velocity of wind 9·2 miles, or 0·1 below average. TSS on 20th, 22nd and 26th; L on 21st and 30th; H on 26th and 30th. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·6 above, of dew point 1°·4 above, and rainfall ·80 in. below, their respective averages. Mean hourly velocity of wind 10·3 miles, or 0·5 below average; extremes, 23·6 on 18th and 1·6 on 10th. Prevailing direction E.S.E. to E. by N. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. 81°·4 or 1°·7 above, mean dew point 0°·4 above, and rainfall 1·01 in. below, their respective averages. Mean hourly velocity of wind 7·1 miles; prevailing directions N.W., N. and N.N.E. TSS on 10 days, and L on 1st and 29th. Slight earthquake on 17th. H. O. BARNARD.

Adelaide.—A hot, dry month. The mean temp. being 2°·6 above, and rainfall ·69 in. below, the average of 40 years. C. TODD, F.R.S.

Wellington.—Strong N.W. winds almost throughout; showery in the earlier, and dry in the latter, part of the month. T on 10th; S on hills on 10th; H on 10th and 30th. Mean temp. 0°·5 above, and R 1·82 below, average. Earthquakes on 11th and 15th. Solar halo on 19th. R. B. GORE.

Auckland.—Unusually dry, with a predominance of cold S.W. winds. R less than half the average of 30 years; mean temp. slightly under the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—In Kingston mean hourly velocity of wind 1·4 miles. Rainfall one-fifth of the average. Island rainfall a little below the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 2·53 in. above the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,  
APRIL, 1898.

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.
I.	Uxbridge, Harefield Pk..	1.18	XI.	Builth, Abergwesyn Vic.	4.20
II.	Dorking, Abinger Hall	1.06	„	Rhayader, Nantgwillt...	4.23
„	Birchington, Thor .....	.69	„	Lake Vyrnwy .....	4.33
„	Hailsham .....	1.22	„	Corwen, Rhug .....	2.27
„	Ryde, Thornbrough .....	1.32	„	Criccieth, Talarvor .....	2.75
„	Emsworth, Redlands ...	1.09	„	I. of Man, Douglas .....	1.95
„	Alton, Ashdell .....	1.85	XII.	Stoneykirk, Ardwell Ho.	1.36
III.	Oxford, Magdalen Col..	1.19	„	New Galloway, Glenlee	4.58
„	Banbury, Bloxham .....	1.85	„	Moniaive, Maxwellton Ho.	4.10
„	Northampton, Sedgebrook	1.76	„	Lilliesleaf, Riddell .....	3.29
„	Duddington [Stamford].	1.97	XIII.	N. Esk Res. [Penicuik]	2.55
„	Alconbury .....	1.56	XIV.	Glasgow, Queen's Park..	1.65
„	Wisbech, Bank House...	1.21	XV.	Inverary, Newtown .....	5.55
IV.	Southend .....	1.22	„	Oban, The Corran .....	...
„	Harlow, Sheering .....	1.45	„	Islay, Gruinart School...	1.91
„	Colchester, Lexden .....	1.12	XVI.	Dollar .....	2.59
„	Rendlesham Hall .....	.86	„	Balquhider, Stronvar...	6.97
„	Rushall Vicarage .....	1.32	„	Ballinluig .....	...
„	Swaffham .....	1.14	„	Dalnaspidal H.R.S. ....	5.82
V.	Salisbury, Alderbury ...	1.47	XVII.	Keith H.R.S. ....	3.11
„	Bishop's Cannings .....	1.81	„	Forres H.R.S. ...	1.12
„	Blandford, Whatcombe ..	1.76	XVIII.	Fearn, Lower Pitkerrie..	1.74
„	Ashburton, Holne Vic...	4.05	„	N. Uist, Loch Maddy ...	...
„	Okehampton, Oaklands ..	2.25	„	Invergarry .....	1.88
„	Hartland Abbey .....	1.90	„	Aviemore H.R.S. ....	1.63
„	Lynton, Glenthorne ...	2.08	„	Loch Ness, Drumnadrochit	1.66
„	Probus, Lamellyn .....	2.17	XIX.	Invershin .....	5.26
„	Wellington, The Avenue	1.88	„	Durness .....	3.20
„	North Cadbury Rectory	1.85	„	Watten H.R.S. ....	2.41
VI.	Clifton, Pembroke Road	2.23	XX.	Dunmanway, Coolkelur...	7.78
„	Ross, The Graig .....	1.76	„	Cork, Wellesley Terrace	4.00
„	Wem, Clive Vicarage ...	1.67	„	Killarney, Woodlawn ...	7.16
„	Wolverhampton, Tettenhall	1.24	„	Caher, Duneske .....	3.16
„	Cheadle, The Heath Ho.	2.30	„	Ballingarry, Hazelfort...	3.96
„	Coventry, Priory Row ...	2.31	„	Limerick, Kilcurnan ...	2.42
VII.	Grantham, Stainby .....	1.86	„	Broadford, Hurdlestown	3.15
„	Horncastle, Bucknall ....	2.41	„	Miltown Malbay .....	2.95
„	Worksop, Hodsck Priory	2.50	XXI.	Gorey, Courtown House	4.07
VIII.	Neston, Hinderton .....	1.69	„	Athlone, Twyford .....	3.70
„	Southport, Hesketh Park	1.98	„	Mullingar, Belvedere ...	3.40
„	Chatburn, Middlewood.	2.03	„	Longford, Currygrane...	4.24
IX.	Melmerby, Baldersby ...	2.89	XXII.	Woodlawn .....	3.07
„	Scarborough, Observat'y	2.88	„	Crossmolina, Enniscoe ...	4.70
„	Middleton, Mickleton ...	2.83	„	Collonore, Markree Obs.	3.13
X.	Haltwhistle, Unthank...	3.63	„	Ballinamore, Lawderdale	...
„	Bomburgh .....	3.01	XXIII.	Warrenpoint .....	5.80
„	Duddon Valley, Ulpha School	6.40	„	Seaforde .....	3.20
„	Keswick, The Bank .....	4.55	„	Belfast, Springfield .....	3.70
XI.	Llanfrechfa Grange .....	2.53	„	Bushmills, Dundarave..	3.19
„	Llandovery .....	4.26	„	Stewartstown .....	4.73
„	Castle Malgwyn .....	2.54	„	Killybegs .....	4.21
„	Brecknock, The Barracks	1.56	„	Horn Head .....	2.85

APRIL, 1898.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.						TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		Days on which -01 or more fell.	Max.		Min.				
				Dpth	Date		Deg.	Date	Deg.	Date.			
		inches.	inches.	in.								In shade.	On grass.
I.	London (Camden Square) ...	1·01	— ·73	·21	27	12	66·5	8	28·9	6	3	10	
II.	Tenterden .....	1·22	— ·50	·39	26	11	65·0	8	31·0	5	2	13	
	Hartley Wintney .....	1·57	— ...	·32	11	13	68·0	16	...	...	...	18	
III.	Hitchin .....	1·30	— ·49	·26	27	12	65·0	8	26·0	4	9	...	
	Winslow (Addington) .....	1·82	— ·10	·35	28	11	67·0	8	23·0	5	9	13	
IV.	Bury St. Edmunds (Westley) ..	1·48	— ·18	·31	27	12	63·0	8	29·0	1	...	...	
	Norwich (Brundall) .....	1·22	— ...	·31	26	12	66·0	8	27·4	1	4	11	
V.	Winterbourne Steepleton ...	1·72	— ...	·65	14	15	58·2	26	24·9	6	11	17	
	Torquay (Cary Green) .....	1·27	— ...	·55	28	11	57·6	12	34·0	5	0	6	
	Polapit Tamar [Launceston]..	1·91	— ·31	·66	29	11	62·0	8	24·0	5	5	8	
VI.	Stroud (Upfield) .....	2·24	+ ·09	·46	11	14	62·0	7, 8	33·0	4	0	...	
	ChurchStretton (Woolstaston)	1·86	— ·48	·44	11	13	64·0	8	31·5	5	1	8	
	Worcester (Diglis Lock) .....	1·55	— ·16	·26	29	16	...	...	...	...	...	...	
VII.	Leicester (Rotherby Hall) ...	2·26	— ...	·88	11	14	...	...	...	...	...	...	
	Boston .....	2·24	+ ·53	·60	11	11	68·0	8	25·0	6	4	...	
	Hesley Hall [Tickhill] .....	2·33	+ ·62	·93	11	14	63·0	8	24·0	4	6	...	
VIII.	Manchester (Plymouth Grove) ..	2·09	+ ·38	·70	11	18	67·0	8	32·0	1	1	1	
IX.	Wetherby (Ribston Hall) ..	4·14	+ 2·29	1·82	11	13	...	...	...	...	...	...	
	Skipton (Arnccliffe) .....	6·44	+ 3·01	1·09	6	21	...	...	...	...	...	...	
	Hull (Pearson Park) .....	2·88	+ ·96	·97	11	13	68·0	8	27·0	5	6	11	
X.	Newcastle (Town Moor) .....	2·04	+ ·21	·55	28	11	...	...	...	...	...	...	
	Borrowdale (Seathwaite) .....	11·16	+ 4·02	2·61	9	18	...	...	...	...	...	...	
XI.	Cardiff (Ely) .....	1·51	— ·90	·28	8	11	...	...	...	...	...	...	
	Haverfordwest .....	3·11	+ ·48	·87	13	11	61·8	8	25·8	5	3	21	
	Aberystwith (Gogerddan) ...	2·61	+ ·05	·74	11	11	65·0	8	...	...	...	...	
	Llandudno .....	2·19	+ ·38	·65	11	13	65·0	8	32·5	5	0	...	
	Cargen [Dumfries] .....	4·68	+ 2·45	·76	6	16	59·0	18	23·6	5	2	...	
XIII.	Edinburgh (Blacket Place) ...	1·91	— ...	·57	28	15	61·3	22	28·3	5	1	4	
XIV.	Colmonell .....	3·50	— ...	·89	13	12	67·0	22	31·0	15	...	...	
XV.	Tighnabruaich .....	3·95	— ...	·65	10	17	58·0	25a	29·0	5	2	...	
	Mull (Quinish) .....	4·27	+ 1·29	·74	8	21	...	...	...	...	...	...	
XVI.	Loch Leven Sluices .....	3·70	+ 1·48	1·30	29	12	...	...	...	...	...	...	
	Dundee (Eastern Necropolis) ..	4·40	+ 2·35	·95	28	15	59·0	9	26·8	5	3	...	
XVII.	Braemar .....	4·41	+ 1·99	1·36	13	19	60·6	22	23·2	5	3	16	
	Aberdeen (Cranford) .....	5·51	— ...	1·20	29	21	60·0	10b	27·0	4	3	...	
	Cawdor (Budgate) .....	1·64	+ ·12	·35	15	18	...	...	...	...	...	...	
XVIII.	Strathconan [Beaully] .....	5·05	+ 2·24	·82	30	10	...	...	...	...	...	...	
	Glencarron Lodge .....	5·57	— ...	·90	10	20	65·8	22	28·6	5	1	...	
XIX.	Dunrobin .....	3·04	+ 1·31	·50	29	15	56·5	24	35·0	12	0	...	
	S. Ronaldshay (Roeberry) ...	4·33	+ 2·72	1·04	15	21	57·0	8	32·0	2, 3	2	...	
XX.	Darrynane Abbey .....	6·03	— ...	1·40	22	21	...	...	...	...	...	...	
	Waterford (Brook Lodge) ...	4·94	+ 2·47	·89	29	16	61·0	27	29·0	1	5	...	
	O'Briensbridge (Ross) .....	3·66	— ...	·49	17	19	...	...	...	...	...	...	
XXI.	Carlow (Browne's Hill) .....	4·15	+ 1·87	·77	11c	15	...	...	...	...	...	...	
	Dublin (FitzWilliam Square) ..	2·67	+ ·55	·96	30	16	64·7	7	33·4	5	0	2	
XXII.	Ballinasloe .....	3·16	+ ·82	·71	12	19	...	...	...	...	...	...	
	Clifden (Kylemore) .....	6·50	— ...	1·22	9	15	...	...	...	...	...	...	
XXIII.	Waringstown .....	3·28	+ ·86	·45	30	15	67·0	22	25·0	4	2	10	
	Londonderry (Creggan Res.) ..	3·93	+ 1·69	·74	17	24	...	...	...	...	...	...	
	Omagh (Edenfel) .....	3·70	+ 1·47	·69	17	18	65·0	21	26·0	4	4	6	

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

a—and 26.

b—and 11.

c—and 30.

# METEOROLOGICAL NOTES ON APRIL, 1898.

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.

TENTERDEN.—After the heavy snow-falls of March, dry, cold weather set in again for 4 weeks, broken only by slightly warmer nights and a few showers from 8th to 16th. Only 3 days with temp. above 60°, fewer than in any April since 1891. Warm, showery weather, after a TS on 26th, was very acceptable. Duration of sunshine, 177 hours.

HARTLEY WINTNEY.—The first 10 days were very spring-like, with light, soft and warm S.W. winds. Most of the R fell in the second and last weeks of the month. Keen, harsh N.E. winds prevailed from 19th to 27th. R ·18 in. above the average; mean max. temp. 61°·3, mean min. 30°·2; ozone on 20 days; distant T on 9th.

ADDINGTON.—Frost occurred on grass on a good many mornings, but little damage was done. The weather was favourable for all outdoor operations, and vegetation of all kinds was in a rather advanced state at the end. More than half of the R fell in the last five days. Swallows seen on 9th, cuckoo and nightingale heard on 19th.

BURY ST. EDMUNDS, WESTLEY.—Cold, with several sharp frosts, and only one day with temp. above 60°. Very dry from 13th to 25th, then nice rains and growing weather. Distant T on 10th.

NORWICH, BRUNDALL.—Fine at first, showery about Easter, then 10 days of exceedingly cold E. winds, keeping back vegetation. The month ended with showery weather. Mean temp. 47°·3. R ·45 in. below the average. T and L in evening on 10th; T at 4 p.m. on 16th. Lunar halo on 27th.

WINTERBOURNE STEEPLTON.—The month was dry, with very cold nights. Mean temp. 45°. In the latter half the wind was mostly E. or N.E., and the weather was the reverse of "growing," until R came on the 27th. Fog on 3 days.

TORQUAY, CARY GREEN.—R 1·15 in. below the average. Mean temp. 48°·5, or 0°·4 above the average. Duration of sunshine 192 hours 5 mins., being 13 hours 30 mins. above the average; one sunless day.

POLAPIT TAMAR.—Rather dry on the whole. S.W. gale on 30th. R for the first four months of the year 3·37 in. below the average.

WOOLSTASTON.—A cold and backward month. Mean temp. 47°·8. T with vivid L on 15th; T on 29th; gale on 29th and 30th.

## WALES.

HAVERFORDWEST.—April commenced with keen ground frosts and fine bright days. Very low temp. on grass, 12 readings being below 25°. Much of the R fell during the night, so that the month might be characterised as bright and sunny, with very cold nights. Moderate gales from 8th to 10th; the 11th

disastrously wet. Fine weather from 14th until 29th. R and storms at the end. Vegetation very forward and hay very promising.

ABERYSTWTH, GOGERDDAN.—The weather on the whole was very good, with a few nice growing showers.

### SCOTLAND.

CARGEN [DUMFRIES].—The cold weather at the end of March continued for the first five days of April, when a welcome change occurred, and the mean temp. from 6th to 14th was  $49^{\circ}$ . Light S winds prevailed during this time, and gentle R fell each day, except 12th. The temp. during the rest of the month was rather lower, and E. winds blew from 24th to 30th, marring the prospect of an early spring. R the greatest recorded in April in 38 years, 1871 being the only other year with more than four inches. T for several hours on the 29th. S. winds on 20 days. Sunshine slightly exceeded the average. Although by no means an early spring, the weather was very favourable for vegetation, and farm work is in a forward state.

EDINBURGH, BLACKET PLACE.—Mean temp.  $2^{\circ}7$  above the average, being the seventh consecutive month with a mean above the average of 134 years. R normal, but bright sunshine (94 hours) much below the mean. Distant T at 2.45 p.m. on 10th; solar halo on 19th.

COLMONELL.—R  $1\cdot15$  in., and mean temp.  $4^{\circ}0$ , above the average of 22 years. H on 4th; T, L and H on 11th.

TIGHNABRUAICH.—A good month for the spring season. T on 30th.

MULL, QUINISH.—Mild, wet, and very unsettled. The rainfall has only twice been exceeded since the gauge was established in 1874; namely, in 1880 and 1882. Vegetation very forward.

ABERDEEN, CRANFORD.—Very cold and wet.

S. RONALDSHAY, ROEBERRY.—The wettest April for 31 years. Mean temp.  $44^{\circ}1$ , or  $0^{\circ}3$  above the average of 8 years.

### IRELAND.

DARRYNANE ABBEY.—A wet month; the first half mild and stormy, with a strong gale on 10th.

WATERFORD, BROOK LODGE.—R about double the average. Fog on 4 days; T on 10th and 15th.

O'BRIENSBRIDGE, ROSS.—Rainfall more than the average. Temp. generally low, with squalls and fog. Very little frost. T, L and H, on 14th. Vegetation backward.

DUBLIN, FITZWILLIAM SQUARE.—A mild, genial spring month, very favourable to vegetation. Heavy rains on 11th, 23rd and 30th made up 75 per cent. of the total for the month. A remarkable and sudden increase of temp. occurred between 5th and 6th. Mean temp.  $49^{\circ}7$ , or  $2^{\circ}0$  above the average. Fog on 5 days. High winds on 8 days and gales on 2. H on 10th. Temp. in shade above  $60^{\circ}$  on 6 days. Solar halos on 4 days; lunar halo on 1st.

OMAGH, EDENFEL.—The wettest April for 34 years except 1871, but following on a dry seed-time, and with a mean temp. somewhat above the average, all crops present a favourable appearance. The principal summer migrants arrived about a week earlier than the average.

# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CCCLXXXIX.]

JUNE, 1898.

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## LIGHTNING CONDUCTORS.

*To the Editor of the Meteorological Magazine.*

SIR,—Having recently been appointed one of the Churchwardens of Bradestone Church, I have had the usual string of requisitions from the Archdeacon, amongst which is “Has the Church a lightning conductor?” After replying in the negative, I drew our rector’s notice to the matter, and was surprised to hear from him that architects put forth the theory that *old churches which have never been struck* do not require conductors, as the probability is that they never will be struck. Now this is to me quite a new theory, and I should be glad to hear whether it has ever been brought to your notice. I am aware that some churches which have been struck have been so on *several occasions, e.g.,* Redenhall Church, near Harleston, Norfolk, and I think Oundle, in Northamptonshire. But certainly the reverse theory is news to me.—Yours very truly,

ARTHUR W. PRESTON.

*Bradestone House, Brundall, Norwich, 20th May, 1898.*

[We had never heard the suggestion, but are not prepared to say that it is wrong, and shall be glad to receive any evidence on either side. There is, however, the case of Rouen Cathedral,\* struck in 1110, 1117, 1284, 1351, 1625, 1627, 1642, 1768, 1822, and never since it was provided with a conductor.

We have just seen in the newspapers the following paragraph, which appears unfavourable to the theory.—ED.]

“During a violent thunderstorm at Dartford on the evening of May 31st, a flash of lightning struck the tower of the ancient parish church, and caused serious damage. The flagstaff was shattered, and other portions of the woodwork were thrown upon the roof. The electric current passed down the rain-pipe, which is shattered,† to the ground, where a large hole was made. The damage is estimated at £300. The tower is the oldest part of the church, and was formerly a fortification, which had been built upon some Roman foundations.”

\* *Report of the Lightning Rod Conference*, p. 161.

† Therefore probably there was no conductor.

## THE DRY WINTER IN THE S.E. OF ENGLAND.

*(Continued from page 56).*

INASMUCH as the exceptional drought did not extend to the N.W. of England or to Scotland, we have altered the heading so as to make that fact clear.

*Appledore.*—The water level of a large tract of low-lying land is kept down by powerful pumps at Appledore, under the care of Mr. E. Case, C.E. Mr. Mace sent us a copy of part of a letter which he had received from Mr. Case, viz.: “We certainly never had the water at such a low level in the month of March. No pumping has been required, which is unprecedented, and we merely ran the engine for a few hours on two or three occasions to see that it was in working order.” We enquired how far back the record extended, and Mr. Case replied “The man in charge tells me that to his knowledge there has not been so dry a winter as the past for 30 years. As far as I can ascertain there has always been some pumping required.”

*Chilgrove.*—The facts for this station, as shown by the table on p. 71, are very striking; they are as under:—

	Jan.	Feb.	Mar.	April.	May.	Mean, Jan.-March.
Average 43 years, )						
1853-97 ..... }	194	194	193	181	147	194
1898.....	143	147	145	143	141	145
Deficiency in 1898...	51	47	48	38	6	49

*Only years since 1852 in which lower levels were recorded in any of these months.*

1855.....	130	138	132	135	138	133
1859.....	132	157	157	156	156	149
1885.....	134	173	192	178	183	166
1891.....	139	159	175	171	162	158
1898.....	143	147	145	143	141	145

This shows that, during the first three months of 1898, the water level was lower than in any corresponding period since 1855.

*Tenterden.*—As, unfortunately, the corrections in the proof of the paragraph on page 53 were overlooked, it will be better to re-write it, incorporating such further facts as Mr. Mace has reported to us. Firstly, as regards the rainfall, the true mean by the Snowdon gauge for the period 1880-89 for the five months, October to February, both inclusive, was 14.07 in.; the fall in 1897-98 was 6.36 in., or only 45 per cent. of the mean; Secondly, concerning wells, the following facts have been mentioned by Mr. Mace: On March 21st, “Empty wells becoming more numerous, and rain water also deficient now.” On March 24th, before the snow, “Our well has been almost empty for 57 days, I never knew it so for more than one day before, nor does Mrs. Mace who has lived in the house nearly 55 years. A deep well that was low last autumn has now 50 ft. or 60 ft. of water. The well at Summerhill has also been nearly dry for a long time.” On May 6th, “The Hales Place spring still supplies the household, but in previous years 2,000 gallons a day have run to waste.” Thirdly, as to the ditches and the sheep, we find the following

notes on March 22nd: "On Shirley Moor, between Tenterden and Appledore, I noticed dry ditches, but others, often dry in summer, had water in them. I learned that in Romney Marsh, there was already some running together of sheep, and likely to be more. Where ditches have been made out during recent dry autumns there is generally a little water, but others are in many cases passable. A man told me that he had no difficulty in getting across when coursing. The state of affairs is certainly most abnormal."

### ROYAL METEOROLOGICAL SOCIETY.

THE monthly Meeting of this Society was held on Wednesday afternoon, May the 18th, at the rooms of the Royal Astronomical Society, Burlington House, Mr. F. C. Bayard, LL.M., President, in the chair.

Horatio H. Bentley, and Frederick George Haworth, M.B., C.M., D.P.H., were ballotted for, and duly elected Fellows of the Society.

Mr. R. H. Scott, F.R.S., read a paper on the frequency of rainy days in the British Islands. He had taken the number of rainy days in each month at 40 Stations for the 20 years 1876-95, and then divided that number by the total number of days in the month, and so ascertained the resulting percentage. The greatest excess of frequency is always on the extreme north and west coasts. The highest figures of all being found at Dunrossness (Shetland), and at Stornoway in most months, but especially in the late autumn and winter. In summer the figures for the west of Ireland are higher.

The map for the year exhibits the highest percentage, 70, in the extreme north, while all the Atlantic coasts, from Scilly up to the Pentland Firth, reach 60. Over England and Wales the values are, as a whole, fairly uniform. Leith and Shields come out as dry with 49, while all the South, Midland, and South-eastern stations, except Hastings, exhibit figures below 50. June and September are the two months with the best chance for rainless days, and November is the month with the greatest frequency of rainy days.

Mr. F. J. Brodie read a paper on the abnormal weather of January last, which was one of the most remarkable winter months on record. The month was singularly dry, with an absence of snow or sleet; a somewhat unusual feature in January even for any individual station, but far more remarkable as applying to the country as a whole. The special feature, however, was the striking absence of severe frost, the frequent prevalence of unusually mild weather, and as a result, the abnormal warmth of the month, especially in the more northern parts of the kingdom. The mean temperature was generally over the whole country about  $5^{\circ}$  above the average, while at many places situated in the more northern parts of the kingdom it was more than  $6^{\circ}$  above the average. The atmospheric pressure throughout the month was also very high, the mean being from two to three tenths of an inch above the average.

# RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858-97.

## MAY.

ELEMENTS.	MONTHLY MEANS OR TOTALS.										ABSOLUTE READINGS.					
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	MEANS 9 A.M. AND 9 P.M.						EXTREMES AT 9 A.M. AND 9 P.M.						
				Mean.	Highest Month.		Lowest Month.		Highest.		Lowest.		Mean of all Highest	Mean of all Lowest.		
					Value.	Date.	Value.	Date.	Value.	Date.	Value.	Date.				
Barometer ..... { (cor. & red.)	1 29.978	2 30.236 1896	3 29.784 1878	4 9 a.m. 9 p.m.	5 29.979 29.978	6 30.244 30.228	7 1896 1896	8 29.781 29.787	9 1878 1878	10 30.643 30.650	11 8th, 10th,	12 28.980 29.083	13 1st, 1st,	14 30.380 30.364	15 29.489 29.510	
Temp { Dry Bulb..... { Max. ....	53.3	58.6 1868	49.2 1879	9 a.m. 9 p.m.	55.1 51.6	61.7 55.5	1868 1868	50.5 47.2	1879 1876	78.2 72.4	19th, 30th,	38.7 35.5	10th, 3rd,	67.0 62.6	45.5 41.8	
Temp { Wet Bulb..... { Max. ....	64.7	..	..	..	..	70.4	1868	59.3	1879	87.6	19th,	42.5	1st,	78.1	51.9	
Trade Wind { Wet Bulb..... { Max. ....	44.4	..	..	..	..	49.3	1889	40.5	1876	60.3	31st,	28.4	7th,	54.5	33.8	
Solar Rad., black ...	49.2	54.4 1868	45.6 1879	9 a.m. 9 p.m.	50.1 48.2	56.3 52.6	1868 1889	46.3 44.5	1879 1876	65.1 63.8	18th, 30th,	36.9 33.0	12th, 3rd,	59.6 57.9	41.4 39.2	
Solar Rad., bright..	106.1	..	..	..	..	114.0	1882	94.8	1886	131.5	26th,	58.0	9th,	124.0	71.1	
Grass Minimum ...	75.6	..	..	..	..	81.8	1893	68.7	1879	98.7	30th,	50.6	18th,	90.5	58.2	
Soil, 1 foot .....	40.3	..	..	..	..	46.9	1889	35.7	1876	56.8	30th,	23.1	7th,	51.5	28.8	
Cloud .....	52.3	..	..	..	..	56.6	1893	48.5	1879	60.9	31st,	43.4	5th,	57.3	47.6	
Rainfall .....	5.5	7.2 1869	3.8 1895	9 a.m. 9 p.m.	5.9 5.0	7.7 7.2	1879, 1869	4.2 3.5	1895 1895	10 10	Every year Every year	0 0	Various Various	10.0 10.0	0.3 0.1	
Rainfall .....	1.92	4.79 1886	1.14 1896	9 a.m. 9 p.m.	.96 .96	3.22 2.18	1886 1878	.01 .02	1880 1896.	1.20 1.27	29th, 7th,	.00 .00	Every year Every year	.38 .40	.00 .00	

Max. Rainfall in 24 hours, 1.71 in., 7th, 1878.      Mean max. daily fall, .60 in.

# SUMMER RAINFALL.

*To the Editor of the Meteorological Magazine.*

SIR,—The following account of this may be found interesting. Consider the rainfall of the four months May to August (which we may here call “summer”) at Greenwich, since 1841. Any of these seasons with a rainfall over the average of 56 years (*viz.*, 8·69 in.) we may call “wet,” and any under the average “dry.”

Then, taking as years of maximum sunspots, 1848, 1860, 1870, 1884, and 1894, I find that the following holds good :—

1. *In every group of five consecutive years, having a sunspot maximum year third (or central), there have been more dry summers than wet.*

The data are these :—

	Rain.		Rain.		Rain.
1846	7·50 d.	1858	7·70 d.	1868	5·81 d.
1847	5·52 d.	1859	8·18 d.	1869	6·34 d.
1848	10·13 w.	1860	16·18 w.	1870	4·89 d.
1849	7·35 d.	1861	6·46 d.	1871	7·74 d.
1850	7·82 d.	1862	9·44 w.	1872	9·79 w.
	Rain.		Rain.		Rain.
	1882 7·34 d.		1892 8·50 d.		
	1883 5·76 d.		1893 5·93 d.		
	1884 5·64 d.		1894 9·85 w.		
	1885 5·60 d.		1895 6·19 d.		
	1886 8·30 d.		1896 5·34 d.		

(In these tables d means dry and w wet.)

It will be asked, Does the corresponding and opposite statement for sunspot minima also hold good? The reply is as follows :—

2. *In every group (except one) of five consecutive years having a sunspot minimum year third (or central), there have been more wet summers than dry.*

Taking as sunspot minimum years, 1843, 1856, 1867, 1879, and 1890, the data are these :—

	Rain.		Rain.		Rain.
1841	10·56 w.	1854	8·78 w.	1865	13·06 w.
1842	7·78 d.	1855	9·30 w.	1866	9·62 w.
1843	11·09 w.	1856	8·37 d.	1867	12·56 w.
1844	5·75 d.	1857	6·63 d.	1868	5·81 d.
1845	9·05 w.	1858	7·70 d.	1869	6·34 d.
	Rain.		Rain.		Rain.
	1877 7·42 d.		1888 14·49 w.		
	1878 14·55 w.		1889 9·24 w.		
	1879 16·56 w.		1890 10·92 w.		
	1880 7·55 d.		1891 10·76 w.		
	1881 9·50 w.		1892 8·50 d.		

The second of these groups is exceptional (more dry than wet). If we took 1855 for the central year instead of 1856, we should obtain conformity to the general type (more wet than dry).

Are we to consider these relations fortuitous? If they afford any presumption for future years, they might, I think, be found practically useful in some cases.

Some facts may here be given as to the continuance of a given type of summers (wet or dry). The longest homogeneous series is the *six* dry summers, 1882–87. Next we have *five* wet summers, 1851–55. Then there are two cases of *four* dry summers coming

together (1856-59 and 1868-71), and one of *four* wet summers (1888-91), two cases of *three*, &c. Thus, the persistence is seldom great.—Yours faithfully, ALEX. B. MACDOWALL.

ADDENDUM.—Since writing the above, I have looked into the previous data of Greenwich rainfall for 1815 to 1840, published in the *Proceedings* of the Meteorological Society. The value of these is, of course, inferior to that of the series since 1841, but the result of the inquiry may be given. Treating the summer values in the same way, in relation to the average for those 26 years (*viz.*, 9·01), I find one exception to each of the two rules above indicated; this makes, for the whole period 1815-1897, one exception to rule No. 1 and two to No. 2.

I have accordingly sought a still more comprehensive expression of relations, and offer the following:—

1. *In the first five years after sunspot minimum years, there have always been more dry summers than wet.*

This holds good since 1815 (*i.e.*, in seven cases); and it is to be borne in mind that the sunspot maximum follows the minimum at a shorter interval than the minimum does the maximum, usually three or four years.

2. *In each group of five consecutive years ending with a sunspot minimum year, there have been (with one exception) more wet summers than dry.* The exception is the five-year group ending in the sunspot minimum year 1823 (three dry summers to two wet).

Briefly, the fact which seems to emerge from the above is this: a tendency to *wet* summers when sunspot minima are approaching, and to *dry* when they have passed (or, in general, near maxima). We are now probably in the former case.

#### A LONG, IF NOT UNIQUE, WELL RECORD.

IN the first volume of this *Magazine*, on page 29 (issued May 16th, 1866), we gave (by the courtesy of the late Mr. Leyland Woods) details of the level of water in the well at his seat, Chilgrove, near Chichester, for the years 1853 to 1865. We recently heard that there were earlier records, and as the observations have been continued to the present time, there are, of course, more than 30 subsequent years. Mr. J. W. Woods has very kindly gone through the entire record, and sent us a copy. In so long a series (62 years) there are naturally some omissions, and the observations have not always been taken on the same day of the month, moreover the well was deepened in February, 1855, and it is uncertain whether it was lowered 10 or 12 feet. Recognizing these drawbacks, we yet believe the record to be so nearly unique that we have had the whole prepared for the press, converting Mr. Woods's records of depth into the corresponding height above Ordnance datum, as thereby the comparability of the values is ensured, irrespective of the deepening of the well. We have accepted Mr. Leyland Woods's values, *viz.*: for the altitude of the brim of the well, 266 ft. above sea level; 135 ft. as the original, and 145 ft. as the present depth.

*Approximate height (in feet above  $\nabla$ ) of top of water in well at Chilgrove.*

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	YEAR
1836	..	174	211	231	214	174	165	152	132	139	169	216	..
7	201	239	227	181	162	154	148	149	138	135	134	137	167
8	138	140	165	167	157	152	145	140	139	135	133	180	149
9	201	210	204	194	179	168	159	151	146	183	212	226	186
1840	179	236	194	174	158	154	146	138	135	134	132	168	162
1	167	187	198	181	173	166	161	..	..	..	..	261	..
2	..	..	..	..	..	..	151	146	140	134	134	174	..
3	207	193	186	168	179	201	189	177	156	152	145	181	178
4	178	205	191	216	182	165	159	146	139	135	134	139	166
5	143	156	163	162	162	157	153	148	143	139	137	150	151
6	174	247	219	196	187	167	159	150	144	140	152	163	175
7	164	169	206	189	161	155	149	142	138	134	130	130	156
8	137	167	218	233	215	189	168	157	174	172	193	193	185
9	221	220	197	188	175	175	170	159	149	143	143	143	174
1850	185	171	190	177	183	176	166	159	151	148	143	155	167
1	179	..	..	..	..	..	..	..	..	..	130	130	..
2	..	133	..	..	..	..	..	..	..	..	226	264	..
3	266	211	191	181	183	174	171	171	180	229	215	185	196
4	185	191	179	169	161	155	148	146	145	144	130	130	157
5	130	138	132	135	138	139	136	134	130	132	156	165	139
6	197	196	177	175	165	162	160	152	147	151	152	183	168
7	192	180	172	168	161	153	147	142	138	146	154	159	159
8	159	160	161	161	156	152	146	142	138	134	132	131	148
9	132	157	157	156	156	157	146	141	136	135	159	197	152
1860	228	212	181	174	171	204	185	186	186	205	206	221	197
1	214	186	187	187	171	158	150	145	142	139	161	191	169
2	178	182	217	203	181	169	159	152	146	151	163	186	174
3	216	202	180	164	154	151	148	144	140	144	158	180	165
4	180	183	211	180	167	156	151	146	137	135	133	137	160
5	153	188	190	171	159	152	146	141	140	166	226	212	170
6	212	260	228	188	174	161	151	150	144	150	152	180	179
7	187	209	201	207	205	161	157	152	147	145	145	146	172
8	149	195	177	172	169	158	150	144	138	137	134	136	155
9	233	232	234	201	182	172	160	..	..	145	..	..	..
1870	..	..	..	..	..	156	152	151	137	..	..	..	..
1	167	..	..	..	..	170	161	161	161	160	157	155	..
2	153	257	222	206	191	176	161	155	149	144	194	229	186
3	259	240	224	208	192	176	160	144	141	137	133	143	180
4	143	151	166	171	165	159	153	147	141	135	135	213	157
5	213	214	235	213	186	163	157	150	147	144	144	214	182
6	185	175	200	219	191	177	168	159	152	143	141	137	171
7	246	252	225	199	198	186	176	164	158	152	148	226	194
8	220	203	206	199	182	174	170	163	154	149	145	211	181
9	218	239	205	184	179	193	205	232	217	205	173	167	201
1880	159	170	178	171	159	152	146	141	141	203	219	227	172
1	213	226	223	193	173	158	155	149	149	153	206	241	187
2	216	191	180	181	172	170	156	152	146	235	233	224	188
3	227	254	209	181	166	159	153	149	145	144	133	181	179
4	182	216	221	188	169	159	152	146	142	134	131	131	164
5	134	173	192	178	183	185	178	169	161	157	171	179	172
6	203	205	181	189	174	168	159	146	145	141	174	250	178
7	245	207	183	163	157	149	145	141	137	135	138	167	164
8	164	161	172	180	170	161	160	179	165	155	175	192	170
9	184	185	192	175	170	166	157	149	144	146	162	171	167
1890	204	192	174	164	162	157	152	149	147	143	140	139	160
1	139	159	175	171	162	159	147	144	158	232	228	242	176
2	201	183	169	157	154	148	143	139	136	135	165	192	160
3	179	195	197	174	158	149	143	140	134	133	132	145	157
4	225	216	202	181	164	154	143	144	140	145	243	216	181
5	219	196	167	164	162	159	151	145	142	139	166	199	167
6	190	178	195	186	164	155	142	141	142	162	163	204	169
7	211	225	238	205	184	171	158	146	142	138	135	135	174
8	143	147	145	143	141	..	..	..	..	..	..	..	..

## THE HEAVY RAINFALL AT JEWELL, ANNE ARUNDEL COUNTY, MARYLAND, U.S.A., JULY 26TH & 27TH, 1897.

(From the Report for December, 1897, of the Maryland Section of the U.S. Climate and Crop Service.)

PROBABLY the heaviest rainfall ever recorded in Maryland fell at Jewell during the eighteen hours from 6 p.m. July 26th to noon of the 27th, the amount measured being 14.75 inches. In a personal interview with the voluntary observer, Mr. J. Plummer, some of the details of the storm were learned.

During the day of the 26th, the wind blew steadily from the north-east. A little before 6 p.m. a thunderstorm suddenly came up from the south-west, accompanied by a heavy downpour of rain, which continued with varying intensity through the entire night and until noon of the following day. The heaviest fall occurred between 6 p.m. and 9 p.m. of the 26th.

The rain gauge is of the standard 8-inch Weather Bureau pattern, holding when filled a 2-inch rainfall. In measuring the contents about noon of the 27th, the observer found the receiver filled and enough in the overflow to fill the receiver six times, with three-fourths of an inch left over, making a total of 14.75 inches. The exposure of the gauge is excellent, being on open ground, raised about 3 feet above the surface, and distant about 60 feet south-east from the two-storey dwelling of the observer. Jewell is situated in the southern extremity of Anne Arundel County, near the Calvert County line, and about three miles from Chesapeake Bay, in about  $38^{\circ} 40' N.$  and  $76^{\circ} 32' W.$ , and about 25 miles S.E. of Washington. The surrounding country is generally rolling, with no marked contrasts in elevation. The vicinity of the station is about 160 feet above mean tide level.

This extraordinary rainfall was confined within narrow limits. There was but one standard rain gauge within a radius of twenty-five miles; there were, however, rough measurements made in the immediate neighbourhood, which tallied closely with the record of Mr. Plummer. On a farm about three miles to the south-west a half barrel, with a depth of about 15 or 16 inches, which was empty before the rain, was completely filled by the rain. Making due allowance for the difference in diameter between top and base, the rainfall must have exceeded 12 inches. At another point distant about two miles some milk cans, with a depth of about 12 inches, were filled to overflowing. The top diameter of these cans was less than that of the base; which again would indicate a rainfall exceeding 12 inches. The roads in the vicinity of Jewell were gullied in places to the depth of 4 and 5 feet by the rain. The lowlands were flooded, crops were destroyed and fences were carried away. The level of Lyons Creek was higher than it had ever been observed before.

The daily weather maps of the United States Weather Bureau for July 26th, 27th and 28th show an irregular and shallow area of low

pressure, nearly stationary over the Lower Lake Region and Middle Atlantic States, together with much cloudiness and rain. Pressure areas over the entire country were much broken up, with but slight differences between the highest and lowest barometer readings. At 8 p.m. of the 26th, during the time of heaviest precipitation, the lowest pressure was recorded at Cleveland, Ohio, 29·68 inches, bringing Jewell within the south-east quadrant of the storm area, and about 500 miles from the centre. The barometer was highest (30·10 inches) over the New England States to the north-east, and in Missouri (30·00 inches) to the south-west. At Baltimore, Philadelphia and Washington the prevailing winds were from the east and north-east on the 26th, 27th and 28th. During these days rain fell to the depth of over 3 inches at the following stations in the eastern portions of Maryland and Pennsylvania :—

MARYLAND.		PENNSYLVANIA.	
Stations.	Amt. in inches.	Stations.	Amt. in inches.
Annapolis .....	3·15	Browsers Lock .....	3·06
Baltimore .....	3·10	Dyberry .....	4·45
Fallston... ..	3·65	Honesdale.....	3·22
Frederick .....	3·07	Philadelphia.....	3·70
Jewell .....	14·75	Pottstown.....	3·34
Solomons .....	3·84	Reading.....	3·15
Taneytown .....	3·38	Shawmont.....	3·39
Van Bibber .....	3·75		

O. L. F[ASSIG].

## THE GLOOMY SUMMERS OF 1860 AND 1879, AND THE 19 YEARS' CYCLE.

*To the Editor of the Meteorological Magazine.*

SIR,—A misprint remained uncorrected, probably by my own fault, in the letter on page 57 of your May number.

The first line of the fourth paragraph ought to have run—as is fairly evident from what follows—“Thus, before 1860 there came the three brilliant summers of 1857, 1858 and 1859.”

There can be no doubt that May, 1898, has followed very closely indeed the patterns set by May, 1860, and May, 1879. Whether the coming months will be equally obsequious, remains to be seen. If 1879 is to be followed *in detail*, we shall get no respite at all from gloom and moisture, and may look for some severe thunderstorms. Vide *Meteorological Magazine* and *British Rainfall* for that year, which most of your readers will have. N.B.—The references in these to 1860 will be found to be very numerous.

But if 1860 be followed *in detail*, the first half of July should be fine. A cartoon will be found in a *Punch* of that date in which Britannia or somebody is greeting a rising sun with the exclamation, “Why, Mr. Phœbus, where *have* you been all this time ?”

But *Punch* was premature, and Mr. Phœbus took offence, and St. Swithin came with his watering-pot, and used it with such effect

that there was, in Rutland, hay ungathered in November, and snow on the beans !

A long and very severe winter followed both in 1860 and 1879.

I am, yours truly, H. A. BOYS.

*North Cadbury Rectory, June 1st, 1898.*

SIR,—As the subject of cycles is now under consideration (*vide* Mr. Boys' letter in the current number of your *Magazine*) the following extract may possibly be of interest to those of your readers to whom it is unknown. It is from Bacon's essay "Of Vicissitude of Things," and is as follows :—"They say it is observed in the Low Countries (I know not in what part), that every five-and-thirty years the same kind and suit of years and weathers comes about again ; as, great frosts, great wet, great droughts, warm winters, summers with little heat, and the like ; and they call it the prime ; it is a thing I do the rather mention, because, computing backwards, I have found some concurrence."—Yours faithfully, G. E. E.

*Wealdstone, R.S.O., Middlesex, May 22nd, 1898.*

[It is impossible for us to print a tenth of the comments which Mr. Boys' letter has elicited, and we think that it will be better to defer further publication until our August or September number. But it may not be amiss to point out that it is a 19-years' cycle for which Mr. H. C. Russell pleads,\* and in working on our Meteorological Catalogue we have just come upon the following card :—

**RASPAIL, François Vincent.**

Prévision du temps. Almanach et Calendrier  
Météorologique pour l'année 1865, suivi d'un  
Traité succinct sur l'art de prognostiquer le  
temps avec un certain probabilité.

(Based upon the idea that the weather repeats  
itself every 19th year.)

16mo.

Paris [1864]

On reading one of our own copies of Raspail's Almanach, that for 1868, we are amused to see that this 19-years' theory dates back more than a century. Here is the paragraph *verbatim et literatim* (because one date † is certainly wrong) :—

"Grand Jean de Fouchy, de l'Observatoire de Paris, ayant signalé, en 1674 [1774], à l'abbé L. Cotte, les rapports de

\* *Met. Mag.*, 1897, p. 40.

† Grand-Jean de Fouchy was not born till 1707, and Cotte not till 1740.

la période lunaire de dix-neuf ans, avec le retour, an par an, des mêmes phénomènes de température moyenne, ce dernier s'appliqua à vérifier cette donnée sur la série des observations météorologiques que l'Observatoire mit à sa disposition ; et il en dressa un tableau pour chaque année, à partir de 1805 jusqu'en 1898 inclusivement. C'est de ce travail que nous avons extrait ce qui concerne l'année 1868."

So also the interesting note by G. E. E. shows that Bacon had examined the 35 year period, of which apparently Dr. Brückner\* (nearly 250 years afterwards) had not heard when he adopted 34 years and 10 months.

It is not very easy to see how 19 years and 35 years can both be well founded.]

## REVIEW.

*Weather Lore : a collection of Proverbs, Sayings and Rules concerning the Weather*, compiled and arranged by RICHARD INWARDS, F.R.A.S. 3rd edition, revised and augmented. London : Elliot Stock. Large 8vo, 1898, xii.-234 pages, 1 plate.

WE spoke highly (*Met. Mag.*, Vol. XXVIII., p. 169) of the second edition of this work, and yet the present is undoubtedly considerably better. The frontispiece, giving reproductions of ten good photographs of clouds, superposed in the order of elevation which has been assigned to them, is original and effective.

The text has been thoroughly examined, and largely increased ; in fact, it would not be bad practice if all who have any collection of weather proverbs would go through them, and compare them with Mr. Inwards's book. If they find any *not* in *Weather Lore*, they should send them on to Mr. Inwards in readiness for his 4th edition. Unless they dive into early Latin authors like Fabritius of Padua, we do not think that they will have many to send, for the collection is now very large. Mr. Inwards does not say how many proverbs there are, but a rough calculation gives 3500 !

Two features of the book are of exceptional excellence, and show plainly that the author has not shrunk from work. The bibliography contains references to 154 books and articles, and the index occupies double columns on 20 pages.

Apparently Mr. Inwards was hurried while revising the bibliography, for though we have noticed only "mantel" for "mantle" in the first 200 pages, we have, on page 208 Chiswick for Criswick ; on 209, "Dr. M. G. Hellmann" for "Dr. G. Hellmann," and on 210, "M. A. Pointer" for "J. Pointer." It would be well if all volumes were as correctly printed.

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\* See *Met. Mag.*, Vol. XXV., 1890, pp. 170-171 and 183.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1897.

STATIONS.  <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London .....	55·9	16	23·7	26	45·5	35·7	37·3	0·100	87	66·9	21·2	17	6·4
Malta.....	66·5	4	45·6	20	60·7	51·6	48·0	79	130·2	40·3	3·97	20	6·8
<i>Cape of Good Hope</i> ...	87·6	31	49·7	26	76·7	58·9	55·8	66	...	...	·56	4	3·0
<i>Mauritius</i> .....	86·6	8	70·1	8	84·4	74·7	71·1	78	134·8	66·1	4·53	18	6·6
Calcutta .....	78·9	28	49·0	17	75·7	55·8	53·7	66	136·0	39·2	·00	0	1·7
Bombay .....	89·1	20	66·0	28	84·6	68·7	62·8	65	134·1	54·0	·00	0	0·4
Ceylon, Colombo .....	90·2	1	71·5	8	86·3	73·2	72·4	84	149·0	68·0	8·89	13	6·8
<i>Melbourne</i> .....	107·3	30	48·2	11	80·3	57·6	52·1	61	157·9	38·5	2·20	5	4·2
<i>Adelaide</i> .....	110·8	16a	45·9	3	90·8	64·0	49·3	38	166·3	35·0	·03	2	2·4
<i>Sydney</i> .....	87·1	17	57·8	12	74·9	63·9	59·3	70	149·0	53·2	5·31	16	6·0
<i>Wellington</i> .....	76·8	24	42·0	2	66·6	51·9	48·8	69	135·0	34·0	·73	7	3·8
<i>Auckland</i> .....	77·0	27	46·0	28	70·0	55·9	53·5	72	137·0	43·0	·13	5	4·4
Jamaica, Kingston.....	91·3	16b	67·7	23	88·6	69·7	66·6	74	...	...	·09	3	2·0
Trinidad .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada .....	87·4	15	69·2	4	82·4	73·0	70·0	79	148·4	...	11·92	19	2·1
Toronto .....	54·2	10	—5·3	24	33·9	20·8	26·2	84	64·5	—11·0	3·66	17	8·3
New Brunswick, Fredericton }	53·8	15	—10·7	4	30·6	13·8	15·8	75	...	...	3·14	11	6·4
Manitoba, Winnipeg }	32·8	9	—28·0	18	13·6	—5·9	...	...	...	...	·55	9	5·8
British Columbia, Esquimalt..... }	51·8	5	28·9	15	44·1	37·7	39·1	93	...	...	10·84	22	8·8

a—and 28. b—and 17.

## REMARKS.

MALTA.—Mean temp. 55°·3, or 0°·9 below average. Mean hourly velocity of wind 11·0 miles, or 0·1 below average. L on 4 days. J. F. DOBSON.

*Mauritius*.—Mean temp. of air 2°·0 above, of dew point 3°·1 above, and rainfall ·44 in. below, their respective averages. Mean hourly velocity of wind 11·4 miles, or 0·5 above average; extremes, 71·0 on 5th and 1·7 on 11th and 27th. Prevailing direction E. to E. by N. L on 3 days and T and L on 24th. The mean of the rainfall at 32 stations was 50 per cent. above the average for December. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. 78°·5 or 0°·6 below, mean dew point 1°·6 above, and rainfall 2·40 in. above, their respective averages. Mean hourly velocity of wind 9·8 miles; prevailing direction N.N.E. T on 4 days, but no L.

*Adelaide*.—The hottest month on record, the mean temp. being 6°·4 above the average for 40 years; there were 17 days when the temp. reached 90° in the shade (greatest number previously being 15), and 9 were over 100°. R ·83 in. below the average. C. TODD, F.R.S.

*Sydney*.—Temp. 0°·5 below, humidity 1 above, and rainfall 2·66 in. above, their respective averages. H. C. RUSSELL, F.R.S.

*Wellington*.—Light showers and generally fine, bright weather, though strong winds prevailed from N.W. Earthshocks on 8th and 27th. Rainfall 3·08 in. below, and mean temp. 1°·6 below, the average. R. B. GORE.

*Auckland*.—The driest December on record. Mean temp. rather under the average of 30 years. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Average hourly velocity of wind 1·7 miles. Rainfall one-twentieth of the average; Island rainfall three-fifths of the average. Shock of earthquake on 14th. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,  
MAY, 1898.

[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.
I.	Uxbridge, Harefield Pk..	2·38	XI.	Builth, Abergwesyn Vic.	5·66
II.	Dorking, Abinger Hall .	3·79	„	Rhayader, Nantgwillt ...	4·82
„	Birchington, Thor .....	3·17	„	Lake Vyrnwy .....	6·27
„	Hailsham .....	3·69	„	Corwen, Rhug .....	3·59
„	Ryde, Thornbrough .....	3·72	„	Criccieth, Talarvor .....	4·45
„	Emsworth, Redlands ...	3·38	„	I. of Man, Douglas .....	3·51
„	Alton, Ashdell .....	3·60	XII.	Stoneykirk, Ardwell Ho.	2·46
III.	Oxford, Magdalen Col..	2·38	„	New Galloway, Glenlee	2·70
„	Banbury, Bloxham .....	3·13	„	Moniaive, Maxwellton Ho.	3·20
„	Northampton, Sedgebrook	3·90	„	Lilliesleaf, Riddell .....	1·59
„	Duddington [Stamford].	2·74	XIII.	N. Esk Res. [Penicuik]	2·90
„	Alconbury .....	3·26	XIV.	Glasgow, Queen's Park..	2·04
„	Wisbech, Bank House...	2·71	XV.	Inverary, Newtown .....	2·75
IV.	Southend .....	2·62	„	Oban, The Corran .....	...
„	Harlow, Sheering.....	2·91	„	Islay, Gruinart School ...	1·92
„	Colchester, Lexden .....	2·85	XVI.	Dollar .....	2·60
„	Rendlesham Hall .....	1·90	„	Balquhiddier, Stronvar...	2·67
„	Rushall Vicarage .....	3·21	„	Ballinluig .....	...
„	Swaffham .....	3·15	„	Dalnaspidal H. R. S. ....	3·62
V.	Salisbury, Alderbury ...	4·68	XVII.	Keith H. R. S. ....	3·41
„	Bishop's Cannings .....	3·20	„	Forres H. R. S. ...	2·44
„	Blandford, Whatcombe .	3·83	XVIII.	Fearn, Lower Pitkerrie..	2·02
„	Ashburton, Holne Vic...	4·48	„	N. Uist, Loch Maddy ...	...
„	Okehampton, Oaklands.	4·88	„	Invergarry .....	1·58
„	Hartland Abbey .....	4·76	„	Aviemore H. R. S. ....	1·90
„	Lynton, Glenthorne ...	4·37	„	Loch Ness, Drumnadrochit	2·61
„	Probus, Lamellyn .....	4·17	XIX.	Invershin .....	4·72
„	Wellington, The Avenue	4·02	„	Durness .....	...
„	North Cadbury Rectory	3·32	„	Watten H. R. S. ....	3·44
VI.	Clifton, Pembroke Road	3·40	XX.	Dunmanway, Coolkelure	3·44
„	Ross, The Graig .....	3·85	„	Cork, Wellesley Terrace	2·24
„	Wem, Clive Vicarage ...	3·88	„	Killarney, Woodlawn ...	2·99
„	Wolverhampton, Tettenhall	3·42	„	Caher, Duneske .....	2·75
„	Cheadle, The Heath Ho.	3·85	„	Ballingarry, Hazelfort...	2·83
„	Coventry, Priory Row ..	2·70	„	Limerick, Kilcornan ...	3·36
VII.	Grantham, Stainby .....	3·15	„	Broadford, Hurdlestown	...
„	Horncastle, Bucknall ...	1·78	„	Miltown Malbay .....	3·36
„	Worksop, Hodsock Priory	2·12	XXI.	Gorey, Courtown House	3·42
VIII.	Neston, Hinderton .....	4·00	„	Athlone, Twyford .....	3·09
„	Southport, Hesketh Park	3·26	„	Mullingar, Belvedere ...	4·41
„	Chatburn, Middlewood.	3·38	„	Longford, Currygrane...	4·00
IX.	Melmerby, Baldersby ...	1·88	XXII.	Woodlawn .....	3·59
„	Scarborough, Observat'y	2·54	„	Crossmolina, Enniscoe ..	3·56
„	Middleton, Mickleton ...	2·11	„	Collooney, Markree Obs.	4·35
X.	Haltwhistle, Unthank...	2·70	„	Ballinamore, Lawderdale	3·16
„	Bamburgh .....	1·95	XXIII.	Warrenpoint.....	3·20
„	Duddon Valley, Ulpha School	4·53	„	Seaforde.....	3·02
„	Keswick, The Bank .....	3·17	„	Belfast, Springfield .....	3·85
XI.	Llanfrechfa Grange .....	3·37	„	Bushmills, Dundarave..	2·49
„	Llandovery .....	4·06	„	Stewartstown .....	3·30
„	Castle Malgwyn .....	5·32	„	Killybegs .....	5·88
„	Brecknock, The Barracks	3·90	„	Horn Head .....	3·96

## MAY, 1898.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.				Days on which "01 or more fell.	TEMPERATURE.						No. of Nights below 32°.	
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours			Max.		Min.					
				inches.	inches.		in.	Dpth	Date	Deg.	Date	Deg.	Date.	In shade.
I.	London (Camden Square) ...	2.26	+ .36	.46	19	21	75.2	23	34.6	13	0	1		
II.	Tenterden ...	3.40	+ 1.84	.68	13	18	74.0	23	35.0	13	0	4		
	Hartley Wintney ...	2.76	...	.38	23	25	78.0	23	...	...	...	...		
III.	Hitchin ...	2.82	+ .87	.60	20	22	73.0	23	35.0	12	0	...		
	Winslow (Addington) ...	3.37	+ 1.27	.64	20	22	72.0	23	32.0	13	1	3		
IV.	Bury St. Edmunds (Westley) ...	2.84	+ 1.09	.31	1	19	67.0	24	36.0	13	0	...		
	Norwich (Brundall) ...	2.78	...	.41	10	19	66.2	23	33.4	15	0	6		
V.	Winterbourne Steepleton ...	3.56	...	.55	20	19	71.0	23	33.5	17	0	6		
	Torquay (Cary Green) ...	3.17	...	.48	20	17	66.5	23	39.5	17	0	0		
	Polapit Tamar [Launceston]..	4.36	+ 2.53	1.21	2	19	70.4	23	33.5	17	0	2		
VI.	Stroud (Upfield) ...	3.32	+ 1.28	.44	20	22	72.0	23	38.0	12	0	...		
	Church Stretton (Woolstaston) ...	5.41	+ 2.54	1.61	23	20	68.0	29	33.5	19	0	3		
	Worcester (Diglis Lock) ...	4.00	+ 1.72	1.09	20	22	...	...	...	...	...	...		
VII.	Leicester (Rotherby Hall) ...	2.66	...	.60	20	23	...	...	...	...	...	...		
	Boston ...	2.41	+ .69	.38	5	17	75.0	22	33.0	2	0	...		
	Hesley Hall [Tickhill].....	1.70	— .34	.45	20	19	69.0	23	34.0	18e	0	...		
VIII.	Manchester (Plymouth Grove) ...	2.81	+ .46	.63	10	17	70.0	22	36.0	12	0	1		
IX.	Wetherby (Ribston Hall) ...	2.61	+ .66	1.10	20	10	...	...	...	...	...	...		
	Skipton (Arncliffe) ...	3.49	— .23	1.17	10	14	...	...	...	...	...	...		
	Hull (Pearson Park) ...	1.82	— .06	.47	20	15	64.0	22	34.0	18e	0	6		
X.	Newcastle (Town Moor) ...	2.20	+ .45	.66	21	12	...	...	...	...	...	...		
	Borrowdale (Seathwaite).....	6.90	+ 1.71	2.26	10	21	...	...	...	...	...	...		
XI.	Cardiff (Ely).....	3.29	+ .44	.45	23	20	...	...	...	...	...	...		
	Haverfordwest ...	4.11	+ 1.75	1.19	2	19	70.6	23	34.8	7	0	16		
	Aberystwith (Gogerddan) ...	3.99	...	.92	10	15	74.0	23	...	...	...	...		
	Llandudno.....	5.16	+ 3.23	.72	22	20	67.0	24	40.0	2, 15	0	...		
XII.	Cargen [Dumfries] ...	3.08	+ .56	.84	10	10	67.0	24	30.0	16	3	...		
XIII.	Edinburgh (Blacket Place)...	2.34	...	.57	2	18	65.1	7	33.8	18	0	4		
XIV.	Colmonell ...	3.19	...	.99	10	16	71.0	24	29.0	13	...	...		
XV.	Tighnabruaich ...	4.01	...	.72	10	17	64.0	20a	33.0	13f	0	...		
	Mull (Quinish).....	2.76	— .19	.46	10	20	...	...	...	...	...	...		
XVI.	Loch Leven Sluices ...	2.20	— .36	.50	3	10	...	...	...	...	...	...		
	Dundee (Eastern Necropolis) ...	1.95	+ .29	.65	10	10	66.9	28	31.8	18	1	...		
XVII.	Braemar ...	2.02	— .39	.32	2	21	62.0	23	27.8	20	9	22		
	Aberdeen (Cranford) ...	3.10	...	.88	2	19	65.0	8	30.0	17g	5	...		
	Cawdor (Budgate) ...	2.77	+ 1.02	.57	31	18	...	...	...	...	...	...		
XVIII.	Strathconan [Beaully] ...	3.71	+ .62	.54	3	13	...	...	...	...	...	...		
	Glencarron Lodge.....	6.18	...	1.11	31	23	62.0	19b	29.5	14	2	...		
XIX.	Dunrobin ...	3.36	+ 1.26	.85	10	18	58.8	7	32.0	16	1	...		
	S. Ronaldshay (Roeberry) ...	5.27	+ 3.55	1.61	31	21	59.0	18	32.0	12f	2	...		
XX.	Darrynane Abbey.....	2.77	...	.80	2	19	...	...	...	...	...	...		
	Waterford (Brook Lodge) ...	2.47	+ .24	.67	2	18	69.5	25	33.0	15	0	...		
	O'Briensbridge (Ross) ...	2.67	...	.46	3	18	...	...	...	...	...	...		
XXI.	Carlow (Browne's Hill) ...	3.34	+ 1.00	.88	2	19	...	...	...	...	...	...		
	Dublin (Fitz William Square) ...	3.33	+ 1.40	.67	2	20	63.7	8, 25	36.0	16	0	0		
XXII.	Ballinasloe ...	2.83	+ .14	.47	2	20	65.0	22c	36.0	14f	0	...		
	Clifden (Kylemore) ...	4.09	...	.63	2	19	...	...	...	...	...	...		
XXIII.	Waringstown ...	3.63	+ 1.19	.70	13	20	69.0	20d	33.0	15	0	7		
	Londonderry (Creggan Res.) ...	3.73	+ 1.21	.45	16	21	...	...	...	...	...	...		
	Omagh (Edenfel) ...	3.26	+ .79	.67	7	20	70.0	24	32.0	12f	2	3		

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

a—and 21, 24, 25. b—and 20. c—and 24. d—and 21. e—and 27. f—and 15. g—and 18.

## METEOROLOGICAL NOTES ON MAY, 1898.

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.

TENTERDEN.—The wettest May in 35 years, except 1878 and 1879; the only others with more than 3·00 in. being 1865, 1872 and 1891. The fourth week, however, was dry, with two days with temp. above 70°, but only 11 days were over 60°. Great abundance of blossom on trees and shrubs. The oak in leaf decidedly before the ash. Duration of sunshine 148 hours. Distant T on 23rd.

HARTLEY WINTNEY.—Wet, cold and ungenial, with no two consecutive rainless days. A short severe TS occurred at midday on 23rd, the L striking three trees and killing sheep; R only ·12 in. L also on 15th and 22nd, and a distant TS on 31st. Mean max. temp. 64°·2, mean min. 39°·0. Ozone on 27 days. Oak in leaf on 12th; hawthorn in flower on 14th; ash in leaf on 30th.

ADDINGTON.—Cold and wet, the number of rainy days having been exceeded only once in 27 years, in 1878. Only one day with temp. above 70°. H storm, covering the ground, on 13th. Sharp TS at 5 p.m. on 22nd.

BURY ST. EDMUNDS, WESTLEY.—Cold and rainy, with little sunshine. TS on 3rd; distant T on 12th and 31st.

NORWICH, BRUNDALL.—A showery month, with a remarkable absence of really warm days. Mean temp. 50°·3. Rainfall ·96 in. in excess of the average. Gale from E. on 19th. Distant T and L at 8 p.m. on 20th. Solar halo on 27th.

WINTERBOURNE STEEPLETON.—Unusually wet and apparently cold, though the mean temp. was not much below the average; but the days were much colder than the nights, comparatively. Mean max. 57°·7, or 4°·0 below, mean min. 44°·0, or 2°·1 above, the average of 5 years. The R was gentle, and when much fell it was continuous.

TORQUAY, CARY GREEN.—Rainfall 1·49 in. above, the average of 22 years. Mean temp. 0°·7, below the average. Duration of sunshine 170 hours, being 61 hours 20 mins. below the average; five sunless days.

POLAPIT TAMAR.—The wettest May for 20 years. A very heavy TS occurred on 2nd, accompanied by vivid L and torrents of R between 10.15 a.m. and 10.45 a.m., ·65 in. falling in 35 minutes; it was very dark and sultry during the storm, with absolute calm. Another TS occurred on 22nd, lasting only 10 minutes, when ·30 in. of R fell, with some half-melted H. The end of the month was finer, but with cold wind, generally northerly.

WOOLSTASTON.—A cold, backward month. A violent storm of T and L with heavy R occurred on 22nd, from 4.30 to 5.30 p.m., ·75 in. of R falling in the hour. On the following day a TS of unexampled severity raged from 7.15 to 8.35 p.m. R came down in sheets, 1·38 in. falling in an hour and 20 minutes. The roads were converted into foaming torrents, and were quite impassable. The damage and destruction were very great. Mean temp. 51°·5.

## WALES.

HAVERFORDWEST.—The month commenced with storm and excess of R, .89 in. falling in 5 hours on 2nd; broken weather generally prevailed until 22nd, when it culminated in a TS, severe to the E., but only slight over Haverfordwest. Fine weather set in after 22nd, with an increase of temp. and sunshine. Mean temp. below the average, and an unusual number of low grass readings. Crops looking well.

## SCOTLAND.

CARGEN [DUMFRIES].—Cold, cloudy and changeable weather. The mean temp.,  $49^{\circ}$ , is only  $4^{\circ}5$  higher than that of January, and the mean on 17th,  $39^{\circ}$ , was lower on only one day (10th) of that month. The R is above the average, and there was considerably less sunshine than usual. E. winds continued without interruption for 10 days (18th to 27th), during which period only .36 in. of R fell, and pastures and hay crops made little progress. The ash was bursting into leaf at the close, reversing its position as compared with the oak, experienced last year. T with H showers on 31st. On 11th the bar. fell to 28.820 in., the lowest in May since observations began in 1860.

EDINBURGH, BLACKET PLACE.—Mean temp.  $1^{\circ}3$  below the average. Sunshine, humidity and rainfall normal. T and L on 3rd; H and L on 4th; Sleet and H on 31st. On 11th the bar. fell to 28.836 in., the lowest in May for 20 years.

COLMONELL.—Rainfall .79 in. above, and mean temp.  $1^{\circ}0$  below, the average of 22 years.

TIGHNABRUACH.—Rainfall normal. Mean temp.  $1^{\circ}$  lower than last year.

ABERDEEN, CRANFORD.—Cold, with little sunshine and N. and N.W. winds.

S. RONALDSHAY, ROEBERRY.—A very wet month; the wettest in 32 years, the rainfall being more than thrice the average of 31 years. The next wettest May was in 1892, when 3.68 in. fell. Mean temp.  $45^{\circ}6$ , or  $2^{\circ}0$  below the average of 8 years.

## IRELAND.

DARRYNANE ABBEY.—Very cold, except from 18th to 25th, and the end of the month dry. Rainfall about the average.

WATERFORD, BROOK LODGE.—Weather very unsettled. L at night on 24th. Distant T in E. from 11 a.m. to 2 p.m. on 25th. H showers on 13th and 30th.

O'BRIENSBRIDGE, ROSS.—Rather cold, and many sunless days, but vegetation fairly good.

DUBLIN, FITZWILLIAM SQUARE.—A cloudy, rainy, showery and cold month. A remarkable preponderance of polar winds. Mean temp.  $51^{\circ}2$ , or  $0^{\circ}8$  below the average. High winds on 9 days. H on 5 days. T and L on evening of 23rd. Lunar halo on 4th; solar halos on 8th and 11th.

OMAGH, EDENFEL.—Unsettled and gloomy, with temp. somewhat below, and rainfall considerably above, the average; and it cannot be said that the weather in either of these respects improved as the month progressed—in fact, the mean temps. of May 31st and June 1st were identical with those of Christmas Day and December 26th last, and appreciably lower than that of many days in January. No damage, however, has as yet accrued to vegetation that a seasonable period would not more than redress.

# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

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## THE INTERNATIONAL AËRONAUTICAL CONFERENCE AT STRASBURG.

(Reprinted from *Science*, New York, June 24th, 1898).

THE meeting, ten weeks ago, of the International Aëronautical Committee, appointed by the Paris Meteorological Conference of 1896, was noteworthy in two respects. First, it marked the beginning of a new era in meteorological investigation, as shown by an organised effort to cut loose from observatories on the earth, and to study the conditions of the free air; and, second, by the assembling at Strasbourg of French and Germans, political questions were held to be subservient to the conquest of the high atmosphere, and the extension of the common realm of science. Official and private hospitality was abundant, and the utmost good fellowship prevailed among the members of the Committee and the other meteorologists, physicists, and aëronauts who were present by invitation. It was regretted, although hardly a surprise, that there was no one from Great Britain, where, since Glaisher's remarkable balloon ascension, little has been done to explore the free air. The following named members of the Committee were in attendance:—

Professor Hergesell, *President*, of Strasburg.

MM. de Fonvielle, *Secretary*, Cailletet and Besançon, of Paris.

Drs. Assmann and Berson, of Berlin.

Professor Erk, of Munich.

General-Major Rykatcheff and Colonel Kowanko, of St. Petersburg.

Mr. Rotch, of Boston, United States.

The methods discussed for obtaining observations in the free air were: balloons with aëronauts; *ballons-sondes*, or unmanned balloons to carry self-recording instruments to the height of ten miles or more; and, for observations within a mile or two of the earth, the captive kite-balloon, and kites with self-recording instruments. Aside from technical details, the most important decisions concerning balloons related to the measurements of the height reached, and of the air temperature around them. Although, for the determination of height,

from observations in the balloon, the mercurial barometer must be considered as the standard, yet its indications are only accurate when the balloon has no vertical velocity. If aneroids are used they should be compared frequently with the standard, and, as far as possible, under actual conditions. It was decided that for the calculation of height, the barometric observations should be reduced everywhere by the same method, whatever that might be ultimately. M. Cailletet described his apparatus for photographing automatically at fixed intervals of time, a barometer in the balloon and the ground vertically below, so that the barometric heights can be calculated, and from a map the true heights, and the route of the balloon may be determined. This apparatus was recommended for use with both manned and unmanned balloons. On account of the rapid changes of temperature, it was recognised that very sensitive thermometers must be employed in *ballons sondes*, and that their artificial ventilation is essential. M. Cailletet exhibited a thermometer having a spiral silver tube for its bulb soldered to a glass tube, both being filled with the liquid toluene. This thermometer is extremely sensitive. M. Teisserenc de Bort showed a very sensitive self-recording thermometer which is, at the same time, almost insensible to shocks. It is composed of a blade of German silver set in a frame of invariable steel, and can be ventilated in a *ballon-sonde* by a fan turned by a weight attached to a long wire. For the determination of the temperature of the air around manned balloons, the proper instrument to employ is Assmann's aspiration thermometer, hung at least five feet outside the basket, but simultaneous comparisons with the sling thermometer were advised. The self-recording instruments carried in manned and unmanned balloons should be verified in pneumatic and refrigerating cabinets, under such changes of pressure and temperature as might occur in the atmosphere.

Prof. Hergesell and Dr. Berson urged the importance of simultaneous balloon ascents in the different countries when there was a barometric depression over the European continent. From a meteorological standpoint the manned ascents have an importance which the *ballons-sondes* do not possess, because the temperature of the highest atmosphere has no influence on the meteorological elements near the surface of the earth. M. de Fonvielle, however, called attention to the interest which thermometric measurements at a very high altitude would offer for the determination of the temperature of planetary space. These measures might enable us to choose between the kinetic theory of gases, which assumes the temperature of 273° Centigrade below zero, and Fourier's hypothesis, that the temperature of space is near that of the minima observed in the polar regions of the earth.

It was agreed that the fifth international ascent of *ballons-sondes* should take place early in June, and manned or unmanned ascents were promised in Austria, Belgium, and Italy, in addition to those in Germany, France, and Russia, which countries had already co-

operated. On the day designated, observations at the mountain stations, as well as with kites and captive balloons, will serve for the simultaneous study of the lower air.

Mr. Rotch read a report, which he had been asked to prepare, on the use of kites for meteorological observations, based on the experiments carried on at Blue Hill Observatory for several years past. The advantages which kites have over balloons up to a height of at least 10,000 feet, whenever there is wind, were pointed out. It was reported that, besides their use in the United States, kites were being employed to obtain meteorological records at St. Petersburg and near Paris. M. Tacchini proposes to try them on Mounts Cimone and Etna, and Professor Hann hopes to obtain data in this way above the Sonnblick, the highest permanently occupied observatory in Europe. The Conference recommended kites as being of great value to meteorology, and desired that they should be used at the chief observatories, together with the kite-balloon (described hereafter), for continuous observations. The Committee was enlarged by the addition of the following persons: M. Teisserenc de Bort and Prince Roland Bonaparte, of Paris; Professor Hildebrandsson, of Upsala; Professor Pernter and Lieutenant Hinterstoisser, of Vienna; Captain Moedebeck, of Strasburg; and Lieutenant von Siegsfeld, of Berlin. The next meeting will be at Paris in 1900.

During the Conference there were two trials of the kite-balloon—a captive balloon which, unlike the ordinary spherical one, is not driven down or carried away by strong winds. It is the invention of Lieutenants von Parseval and von Siegsfeld, of the German army, where it is used for reconnoitering, but the smaller Strasburg balloon, constructed by M. Riedinger, of Augsburg, for Professor Hergesell and Captain Moedebeck, is the first to lift self-recording meteorological instruments. It consists essentially of a cylinder of varnished linen, having a volume of 7,770 cubic feet, so attached to the cable that its upper end is inclined towards the wind, which thus tends to raise the balloon. The cylindrical form is preserved, notwithstanding leakage of gas, by admitting wind into an auxiliary envelope at the rear end, which also serves as a rudder, stability about the axis being secured by lateral wings. The instruments are contained in a basket, with open ends, hung far below the balloon. The azimuth, angular altitude and traction of the cable are recorded continuously by an ingenious dynamometer. In spite of unfavourable weather and gas of insufficient lifting power, the experiments were fairly successful, and previously the balloon had been maintained during several days above the city.

The Committee also witnessed an ascent of the *ballon-sonde*, "Langenburg," carrying self-recording instruments. This silk balloon, when inflated with 14,000 cubic feet of coal gas, had an initial lifting force of 440 pounds in excess of its load. Owing to a premature start the ballast was left behind, and the sudden plunge upward not only emptied some of the gas, but stopped the clock

movements of the thermographs. The ascent was made in the late afternoon, and the balloon, which soon disappeared in the clouds, was found the next day about sixty miles south-east of Strassburg, having risen more than six miles, as was determined from its barometric record.

A. LAWRENCE ROTCH.

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## SCIENTIFIC BALLOON ASCENTS.

(From the *Times* correspondent).

PARIS, *June 8th.*

THREE balloons were sent up from La Villette this morning, as arranged at the recent Aeronauts' Conference at Strasburg. The first, measuring only 1,200 cubic feet, was sent up at 2.30 a.m. for the purpose of registering the temperature of the air before sunrise. This operation had but few spectators, whereas the two later ascents attracted about 500 persons belonging to scientific, aeronautic, and Press circles, including the Prince of Monaco and a large number of ladies, as also several members of the United States Legation, now naturally interested in ballooning.

The second balloon, measuring 14,000 cubic feet, was sent up at nine o'clock. The Prince of Monaco cut the rope attaching it to the ground. The car of the balloon contained various instruments, including a baro-thermometer by Richard, another by M. Teisserenc de Bort, director of the Trappes Observatory, a registering actinometer by M. Viollet, of the Institute, and an automatic photographic camera by M. Cailletet, taking, at five minute intervals, 20 views of the surface at the nadir of the balloon, whether land, sea, or cloud. Nothing was seen of the balloon from the top of the Tour St. Jacques, whence observations were to have been taken by M. Jaubert, director of the municipal meteorological department, and a like disappointment awaited M. Secretan on the top of the Eiffel Tower. Persons who had assembled in the grounds of the gas company watched the balloon, but only for eight minutes. It then disappeared in the clouds which were passing at an altitude of 4,000 or 5,000 feet. This shows a mean velocity of somewhat less than 10 feet per second, and indicates that the French balloon could not reach an altitude of 45,000 feet, as on former occasions, but will hardly reach 30,000 feet, owing to the increased weight of scientific instruments. When it passed out of sight it was travelling in the direction of the North Sea, but it is expected that the strong westerly wind always blowing in high altitudes above the loftiest mountains will send it eastwards. At 9.30 a slight rain set in and continued for some hours. The wind was very moderate and varied in direction.

The ascent of the Balachoff, which was sent up with an aeronaut and with M. Hermite, was a very easy and picturesque one. The car was full of scientific apparatus, so that the occupants had scanty elbow room. There were two large baskets containing Violett's registering actinometers in order to determine by accurate measurements the intensity of solar radiation.

To-day is St. Médard's, the French St. Swithin's, and many people will expect 40 days' consecutive rain, but what is certain is that to-day was

unfavourable for the balloons. Berlin, Munich, Vienna, Strasburg, Warsaw, Brussels, and Rome may perhaps have had better luck for their simultaneous ascents. The aerial district thus constituted to-day covers about 1,200 miles in longitude and as many in latitude, or 12 to 14 times the extent of England and Wales. This is the most extensive scientific operation on record, and the non-participation of England is much regretted, especially as Glaisher was one of the creators of scientific aeronautics. The collection and discussion of the observations will, of course, take some little time.

## FLOODS AND STORMS IN SOUTH AFRICA.

*To the Editor of the Meteorological Magazine.*

SIR,—Having noticed in your Magazine for April an article on "Floods and Storms in South Africa," I thought you might be interested in the details of the rainfall all over the Colony during the month of January last. I have accordingly sent you by the same mail a complete list of the Stations, giving the amount of rainfall during that month as well as the number of "days on which rain fell."—I am, Sir, yours faithfully,

CHARLES STEWART,

Secretary.

*Meteorological Commission, Cape Town, May 4th, 1898.*

[WE are glad to be favoured with Mr. Stewart's letter and table, especially as the latter affords evidence of the remarkable development of rainfall work in South Africa. It is very much too long to print *in extenso*, and we have, therefore, prepared the following abstract, which not merely gives all the monthly totals which exceeded 12 inches, but also the largest in each Division and the total number of stations in it, thus giving full details as to the strength of the observing staff in South Africa.

Division.	Name.	No. of Stations.	Greatest Total, and Totals exceeding 12 in., for January, 1898.
I.	Cape Peninsula .....	29	St. Michael's, Table Mountain 2·39
II.	South-West .....	24	Houw Hoek ..... 3·80
III.	West Coast.....	15	Piquetberg ..... 85
IV.	South Coast .....	31	Concordia ..... 7·20
V.	Southern Karroo .....	9	Glenconnor ..... 3·99
VI.	West-Central Karroo ...	13	Camfer's Kraal ..... 4·74
VII.	East-Central Karroo.....	23	Somerset East ..... 9·65
VIII.	Northern Karroo .....	39	Colesberg ..... 10·05
IX.	Northern Border .....	17	Groot Boetsaap, 13·77; Bell's Bank ..... 13·23
X.	South-East.....	49	Evelyn Valley, 15·95; Kat- berg, 13·25; Thaba N'doda 12·88
XI.	North-East.....	27	Barkly East, Avoca, 18·09; Palmeitfontein, 17·15; Glen Lyon, 16·48; Herschel, 16·41; Lady Grey, 15·92; Gateshead, 14·45; Barkly East, 12·95; Aliwal North 12·17

Division.	Name.	No. of Stations.	Greatest Total, and Totals exceeding 12 in., for January, 1898.
XII.	Kaffraria.....	18	Woodcliff, 18·66; Maclear, 14·82; Engcobo ..... 12·57
XIII.	Basutoland.....	5	Mafeting, 21·78; Moyeni, 19·71; Leribe, 16·35; Butha Butha ..... 14·80
XIV.	*Orange Free State.....	1	Philipolis ..... 9·16
XV.	*Natal.....	47	Impendhle, 15·20; Umzinto, 13·62; Nottingham Road, 13·56; Polela, 13·22; Pietermaritzburgh (Bush Valley), 12·29; Everdon (Howick)... 12·16
XVI.	South African Republic	3	Bremersdoon ..... 17·10
XVII.	Bechuanaland.....	4	Taung ..... 7·80
XVIII.	Rhodesia.....	2	Hope Fountain ..... 7·75

From the above we see that there are now more than 300 rainfall stations reporting to the Cape Commission, to which it should be added that there are about 50 in Natal, and others belonging to the British Association and other bodies, further to the N. and W.; so that we think that the entire number of rain records kept in Africa, S. of the Equator, must be nearly, if not quite, 500.

As regards the intensity of the excess in January, 1898, the following table seems to show that our previous note indicated accurately the locality most affected—*viz.*, the upper portion of the watershed of the Orange River between Bloemfontein and Aliwal North.

Div.	Station.	Lat. S.	Lon. E.	Altitude.	RAINFALL IN JANUARY.		Per cent. of Mean.	Excess in 1898.
					Mean, 1885-94.	1898.		
		° ' "	° ' "	feet.	in.	in.		
XVIII.	Hope Fountain..	20 20	28 30	4700	10·73	7·75	72	-2·98
IX.	Groot Boetsaap..	28 0	24 25	—	3·82	13·77	361	9·95
XIII.	Mafeting .....	29 54	27 7	—	5·79	21·78	376	15·99
XIV.	Philipolis .....	30 13	25 18	4700	3·74	9·16	245	5·42
XI.	Herschel .....	30 36	27 7	5110	4·24	16·41	387	12·17
"	Aliwal N.....	30 41	26 40	4330	3·30	12·17	369	8·87
VIII.	Colesberg .....	30 43	25 5	4400	2·30	10·05	437	7·75
XI.	Lady Grey .....	30 43	27 12	—	5·64	15·92	282	10·28
"	Barkly E., Avoca	30 44	27 30	—	6·69	18·09	271	11·40
"	Gateshead .....	30 58	28 0	—	7·22	14·45	200	7·23
"	Barkly E. ....	31 2	27 35	5831	4·22	12·95	307	8·73
XII.	Maclear .....	31 4	28 21	4300	7·23	14·82	205	7·59
VI.	Camfer's Kraal..	32 17	23 3	3000	1·39	4·74	341	3·35
VII.	Somerset East...	32 44	25 35	2400	3·34	9·65	289	6·31
X.	Thaba N'doda...	32 50	27 1	—	3·98	12·88	324	8·90
III.	Piquetberg .....	32 53	18 45	700	·15	·85	566	·70
II.	Houw Hoek.....	34 12	19 10	960	·51	3·80	745	3·29

\* We believe that both the Orange Free State and Natal have separate organizations; Mr. Stewart has quoted only one station for each, but as regards Natal, we have taken the full details from the *Natal Farmers' Magazine*, which some unknown Sheffield correspondent is so kind as to send us.

R E V I E W S.

*Science Progress.* New series. Vol. II., No. 8. July, 1898, large 8vo. Scientific Press, London, 1898.

WE take the earliest opportunity of telling those of our readers who are interested in the History of Meteorites, or as the author entitles his article, "*The Fall of Meteorites in Ancient and Modern Times*," where to find a treat. It is a lecture given by Prof. H. A. Miers, F.R.S., Waynflete Professor of Mineralogy in the University of Oxford, printed in the above number of *Science Progress*. Of course, in one lecture it is impossible to deal with a literature which we suppose would, in the aggregate, take at least 30 ft. of shelving, and Prof. Miers did not attempt the impossible; but he has wisely taken only one aspect of the subject, and has concentrated in 22 pages information which few writers could have given, and which still fewer would have been willing to compress into a single lecture.

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*Wragge's Australasian Weather Guide and Almanac for 1898.* 8vo. Sapsford & Co., Brisbane, 1898.

IT is rather more than ten years since Mr. Wragge was appointed Government Meteorologist for Queensland, and during the whole period we have not received a single annual or other summary of the observations made in that colony. We are aware that Mr. Wragge has been very busy establishing stations, and it is of course quite possible that the regular publications which used to be issued in Queensland, as well as in the other Colonies, have been continued; all that we know is that nothing, except some large scale maps, has come under our notice.

Now, however, Mr. Wragge appears as the patron of an Almanac, which the publishers hope to make an Australian "Whitaker," and although we do not know what rivals may already exist, we do not see any reason why we should not wish that their hope may be fulfilled.

The present volume is excellently printed, on very good paper, and amply illustrated,—the tree or trees in the view of the Brisbane Observatory improve its appearance, but suggest anxieties respecting their influence upon the records. Mr. Wragge is too experienced to approve of trees near his instruments, how then do they get into the photograph whence the block was prepared?

Much of the mass of information given is very good; but on the whole we are inclined to regard as the best, the article on Artesian Water Supply, by Mr. W. Gibbons Cox, C.E., in which we have noticed only one mistake—(on p. 251) there are no "waterworks at Kentish Town," and the old chalk supply pumped there, was spoiled and abandoned nearly 50 years ago.\*

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\**Met. Mag.*, Vol III., (1868) p. 176.

While no one can feel otherwise than grateful to Mr. Wragge for his enthusiastic devotion to obtaining meteorological records from Ben Nevis, and while we have no doubt that that enthusiasm alone made possible the establishment of the permanent observatory there, we are still waiting for evidence of the utility *for forecasting purposes* of the records from it, or any other lofty station. Though there may be excitement and fun in starting stations on Mount Kosciusko, or Mount Wellington, we should have waited until the London Meteorological Council had announced that Ben Nevis records were useful for forecasting purposes. Have not the United States authorities given up Pike's Peak and Mount Washington? Does M. Fron rely upon the records from the Pic du Midi or the Puy de Dôme?

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*Earthquakes and other Earth Movements*, by J. MILNE, F.R.S., G.F.S., late Prof. of Mining and Geology, Tokio, Japan. Fourth ed. Inter. Scientific Series, Kegan Paul & Co., London, 1898. 8vo, xvi.—376 pp., map and engravings.

PERHAPS there is no stronger evidence of the widespread interest now taken in what in old times were all considered together as "Earthquakes and Volcanoes," than the fact that the International Scientific Series has, or will shortly have, three separate volumes devoted to them,—Prof. Judd's *Volcanoes*, which has reached its fifth edition, Prof. Milne's *Earthquakes*, of which we now welcome the fourth edition, and *Seismology*, by Prof. Milne, which is announced in the work before us.

The volume is crammed with facts, and with sound conclusions based upon them, and we have not noticed the omission of any aspect of the subject. We are, however, rather at a loss to know why there is not a single reference to all the labour spent upon the Krakatoa eruption. If the answer be that it belongs to the sister volume on *Volcanoes*, we should certainly reply by enquiring whether Admiral Sir William Wharton's work upon the transmission of the sea waves from Krakatoa to the English Channel is not at least equal to any of those quoted between pp. 179 and 186. Perhaps the *Report on the Eruption of Krakatoa* may have the honour of insertion in the appendix to the 5th edition, and might even be accompanied by the *Report on the East Anglian Earthquake of April 22nd, 1884*, by Prof. R. Meldola, F.R.S., and William White, and by the late W. Roper's "*A list of the more remarkable earthquakes in Great Britain and Ireland during the Christian era.*"

However, these are small matters, and the volume is already so crammed with information, that probably the only thing to be done is to jettison some of the cargo—but it would not be easy to select what should go overboard first.

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# PUBLICATIONS OF THE ROYAL ALFRED OBSERVATORY, MAURITUS.

It is a matter of general knowledge that the publications of this establishment have been distributed somewhat irregularly, and that most European Meteorological Libraries have only incomplete sets.

We have been in communication with the new Director, Mr. T. F. Claxton, F.R.A.S., upon the subject, and thanks to his hearty co-operation we are now able to announce that, for convenience of distribution, all surplus copies have been shipped to us.

Any society, establishment, or person wishing for any of the under-noted publications must send a clearly written list of what is desired; to reach Mr. G. J. Symons, 62, Camden Square, N.W., by October 15th, 1898, after which date he will proceed to allot the entire remaining copies of the said publications.

## *Royal Alfred Observatory, Mauritius.*

### REPORTS.

1876, 1878, 1879, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1894.

### RESULTS.

1862, 1866, 1867, 1872, 1873, 1875, 1876, 1877, 1878, 1879, 1880, 1881, 1882, 1883, 1884, 1885, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895.

Years not mentioned above cannot be supplied, and of some of those quoted there are very few copies.

No charge will be made, but where large numbers are required, applicants will be left to pay carriage.

The Royal Alfred Observatory itself has no copy of the Results for 1886 or 1887; we have had the pleasure of sending a copy for 1886; we hope that every librarian will search for a duplicate of 1887.

We desire to point out that it will be for the general benefit if all who have duplicates of any of the publications of the observatory will send them here, because what is useless to them, may be very useful to some one else.

There is similar incompleteness in the sets of the publications of the Meteorological Society of the Mauritius. We do not know of a single perfect set in Europe—and we hope that eventually we may be enabled to make a similar announcement with respect to its publications.

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## THE FIFTH INTERNATIONAL CONGRESS ON HYDROLOGY, CLIMATOLOGY AND GEOLOGY.

WE have been requested to announce that the above Congress will meet at Liège, in Eastern Belgium, under the patronage of H.R.H.

Prince Albert of Belgium, from September 25th to October 3rd, of the present year.

Those who had the privilege of joining the first of these Congresses (Biarritz and the Pyrenees) in 1886, will not soon, if ever, forget the boundless hospitality and kindness with which they were received. Those who have attended subsequent ones in Italy and in France, know that the example set at the outset has been followed, though not surpassed,—it would be hard, if not impossible, to beat the quaint festivities of Amélie les Bains, or the fairy-like beauty of Luchon. But now the Congress goes to a new country, Belgium, and we know that the Belgians intend to make it a red letter week for all who will go.

We cannot spare space to set out the programme, either of work or of play, but we must give the titles of some of the meteorological papers:—

- 1.—On the utilization of hygrometric records in relation to medical climatology and hygiene.
- 2.—On the hygienic importance of records of sunshine.
- 3.—The advantage of sanitary stations on plateaux in districts without mountains.
- 4.—Determination of daily mean temperature.
- 5.—On the importance of researches on the amount of ozone.
- 6.—On the mean temperature of the air, and of a spring at Spa.

There are, we see in the Geological section, several papers of interest to hydraulic engineers.

We wonder when Bath, Buxton, or Harrogate, or the three combined, will muster up courage enough to invite the Congress to England? Perhaps it is hopeless to think of it. English railway managers would be shocked at what the Continental managers do to facilitate the gathering of scientific men. So we had better not ask our foreign friends to see how much *worse* we do these things in England.

For full details respecting the Congress, railway facilities, excursions, &c., application should be made, in any language, distinctly written, to M. le Dr. G. Jorissenne,

*Sécretaire Général,*

Boulevard de la Sauvinière 130,  
à Liège.

# RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858-97.

## JUNE.

ELEMENTS.	MONTHLY MEANS OR TOTALS.										ABSOLUTE READINGS.					
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	MEANS 9 A.M. AND 9 P.M.						EXTREMES AT 9 A.M. AND 9 P.M.			Mean of all Highest	Mean of all Lowest.		
				Mean.	Highest Month.		Lowest Month.		Highest.	Lowest.						
					Value.	Date.	Value.	Date.								
											Value.	Date.				
1	2	3	4	5	6	7	8	9	10	11			12	13	14	15
Barometer ..... { (cor. & red.)	29.995	30.216 1865	29.782 1860	9 a.m. 9 p.m.	29.995 29.994	30.221 30.211	1865 1865	29.773 29.792	1860 1860	30.600 30.590	27th, 1867 27th, 1867	29.312 29.173	30th, 1865 2nd, 1860	30.323 30.319	29.563 29.563	
{ Dry Bulb..... { Solar Rad., bright..	59.8	65.8 1858	55.4 1871	9 a.m. 9 p.m.	61.5 58.1	68.1 63.5	1858 1858	57.1 53.2	1860 1871	80.8 76.1	16th, 1858 22nd, 1870	48.4 44.3	3rd, 1871 3rd, 1871	72.0 67.9	52.3 49.5	
{ Max. .... { Min. .... { Wet Bulb..... {	71.3	..	...	...	...	79.1	1858	64.7	1860	92.6	16th, 1858	53.5	10th, 1889	83.1	59.1	
{ Trade Wind .. { Solar Rad., black ...	50.9	...	...	...	...	55.1	1858	46.9	1869	63.8	25th, 1878	35.6	1st, 1869	59.4	41.8	
{ Solar Rad., bright.. { Grass Minimum ...	55.2	61.0 1858	52.2 1869	9 a.m. 9 p.m.	56.1 54.4	62.6 59.5	1858 1858	53.3 50.9	1886 1869	70.3 69.2	16th, 1858 16th, 1858	44.4 41.8	8th, 1890 8th, 1881	64.5 62.8	48.6 46.5	
{ Soil, 1 foot .....	113.2	...	...	...	...	120.4	1870	106.9	1888	136.8	20th, 1870	64.7	4th, 1890	129.5	76.5	
{ Cloud .....	82.2	...	...	...	...	87.8	1896	76.9	1879	104.3	19th, 1893	57.9	8th, 1897	95.1	63.6	
{ Rainfall .....	47.0	...	...	...	...	49.9	1889	43.4	1869	60.7	25th, 1878	31.0	1st, 1884	56.5	36.8	
	58.7	...	...	...	...	62.6	1896	55.3	1879	67.0	20th, 1893	51.2	1st, 1894	63.3	54.3	
	5.6	7.6 1860	3.5 1868	9 a.m. 9 p.m.	6.0 5.2	8.0 7.3	'79, '82 1860	3.5 3.1	1868	10 10	Every year Every yr. but '58	0 0	Various Various	10.0 10.0	0.4 0.1	
	2.23	6.71 1878	.30 1895	9 a.m. 9 p.m.	.95 1.28	3.09 5.73	1863 1878	.11 -.04	1886 1895	1.55 3.28	19th, 1863 23rd, 1878	.00 -.00	Every year Every year	.41 .50	.00 .00	

Max. Rainfall in 24 hours, 3.28 in., 23rd, 1878. Mean max. daily fall, .70 in.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1898.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
England, London .....	55·0	30	29·2	11	47·5	39·8	40·3	86	77·8	26·9	·73	9	8·3
Malta.....	64·0	10	42·2	29	60·8	51·5	48·1	80	126·5	35·2	2·83	7	6·0
<i>Cape of Good Hope</i> ...	92·0	16	48·1	28	77·9	60·3	56·3	67	...	...	1·34	5	3·3
<i>Mauritius</i> .....	86·3	19	71·1	18	84·2	74·2	71·5	80	136·5	65·8	6·48	25	6·4
Calcutta.....	83·9	26	48·4	8,9	76·5	53·5	51·1	63	140·0	39·0	·36	1	4·9
Bombay.....	90·8	16	63·3	5	85·1	67·7	63·1	65	137·5	52·5	·00	0	0·0
Ceylon, Colombo ...	92·7	11	66·8	28	88·2	71·8	70·8	81	150·0	58·0	2·32	8	3·4
Melbourne.....	109·2	11	48·1	23	82·3	58·3	52·0	54	157·1	38·1	·36	2	3·9
Adelaide .....	113·3	11	53·2	22	90·1	62·0	50·4	41	173·7	43·0	·09	1	1·7
Sydney .....	98·1	19	58·3	22	79·5	66·2	69·0	71	148·7	54·0	5·40	14	6·1
Wellington .....	76·0	6	49·0	19	69·5	55·9	52·0	69	135·0	35·0	·95	5	3·8
Auckland .....	90·0	4	49·0	19	74·0	58·0	54·0	65	138·0	46·0	3·14	10	5·4
Jamaica, Kingston.....	93·5	13	63·4	4	86·8	68·1	64·7	69	...	...	·03	1	...
Trinidad .....	89·0	3,7	64·0	20	85·6	67·4	70·1	82	163·0	61·0	3·05	15	...
Grenada.....	86·2	3	70·0	20	82·1	72·4	68·8	69	152·2	...	2·65	21	1·1
Toronto .....	44·9	12	—15·0	30	31·6	17·7	23·2	83	56·2	—17·5	3·65	18	8·1
New Brunswick, } Fredericton .....	37·9	7	—31·5	31	21·2	—3·3	2·0	77	...	...	6·36	13	5·3
Manitoba, Winnipeg ...	31·4	5	—30·3	10	15·4	—7·9	...	...	...	...	·89	12	4·4
British Columbia, } Esquimalt.....	48·0	14	27·5	23	42·7	34·6	36·0	92	...	...	2·40	18	8·3

## REMARKS.

MALTA.—Adopted mean temp. 55°·5, or 2°·6 above average. Mean hourly velocity of wind 11·3 miles, or 0·1 below average. Mean temp. of sea 60°·3. TSS on 21st and 22nd; H on 21st and 22nd. J. F. DOBSON.

*Mauritius*.—Mean temp. of air 0°·2 above, of dew point 1°·6 above, and rainfall ·77 in. below, their respective averages. Mean hourly velocity of wind 9·7 miles, or 1·4 below average; extremes, 24·8 on 24th and 0·0 on 16th. Prevailing direction E.S.E. to E. by N. L, T, or both, on 23 days; being the greatest number during the period 1861-98, the previous greatest number being 14 in 1877 and 1887.

CEYLON, COLOMBO.—Mean temp. 77°·9 or 1°·1 below, mean dew point 1°·2 above, and rainfall ·75 in. below, their respective averages. Mean hourly velocity of wind 9·2 miles; prevailing direction N.N.E. T on 3 days. L on 3 days. TS on 25th. H. O. BARNARD.

Adelaide.—Mean temp. 1°·7 above, and rainfall ·76 in. below, their respective averages for 41 years. An extremely hot and dry summer thus far. C. TODD, F.R.S.

Sydney.—Temp. 1°·4 above, humidity 0·3 below, and rainfall 1·71 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—A small rainfall, but strong winds almost throughout the month; prevailing direction N.W. Temp. 0°·1 above, and R 2·95 in. below, their respective averages. R. B. GORE.

Auckland.—An average month. Mean temp. slightly below the average of 31 years. The max. temp. is, however, one of the highest readings in Auckland. Rainfall slightly above the average. T. F. CHEESEMAN.

TRINIDAD.—Rainfall ·11 in. above the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,  
JUNE, 1898.

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.
I.	Uxbridge, Harefield Pk..	·91	XI.	Builth, Abergwesyn Vic.	4·73
II.	Dorking, Abinger Hall ..	1·50	„	Rhayader, Nantgwillt ...	4·15
„	Birchington, Thor .....	2·35	„	Lake Vyrnwy .....	2·97
„	Hailsham .....	1·16	„	Corwen, Rhug .....	2·28
„	Ryde, Thornbrough .....	2·62	„	Criccieth, Talarvor .....	2·83
„	Emsworth, Redlands ...	2·65	„	I. of Man, Douglas .....	1·79
„	Alton, Ashdell .....	2·06	XII.	Stoneykirk, Ardwell Ho.	2·09
III.	Oxford, Magdalen Col..	1·44	„	New Galloway, Glenlee	2·86
„	Banbury, Bloxham .....	1·30	„	Moniaive, Maxwelton Ho. ...	...
„	Northampton, Sedgebrook	·46	„	Lilliesleaf, Riddell .....	1·69
„	Duddington [Stamford].	·87	XIII.	N. Esk Res. [Penicuik]	2·35
„	Alconbury .....	1·28	XIV.	Glasgow, Queen's Park..	1·98
„	Wisbech, Bank House...	1·82	XV.	Inverary, Newtown .....	4·37
IV.	Southend .....	1·20	„	Oban, The Corran .....	...
„	Harlow, Sheering.....	1·81	„	Islay, Gruinart School ...	1·75
„	Colchester, Lexden .....	1·82	XVI.	Dollar.....	3·52
„	Rendlesham Hall .....	2·88	„	Balquhiddy, Stronvar...	3·28
„	Rushall Vicarage .....	...	„	Ballinluig .....	...
„	Swaffham .....	2·57	„	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	·78	XVII.	Keith H.R.S.....	1·50
„	Bishop's Cannings .....	1·67	„	Forres H.R.S. ....	1·24
„	Blandford, Whatcombe .	1·19	XVIII.	Fearn, Lower Pitkerrie..	·91
„	Ashburton, Holne Vic...	3·24	„	N. Uist, Loch Maddy ...	...
„	Okehampton, Oaklands.	3·86	„	Invergarry .....	2·42
„	Hartland Abbey .....	3·21	„	Aviemore H.R.S. ....	1·26
„	Lynton, Glenthorne ...	1·67	„	Loch Ness, Drumnadrochit	2·10
„	Probus, Lamellyn .....	1·93	XIX.	Invershin .....	2·56
„	Wellington, The Avenue	1·94	„	Durness .....	2·83
„	North Cadbury Rectory	1·81	„	Watten H.R.S.....	1·98
VI.	Clifton, Pembroke Road	1·37	XX.	Dunmanway, Coolkelure	3·32
„	Ross, The Graig .....	·84	„	Cork, Wellesley Terrace	1·76
„	Wem, Clive Vicarage ...	1·39	„	Killarney, Woodlawn ...	2·73
„	Wolverhampton, Tettenhall	1·96	„	Caher, Duneske .....	2·72
„	Cheadle, The Heath Ho.	2·15	„	Ballingarry, Hazelfort...	2·92
„	Coventry, Priory Row ..	·89	„	Limerick, Kilcornan ...	...
VII.	Grantham, Stainby .....	1·16	„	Broadford, Hurdlestown	2·91
„	Horncastle, Bucknall ...	1·51	„	Miltown Malbay .....	3·89
„	Worksop, Hodack Priory	1·33	XXI.	Gorey, Courtown House	2·48
VIII.	Neston, Hinderton .....	2·09	„	Athlone, Twyford .....	3·29
„	Southport, Hesketh Park	1·85	„	Mullingar, Belvedere ...	3·48
„	Chatburn, Middlewood.	2·83	„	Longford, Currygrane...	3·80
IX.	Melmerby, Baldersby ...	1·70	XXII.	Woodlawn .....	3·04
„	Scarborough, Observat'y	1·83	„	Crossmolina, Enniscooe ..	3·48
„	Middleton, Mickleton ...	2·02	„	Collooney, Markree Obs.	3·85
X.	Haltwhistle, Unthank...	2·36	„	Ballinamore, Lawderdale	...
„	Bamburgh .....	1·34	XXIII.	Warrenpoint.....	3·59
„	Duddon Valley, Ulpha School	5·20	„	Seaforde.. ..	3·21
„	Keswick, The Bank .....	2·92	„	Belfast, Springfield .....	3·53
XI.	Llanfrecifa Grange .....	1·82	„	Bushmills, Dundarave..	2·54
„	Llandovery .....	3·15	„	Stewartstown .....	3·00
„	Castle Malgwyn .....	2·21	„	Killybegs .....	4·50
„	Brecknock, The Barracks	2·63	„	Horn Head .....	3·06

JUNE, 1898.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.				Days on which -01 or more fell.	TEMPERATURE.				No. of Nights below 32°.			
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours			Max.		Min.					
				Dpth	Date		Deg.	Date	Deg.	Date.			In shade.	On grass.
		inches.	inches.	in.										
I.	London (Camden Square) ...	1.11	— .90	.20	24	15	77.4	18	40.1	1	0	0		
II.	Tenterden .....	2.11	+ .26	.52	9	13	72.0	21	38.0	1	0	1		
III.	Hartley Wintney .....	1.52	...	.50	8	13	78.0	29	...	...	...	...		
IV.	Hitchin .....	1.88	+ .02	.66	25	14	77.0	18	39.0	3, 15	0	0		
V.	Winslow (Addington) .....	3.37	+ 1.58	2.13	9	13	71.0	21 <sup>a</sup>	39.0	1	0	..		
VI.	Bury St. Edmunds (Westley) .....	3.22	...	1.80	9	16	74.4	18	36.8	1	0	0		
VII.	Norwich (Brundall) .....	1.02	...	.24	5	7	75.0	11	35.0	3	0	2		
VIII.	Winterbourne Steepleton ...	1.39	...	.35	5	10	74.1	11	42.9	15	0	0		
IX.	Torquay (Cary Green) .....	2.04	— .17	.60	12	14	75.7	11	35.9	15	0	1		
X.	Polapit Tamar [Launceston]..	.98	— 1.41	.29	26	12	78.0	20	43.0	2	0	...		
XI.	Stroud (Upfield) .....	1.37	— 1.18	.25	25	12	73.0	10	39.0	1	0	0		
XII.	Churchstretton (Woolstaston) ..	1.34	— 1.09	.40	25	11	...	...	...	...	...	...		
XIII.	Worcester (Diglis Lock) .....	.91	...	.29	21	14	...	...	...	...	...	...		
XIV.	Leicester (Rotherby Hall) ...	.99	— .90	.20	23	13	80.0	8	35.0	1	0	...		
XV.	Boston .....	.69	— 1.23	.21	21	14	75.0	8	32.0	15	1	...		
XVI.	Hesley Hall [Tickhill] .....	3.20	+ .55	.75	21	15	77.0	11	40.0	14	0	...		
XVII.	Manchester (Plymouth Grove) ..	1.82	— .07	.32	21	11	...	...	...	...	...	...		
XVIII.	Wetherby (Ribston Hall) ..	4.95	+ 1.59	1.07	26	16	...	...	...	...	...	...		
XIX.	Skipton (Arnccliffe) .....	1.66	— .09	.41	21	14	75.0	29	34.0	1	0	1		
XX.	Hull (Pearson Park) .....	2.31	+ .67	.45	1	13	...	...	...	...	...	...		
XXI.	Newcastle (Town Moor) .....	8.40	+ 1.82	3.27	23	18	...	...	...	...	...	...		
XXII.	Borrowdale (Seathwaite) .....	1.99	— .44	.31	22	17	...	...	...	...	...	...		
XXIII.	Cardiff (Ely) .....	1.95	— .61	.44	23	14	75.0	11	39.6	15	0	6		
XXIV.	Haverfordwest .....	3.34	...	.70	12	15	83.0	11	...	...	...	...		
XXV.	Aberystwith (Gogerddan) ...	1.91	+ .14	.43	24	15	70.0	11 <sup>b</sup>	44.0	2	0	...		
XXVI.	Llandudno .....	2.88	+ .93	.56	23	10	78.6	9	38.0	1	0	...		
XXVII.	Cargen [Dumfries] .....	1.39	...	.28	3	12	73.3	17	41.6	1	0	0		
XXVIII.	Edinburgh (Blacket Place) ...	2.99	...	.61	6	13	79.0	10	40.0	1	0	...		
XXIX.	Colmonell .....	4.09	...	.98	23	13	69.0	9 <sup>c</sup>	43.0	1	0	...		
XXX.	Tighnabruaich .....	3.55	+ .26	1.05	23	14	...	...	...	...	...	...		
XXXI.	Mull (Quinish) .....	2.20	+ .45	.50	24	9	...	...	...	...	...	...		
XXXII.	Loch Leven Sluices .....	1.45	— .05	.40	24	12	77.3	17	39.9	1	0	...		
XXXIII.	Dundee (Eastern Necropolis) ..	1.27	— .72	.28	6	12	73.0	28	32.4	28	1	6		
XXXIV.	Braemar .....	1.36	...	.30	6	13	73.0	29 <sup>d</sup>	34.0	27	0	...		
XXXV.	Aberdeen (Cranford) .....	1.84	+ .44	.56	22	14	...	...	...	...	...	...		
XXXVI.	Cawdor (Budgate) .....	3.31	+ .82	.72	1	8	...	...	...	...	...	...		
XXXVII.	Strathconan [Beaul] .....	4.09	...	.80	24	20	66.8	17 <sup>e</sup>	39.0	1	0	...		
XXXVIII.	Glencarron Lodge .....	1.60	— .42	.30	4	10	67.0	29	40.8	1, 3	0	0		
XXXIX.	Dunrobin .....	2.20	+ .44	.53	6	16	64.0	9, 29	40.0	2	0	...		
XL.	S. Ronaldshay (Roeberry) ...	2.28	...	.42	23	17	...	...	...	...	...	...		
XLI.	Darrynane Abbey .....	3.04	+ .97	1.36	5	13	73.0	10 <sup>f</sup>	38.0	3	0	...		
XLII.	Waterford (Brook Lodge) ...	3.25	...	.66	23	16	...	...	...	...	...	...		
XLIII.	O'Briensbridge (Ross) .....	2.89	+ 1.05	.90	5	14	...	...	...	...	...	...		
XLIV.	Carlow (Browne's Hill) .....	1.55	— .11	.43	5	14	74.9	17	41.8	2	0	0		
XLV.	Dublin (FitzWilliam Square) ..	2.99	+ .69	.55	23	17	70.0	10 <sup>g</sup>	40.0	2	0	...		
XLVI.	Ballinasloe .....	5.20	...	1.09	5	18	...	...	...	...	...	...		
XLVII.	Clifden (Kylemore) .....	3.83	+ 1.76	.85	5	14	75.0	10 <sup>b</sup>	36.0	27	0	0		
XLVIII.	Waringstown .....	3.23	+ .81	.51	24	20	...	...	...	...	...	...		
XLIX.	Londonderry (Creggan Res.) ..	3.40	+ .93	.92	5	17	73.0	10	41.0	6	0	0		
L.	Omagh (Edenfel) .....													

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

a—and 29. b—and 17. c—and 10, 11. d—and 30. e—and 18. f—and 16. g—and 11.

# METEOROLOGICAL NOTES ON JUNE, 1898.

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.

TENTERDEN.—Cold and cloudy, with seven days with a max. temp. below 60°, four being from 12th to 15th. Showery from 1st to 9th also in the last week, but a remarkable absence of TSS. Duration of sunshine 176 hours, being the least in 8 years. Heavy showers and H on 26th, 14 in. fell in ten minutes.

HARTLEY WINTNEY.—An unkind month; cold showers for the first 8 days, followed by a fortnight of dull and cloudy weather with keen dry N. wind. The last week was wet. Distant T on 27th and 28th. Ozone on 19 days. Hay crop good. Dog rose in flower on 9th.

ADDINGTON.—A little R during the first week, then very dry from 7th to 22nd, and from 23rd to 26th a copious rainfall, doing an immense amount of good to the root crops. The 12th, 13th and 14th were cold, the max. temp. being respectively 55°, 53° and 55°. TS on 25th and T on 26th.

BURY ST. EDMUNDS, WESTLEY.—Cold to the 18th, and showery from the 23rd to the end. Remarkable for the heavy R of the 9th and 10th, 2.30 in. falling continuously. Unfavourable for hay-making. TS on 25th. Distant T on 2nd, 6th and 26th.

NORWICH, BRUNDALL.—The month was cool and generally unsettled, with some very cold bleak weather from 12th to 17th, the max. temp. being below 60° on 5 days in succession. Torrential R all night on 10th, particularly from 2 to 3 a.m., and again at 6 a.m. with T and distant L, the fall being the greatest recorded in 24 hours since July 13th, 1889. Sharp TS from 3 to 4 p.m. on 2nd, and at 1 p.m. on 25th. Distant TS from 5.30 to 7.30 p.m. on 6th. T and L on 22nd.

WINTERBOURNE STEEPLETON.—The month was dry and cold, the mean temp. being only 54°·9. The deficiency was greater in the max. readings than in the min. Many of the days on which no R was registered were dull and gloomy, but 10 were noted as bright and beautiful. H on 1st. Distant T on 26th. Foggy on 6th and 21st.

TORQUAY, CARY GREEN.—R 1.25 in. below the average of 22 years. Mean temp. 1°·2 below the average. Duration of sunshine 229 hours 45 minutes, being 7 hours 15 minutes below the average. No sunless day.

POLAPIT TAMAR.—The temp. generally was unseasonably low, and the night of 15th was unusually cold, the temp. on grass touching 32°. T and L on 12th. H on 1st and 2nd.

WOOLSTASTON.—A rather cold month. Mean temp. 57°·1. The hay crop was unusually large.

MANCHESTER, PLYMOUTH GROVE.—On the whole the weather was very unsettled and cold for the season, and there was only one week of summer weather from 7th to 12th inclusive. Mean temp. 57°·3. H shower on 1st. Distant T on 6th. T and L on 26th.

## WALES.

HAVERFORDWEST.—June commenced cool and cloudy, with some hours of sunshine and little R. Fine and warm weather set in on 7th and continued to 18th, interrupted by a TS on 12th, followed by a week of broken weather. Bright but cool from the 26th to the end. Hay crop above the average. Sharp TS at 7 p.m. on 12th, with several near flashes of L.

GOGERDDAN.—Very heavy T lasting for two hours on 12th, followed by heavy R.

## SCOTLAND.

CARGEN [DUMFRIES].—The temp., rainfall, and sunshine during the month were chiefly remarkable for their very close approximation to the average of 39 years. A period of warm dry weather was experienced for 10 days commencing on 7th, when half of the sunshine of the month (232 hours) was registered, and the max. temp. from 9th to 17th averaged  $70^{\circ}\cdot 1$ . The remainder was characterised by unsettled weather, low temp., and cloudy sky. Light S. and E. winds prevailed on 25 days. On 25th a sharp H storm occurred which did considerable damage to foliage, in some instances beating down the young corn. Farm crops hardly ever looked better at this season, and hay promises to be a heavy crop.

EDINBURGH, BLACKET PLACE.—Mean temp.  $0^{\circ}\cdot 3$  above, and R 34 per cent. below the average. H on 1st. Slight TS on 24th. T on 21st. Fog on 9th and 10th.

COLMONELL.—R  $\cdot 12$  in., and mean temp.  $0^{\circ}\cdot 4$ , above the average of 22 years.

TIGHNABRUACH.—A good summer month.

ABERDEEN, CRANFORD.—A cold month with little sunshine.

S. RONALDSHAY, ROEBERRY.—A very good month upon the whole. Mean temp.  $51^{\circ}\cdot 6$  or  $0^{\circ}\cdot 4$  below the average of 8 years.

## IRELAND.

DARRYNANE ABBEY.—Fine and hot from 6th to 21st; the rest of the month cold, and the last part misty and foggy.

O'BRIENSBRIDGE, ROSS.—A bad month for hay-making. T and L on 12th.

DUBLIN, FITZWILLIAM SQUARE.—An average month. Pressure temp. and R all about the normal value. Conducive to health and propitious to vegetation. It was, however, eminently changeable, and the fluctuations of temp. were abrupt and considerable. Mean temp.  $58^{\circ}\cdot 0$  or  $0^{\circ}\cdot 2$  above the average. High winds were noted on 8 days, but there were no gales. The temp. reached or exceeded  $70^{\circ}$  on 4 days. TS on 12th. T on 26th. H on 1st and 22nd.

OMAGH, EDENFEL.—June was a blustering unsettled month, with rainfall above and temp. below the average. On only 3 days did the temp. reach  $70^{\circ}$ , but on the other hand there were no night frosts. Oats, barley, turnips, and potatoes luxuriant, and the hay crop heavier than for many years.

# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

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CCCXCI.]

AUGUST, 1898.

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## BRITISH LOCAL METEOROLOGICAL PUBLICATIONS.

It is quite impossible for us to review all the pamphlets of this class which we receive—and are glad to receive—because we always check the rainfall values against those supplied to us in MS., and so not infrequently detect mistakes. But, as we have just said, we have neither time nor space to review them regularly year after year, though many of them are interesting as well as useful, and merit a much larger circulation than they obtain.

We intend to give a list of those we have received referring to 1897, arranging them in the sequence of Divisions, Counties, and Stations adopted in *British Rainfall*, but we must in the first place define what we intend to catalogue—viz. books, pamphlets, and broadsheets referring to the weather of 1897 in the British Isles. We do not intend as a rule to include articles, letters or tables in newspapers, even though a few separate copies may be pulled and supplied to the author—if we did this article would itself become almost a volume. Before starting with our county list it may be well to mention some of the *general* publications of the country. By far the oldest are the Quarterly Reports prepared by Mr. Glaisher, F.R.S., for the “Registrar General of Births, Deaths and Marriages of England and Wales,” then similar ones for Scotland, and still later we believe (but have not seen) the like for Ireland. There are the *daily, weekly, monthly* and *yearly* reports of the Meteorological Office; there are the *Quarterly Journal* and *Quarterly Record* of the Royal Meteorological Society, and the *Journal* of the Scottish Meteorological Society. There is also a section on Meteorology, giving remarks and a tabular summary, in the “Natural History Journal,” epitomizing the work done at the various schools belonging to the Society of Friends.

### MIDDLESEX.

*London (Old Street).*—An abstract is given in the “Report of the M.O.H.\* for Hackney.”

*London (Roy.Bot.Soc., Regent's Park).*—Daily observations published in the “Quarterly Record of the Roy. Botanic Soc.”

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\* Medical Officer of Health.

*London (Camden Square).*—Daily observations printed weekly in the "Journal of Horticulture."

#### SURREY.

For part of this county and of Kent, the daily rainfall at about 70 stations is tabulated by Mr. F. C. Bayard, Pres. R.Met.Soc., printed monthly by the Croydon Microscopical and Natural History Club, and reprinted in full in its annual "Report."

*Redhill (Oxford Road).*—Summary with remarks in 12-page 8vo. pamphlet privately printed by the observer, Mr. W. H. Tyndall, F.R.Met.Soc., entitled "Meteorology, Oxford Road, Redhill."

*Horsell (Lindisaye).*—Abstract in "Report of M.O.H., Guildford."

#### KENT.

*Margate (Apsley House).*—Report by the observer (Mr. Stokes, F.R.Met.Soc.) is printed with the "Report of the M.O.H., Margate."

*Greenwich (Royal Observatory).*—Daily observations published in the "Weekly Return of the Registrar General" and a complete volume a year or two after date.

#### SUSSEX.

*Eastbourne (Wilmington Square).*—Summaries and remarks by Mr. Sheward, F.R.Met.Soc. (in, we believe, two editions annually, one 16mo. for the pocket, and the other 8vo.) entitled "Annual Report of Meteorological observations."

*Crowborough (The Observatory).*—Summary and table privately printed in foolscap folio by Mr. C. L. Prince, F.R.A.S., F.R.Met.Soc. A very important series going back, at Uckfield, with, we think, few exceptions, for half a century. "The Summary" for 1897 is accompanied by a beautiful process block representing the Seaford hailstones of May 30th.

#### HAMPSHIRE.

*Old Lodge [Salisbury].*—The observer (Mr. E. Lamb) prints privately a compact broadsheet table of "Climatological Observations," i.e. a tabular statement of extremes and means.

#### HERTFORDSHIRE.

The monthly rainfall at stations in this county and a few outside is collected by Mr. J. Hopkinson, F.L.S., F.R.Met.Soc., and published in the "Transactions of the Hertfordshire Natural History Society," in which publication is also given a summary of Mr. Hopkinson's own observations at *The Grange, St. Albans*.

*Great Berkhamstead (Rose Bank).*—Mr. E. Mawley, Sec. R.Met.Soc., has for many years published a summary of his observations under the title "The Rose Year" in the annual volume "The Rosarian's Year Book."

# OXFORD.

*Oxford (Radcliffe Observatory).*—Daily observations are printed in *extenso* in an 8vo volume, part of the “Radcliffe Observations.”

# NORTHAMPTON.

Here again we have a county organisation, under the personal care of Mr. Christopher Markham, F.S.A., F.R.Met.Soc., who collects the returns and publishes them in the Trans. of the Northamptonshire N.H.Soc.

# HUNTINGDON AND CAMBRIDGE.

Many of the rain returns for these counties (and a few just outside them) are collected and edited by Mr. H. G. Fordham, and published monthly in a 4to table.

# NORFOLK.

Although published only in a newspaper, we cannot pass without mention the very valuable series of monthly tables of daily rainfall at about 40 stations which for more than a quarter of a century have been compiled by the Rev. Canon Du Port and published in the “Norfolk Chronicle.”

*Norwich (Brundall).*—Remarks upon each month and a tabular statement for the year are contributed yearly under the title “Meteorological Notes,” by Mr. A. W. Preston, F.R.Met.Soc., and published in the “Trans. of the Norfolk and Norwich Naturalists’ Society.”

# DORSET.

The rainfall of Dorset has been discussed with great care by Mr. H. Storks Eaton, M.A., F.R.Met.Soc., and several valuable reports have been published by him in the “Proceedings of the Dorset Nat. His. and Field Club.” We have an impression that monthly tables also are now being prepared under the Club’s auspices, and published in the local papers, but we do not receive them.

# DEVONSHIRE.

Respecting what is being done in this county, we are not fully aware. In the early years of the Devonshire Association there used to be a Meteorological Committee, which reported to the annual meeting. At that time Mr. Pengelly, F.R.S., of Torquay, was in full activity, and he communicated two or three papers per annum, so that a considerable amount of meteorological publication took place, and there were long rainfall tables published by the “Western Morning News.” We have seen none of these for a long time, and therefore do not know whether or not they are being continued.

*Plymouth (The Hoe).*—The results for this and other stations established by the Corporation are issued annually (but we have not had 1897) as a pamphlet (8vo, 26 pp.), "Meteorological Report," by Mr. H. Victor Prigg, A.M.I.C.E., Borough Meteorologist.

*Rousdon [Lyme Regis].*—For, and since, 1884 the observations at this station have been published yearly in 4to under the care and at the cost of Mr. Cuthbert E. Peek, M.A., F.R.A.S., F.R.Met.Soc., under the title "Rousdon Observatory, Devon. Meteorological Observations." The observatory is fully equipped, and the results are well worked out, the last received (1896) has a fine general view of the station, but a ground plan, drawn to scale, is much needed; without one it is almost impossible to follow the arguments on pages 19 to 21 of the 1896 volume.

*Barnstaple Athenæum.*—Mr. Wainwright started the compilation of a monthly table of rainfall for stations in N. Devon; it is, we hope, going on, and being published in the local press, but we have not seen a copy for many months.

#### CORNWALL.

This county has long been represented in current meteorological publications—the names of Barham, Dymond, Fox, Jordan, Liddell, Moyle, Richards, Squire, Whitley, at once occur to us, but we have to deal with present workers only. Cornwall is (as far as we are aware) alone in having a County Council which takes the slightest notice of its climate. Originated we believe by Mr. Trevail, a fcap. folio monthly summary of statistics of meteorology and diseases has for some years been issued at the cost of the County Council.

*Falmouth Observatory.*—For twenty years at least the Annual Reports of the "Roy. Cornwall Polytechnic Soc.," prepared by Mr. W. L. Fox, F.R.Met.Soc., have contained summaries of the observations at Falmouth, and of these, separate copies are printed for gratuitous distribution. Originally these reports included data for other stations in West Cornwall and Scilly, but since 1892 have dealt with Falmouth alone.

*Truro (Roy. Inst.).*—In bygone years we used to receive copies of the "Reports of the Roy. Inst.," which contained abstracts of the observations made at the Institute; we do not know whether they are continued.

*Liskeard (Dean Terrace).*—For more years than (without a long search) we can tell, but certainly for more than a quarter of a century, an interesting broadsheet has been issued by Mr. S. W. Jenkin, C.E., giving an abstract of his observations for the year, and a comparison with those of previous years. As we see that the values for 1897 are compared with those for the "previous 34 years," it is not improbable that the series extends over that long period.

SOMERSET.

*Bath Royal Institute*.—In the time of the late Rev. L. Blomfield various abstracts of these observations were published, and they may be continued, but we have nothing later than "The 68th Report of the Bath Roy. Lit. and Sci. Inst. for 1892," 8vo. 1893.

GLOUCESTER.

*Cheltenham (Naunton Park Villas)*—W. Ll. Evans, Esq. } Each of  
 „ *(Southam Villa)*—R. Tyrer, Esq. } these gentlemen contributes to local newspapers, and Mr. Tyrer collects the rainfall at many stations in the county, and publishes the monthly totals, but as far as we are aware there is no separate publication issued by either.

*Tewkesbury (Beckford)*.—Mr. F. Slade, C.E., F.R.Met.Soc., prepares and issues annually a very full tabular summary of his observations, remarks and notes as a large broadsheet.

HEREFORD.

A county rainfall table is prepared by, and published monthly in, the "Hereford Times," but we are not aware of any separate local publication in this county. Mr. Southall, F.R.Met.Soc., occasionally contributes important papers to the "Transactions of the Woolhope Club," but we do not see that publication and therefore cannot state what is being done.

STAFFORD.

*Burton (St. Paul's St.)*.—These observations are, we believe, published in the Reports of the Burton Nat. Hist. and Antiq. Soc., but we do not see them, and for 1897 did not receive the returns at all.

WORCESTER.

*Kidderminster (Prospect Hill)*.—Abstract tables published annually in the "Report of the M.O.H. and the Chief Sanitary Inspector."

WARWICK.

*Rugby School*.—An abstract of these observations is published in the yearly "Report of the Rugby School Nat. Hist. Soc."

*Coventry (City Hospital)*.—Abstract in the Annual Report of the M.O.H.

*Coventry (Priory Row)*.—The daily rainfall and chatty notes on the weather and on phenological phenomena are reported monthly by Alderman Gulson, and printed in the "Coventry Herald."

*Birmingham (Edgbaston)*.—Daily observations *in extenso* with diagrams printed in several colours published annually in the "Proc. Birmingham Nat. Hist. and Phil. Soc.," also with another excellent diagram in the "Report on the health of the City of Birmingham," by Dr. Alfred Hill, M.O.H.

## LINCOLNSHIRE.

As this is the first of the seven counties (Lincoln, Notts., Derby, Chester, Lancashire, Yorkshire and Flint) in which are stations of the Great Central Railway Company, we have to mention here that, from 1855 onwards the Manchester, Sheffield and Lincolnshire Railway Company (now called the Great Central) has maintained, in connection with its canals, a gradually increasing number of rain gauges (now 50), and prints annually the monthly totals, and a comparison of the yearly total with the mean for previous years.

## NOTTINGHAM.

*Nottingham (The Castle).*—Under the title "City of Nottingham. The Meteorology of Nottingham," the Corporation issue annually in foolscap folio a summary of The Castle observations, and monthly rainfall at several stations in the Trent valley, illustrated by the best meteorological diagram for the year of which we are aware, it is about  $2\frac{1}{2}$  feet square, and gives *daily* values of all the principal meteorological elements, and also statistics as to disease. Nine different colours are employed in this beautiful diagram.

*Worksop (Hodsock Priory).*—A compact table of results (with several 8vo pages of remarks) is privately printed by Mr. H. Mellish, F.R.Met.Soc., under the title of "The Weather of 1897 at Hodsock Priory."

## DERBYSHIRE.

We do not know of any separate publication for this county, but Mr. Hunter, C.E., F.R.Met.Soc., supplies a monthly and an annual summary to one of the local newspapers.

## CHESHIRE.

For certain stations in this county, also in Lancashire, Yorkshire, Cumberland and parts of Scotland, rain returns from various water works (of which Messrs. G. H. Hill and Sons, M.M.I.C.E., are consulting engineers) are given in a privately printed 4to pamphlet issued by them.

*Birkenhead (Bidstone Observatory).*—This establishment, under the care of Mr. W. E. Plummer, F.R.A.S., is recovering the position which it held under its original superintendent, and the results are published by the Mersey Harbour Board in an annual 8vo "Report."

## LANCASHIRE.

*Heaton Moor [Stockport].*—Dr. Jordan, M.O.H. for Heaton Norris, published in his annual report for 1895 a summary of his observations. He probably does so annually, but that is the only year which we have seen.

*St. Anne's-on-Sea.*—Dr. Booth, M.O.H. for this health resort, publishes in his annual report a summary of meteorological observa-

tions, but they are hopelessly wrong. To quote one point only, the mean yearly rainfall for the four years 1893-96 is given as 17·82 in. ! an outrageous value for the Lancashire coast, as is shown by Southport 10 miles S. with 29·42 in., and by Blackpool 5 miles N. with 31·39 in. for the same four years. We have not the report for 1897 or would have dealt with it. Either the records should be trustworthy or they should be given up. Dr. Booth is not wholly to blame, for he appealed in March, 1897, for a proper equipment, whether successfully or not we do not know, but we should have left the report without any returns rather than have given bad ones.

*Manchester (Oldham Road).*—The daily observations are published in extenso in the "Weekly Reports" of Dr. Niven, M.O.H., Manchester.

*Bolton (The Park).*—A tabular summary and a few pages of remarks by the observer, Mr. W. W. Midgley, F.R.Met.Soc., are published annually in 8vo by the Bolton Corporation as "Borough of Bolton. Annual report of the Museums and Meteorological Observatory."

*Southport (Hesketh Park).*—This is one of the best of the "Health Resort" stations, but as we have previously\* described one of the "Borough of Southport Meteorological Department's Reports," we need say only that Mr. Baxendell, F.R.Met.Soc., is yearly improving them. The Fearnley Trustees are supplying excellent instruments, and we do not think that there will be a fault to find with the equipment when Mr. Baxendell has thrown away his evaporator, which he says is "In a Stevenson screen, painted white, and erected upon the roof of the observatory."

*Over Darwen (Hoddlesden).*—For this and 14 other stations in Lancashire and Yorkshire maintained by the Waterworks Department of the Blackburn Corporation, an annual table is issued by the Engineer, Mr. W. Stubbs, C.E.

*Stonyhurst College.*—A very interesting little volume of the "Results of Meteorological Observations" has been issued by the Stonyhurst authorities annually from 1860 to 1897†; they have been noticed on three occasions in these pages, and therefore need not be further described.

*Skelwith Fold [Ambleside].*—Mr. S. A. Marshall issues privately a monthly card giving the total fall of rain for the month at his own stations, and at others in the S.W. portion of the Lake district.

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\* *Met. Mag.*, Vol. XXVIII., p. 75.

† We should be very thankful for copies for 1861, 62, 63 and 64 if anyone possesses a spare set.

## YORKSHIRE.

In the "Annual Reports" of the M.O.H. for the West Riding there is a general table of rainfall, which as it is derived from *British Rainfall* it need not be described; but there is another table on an earlier page which suggests other publications, and which seems to indicate one or two unknown observers. The various M.O.H.'s in the Riding have, we believe, to forward to Dr. Kaye a copy of their reports, and Dr. Kaye acknowledges receipt of 121 such printed documents, in 15 of which more or less meteorological information was given. This will be looked into.

*Halifax (Albert).*—For this and 9 other stations belonging to the Halifax Corporation Water Works, a small annual table is printed by Mr. J. A. Paskin, C.E.

*Bradford (Brayshaw Res.)*—For this and 36 other stations belonging to the Bradford Corporation Water Works a table is annually printed by Mr. J. Watson, C.E.

*Bradford (The Exchange).*—We believe that abstracts of these observations are sometimes published by the Yorkshire Naturalists' Union, but have not seen them.

*York (Phil. Soc.)*—We do not know what has happened here. For some years Mr. J. E. Clark, B.A., has prepared an interesting report on the meteorology of the district, but he has left York, and we have seen no report for either 1896 or 1897.

*Scarborough (Observatory).*—For 1896 Mr. E. W. Ellerbeck, F.R.A.S., Meteorologist to the Corporation, published an 8vo "Meteorological Report," consisting of four pages, chiefly tables. We presume that there is a similar (or larger) one for 1897, but we have not seen it.

## MONMOUTH.

*Marshfield (Llwynarthan).*—Here again we are not sure as to what is being done.—For many years Mr. F. G. Evans, F.R.Met.Soc., compiled very valuable reports on the rainfall of the district, which were published in the "Transactions of the Cardiff Naturalists' Society," but we have not seen a copy for several years.

*Chepstow (Shirenewton Hall).*—Mr. E. J. Lowe, F.R.S., who, thirty or forty years ago, worked very hard at the meteorology of Nottinghamshire, still devotes much time to the subject, and though he does not publish anything separately, compiles an elaborate report on the meteorology and especially on the rainfall of the district around his new residence, and has it inserted in the local newspapers.

## GLAMORGAN.

*Penarth (Cwrt-y-Vil).*—This and several other returns from the county are published regularly in the "Western Mail" and also this year (1898) in "The Cambrian Natural Observer."

## I. OF MAN.

We are not aware of any special publication on the meteorology of the Island, but Mr. A. W. Moore prepares an annual summary which is published in the local papers.

# DUMFRIES.

*Dumfries (Ivy Bank).*—A full report is prepared annually by the Rev. W. Andson and published in the "Report of the Dumfries and Galloway Nat. Hist. and Antiq. Soc."

# EDINBURGH.

*Edinburgh (Blacket Place).*—For 1897 (also for 1895, so probably annually) a carefully compiled summary has been prepared by Mr. Mossman, F.R.S.E., F.R.Met.Soc., and published in the "Proceedings of the Roy. Phys. Soc. of Edinburgh."

# LANARK AND RENFREW.

Glasgow, as is well known, is partly in both these counties. Glasgow, as is not so well known, has an exceptional number of parks, and Glasgow is unique in the fact that every park has a thermometer stand, thermometers and a rain guage, and the Superintendent, Mr. J. Whitton, publishes the results annually in an 8vo. pamphlet "Meteorological Notes and Remarks upon the Weather during the year —, with its general effects upon vegetation." Glasgow fetches the bulk of its water from Loch Katrine, but there are altogether 15 rain guages connected with the Water Works, and an abstract of their results is privately printed annually by the engineer, Mr. J. M. Gale, C.E.

# RENFREW.

*Paisley (The Coats Obs.).*—Some years since, there used to be useful summaries of these observations in the "Reports of the Coats Observatory," but we have no recent ones.

# STIRLING.

*Gargunnoch.*—Col. Stirling, of Gargunnoch, prepares annually for some local society, and favours us with a reprint of, a table giving the monthly rainfall at his own and 14 other stations in the county.

# DUBLIN.

*Dublin (FitzWilliam Square).*—Dr. J. W. Moore, F.R.Met.Soc., prepares a very full abstract of, and remarks upon, his observations, but we do not know in what periodical they appear.

*Balbriggan (Ardgillan).*—Although Captain Taylor, F.R.Met.Soc., has not carried on his observations for many years, he has made rapid strides in improving his privately printed 4to. pamphlets "Report and Results of Met. Obs. made at Ardgillan" until the last, for 1897, with its excellent view of the instruments in his beautiful garden, is thoroughly well done.

Obviously the above list has many imperfections; we invite everyone to help us to remove them.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858-97.

JULY.

ELEMENTS.		MONTHLY MEANS OR TOTALS.										ABSOLUTE READINGS.									
		MEANS 9 A.M. AND 9 P.M.										EXTREMES AT 9 A.M. AND 9 P.M.									
		Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	Mean.	Highest Month.		Lowest Month.		Highest.		Lowest.		Mean of all Highest Lowest.	Mean of all Highest Lowest.						
						Value.	Date.	Value.	Date.	Value.	Date.	Value.	Date.								
Barometer ..... (cor. & red.)	1 29.961	2 30.193 1885	3 29.767 1861	4 9 a.m. 9 p.m.	5 29.963 29.959	6 30.197 30.189	7 1885 1885	8 29.766 29.769	9 1861 1861	10 30.469 30.450	11 27th, 1882 26th, 1882	12 29.210 29.247	13 15th, 1877 14th, 1877	14 30.302 30.283	15 29.553 29.547						
(Dry Bulb..... Max. .... Min. .... Wet Bulb.....)	62.5 74.1 54.0 57.8	68.1 1868	58.1 1888	9 a.m. 9 p.m.	64.1 60.9	70.4 67.1	1868 1859	59.2 56.9	79.88 1888	80.3 79.7	21st, 1868 15th, 1881	45.4 49.4	11th, 1888 15th, 1883	73.6 69.7	55.8 53.5						
Solar Rad., black ... Solar Rad., bright.. Grass Minimum ... Soil, 1 foot .....	116.2 84.6 50.4 62.1	...	...	...	...	123.4 91.4	1874 1887	105.9 75.6	1888 1879	137.7 105.4	19th, 1881 15th, 1881	65.1 58.4	15th, 1875 21st, 1879	130.6 96.3	84.5 69.1						
Cloud .....	5.7	7.9 1879	4.0 1879	9 a.m. 9 p.m.	5.9 5.4	8.6 7.6	1879 1888	3.8 2.8	1865 1897	10 10	Every year Every year	0 0	Various Various	10.0 10.0	0.3 0.1						
Rainfall .....	2.39	5.10 1880	4.5 1868	9 a.m. 9 p.m.	1.01 1.38	3.03 3.59	1867 1888	.04 .02	1863 1868	1.82 1.39	26th, 1867 14th, 1883	.00 .00	Every year Every year	.41 .49	.00 .00						

Max. Rainfall in 24 hours, 1.82 in., 25th, 1867. Mean max. daily fall, .71 in.

# ROYAL METEOROLOGICAL SOCIETY.

THE monthly Meeting of this Society was held on Wednesday afternoon, June the 15th, at the rooms of the Royal Astronomical Society, Burlington House, Mr. F. C. Bayard, LL.M., President, in the chair.

Matthew William Dunscombe and Robert Stokes-Beagley were duly elected Fellows of the Society.

A paper by Mr. R. C. Mossman, F.R.S.E., was read on the "Frequency of the Non-Instrumental Meteorological Phenomena in London with different winds from 1763-1897." In previous papers, the author has discussed the secular and seasonal variation of various phenomena, and he now gives the results of an analysis of the direction of the surface winds observed during the occurrence of snow, hail, gales, thunderstorms, lightning, fog and aurora. Snow is of most frequent occurrence with north and east winds, and least common with S.W. winds. Hail showers occur most often with W., N.W. and N. winds. Gales are most frequent with W. and S. winds. The greatest number of both summer and winter thunderstorms occurs with W. winds, although the values in summer are high with E., S.E. and S. winds. The greatest number of fogs are recorded on calm days, closely followed by days on which the wind blew from the east.

A paper by Mr. A. L. Rotch also was read, on "The Exploration of the free air by means of Kites, at Blue Hill Observatory, Mass., U.S.A." After giving a brief account of the use of kites for scientific purposes from 1749 to the present time, the author described the various forms of kites which have been employed at Blue Hill Observatory, viz., the Eddy, or Malay tailless kite; the Hargrave cellular, or box kite; and the Lamson aëro-curve kite. The highest flight was on October 15th, 1897, when by means of four kites, having a combined lifting surface of 150 square feet, the meteorograph, at the end of 20,100 feet of wire, was raised vertically 11,080 feet above the hill. About 200 records from kites have been obtained in the free air at heights from 100 to 11,000 feet in all kinds of weather. Mr. Rotch maintains that the kite can be made of the greatest importance for meteorological investigation. At the recent meeting of the International Aéronautical Committee, at Strassburg, it was recommended that all central observatories should employ kites as being of prime importance for the advancement of meteorological knowledge.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1898.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
England, London .....	56·2	1	24·3	21	46·9	35·6	36·0	82	92·1	22·6	1·08	15	6·1
Malta.....	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape of Good Hope ...	95·7	22	50·6	2	79·4	60·1	57·5	69	...	...	·92	4	1·5
Mauritius.....	86·8	9	67·4	13	84·5	74·2	70·4	77	142·1	61·1	3·70	17	5·6
Calcutta.....	89·1	19	50·2	23	81·5	60·3	55·1	59	144·0	39·2	·00	0	2·3
Bombay.....	88·4	26	63·9	20	82·6	69·6	64·9	69	135·3	52·9	·17	2	0·9
Ceylon, Colombo .....	91·4	24	67·5	18	89·6	73·1	70·4	75	154·0	64·0	1·98	8	4·0
Melbourne.....	107·5	4	47·1	18	86·4	61·9	54·7	51	158·5	35·9	1·06	2	4·8
Adelaide .....	109·6	1	52·4	17	90·9	67·4	52·2	41	163·9	42·2	·55	4	3·0
Sydney .....	94·8	9	59·8	20	78·6	65·9	62·6	70	162·1	50·9	4·92	8	5·2
Wellington .....	75·0	1	44·0	2	67·3	52·2	52·8	79	133·0	36·0	1·85	8	4·0
Auckland .....	78·5	18	47·5	2	71·2	56·1	53·9	71	140·0	44·0	·78	3	4·3
Jamaica, Kingston.....	87·3	17	63·2	7	84·3	66·4	64·5	74	...	...	2·66	8	3·0
Trinidad .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada.....	86·8	11a	69·6	21	82·5	71·2	67·2	71	155·2	...	2·16	13	3·1
Toronto .....	46·9	11	— 5·6	1	30·9	17·2	23·2	86	63·0	—10·8	3·06	17	7·2
New Brunswick, Fredericton .....	46·9	25	—20·5	...	31·4	12·1	15·0	75	...	...	3·71	11	6·7
Manitoba, Winnipeg .....	37·5	12	—26·6	18	17·4	—7·5	...	...	...	...	1·07	7	4·9
British Columbia, Esquimalt .....	54·6	27	31·8	19	48·0	38·5	39·5	89	...	...	5·19	19	8·3

a—and 12.

## REMARKS.

*Mauritius*.—Mean temp. of air 0°·1 above, of dew point 0°·3 above, and rainfall 3·14 in. below, their respective averages. Mean hourly velocity of wind 10·2 miles, or 1·2 below the average; extremes, 26·6 on 4th and 1·6 on 20th. Prevailing direction E.S.E. L on 3rd, T on 20th, and L and T on 21st and 22nd. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 80°·8 or 0°·7 above, of dew point 0°·2 above, and rainfall ·07 in. above, their respective averages. TSS on 7 days. L on 3 days. H. O. BARNARD.

*Adelaide*.—Good rains in the interior and far N. district in the early part of the month, and over the colony generally at the close, breaking up the drought. Mean temp. 5°·4 above the average for 41 years, only two Februaries having had higher temp. C. TODD, F.R.S.

*Sydney*.—Temp. 1°·4 above, humidity 3·7 below, and rainfall ·43 in. below, their respective averages. A monsoonal rainstorm passed over the colony from 10th to 14th, causing heavy floods on the Hunter and Hawkesbury Rivers. H. C. RUSSELL, F.R.S.

*Wellington*.—On 1st a sudden storm from S. caused a severe dust-storm, with rain and hail and the bar. fell to 29·3; rain and hail also on 2nd, then showery to the 7th. The remainder of the month was tolerably fine, but generally strong N.W. winds; fog on 17th and 18th. Slight earthquake before midnight on 13th. Mean temp. 2°·8, and rainfall 1·69 in., below their respective averages. R. B. GORE.

*Auckland*.—An unusually dry and cool month, the rainfall being little more than one-fifth of the average of 31 years, and the temp. 4° lower than the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 1·5 miles. Rainfall for the two months of the year one-third over the average. Hailstorm at King's Valley in the lowlands on 24th. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,  
JULY, 1898.

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.
I.	Uxbridge, Harefield Pk..	·51	XI.	Builth, Abergwesyn Vic.	1·36
II.	Dorking, Abinger Hall ..	·51	„	Rhayader, Nantgwillt ...	1·04
„	Birchington, Thor .....	1·26	„	Lake Vyrnwy .....	1·20
„	Hailsham .....	·53	„	Corwen, Rhug .....	1·65
„	Ryde, Thornbrough .....	·27	„	Criccieth, Talarvor .....	·73
„	Emsworth, Redlands ...	·46	„	I. of Man, Douglas .....	·28
„	Alton, Ashdell .....	·49	XII.	Stoneykirk, Ardwell Ho.	·54
III.	Oxford, Magdalen Col..	·47	„	New Galloway, Glenlee ..	·89
„	Banbury, Bloxham .....	·85	„	Moniaive, Maxwellton Ho.	·49
„	Northampton, Sedgebrook	·80	„	Lilliesleaf, Riddell .....	·85
„	Duddington [Stamford].	·91	XIII.	N. Esk Res. [Penicuik]	1·60
„	Alconbury .....	·83	XIV.	Glasgow, Queen's Park..	1·46
„	Wisbech, Bank House...	1·17	XV.	Inverary, Newtown .....	2·97
IV.	Southend .....	·65	„	Ballachulish, Ardsheal...	3·42
„	Harlow, Sheering.....	1·58	„	Islay, Gruinart School ...	·96
„	Colchester, Lexden .....	·98	XVI.	Dollar.....	2·06
„	Rendlesham Hall .....	1·73	„	Balquhidder, Stronvar...	1·67
„	Scole Rectory .....	1·52	„	Coupar Angus Station...	·63
„	Swaffham .....	1·22	„	Dalnaspidal H. R. S.....	...
V.	Salisbury, Alderbury ...	·44	XVII.	Keith H. R. S.....	2·30
„	Bishop's Cannings .....	·53	„	Forres H. R. S. ....	1·57
„	Blandford, Whatcombe .	·42	XVIII.	Fearn, Lower Pitkerrie..	1·51
„	Ashburton, Holne Vic...	·56	„	N. Uist, Loch Maddy ...	...
„	Okehampton, Oaklands.	·64	„	Invergarry .....	1·10
„	Hartland Abbey .....	·79	„	Aviemore H. R. S. ....	1·43
„	Lynton, Glenthorne ...	·52	„	Loch Ness, Drumnadrochit	2·22
„	Probus, Lamellyn .....	·80	XIX.	Invershin .....	2·43
„	Wellington, The Avenue	·25	„	Durness .....	3·27
„	North Cadbury Rectory	·59	„	Watten H. R. S.....	1·28
VI.	Clifton, Pembroke Road	·66	XX.	Dunmanway, Coolkelure	1·15
„	Ross, The Graig .....	·55	„	Cork, Wellesley Terrace	1·07
„	Wem, Clive Vicarage ...	·83	„	Killarney, Woodlawn ..	1·29
„	Wolverhampton, Tettenhall	...	„	Caher, Duneske .....	1·58
„	Cheadle, The Heath Ho.	1·32	„	Ballingarry, Hazelfort...	1·55
„	Coventry, Priory Row ..	1·10	„	Limerick, Kilcornan ...	1·46
VII.	Grantham, Stainby .....	1·46	„	Broadford, Hurdlestown	...
„	Horncastle, Bucknall ...	·48	„	Milton Malbay .....	1·51
„	Worksop, Hodack Priory	1·61	XXI.	Gtewyn, Courtown House	1·77
VIII.	Neston, Hinderton .....	·93	„	Athlone, Twyford .....	1·29
„	Southport, Hesketh Park	·35	„	Mullingar, Belvedere ...	1·85
„	Chatburn, Middlewood.	·71	„	Longford, Currygrane...	·80
IX.	Melmerby, Baldersby ...	1·01	XXII.	Woodlawn .....	1·11
„	Scarborough, Observat'y	1·19	„	Crossmolina, Enniscoe ..	1·26
„	Middleton, Mickleton ...	·83	„	Collooney, Markree Obs.	1·45
X.	Haltwhistle, Unthank...	1·56	„	Ballinamore, Lawderdale	2·02
„	Bamburgh .....	·82	XXIII.	Warrenpoint.....	·48
„	Duddon Valley, Ulpha School	2·16	„	Seaforde.....	·70
„	Keswick, The Bank .....	1·13	„	Belfast, Springfield .....	·74
XI.	Llanfrechfa Grange .....	·96	„	Bushmills, Dundarave..	·75
„	Llandovery .....	1·10	„	Stewartstown .....	·50
„	Castle Malgwyn .....	1·43	„	Killybegs .....	1·28
„	Brecknock, The Barracks	·95	„	Horn Head .....	1·06

JULY, 1898.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which "01 or more fell.	TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours		Max.		Min.					
				Dpth	Date			Deg.	Date	Deg.	Date		
I.	London (Camden Square) ...	1·09	— 1·59	·46	27	7	82·9	15	43·9	11	0	0	
II.	Tenterden .....	·25	— 2·10	·10	22	5	78·5	16	42·0	14	0	0	
III.	Hartley Wintney .....	·49	...	·13	1, 22	6	86·0	16	...	...	1	...	
	Hitchin .....	·93	— 1·79	·37	28	7	77·0	16	42·0	10	0	0	
IV.	Winslow (Addington) .....	·95	— 2·34	·44	1	7	81·0	15	40·0	11	0	0	
	Bury St. Edmunds (Westley) ...	1·72	— ·85	·61	28	8	73·0	16	45·0	14	0	...	
V.	Norwich (Brundall) .....	2·00	...	1·00	28	8	76·0	18	40·0	21	0	0	
	Winterbourne Steepleton ...	·28	...	·11	1	6	80·2	16	39·0	30	0	2	
VI.	Torquay (Cary Green) .....	·24	...	·07	19	6	78·2	16	49·0	4	0	0	
	Polapit Tamar [Launceston]..	·38	— 3·03	·09	22	6	75·9	16	37·7	5	0	0	
VII.	Stroud (Upfield) .....	·77	— 2·80	·37	1	8	82·0	15	45·0	29	0	...	
	Church Stretton (Woolstaston) ..	·80	— 2·17	·61	1	7	75·5	16	43·0	30	0	0	
VIII.	Worcester (Diglis Lock) .....	·74	— 2·13	·40	1	5	...	...	...	...	...	...	
	Leicester (Rotherby Hall) ...	·98	...	·61	1	5	...	...	...	...	...	...	
IX.	Boston .....	·78	— 2·01	·52	1	6	85·0	15	44·0	14	0	0	
	Hesley Hall (Tickhill) .....	2·45	— ·22	2·15	22	7	79·0	15	41·0	30	0	0	
X.	Manchester (Plymouth Grove) ..	·62	— 3·17	·20	1	9	77·0	10a	42·0	29	0	0	
XI.	Wetherby (Ribston Hall) ..	·87	— 2·31	·52	22	6	...	...	...	...	...	...	
	Skipton (Arneliffe) .....	1·83	— 3·81	·77	17	9	...	...	...	...	...	...	
XII.	Hull (Pearson Park) .....	·50	— 2·09	·22	1	8	74·0	21	40·0	20	0	0	
	Newcastle (Town Moor) .....	·67	— 2·85	·28	28	7	...	...	...	...	...	...	
XIII.	Borrowdale (Seathwaite) .....	3·66	— 7·33	1·49	17	13	...	...	...	...	...	...	
	Cardiff (Ely) .....	·69	— 3·37	·33	22	3	...	...	...	...	...	...	
XIV.	Haverfordwest .....	1·06	— 3·15	·42	1	5	75·8	16	40·2	31	0	0	
	Aberystwith (Gogerddan) ...	3·78	— 2·15	2·22	7	7	77·0	8	...	...	...	...	
XV.	Llandudno .....	·83	— 2·17	·35	1	9	71·2	16	48·0	9, 26	0	...	
	Cargen [Dumfries] .....	·56	— 3·37	·32	2	3	75·0	11	40·0	25d	0	0	
XVI.	Edinburgh (Blacket Place) ..	1·28	...	·28	17	10	74·1	21	42·9	30	0	0	
	Colmonell .....	1·09	...	·33	17	10	78·0	21	35·0	24	0	...	
XVII.	Tighnabruaich .....	3·13	...	1·19	5	10	69·0	9, 10	43·0	24	0	0	
	Mull (Quinish) .....	2·91	— 1·14	·72	5	18	...	...	...	...	...	...	
XVIII.	Loch Leven Sluices .....	·90	— 2·72	·20	4, 17	7	...	...	...	...	...	...	
	Dundee (Eastern Necropolis) ..	·85	— 2·61	·25	28	8	78·5	10	44·1	2, 20	0	...	
XIX.	Braemar .....	·87	— 2·34	·29	5	12	73·5	11	32·7	21	0	5	
	Aberdeen (Cranford) ...	·78	...	·19	17	16	75·0	6	35·0	19	0	...	
XX.	Cawdor (Budgate) .....	1·90	— 1·40	·42	17	13	...	...	...	...	...	...	
	Strathconan [Beaully] .....	2·38	— 1·12	·86	18	8	...	...	...	...	...	...	
XXI.	Glencarron Lodge .....	5·66	...	1·72	17	19	71·1	9	37·6	25	0	...	
	Dunrobin .....	1·07	— 1·78	·47	17	10	73·0	11	41·0	25	0	...	
XXII.	S. Ronaldshay (Roeberry) ...	2·83	— ·47	·73	27	17	67·0	22	44·0	7	0	...	
	Darrynane Abbey .....	1·39	...	·42	27	12	...	...	...	...	...	...	
XXIII.	Waterford (Brook Lodge) ...	1·55	— 1·98	·71	21	8	78·0	11b	40·0	30	0	...	
	O'Briensbridge (Ross) .....	1·82	...	·53	22	8	...	...	...	...	...	...	
XXIV.	Carlow (Browne's Hill) .....	1·05	— 2·47	·69	1	5	...	...	...	...	...	...	
	Dublin (Fitz William Square) ..	·94	— 1·74	·34	22	8	75·2	11	44·9	4	0	0	
XXV.	Ballinasloe .....	1·81	— 1·74	·68	22	10	74·0	10c	43·0	4	0	...	
	Clifden (Kylemore) .....	2·58	...	1·30	21	11	...	...	...	...	...	...	
XXVI.	Waringstown .....	·60	— 2·92	·44	21	5	80·0	11	39·0	2	0	0	
	Londonderry (Creggan Res.) ..	·70	— 3·42	·16	27	16	...	...	...	...	...	...	
XXVII.	Omagh (Edenfel) .....	·61	— 3·11	·30	21	7	74·0	9	38·0	4	0	...	

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

a—and 21. b—and 16. c—and 12. d—and 30.

# METEOROLOGICAL NOTES ON JULY, 1898.

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.

TENTERDEN.—Rainfall even less than in 1896 and 1897; the record showing only two drier Julys, viz. '21 in. in 1869, and '19 in. in 1885, and no other instance of three Julys in succession with less than an inch. Mean temp. two or three degrees lower than in the two previous years. Duration of sunshine 217 hours 40 mins. T in distance on 28th. Max. temp. on 10th only 58°·5.

HARTLEY WINTNEY.—The driest July registered in 12 years; the rainfall being 2·50 in. below the average. In the first three weeks N. winds were prevalent. Ozone was recorded on 17 days. TSS on 27th and 28th; L on 26th. Rainfall of the first 7 months of the year 6·16 in. below the average.

ADDINGTON.—A month of fine weather; nearly half of the small rainfall falling on the first day, followed by absolute drought until the 18th. A fine time for securing the hay crop, which was heavy in this part of the country. The last two mornings were very cold for the season. T on 27th and 28th.

BURY ST. EDMUNDS, WESTLEY.—A cold month with little sunshine, the max. temp. being below 62° on 7 days. TS on 28th.

NORWICH, BRUNDALL.—Generally dry and somewhat cool, the mean temp. being about 2° below the average. No days of excessive heat. Great R with T and L in the early morning on 29th.

WINTERBOURNE STEEPLTON.—Remarkably dry with a complete succession of bright and fine days from the 2nd to the 9th inclusive. The max. temp. reached 80° on only one day, and on the 30th and 31st frost on grass was recorded. Mean temp. 59°·3, being exactly the average of 5 years. No TSS. Fog on 1st and 22nd; distant T on 27th.

TORQUAY, CARY GREEN.—R 2·41 in. below the average of 22 years. Mean temp. 62°·2 or 0°·9 above the average. Duration of sunshine 255 hours 45 mins., being 60 hours 25 mins. above the average. No sunless day.

POLAPIT TAMAR.—The driest July for 18 years, with absolute drought from 2nd to 21st inclusive. Thick fog on 16th; T on 22nd.

WOOLSTASTON.—A very dry month; the country much burnt up, but the hay crop excellent and well gathered in. Mean temp. 59°·4.

HESLEY HALL [TICKHILL].—A very severe TS occurred on the night of 22nd.

MANCHESTER, PLYMOUTH GROVE.—The driest July in 31 years excepting the year of drought, 1868, when the rainfall was '48 in. Mean temp. 61°·5.

ARNcliffe VIC.—A very dry month; the third dry July in succession following the very wet July of 1895.

## WALES.

HAVERFORDWEST.—One of the finest Julys on record; it commenced with heavy R on the 1st, after which absolute drought prevailed until the 21st when R fell, and also in the forenoon of the 22nd, followed by fine bright weather again, until the 28th when a little R fell, with a strong wind. Fine weather prevailed on the last three days. Low temp. on grass on 30th, 34°·0.

GOGERDDAN.—A very heavy TS occurred on 22nd, with the greatest R in so short a time for more than 20 years.

LLANDUDNO.—A fine month throughout. Duration of sunshine 247 hours.

## SCOTLAND.

CARGEN [DUMFRIES].—High pressure, low temp. and light rainfall were the features of the month. The mean temp.  $57^{\circ}\cdot8$  has been lower in eight years since 1860, but only in 1878 was a smaller rainfall recorded. Low night temp. was generally prevalent, and the range on several days exceeded  $30^{\circ}$  being  $33^{\circ}\cdot2$  on 15th. More than half the R fell during a TS on 2nd, only  $\cdot24$  in. falling during the remaining 30 days. W. winds prevailed on 13 days and N. on 14; it is somewhat remarkable that the wind was N.E. on the warmest day of the month. Owing to the dry sunny weather the hay crop was secured in excellent condition, and, owing to the heavy rainfall of the late spring and early summer, it proved of exceptional bulk. Pastures and turnips are suffering severely from the long continued drought.

EDINBURGH, BLACKET PLACE.—A dry month with a good deal of sunshine but no great heat. Mean temp.  $0^{\circ}\cdot2$  below the average. R only 38 per cent. of the normal. Mean pressure the highest in July since 1863. TS with heavy R at 2.15 p.m. on 28th.

COLMONELL.—R  $2\cdot50$  in. and mean temp.  $1^{\circ}\cdot0$ , below the average of 22 years.

TIGHNABRUACH.—Everyone satisfied with the weather during the month.

S. RONALDSHAY, ROEBERRY.—Upon the whole a pretty fine month. Mean temp.  $53^{\circ}\cdot2$ , or  $1^{\circ}\cdot5$  below the average of 8 years.

## IRELAND.

DARRYNANE ABBEY.—A very dry, fine, hot month. Of the total R,  $1\cdot09$  in. or nearly four-fifths of the whole, fell on three days.

O'BRIENSBRIDGE, ROSS.—The finest July since 1878, when  $1\cdot42$  in. of R fell. Frequent T and L on 22nd.

DUBLIN, FITZWILLIAM SQUARE.—Strangely, like July, 1897, this month was very fine and dry with mean temp.  $61^{\circ}\cdot1$ , or  $0\cdot5$  above the average. Of the total R more than 60 per cent. fell on 21st and 22nd, the R and number of rainy days being much below the average. High winds occurred on 9 days, reaching the force of a gale on the 18th. The temp. in shade reached or exceeded  $70^{\circ}$  on 7 days. T on 22nd; solar halo on 20th.

WARINGSTOWN.—A very dry month, but not without precedent in the 36 years recorded, only  $\cdot52$  in. falling in July, 1863, and  $\cdot57$  in. in July, 1878.

OMAGH, EDENFEL.—The driest and finest July since the record commenced in 1864, for although there were no very high temperatures ( $74^{\circ}$  being reached only twice), there was warmth enough for the maturing of all crops, which are the finest for years. An abundant hay crop being saved "literally" without a shower.

## ERRATA IN "METEOROLOGICAL MAGAZINE," 1897.

## REGULAR TABLES.

Waringstown ..... Mar. Total rain *should be*  $5\cdot35$  in., *not*  $5\cdot38$  in.

## SUPPLEMENTARY TABLES.

Stoneykirk, Ardwell House...	Jan.	Total rain <i>should be</i> $1\cdot94$ in., <i>not</i> $1\cdot65$ in.
Scarborough, Observatory ...	Mar.	" " " " $2\cdot69$ " " $2\cdot66$ "
" " " " " "	May	" " " " $1\cdot22$ " " $\cdot88$ "
Cheadle, The Heath House...	June	" " " " $3\cdot18$ " " $3\cdot13$ "
Bushmills, Dundarave .....	Oct.	" " " " $2\cdot34$ " " $2\cdot24$ "
Lough Swilly, Carrablagh ...	Nov.	" " " " $2\cdot87$ " " $2\cdot74$ "

# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

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CCCXCII.]

SEPTEMBER, 1898.

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### BRITISH LOCAL METEOROLOGICAL PUBLICATIONS.

*(Continued from p. 105.)*

THANKS to the help of several correspondents, but especially to that of Mr. Baxendell, of Southport, we are able to make important additions to the list given in our last number ; but our impression is that unless some hard line of definition be drawn, the list may be extended almost indefinitely—certainly to several hundred publications per annum. Perhaps it would be better to state our reasons for this belief. Although neither the previous M.O.H. to the County Council of the West Riding of Yorkshire (Dr. Whitelegge), nor the present (Dr. Kaye), is a rainfall observer, we have had the pleasure of corresponding with them and receiving copies of their annual reports. In these reports are summaries of those of the Medical Officers of more than one hundred urban and rural sanitary authorities ; and we found that several of these local reports contained meteorological data ; and Dr. Kaye tells us that for 1897 they are even more numerous. Suppose there are 30. There are also in Yorkshire, the N. and the E. Ridings ; if we take them each at one-third of the W. Riding, we have for this one county 50 such reports per annum ; and although Yorkshire is the largest and probably most populous of the counties, we must remember that there are 39 others ; and if we take each (including Lancashire, Devonshire, &c.) at even one-tenth as many as Yorkshire, we have  $39 \times 5 = 195 + 50 = 245$  such reports.

Moreover, in our list we did not quote the report from any lunatic asylum, because we do not now receive any, but we know that meteorological records are kept at many of them, and abstracts used to be given in their reports.

For these reasons we think it probable that if all local publications (irrespective of newspapers) which are issued annually and which contain meteorological data are to be catalogued, the number of entries would reach, or exceed, 200.

However, we give a few more, and we hope that this enquiry will continue (as it has begun) to lead to the discovery of some observers of whom we had not previously heard.

## WEST SUSSEX.

In his annual report for 1897, Dr. Kelly, M.O.H. for the combined district of West Sussex, gives a few meteorological tables and remarks for Worthing, and monthly sunshine values for Westbourne and for Brighton.

## SUFFOLK.

*Lowestoft*.—A summary entitled, "Meteorology of Lowestoft in 1896," by Mr. S. H. Miller, F.R.Met.S., F.R.A.S., was printed by the Corporation.

## DEVONSHIRE.

*Torquay*.—A full annual report of about 30 pages, by Mr. A. Chandler, F.R.Met.S., Borough Meteorologist, was published in pamphlet form by the Corporation.

The "Fifteenth Report (third series) of the Committee on the Climate of Devon, edited by Alfred Chandler, F.R.Met.S., Honorary Secretary, reprinted from the Transactions of the Devonshire Association for the Advancement of Science, Literature and Art," giving full monthly results for 1896 for 17 stations, also was published separately.

*Barnstaple Athenæum*.—We have received copy of the tables for several months printed in the "North Devon Herald"; rainfall totals and max. fall at 19 stations, temperature extremes at 7 stations. Monthly rainfall tables are also printed in the "Devon and Exeter Gazette."

## CORNWALL.

*Newquay*.—Dr. Hardwick, the local M.O.H., now appends to his annual report a summary of the work of the Urban District Council's Climatological Station.

## GLOUCESTER.

*Cheltenham*.—An "Annual Report upon the Meteorology of Cheltenham," by Mr. Richard Tyrer, B.A., F.R.Met.S., Borough Meteorologist, appeared as an appendix to the annual report for 1897 of Dr. Garrett, M.O.H. for Cheltenham. Mr. Tyrer's report is also published separately as a broadsheet, printed in smaller type than the foregoing. He recently prepared for a local society an interesting paper on the climate of Cheltenham, which has probably by this time been published.

## YORKSHIRE, WEST RIDING.

*Bradford (The Exchange)*.—An elaborate tabular broadsheet is published annually by Messrs. McLandsborough and Johnson.

*Reports of M.O.H.*—These have already been mentioned, and it does not seem worth while to set out the list *in extenso*.

*York (Phil. Soc.)*—Mr. J. E. Clark says that he drew up the reports for 1896 and 1897, and the Secretary has promised to send us

copies of the Society's annual reports containing them. Mr. Clark's successor in the meteorological curatorship of the Society is the Rev. — Johnson.

#### MONMOUTH AND GLAMORGAN.

*Marshfield*.—We regret to hear that Dr. Evans has been obliged to discontinue the valuable reports which we mentioned. Our own set is, we regret, very incomplete, but we are glad to hear that there has been no interruption, and that the Society has succeeded in finding another volunteer to carry on Dr. Evans' work.

#### CARNARVONSHIRE.

At the end of the 1897 report of Dr. Fraser, M.O.H. for the combined sanitary district, appear some monthly climatological results for the year at Carnarvon and Llandudno.

#### ISLE OF MAN.

A valuable summary of all Manx meteorological observations, read by Mr. A. W. Moore, H.K., before the Manx Antiquarian Society, has been reprinted from the "Manx Sun" of April 30, 1898.

#### GUERNSEY.

Two 8vo papers, one upon "The Rainfall of Guernsey for the year 1897" at various stations, and the other upon "The Sunshine of Guernsey for the year 1897," by Mr. A. Collenette, F.C.S., have been reprinted from the "Transactions of the Guernsey Society of Natural Science" and circulated by the author.

#### ROXBURGH.

*Hawick (Ladylaw)*.—A neat sheet of monthly results is published privately annually.

#### BUTE.

*Rothesay*.—A pamphlet entitled "Abstract of Meteorological Observations made at Barone Cottage, Rothesay, by James Kay," has been issued annually at least as far back as 1889 by the Archaeological and Physical Society of Bute.

#### ARGYLL (MAINLAND).

*Oban*.—Some remarks on the climate, accompanied by a table containing meteorological averages for the 10 years 1887-96, are included in a 48 pp. pamphlet entitled, "Oban: a Health and Holiday Resort," by Dr. Baily, M.O.H.

#### DUBLIN.

*Dublin (FitzWilliam Square)*.—Observations published in the "Dublin Journal of Medical Science."

## ABSOLUTE DROUGHT IN JULY.

*To the Editor of the Meteorological Magazine.*

SIR,—An absolute drought has held here for 16 days. The rainfall on the 1st instant was  $\cdot 21$  in., measured at 9 a.m. on the 2nd; since then no rain whatever has fallen till the 18th,  $\cdot 05$  in. fell on that day and  $\cdot 03$  in. on the 19th. Until the present one, there has been no absolute or partial drought since I commenced recording here in October, 1896.

JAMES WATKINS.

*13, Park Crescent, Southport, July 20th, 1898.**To the Editor of the Meteorological Magazine.*

SIR,—I fancy from what I hear from various correspondents that the drought here must be somewhat in excess of the average. My record for this month is:—

July	1	.....	in.	July	7	.....	in.	July	13	.....	in.
			$\cdot 03$				—				—
„	2	.....	—	„	8	.....	—	„	14	.....	—
„	3	.....	—	„	9	.....	—	„	15	.....	—
„	4	.....	—	„	10	.....	—	„	16	.....	—
„	5	.....	—	„	11	.....	—	„	17	.....	—
„	6	.....	—	„	12	.....	—	„	18	.....	$\cdot 02$

and, in point of fact, the  $\cdot 02$  in. which I record this morning all fell between 7 and 7.15 this day, though, according to our rules, it appears under the 18th.

Faithfully yours,

W. C. PLENDERLEATH.

*Mamhead Rectory, Exeter, July 19th, 1898.*

## EVAPORATION AND TEMPERATURE.

WE have in a previous volume of the *Weather Review* explained how difficult, if not impossible, it must ever be to determine from ordinary observations of the evaporimeter the quantity of water added to the atmosphere daily by evaporation from the oceans, lakes and continents. One of the principal elements of uncertainty in determining *a priori* the quantity of evaporation from a given surface of water consists in our uncertainty as to the temperature of the surface water and the velocity of the wind at the surface. If the evaporation observations are made in a shallow tank of quiet water, we have then the still further difficulty of computing what the results would be on the surface of a flowing stream or lake of much greater depth. Professor Carpenter says:—

“It will be noticed that the evaporation from the tanks floating in the various lakes is much greater than that from the corresponding

tank on the grounds of the Agricultural College, which latter tank is of galvanized iron, 3 feet square and 3 feet deep, set in the ground at Fort Collins, so that its rim is flush with the surface of the ground. The elevation is 4,990 feet above the sea level, latitude  $40^{\circ} 34'$ , longitude  $105^{\circ}$ . The rain which falls into the tank is allowed for in accordance with the readings of a standard rain gauge near by.

"The excess of evaporation from the tanks floating in the lakes, over that from the tank sunk in the ground is partially, but not entirely, due to temperature. The tanks in the lakes are more freely exposed to the wind than the standard tank, and this would, therefore, make a great difference. The floating tanks are more or less agitated by the waves, and, consequently, the water surface exposed to the air is larger than the cross section of the tank. A film of water is also left on the metal side with every movement of the floating tanks, and this water is apt to be of a higher temperature than the water in the lake or in the tank, and evaporates more rapidly. This influence was noticed by Mr. Trimble, who suggested it as a cause of some of the excess of evaporation observed from the lakes. The effect may be considerable, but how much is uncertain. The wave action differs in the different lakes. As the waves also increase the area of the surface of the lakes, which is exposed to the wind, the resulting measurement in the tank is possibly closer to the loss from the lake than if the tank had been stationary. The effect of increase of surface was an increase of 33 per cent., as deduced from the observations by Aymard in 1849.

"Professor Carpenter gives the following estimate of evaporation from the surface of an open reservoir, at Fort Collins, as based on ten years of observations and corresponding, therefore, to the average cloudiness, windiness, and relative humidity of that location:—

	Evaporation, in inches.
January .....	1.5
February.....	2.0
March .....	3.5
April ..	5.0
May .....	6.5
June.....	8.0
July .....	9.5
August .....	8.5
September .....	6.5
October .....	4.5
November .....	2.5
December .....	1.5
Total .....	59.5 "

Special attention has been given by Professor Carpenter to the temperature of the water in the standard evaporation tank and also in the reservoirs and lakes. As regards the tank, temperatures were observed at 7 a.m. and 7 p.m. as also by self-recording maximum

and minimum thermometers, all near the surface. The mean of the 7 a.m. and 7 p.m. [one hundred and fifth meridian time] is less than the mean of the maximum and minimum by about  $3^{\circ}\cdot 5$ , and the latter is probably much closer to the true average. The difference is attributable to the fact that during the daytime the surface heats rapidly and the lower layers slowly, but during the night-time the whole mass cools more uniformly. On the average of ten years the surface temperature in the tank, namely, the average of the 7 a.m. and the 7 p.m., is as follows :—

April .....	49° 0
May .....	58·9
June .....	67·9
July .....	72·7
August .....	70·8
September.....	63·4
October.....	51·2
November.....	41·6

During the other months of the year the tank, of course, is frozen.

The temperature of the free water in Lake Lee, at the surface and at the bottom 6 feet below, as also the temperature of the water in a small tank floating at the surface of Lake Lee, was read every fifteen minutes on August 6th, 1896. Lake Lee is a small reservoir four miles from the college, shallow, exposed to the wind, and full of weeds that greatly hinder the formation of waves. The following is the temperature record :—

Time of Observation.	Clouds, tenths.	Wind.	Temperature of Water.		
			Tank.	Lake.	
				Surface.	Bottom.
9.00 a.m. ....	.....	.....	71° 0	70° 2	68° 8
9.30 „ .....	Few	Lt. S.E.	72° 0	70° 7	68° 0
10.00 „ .....	Few	E.	72° 0	71° 0	68° 0
10.30 „ .....	1	Lt. S.E.	73° 7	72° 2	69° 0
11.00 „ .....	2	Lt. S.E.	74° 0	73° 0	68° 5
11.30 „ .....	3	Lt. S.E.	73° 2	72° 9	68° 5
12.00 noon.....	2	Lt. S.E.	74° 2	73° 2	69° 2
12.30 p.m. ....	2	Lt. S.E.	74° 4	74° 0	68° 8
1.00 „ .....	4	Lt. S.E.	74° 0	73° 9	68° 3
1.30 „ .....	7	Brisk N.	73° 8	73° 8	69° 1
2.00 „ .....	4	Lt. S.	74° 9	74° 7	69° 8
2.30 „ .....	2	W.	75° 5	76° 0	69° 5
3.00 „ .....	1	S.E.	76° 6	77° 2	69° 3
3.30 „ .....	2	S.E.	76° 2	76° 0	69° 0
4.00 „ .....	1	S.E.	76° 0	76° 0	68° 8
4.30 „ .....	3	None	76° 0	76° 2	69° 0
5.00 „ .....	.....	.....	75° 5	76° 8	68° 6

In reference to this table Professor Carpenter writes to the Editor as follows :—

“At different times we have carried on observations throughout the twenty-four hours on the evaporation tanks, measuring the temperature at the surface, and at one foot below the surface. One of the most marked results was that the average temperature, as determined by observations at twelve hours' interval, was less than the true average by several degrees. The increase in temperature during the day at the surface is quite rapid, and the surface temperature becomes much warmer than the water below the surface. On cooling, however, convective currents form, and the whole mass of water practically cools together.

“I had observations carried on at hourly intervals for several days, at the surface and 1 foot below, which showed this fact clearly. For the last three or four years I determined the average temperature from the maximum and minimum temperatures instead of from the observations at 12-hour intervals, as had been done before.”—*Abridged from the Monthly Weather Review, May, 1898.*

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## ROCKALL.

MR. MILLER CHRISTY, F.L.S., has long been deeply interested in this N.W. outpost of the British Isles ; so far away, about 300 miles W. of Scotland, and 260 miles N.W. of Donegal, and so small (only about 80 ft. across) that few persons know it, and no map can show its true size. Most persons regard St. Kilda as practically out of the world, 130 miles W. of Scotland, and severely beaten by Atlantic waves, but St. Kilda is not half way to Rockall ; St. Kilda is inhabited, and St. Kilda can be landed upon many days in a year. The August number of *The Scottish Geographical Magazine* gives the best history and account of Rockall that we have ever seen, with two excellent photos, maps, &c. ; in fact, Mr. Miller Christy has given a monograph which in every way redounds to his credit, and which we have read through and through with keen enjoyment.

Of course, in these pages we are concerned with it solely as a possible base on which to build a lighthouse and observatory. Mr. Christy quotes upon this subject the high authority of Dr. R. H. Scott, F.R.S. :—

“If a station on Rockall could possibly be established and maintained, its value to weather-telegraphy would be incalculable ; but [he adds] there are one or two fearful *ifs* :—

- “(1). *If* the place can be built upon ;
- “(2). *If* the communication by wire can be kept up ;
- “(3). *If* anyone will live there.”

Mr. Christy puts the cost of the cable alone at £35,000 to £40,000, and evidently considers that no building could be erected

on the rock, but we cannot see why the seas should be worse than at Skerryvore; and with a basalt needle about 2000 square feet in area sloping up to 70 ft. above sea level, we should have thought that once get the mortices cut in its upper face, it would be only a question of patience to build another Skerryvore, and at Skerryvore, unless we are mistaken, the builders had to begin almost at sea level, not with a rock from 20 ft. to 70 ft. above it. However, Skerryvore cost £87,000, and therefore with the telegraph cable there would be a capital expenditure of £125,000, which at 6% (to provide for redemption) would require £9000 a year, and there would be probably £3000 more for salaries and expenses, or £12,000 a year. This looks alarming, but we are inclined to agree with Mr. Christy that, "Without doubt, however, the time will come when this difficulty will be successfully overcome."

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### THE AMERICAN ASSOCIATION.

FROM *Science*, N.Y., of August 19th we see that the following papers are among those to be read at the Boston meeting. We hope that eventually we may be able to give some notice of them:—

Second Report on the Magnetic Survey of Maryland. By Professor L. A. Bauer, Cincinnati, Ohio.

Meteorology from a Mathematical and Physical Point of View. By Professor Cleveland Abbe, Weather Bureau, Washington, D.C.

Lightning Photographed on Moving Plates.

The Structure of Cyclones and Anticyclones.

Temperature and Vapor Gradients in the Atmosphere. By Professor F. H. Bigelow, Washington, D.C.

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### THUNDERSTORMS OF JULY AND AUGUST.

WE have not space here to treat of this subject fully—in fact, we mention it chiefly in the hope that someone with the necessary time may be induced to volunteer to collect and consider the facts and prepare a paper thereupon. We will gladly lend, or supply, copy of the data in our possession.

The first step will be to collect and reduce to a uniform scale all the records of barometric pressure over the S. of England which can be procured. We have seen several and their agreements and differences seem equally indicative that careful study will probably be fruitful. As it is the type of the curve on August 18th and the time of the occurrence of certain marked features in it which will be the leading characteristics to be determined, the fact of a curve being a tenth-of-an-inch too high or too low will be of no consequence, and therefore probably nearly every sheet from a recording aneroid for that week would be useful.

We are not here trying to give an account of the storms, but merely arrange in chronological sequence a few notes which appear to us important or suggestive.

JULY 22ND.

On the morning of the 23rd I measured 3·18 in. as the fall of the previous night.—REV. J. C. ROSS, *Wadworth Hall, Doncaster.*

AUGUST 6TH.

Heavy shower early, about 7 a.m.; in 8 minutes 0·27 in. fell. Between 1 and 2 p.m. on the same day we had 0·95 in. in 40 minutes.

MR. J. MATHESON, *Addington, Winslow, Bucks.*

The rainfall of the 6th as measured at 9 a.m. on 7th was—

At West Hill, 8 miles S. of Coventry .. ..	1·74 in.
„ Priory Row, Coventry .. .. .	1·19 „
„ The Hospital, „ .. .. .	1·10 „
„ Stoke, 2 miles E. of Coventry .. .. .	1·61 „
„ Coundon, 2½ miles N.W. of Coventry...	1·40 „

ALDERMAN GULSON, *Coventry.*

Steady R, with a little T, from about noon till 4 p.m.; total 0·50 in. Heavy R, with wind, 4.30 to 6.50 p.m., yielding 1·09 in.; total for the day 1·60 in.

C. B. MULLINS, Esq., *West Deyne, Uppingham.*

*Wing Rectory, Oakham.*—R 1·68 in.; little or no T.—REV. H. A. BOYS.

*Duddington, Stamford.*—R 1·22 in., with a little T.

F. COVENTRY, Esq., *Duddington.*

At 6 a.m. at *Aysgarth, Yorks*, the Ure was in the highest flood for 18 years.—J. EDMUND CLARK, Esq., B.A., B.Sc., *Croydon.*

AUGUST 14TH TO 20TH.

This week has been remarkable meteorologically. On Monday, the 15th, from about 9.30 to 10.30 p.m. a heavy thunderstorm occurred, and this left no indication on the barometric curve. On Thursday, the 18th, about 0 hr. 45 min. p.m., a very remarkable black cloud rose on the W. or N.W. horizon, and seemed to fill the landscape with darkness. The effects were very striking; white objects, such as white butterflies and the bellies of the martins and white cows, standing out in startling relief against the black mass. As this rose towards the zenith, a violent wind rose, blowing apparently from every direction, and raising the familiar whirls of dust and leaves. The birds appeared to be greatly alarmed by the condition of things, and flew in troops from bush to bush, as if hoping that each change of position would give them better shelter. At the same time, and as the cloud lifted, there appeared over the horizon a dull red streak of cloud, not so thick as the black cloud, but reminding one of what one has read of sand storms in the East. The cloud passed over without a drop of rain or any lightning. The passage of this storm was marked by a rapid rise and fall in the

barometer. Later in the afternoon—viz., about 4 p.m.—a thunder-storm came on, accompanied by rain, and continued with intermissions late into the evening, accompanied by rapid rises and falls of pressure. About 11 p.m. the wind rose to violence for a short time, accompanied by an almost perpendicular fall in the barometric curve. The comparison of Monday and Thursday in this week seems to afford a striking evidence of the difference between two kinds of storms—those accompanied with disturbances of pressure, and those without such accompaniment.

THE RT. HON. SIR G. FRY, *Failand House, Bristol.*

#### AUGUST 15TH-16TH.

*Wing Rectory, Oakham.*—Another great R; 1·80 in. here at 9 a.m. on 16th, and 1·06 in. at *Duddington*; much T and L, but not near.

REV. H. A. BOYS.

#### AUGUST 18TH.

Violent TS, with almost incessant L in early morning. It began about 1 a.m., and was worst between 2 and 4, with a gale from the S. My old (rather sheltered) gauge gave at 9 a.m. 2·35 in.; the new one gave 2·50 in. The 17th was *very hot*.

R. E. LONGFIELD, Esq., *Longueville, Mallow, co. Cork.*

Heavy TS, with much wind, 7 to 11 p.m.; road about 3 miles S. of *Street, Somersetshire*, much obstructed by fallen trees and branches.

J. EDMUND CLARK, Esq., B.A., B.Sc., *Croydon.*

#### AUGUST 19TH.

Sharp TS in *Leicester*; the storm began at 6.40 p.m., and in 20 minutes 1·00 in. fell, the total was 1·05 in. in 35 minutes.

E. G. MAWBEY, Esq., M.I.C.E. (Borough Engineer).

#### AUGUST 21st.

The sky was clear till afternoon, and the max. temp., 83°·2, occurred about 1 p.m. About 3 p.m. there were signs of an approaching TS, and about 6 p.m. thunder clouds with low rumbling were a few miles to S. or S.E. About sunset another storm was seen approaching from S.E. to S.W., and it was a very fine sight to behold the constant brilliance of the flashes, so constant and continuous that probably for three hours there must have been at least one per second! Apparently most of them moved horizontally, from cloud to cloud. The thunder was loud and continuous, and seemed almost perpetual. The centre passed over a little before 10 p.m., but I think no flash of any consequence was within a mile. It seemed as if there would be no accompanying rain, but for 40 mins., from 9.25 p.m., rain and then hail fell, yielding ·90 in.

H. SOUTHALL, Esq., *The Graig, Ross, Herefordshire.*

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858-97.

AUGUST.

ELEMENTS.	MONTHLY MEANS OR TOTALS.										ABSOLUTE READINGS.									
	Mean, 40 years.	Highest Month and Date.	Lowest Month and Date.	MEANS 9 A.M. AND 9 P.M.						EXTREMES AT 9 A.M. AND 9 P.M.										
				Mean.	Highest Month.		Lowest Month.		Highest.	Lowest.		Mean of all Highest.	Mean of all Lowest.							
					Value.	Date.	Value.	Date.		Value.	Date.									
Barometer ..... (cor. & red.)	1 29.946	2 30.156 1869	3 29.720 1860	4 9 a.m. 9 p.m.	5 29.947 29.945	6 30.149 30.163	7 1869 1869	8 29.716 29.724	9 1860 1860	10 30.480 30.488	11 14th, 1864 27th, 1871	12 29.149 29.010	13 31st, 1876 31st, 1864	14 30.285 30.272	15 29.506 29.501					
(Dry Bulb.....)	61.3	65.6 1884	57.8 1885	9 a.m. 9 p.m.	62.8 59.7	67.4 64.4	1871 1884	59.4 56.1	1860 1885	84.3 76.3	18th, 1893 11th '84, 17th '93	45.2 47.0	3rd, 1865 2nd, 1867	71.6 68.1	54.8 52.0					
Max. ....	72.6	..	..	..	..	77.9	1871	66.6	1860	93.6	18th, 1893	58.5	18'60, 2'67 24 '68	84.0	62.7					
Min. ....	53.4	..	..	..	..	56.4	1893	49.0	1864	67.0	18th, 1858	38.2	27th, 1864	61.1	44.3					
Wet Bulb.....	57.4	60.0 1871	53.6 1885	9 a.m. 9 p.m.	58.1 56.6	61.3 59.1	1871 '80, '84	54.5 52.7	1885 1885	69.5 69.8	13th, 1870 14th, 1867	45.2 45.0	3rd, 1865 30th, 1869	65.5 64.0	51.0 49.0					
Solar Rad., black....	113.6	..	..	..	..	120.2	1873	105.4	1885	134.0	13th, 1870	62.9	12th, 1881	127.9	80.3					
Solar Rad., bright..	82.8	..	..	..	..	88.8	1893	77.2	1879	104.2	18th, 1893	60.5	17th, 1879	94.8	66.7					
Grass Minimum ...	49.8	..	..	..	..	53.8	1880	44.2	1866	65.0	7th, 1868	31.9	27th, 1864	58.6	39.5					
Soil, 1 foot .....	61.7	..	..	..	..	64.8	1876	58.7	1891	70.3	16th & 18th, '76	56.2	31st, 1890	65.0	58.8					
Cloud .....	5.6	7.4 1860	2.0 1871	9 a.m. 9 p.m.	6.0 5.2	8.0 7.2	1880 1860	2.0 2.0	1871 1871	10 10	Every year Every year	0 0	Various Every yr. but '61	10.0 10.0	0.3 0.0					
Rainfall .....	2.39	6.72 1878	.45 1880	9 a.m. 9 p.m.	1.00 1.39	2.85 3.87	1878 1878	.01 .10	1880 1871	1.10 1.41	28th, 1892 17th, 1887	.00 .00	Every year Every year	.44 .48	.00 .00					

Max. Rainfall in 24 hours, 1.71 in., 27th, 1892. Mean max. daily fall, .68 in.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1898.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
England, London .....	59·1	18	25·1	13	47·9	33·8	34·8	82	92·1	22·6	1·46	10	6·8
Malta.....	74·4	26	45·4	3	64·1	51·1	50·3	82	145·4	38·9	1·35	9	4·9
Cape of Good Hope ...	95·6	12	46·7	8	76·1	57·7	57·3	80	...	...	1·11	4	3·4
Mauritius.....	84·7	4, 12	70·0	2	83·0	74·0	71·5	83	136·3	62·1	6·53	26	7·6
Calcutta .....	100·1	19	50·2	5	92·9	65·9	56·4	49	155·6	41·7	·00	0	0·8
Bombay.....	88·9	4	62·3	3	86·5	73·3	68·9	70	137·1	56·3	·00	0	0·6
Ceylon, Colombo ...	94·5	30	70·0	10	90·9	73·8	72·0	75	155·0	65·0	4·21	6	2·3
Melbourne.....	96·0	8	41·2	22	75·5	55·5	50·2	59	149·4	35·0	·37	4	3·7
Adelaide .....	100·4	8	49·6	22	82·9	58·6	49·4	49	160·8	36·8	·06	3	1·6
Sydney .....	83·8	2	55·6	16	76·3	64·1	60·5	70	146·4	43·1	1·29	14	5·4
Wellington .....	75·0	8	42·0	31	65·4	51·5	50·6	75	131·0	30·0	2·47	13	4·1
Auckland .....	73·0	7	47·0	27	69·2	54·9	53·5	74	137·0	43·0	3·02	11	4·4
Jamaica, Kingston.....	89·6	29	64·0	14c	85·7	67·4	64·6	72	...	...	1·31	2	2·2
Trinidad .....	89·0	2a	64·0	7, 22	85·9	69·5	69·0	76	168·0	60·0	2·10	11	...
Grenada.....	88·2	14b	70·0	17d	84·3	72·1	66·3	67	154·0	...	1·41	13	2·1
Toronto .....	61·7	19	9·0	1	44·4	29·0	30·8	77	72·5	6·0	2·40	11	5·7
New Brunswick, Fredericton .....	52·8	9, 13	1·0	4	44·4	20·4	21·8	60	...	...	2·27	11	4·2
Manitoba, Winnipeg }	40·2	7	21·5	22	27·3	4·7	...	...	...	...	2·56	13	6·0
British Columbia, Esquimalt.....	55·1	1	26·2	26	48·6	34·3	35·8	84	...	...	1·66	17	5·8

a—and 3, 21. b—and 28. c—and 15. d—and 22, 28, 29.

## REMARKS.

MALTA.—Mean temp. 56°·4, or 0°·6 above average. Mean hourly velocity of wind 9·3 miles, or 1·7 below average. Mean sea temp. 61°·0. TSS on 6th, 11th and 23rd; L on 13th and 14th; H on 11th. J. F. DOBSON.

Mauritius.—Mean temp. of air equal to, dew point 1°·7 above, and rainfall 1·56 in. below, their respective averages. Mean hourly velocity of wind 9·7 miles or 0·3 below average; extremes, 25·8 on 21st, and 2·1 on 17th; prevailing direction E.S.E. to E. T on 10 days; L on 6 days. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 82°·2, or 0°·3 above, of dew point 0°·8 below, and rainfall 73 in. below, their respective averages. Mean hourly velocity of wind 5·8 miles; prevailing direction W. to S.W. TSS on 7 days; L on 7th and 14th. H. O. BARNARD.

Adelaide.—An exceedingly clear, dry month, the mean amount of cloud being 24 per cent. below the average of 30 years. Mean temp. 0°·4 below, and rainfall 98 in. below, the average. C. TODD, F.R.S.

Sydney.—Temp. 1°·0 above, humidity 5·9 below, and rainfall 4·01 in. below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Generally fine; light showers during the middle and end. Prevailing winds from N.W. and S.E., and frequently strong from the former quarter. Some very fine warm weather in the early part. Slight earth-shock on 10th. Temp. 3°·7 below, and rainfall 1·07 in. below, their respective averages. R. B. GORE.

Auckland.—Rainfall about 75 in. above the average of 31 years. Mean temp. 3° below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind in Kingston 1·7 miles. Rainfall for the month about the average, and for the three months a little over the average; the Island rainfall for the same periods being one-third, and two-thirds of the average. Hail at Appleton on the 4th. R. JOHNSTONE.

TRINIDAD.—Rainfall 23 in. above the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,  
AUGUST, 1898.

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.
I.	Uxbridge, Harefield Pk..	1·08	XI.	Builth, Abergwesyn Vic.	7·60
II.	Dorking, Abinger Hall .	1·15	„	Rhayader, Nantgwillt ...	5·07
„	Birchington, Thor .....	1·47	„	Lake Vyrnwy .....	8·07
„	Hailsham .....	1·92	„	Corwen, Rhug .....	5·56
„	Ryde, Thornbrough .....	1·77	„	Criccieth, Talarvor .....	6·02
„	Emsworth, Redlands ...	1·31	„	I. of Man, Douglas .....	6·41
„	Alton, Ashdell .....	1·70	XII.	Stoneykirk, Ardwell Ho.	4·50
III.	Oxford, Magdalen Col..	1·61	„	New Galloway, Glenlee	6·68
„	Banbury, Bloxham .....	2·36	„	Moniaive, Maxwellton Ho.	5·49
„	Northampton, Sedgebrook	2·39	„	Lilliesleaf, Riddell .....	1·89
„	Duddington [Stamford].	2·97	XIII.	N. Esk Res. [Penicuik]	5·60
„	Alconbury .....	2·96	XIV.	Glasgow, Queen's Park..	4·77
„	Wisbech, Bank House...	2·92	XV.	Inverary, Newtown .....	6·89
IV.	Southend .....	·82	„	Ballachulish, Ardsheal...	8·28
„	Harlow, Sheering.....	1·45	„	Islay, Gruinart School...	2·71
„	Colchester, Lexden .....	1·11	XVI.	Dollar.....	5·04
„	Rendlesham Hall .....	...	„	Balquhiddier, Stronvar...	6·91
„	Scole Rectory .....	1·58	„	Coupar Angus Station...	2·61
„	Swaffham .....	2·12	„	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	1·35	XVII.	Keith H.R.S.....	3·65
„	Bishop's Cannings .....	1·87	„	Forres H.R.S. ....	1·82
„	Blandford, Whatcombe .	1·27	XVIII.	Fearn, Lower Pitkerrie..	2·37
„	Ashburton, Holne Vic...	3·18	„	N. Uist, Loch Maddy ...	...
„	Okehampton, Oaklands.	4·31	„	Invergarry.....	2·54
„	Hartland Abbey .....	3·87	„	Aviemore H.R.S. ....	1·78
„	Lynton, Glenthorne ...	2·73	„	Loch Ness, Drumnadrochit	2·45
„	Probus, Lamellyn .....	2·82	XIX.	Invershin .....	3·05
„	Wellington, The Avenue	3·09	„	Durness .....	4·53
„	North Cadbury Rectory	1·58	„	Watten H.R.S.....	2·45
VI.	Clifton, Pembroke Road	3·46	XX.	Dunmanway, Coolkelure	8·94
„	Ross, The Graig .....	2·86	„	Cork, Wellesley Terrace	4·21
„	Wem, Clive Vicarage ...	3·91	„	Killarney, Woodlawn ..	5·23
„	Wolverhampton, Tettenhall	2·28	„	Caher, Duneske .....	6·88
„	Cheadle, The Heath Ho.	4·36	„	Ballingarry, Hazelfort...	5·00
„	Coventry, Priory Row ..	3·88	„	Limerick, Kilcornan ...	5·41
VII.	Grantham, Stainby .....	3·30	„	Broadford, Hurdlestown	6·36
„	Horncastle, Bucknall ...	2·39	„	Miltown Malbay .....	6·28
„	Worksop, Hodsck Priory	3·29	XXI.	Gorey, Courtown House	4·01
VIII.	Neston, Hinderton .....	4·10	„	Athlone, Twyford .....	5·80
„	Southport, Hesketh Park	5·14	„	Mullingar, Belvedere ...	6·05
„	Chatburn, Middlewood.	6·55	„	Longford, Currygrane...	4·52
IX.	Melmerby, Baldersby ...	2·64	XXII.	Woodlawn .....	...
„	Scarborough, Observat'y	2·85	„	Crossmolina, Enniscoe ...	4·89
„	Middleton, Mickleton ...	4·42	„	Collooney, Markree Obs.	4·15
X.	Haltwhistle, Unthank...	4·45	„	Ballinamore, Lawderdale	5·41
„	Bamburgh .....	1·75	XXIII.	Warrenpoint.....	4·71
„	Duddon Valley, Ulpha School	12·53	„	Seaforde.....	4·48
„	Keswick, The Bank .....	5·88	„	Belfast, Springfield .....	...
XI.	Llanfrechfa Grange .....	3·81	„	Bushmills, Dundarave..	5·27
„	Llandovery .....	6·10	„	Stewartstown .....	4·02
„	Castle Malgwyn .....	4·16	„	Killybegs .....	7·92
„	Brecknock, The Barracks	3·02	„	Horn Head .....	4·24

## AUGUST, 1898.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°.		
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		Days on which "0" or more fell.	Max.		Min.				
				Dpth	Date		Deg.	Date	Deg.	Date.			
		inches.	inches.	in.								In shade.	On grass.
I.	London (Camden Square) ...	1.18	—	.70	.69	7	10	87.9	22	45.9	8	0	0
II.	Tenterden .....	1.66	—	.20	.98	7	8	85.0	14	46.0	29	0	0
	Hartley Wintney .....	1.07	—	...	.31	7	12	88.0	15	46.0	28	0	0
III.	Hitchin .....	1.39	—	.43	.51	15	12	86.0	22	42.0	7	0	...
	Winslow (Addington) .....	2.03	+	.06	1.14	6	12	85.0	22	43.0	8	0	0
IV.	Bury St. Edmunds (Westley) .....	1.80	—	.40	.51	7	14	79.0	14	47.0	7, 8	0	...
	Norwich (Brundall) .....	1.68	—	...	.47	6	12	86.0	13	44.2	29	0	0
V.	Winterbourne Steepleton .....	1.35	—	...	.34	6	14	81.0	15	41.0	9	0	0
"	Torquay (Cary Green) .....	2.10	—	...	1.00	18	13	78.9	16	48.2	9	0	0
"	Polapit Tamar [Launceston] .....	3.22	+	.74	1.43	18	15	78.8	17	40.4	25	0	0
VI.	Stroud (Upfield) .....	2.97	+	.88	1.31	6	15	81.0	12a	49.0	31	0	...
"	ChurchStretton(Woolstaston) .....	2.88	+	.12	.52	21	18	77.5	21	46.0	7, 29	0	0
"	Worcester (Diglis Lock) .....	2.34	+	.37	.66	6	17	...	...	...	...	...	...
VII.	Leicester (Rotherby Hall) ...	2.26	—	...	.99	6	15	83.0	13b	41.0	8	0	0
"	Boston .....	3.62	+	1.50	1.67	6	14	86.0	14	42.0	2	0	...
"	Hesley Hall [Tickhill] .....	3.55	+	1.39	1.47	3	14	85.0	12	44.0	24	0	...
VIII.	Manchester(PlymouthGrove) .....	6.00	+	2.91	1.04	8	20	83.0	21	44.0	24f	0	0
IX.	Wetherby (Ribston Hall) ...	3.45	+	1.11	.77	3	14	...	...	...	...	...	...
"	Skipton (Arnccliffe) .....	8.57	+	4.24	1.91	5	16	...	...	...	...	...	...
"	Hull (Pearson Park) .....	3.71	+	1.07	1.10	3	14	81.0	12	44.0	9, 29	0	0
X.	Newcastle (Town Moor) .....	1.78	—	.93	.33	5	12	...	...	...	...	...	...
"	Borrowdale (Seathwaite) .....	19.65	+	11.20	4.79	26	17	...	...	...	...	...	...
XI.	Cardiff (Ely) .....	3.64	+	.03	.74	18	15	...	...	...	...	...	...
"	Haverfordwest .....	5.06	+	1.88	1.10	21	17	77.2	21	45.0	7	0	0
"	Aberystwith (Gogerddan) ...	7.40	—	...	2.20	3	15	82.0	21	...	...	...	...
"	Llandudno .....	4.92	+	2.56	.83	8	17	79.5	21	46.0	25	0	...
XII.	Cargen [Dumfries] .....	6.77	+	3.78	.96	5	16	79.4	12	40.0	7	0	...
XIII.	Edinburgh (Blacket Place) ...	3.30	—	...	1.58	30	18	76.9	12	44.0	31	0	0
XIV.	Colmonell .....	4.52	—	...	.68	2	18	80.0	16	36.0	6	0	...
XV.	Tighnabruaich .....	6.75	—	...	1.24	9	18	69.0	22	44.0	8, 30	0	...
"	Mull (Quinish) .....	6.45	+	2.30	.86	30	22	...	...	...	...	...	...
XVI.	Loch Leven Sluices .....	3.70	+	.76	1.00	30	14	...	...	...	...	...	...
"	Dundee (Eastern Necropolis) .....	3.30	+	.73	.75	30	17	76.0	14	43.0	24	0	...
XVII.	Braemar .....	3.33	—	.00	.78	12	21	74.3	12	32.3	25	0	2
"	Aberdeen (Cranford) .....	2.95	—	...	.63	30	18	75.0	11	39.0	24	0	...
"	Cawdor (Budgate) .....	3.11	+	.86	.86	30	19	...	...	...	...	...	...
XVIII.	Strathconan [Beaully] .....	5.95	+	2.65	1.45	28	14	...	...	...	...	...	...
"	Glencarron Lodge .....	9.33	—	...	2.41	1	23	78.1	22	39.6	9	0	...
XIX.	Dunrobin .....	...	—	...	...	...	...	...	...	...	...	...	...
"	S. Ronaldshay (Roeberry) ...	5.17	+	2.61	1.30	27	20	68.0	13c	44.0	30	0	...
XX.	Darrynane Abbey .....	4.42	—	...	.89	11	24	...	...	...	...	...	...
"	Waterford (Brook Lodge) ...	4.75	+	1.33	.89	12	19	73.0	2, 16	44.0	9	0	...
"	O'Brienabridge (Ross) .....	6.00	—	...	.76	18	20	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill) .....	5.28	+	2.31	.77	25	20	...	...	...	...	...	...
"	Dublin (Fitz William Square) .....	3.46	+	.94	.99	25	18	75.4	5	47.2	9	0	0
XXII.	Ballinasloe .....	6.84	+	3.66	.93	9	22	69.0	17d	48.0	31	0	...
"	Clifden (Kylemore) .....	8.67	—	...	1.95	9	19	...	...	...	...	...	...
XXIII.	Waringstown .....	4.39	+	1.28	.80	9	19	76.0	16e	41.0	31	0	0
"	Londonderry (Creggan Res.) ..	4.23	+	.11	.69	30	24	...	...	...	...	...	...
"	Omagh (Edenfel) .....	5.28	+	1.79	.90	9	21	72.0	21	41.0	8	0	0

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

a—and 22. b—and 15. c—and 14. d—and 21, 25. e—and 21. f—and 28.

# METEOROLOGICAL NOTES ON AUGUST, 1898.

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.

CAMDEN SQUARE.—In the 52 weeks ending September 3rd there was no week in which the rainfall reached a total of 1·00 in., while in the preceding year there were 9 weeks with a fall of more than 1·00 in.

TENTERDEN.—A splendid harvest month, but water was again much needed, for although the heavy R of the 7th was of great service, the slight showers of 18th and 27th to 29th were very little good. It was very hot from 11th to 22nd, the temp. on 8 days being over 80° or only 2 days less than in the hot Augusts of 1884 and 1893. Hardly any T. A good deal of wind in the first and last weeks. Duration of sunshine 249 hours. TS on 18th; T on 22nd. The rainfall of the past 16 months is only 27·05 in., or ten inches less than the average.

HARTLEY WINTNEY.—The great drought which had continued through June and July did not terminate in August, this being the driest August since 1886. A great wave of heat prevailed from 12th to 22nd, and rough S.W. winds from 27th to 29th. TSS on 15th and 18th, and L on 21st and 22nd. Ozone registered on 16 days. Great dearth of wild flowers. Rainfall of the first 8 months of the year 6·64 in. below the average.

HITCHIN.—In the 12 months ending August 31st, only 17·27 in. of R fell, against 30 inches in the same months in 1896-7. There has been only one hotter August since the record began in 1849.

ADDINGTON.—A very fine month. A sharp TS with very heavy R occurred on the 6th, and T and L, without R, on the 21st; T on 15th and 16th also. Foggy on 17th. Wasps were very plentiful, and did much injury to fruit.

BURY ST. EDMUNDS, WESTLEY.—The month was cold and wet till the 10th, after that date summer-like and very favourable for the harvest. T on 15th, 19th, 21st and 22nd.

NORWICH, BRUNDALL.—The bulk of the R fell during the week ending 10th. Harvest commenced on 16th, and was favoured with splendid weather, the crops being unusually good. There were great variations of temp.; the max. being above 80° on four days, while 86°·0 on 13th is the highest recorded since 1893. On the 7th the max. did not exceed 58°, but the min. exceeded 60° on 3 nights. Great darkness occurred at 4 p.m. on 6th, with T, L and H: L was seen on 21st, 22nd and 27th, and T heard on 22nd and 23rd. N.W. gale in early morning on 31st.

WINTERBOURNE STEEPLTON.—Another dry month, very similar to August, 1896, when the rainfall was 1·75 in. on 11 days. In June, July and August this year the fall amounted to only 2·65 in., and the shortness of R caused the corn crops to ripen all together. The total R for the first 8 months of the year is 13·61 in., while in 1896 only 12·87 in. fell, but in the September following 8·80 in. fell. The only TS was on the 18th, when vivid L and heavy T occurred, followed by heavy R for a short time between 2 and 3 p.m. L on 21st. Fog at night on 19th and early on 20th.

TORQUAY, CARY GREEN.—Rainfall for August ·68 in. below the average of 22 years, and for the first 8 months of the year 7·25 in. deficient. Mean temp. 63°·6, or 2°·2 above the average. Duration of sunshine 193 hours 35 mins., being 1 hour above the average; no sunless day.

POLAPIT TAMAR.—An average rainfall: a very heavy TS occurring on 18th, with vivid L and heavy showers from 10 a.m. till midnight. T and L on 15th and 21st; distant T on 17th. Thick fog on 1st.

STROUD, UPFIELD.—T and L from 8 p.m. to 11.30 p.m. on 15th; T, L and heavy storm to S. from 8 to 10.30 p.m. on 18th. A small TS about 6 p.m. and a heavy TS to E. at the same time on 21st.

WOOLSTASTON.—The first 9 days were wet and chilly; it then became very

warm and sultry and most favourable for harvest work. Mean temp.  $60^{\circ}\cdot 8$ . A violent storm of T and L occurred from 7 p.m. on 21st to 2.30 a.m. on 22nd; the L was intensely vivid and almost continuous.

MANCHESTER, PLYMOUTH GROVE.—The wettest August for 31 years excepting 1891, when  $6\cdot 13$  in. of R fell. Mean temp.  $61^{\circ}\cdot 8$ .

### WALES.

HAVERFORDWEST.—Another wet August, but characterised by bright sunshine and uniform high day and night temp. R fell principally at night or before 11 a.m. and in the two TSS. The TS of 18th commenced between 2 and 3 a.m., with incessant T and L till 6 a.m., but no R. The storm recommenced at 8.30 a.m. and continued till noon,  $\cdot 50$  in. of R falling in 15 mins. from 10.30 a.m. The two following days were fine and sultry. On 21st, at 1 p.m., there were violent gusts of wind, lurid haze, disturbed action of the clouds and sudden darkness; the storm burst at 2 p.m. with heavy R and inky blackness at 3 p.m. At 7.45 a grand storm commenced with a whirlwind, followed by every variety of L, with continuous T. The storm lasted till 10 p.m., but L was visible all night. No storm of similar magnitude has occurred since the great TS of July 19th, 1878. This, as an electrical display, was magnificent and grand but far less destructive, and the absence of H was extraordinary. Crops of every kind are plentiful, and harvest operations were carried on almost without a hitch.

GOGERDDAN.—On the 22nd occurred the most violent TS ever remembered, lasting for 8 hours.

LLANDUDNO.—T and L on 8th, 19th and 21st.

### SCOTLAND.

EDINBURGH, BLACKET PLACE.—Temp.  $1^{\circ}\cdot 2$  above the average; pressure, rainfall, sunshine and humidity normal. TS with heavy R at 7.55 a.m. on 16th; TS with heavy R at 8.30 p.m. on 30th, when  $1\cdot 42$  in. of R fell in 4 hours; H on 28th. Solar halos on 9th and 15th.

COLMONELL.—R  $\cdot 42$  in., and temp.  $1^{\circ}\cdot 6$ , above the average of 22 years. T and L on 27th; T on 22nd.

TIGHNABRUACH.—Very nearly a repetition of August, 1897, the amount of R being only  $\cdot 16$  in. in excess and the number of rainy days the same. Mean temp.  $2^{\circ}\cdot 3$  lower than in August, 1897.

S. RONALDSHAY, ROEBERRY.—A very wet month. Mean temp.  $55^{\circ}\cdot 1$ , or  $0^{\circ}\cdot 9$  above the average of 8 years. A heavy TS occurred on the evening of the 12th.

### IRELAND.

DARRYNANE ABBEY.—A rather wet month and the early part very hot. T and L from 8 p.m. on 17th to 4 a.m. on 18th; the longest and one of the heaviest thunderstorms for certainly 30 years. Summer TSS are very rare here.

WATERFORD, BROOK LODGE.—Very broken weather all the month, with heavy TSS on 19th and 21st, and gales from N.N.W. on 23rd and S.W. on 30th.

DUBLIN, FITZWILLIAM SQUARE.—Like August, 1897, this was a changeable, showery and windy, but warm month. Mean temp.  $61^{\circ}\cdot 4$  or  $1^{\circ}\cdot 7$  above the average. High winds were noted on 13 days, reaching the force of a gale on four. L on 7th, 15th and 21st; T on 21st. The temp. in shade reached  $70^{\circ}$  on 9 days. Solar halos were seen on 7th and 9th. The air was foggy on 19th to 21st and 26th.

BALLINASLOE.—L and T on 17th and 21st; L on 16th.

OMAGH, EDENFEL.—August was a much finer and pleasanter month than the record would seem to indicate. The rainfall was considerably above the average, but a large proportion fell at night, and there were many fine bright days with warm air, but without any of the fierce heat of the English stations. The grain harvest was earlier and better than the average, added to a promise of equal abundance in all green crops.

# SYMONS'S

## MONTHLY

# METEOROLOGICAL MAGAZINE.

CCCXCIII.]

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### HEAT AND DROUGHT IN SEPTEMBER, 1898.

IN 1895 we had to chronicle a September phenomenally warm and dry, and now—only three years after—we have another September exceptionally dry, and even more remarkable for high temperatures, for referring to the article\* above mentioned we find no max. reading in 1895 as high as 90°, while this year we have at least a dozen readings exceeding that point.

### RAINFALL.

Dealing first with the drought. Reference to the regular table of rainfall and temperature at 50 stations will at once show that the month was remarkably dry over the whole of England and Wales. We have extracted, to form the following table, all returns in those countries of less than half the average fall. There are 21 stations for which the average is available, and of these, 15 or nearly three-quarters, show a deficiency of more than 50 per cent., and 9 of 75 per cent. The deficiency is most marked in the E. and N.E. of England, where the falls are generally about a quarter-of-an-inch.

Station.	County.	Rainfall in.	Rainy days.	Per cent. of average
Bury St. Edmunds, Westley .. .. .	<i>Suffolk</i> .....	·20	4	7
Boston .....	<i>Lincoln</i> .....	·27	3	10
Hull, Pearson Park .....	<i>York, E. R.</i> .....	·26	3	11
Hitchin .....	<i>Hertford</i> .. .....	·31	3	12
London, Camden Square .....	<i>Middlesex</i> .....	·33	4	13
Manchester, Plymouth Grove .....	<i>Lancashire</i> .....	·54	8	16
Newcastle, Town Moor .....	<i>Northumberland</i> .....	·61	5	22
Church Stretton, Woolstaston .....	<i>Shropshire</i> .....	·60	7	24
Hesley Hall [Tickhill] .....	<i>Nottingham</i> .....	·51	5	24
Tenterden .....	<i>Kent</i> .....	·77	6	26
Stroud, Upfield .....	<i>Gloucester</i> .....	·78	6	27
Wetherby, Ribston Hall .....	<i>York, W. R.</i> ...	1·13	5	46
Polapit Tamar [Launceston] .....	<i>Devon</i> ...	1·71	12	46
Haverfordwest .....	<i>Pembroke</i> .....	2·03	9	46
Aberystwith, Gogerddan .. .. .	<i>Cardigan</i> .....	2·04	7	48

In the next table are given all the absolute and partial droughts which occurred at the 26 English and Welsh stations. Absolute

\* See *Met. Mag.*, November, 1895, pp. 150–156.

droughts occurred at nine stations, and partial droughts at 16 stations, but in no case is the duration exceptional, for as is well known, rain fell over the country generally on the 29th, this being the day of max. fall at the majority of stations. We should, perhaps, add, in explanation of the absence of drought of exceptional duration (according to the definitions so long adopted in *British Rainfall*) at a time when it is matter of common knowledge that wells and springs were failing and dry over vast areas of the kingdom, that in the dry districts not only was the rainfall of the years 1895, 1896 and 1897 below the average, but that for more than twelve months past almost every month had a deficient fall, and there was a marked absence of heavy rains.

*Droughts in September, 1898.*

ABSOLUTE DROUGHTS.—Periods of more than 14 consecutive days absolutely without rain.

PARTIAL DROUGHTS.—Periods of more than 28 consecutive days, the aggregate rainfall of which does not exceed 0·01 in. per diem.

STATION AND COUNTY.	ABSOLUTE DROUGHTS.			PARTIAL DROUGHTS.			
	Began.	Ended.	Lasted.	Began.	Ended.	Lasted.	Amount
			days.			days.	in.
London, Camden Square, ... <i>Middlesex.</i>	None.	...	...	Aug. 16	Sep. 28	44	·35
Tenterden, ..... <i>Kent.</i>	None.	...	...	Aug. 9	Sep. 17	40	·37
Hartley Wintney, ..... <i>Hampshire.</i>	Aug. 31	Sep. 16	17	Aug. 16	Sep. 28	44	·34
Hitchin, ..... <i>Hertfordshire.</i>	Aug. 31	Sep. 17	18	Aug. 16	Sep. 28	44	·25
Winslow, Addington, ..... <i>Buckingham.</i>	Aug. 31	Sep. 16	17	Aug. 8	Sep. 28	52	·36
Bury St. Edmunds, ..... <i>Suffolk.</i>	Aug. 30	Sep. 17	19	Aug. 30	Sep. 30	32	·20
Norwich, Brundall, ..... <i>Norfolk.</i>	None.	...	...	Aug. 11	Sep. 26	47	·46
Torquay, Cary Green, ..... <i>Devonshire.</i>	Aug. 31	Sep. 16	17	Aug. 19	Sep. 27	40	·40
Stroud, Upfield, ..... <i>Gloucester.</i>	Aug. 31	Sep. 16	17	Aug. 29	Sep. 28	31	·24
Church Stretton, Woolstaston <i>Shropshire.</i>	None.	...	...	Aug. 31	Sep. 28	29	·28
Worcester, Diglis Lock, ..... <i>Worcester.</i>	None.	...	...	Aug. 28	Sep. 28	32	·24
Leicester, Rotherby Hall, ... <i>Leicester.</i>	Aug. 30	Sep. 17	19	Aug. 28	Sep. 28	32	·22
Boston, ..... <i>Lincolnshire.</i>	Aug. 30	Sep. 18	20	Aug. 16	Sep. 28	44	·44
Hesley Hall [Tickhill], ..... <i>Nottingham.</i>	None.	...	...	Aug. 28	Sep. 28	32	·26
Wetherby, Ribston Hall, ... <i>Yorkshire, W.R.</i>	None.	...	...	Aug. 30	Sep. 28	30	·23
Hull, Pearson Park, ..... <i>Yorkshire, E.R.</i>	Sep. 11	Sep. 26	16	Aug. 30	Sep. 30	32	·26

The rain on the 29th was very irregularly distributed, and at several stations reached an exceptional amount, the following being all instances of two inches, or more, yet reported to us.

Haslemere, Lower Street.....	Surrey .....	in. 2·42
„ Hazelhurst.....	„ .....	2·19
Chiddingfold .....	„ .....	2·31
Chichester, Chilgrove .....	Sussex .....	2·09
Midhurst, Borden Wood .....	„ .....	2·18
Seathwaite .....	Cumberland .....	2·29
Oakley Quarries .....	Merioneth .....	2·45
Stoneykirk, Ardwell House .....	Wigton .....	2·00

Comparing 1898 with 1895 we find that the former month yielded a larger number of both absolute and partial droughts, but a smaller number of stations with less than half the average fall.

		Absolute Droughts.		Partial Droughts.		Difference from Average.			
No. of Stations.	No.	Average duration.	No.	Average duration.	No. of Stations.	Below 50 p. c.	No. Average	Below 25 p. c.	No. Average
1895	50	4	19 days.	2	41 days.	41	30	28	13
1898	50	9	18 „	16	38 „	37	16	25	10
								per cent.	per cent.

For Camden Square we have complete details of the rainfall for 40 years, and at this station, September, 1898, had only ·33 in. of rain on four days, being the smallest September fall in the whole period, and with one exception (1895) the smallest number of rainy days.

### TEMPERATURE.

*Maximum Temperatures, September 3rd to 9th, and 14th to 17th, 1898.*

STATIONS.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	14th.	15th.	16th.	17th.
Kensington (Edith Rd.)	82·7	82·7	80·0	81·1	88·2	92·1	85·7	78·5	82·8	85·8	88·6
Regent's Park .....	82·5	81·5	77·0	78·0	87·0	90·2	85·0	78·0	80·5	82·6	88·0
Camden Square .....	83·7	82·0	78·1	79·1	85·7	90·6	85·9	78·8	80·7	83·6	88·3
„ „ .....	83·3	82·2	79·1	79·9	86·1	91·2	86·0	79·2	81·1	84·2	89·0
West Norwood .....	82·6	81·5	78·2	78·4	92·1	89·6	87·0	78·4	80·4	81·8	86·9
Brixton .....	83·0	86·0	80·0	82·0	87·0	91·0	88·0	80·0	81·0	86·0	88·0
Hythe .....	76·5	81·0	85·0	83·5	83·5	88·0	80·0	79·0	76·5	84·5	84·5
Greenwich .....	82·9	82·5	79·0	80·1	84·8	92·1	89·8	80·1	82·0	83·9	89·9
Berkhampstead .....	81·6	83·1	78·9	80·9	84·5	90·3	82·9	79·3	79·2	83·0	88·2
Addington Manor .....	80·0	82·0	80·0	81·0	85·0	91·0	81·0	80·0	80·0	83·0	89·0
Oxford (Radeliffe Obsy.)	79·0	83·0	79·0	82·0	85·0	90·0	78·0	75·0	78·0	83·0	86·0
Stamford (Duddington).	75·0	81·0	80·0	81·0	85·0	90·0	78·0	76·0	80·0	83·0	88·0
Cambridge Observatory	79·0	82·0	82·0	83·0	87·0	92·0	84·0	80·0	82·0	86·0	89·0
Norwich (Brundall) .....	79·0	77·2	67·0	78·0	83·6	87·0	89·0	80·0	77·6	79·0	82·0
Liskeard (Green Bank)..	74·5	78·0	80·0	79·0	75·0	80·0	70·5	69·0	72·0	78·0	62·5
Cheltenham .....	78·8	80·0	80·0	80·1	81·7	86·0	74·4	75·0	76·8	81·2	83·5
Rotherby Hall .....	73·0	80·0	81·0	79·0	83·0	89·0	77·0	77·0	78·0	81·0	86·0
Bolton (The Park).....	66·2	76·1	79·9	76·4	78·3	74·2	67·8	69·1	72·9	78·2	78·0
York (Phil. Soc.) .....	75·0	81·0	80·0	75·0	81·0	81·0	72·0	72·0	72·0	80·0	84·0
Pembroke .....	62·0	70·0	71·0	64·0	64·0	63·0	63·0	71·0	66·0	69·0	65·0
Llandudno .....	68·0	70·0	81·0	81·0	74·0	68·0	65·0	71·2	73·0	81·0	75·0
Edinburgh .....	67·0	82·0	82·8	80·0	76·2	72·0	63·9	63·3	64·2	78·6	78·5
Nairn .....	75·0	83·0	83·0	82·0	77·0	68·0	65·0	64·0	64·0	79·0	83·0
Parsonstown .....	77·0	79·0	78·0	76·0	73·0	66·0	67·0	71·0	70·0	72·0	71·0
Seaforde .....	73·0	68·0	70·0	71·0	69·0	68·0	65·0	72·0	72·0	70·0	73·0
Jersey.....	77·0	80·0	80·0	83·0	79·0	84·0	68·0	68·0	72·0	80·0	79·0
No. of entries of 80° or above	9	19	14	14	17	19	12	5	10	18	18

*a* Stevenson Screen.

*b* Glaisher Screen.

To illustrate the distribution of temp. during the month, we give in the first place a table of shade maxima at 25 stations, from the 3rd to the 9th, and the 14th to the 17th. On all of these days there are numerous entries above 80°, while on the 8th there are no fewer than eleven records of 90° and upwards, while on the 4th, 5th, 6th, 7th, 8th, 16th, and 17th, more than half the stations recorded 80° or upwards. At three stations, Kensington, Brixton, and Addington, the temp. rose to, or above, 80° for seven consecutive days; while there are only four stations in the table, Bolton, Pembroke, Parsonstown, and Seaforde, at which 80° was not reached.

If we take the average of the maxima for these seven days, we find that at 15 out of the 25 stations the average max. was above 80°, while at Brixton it was 85°·3.

Of the stations which give an average above 80°, Duddington, Stamford, is the most northerly, and Cheltenham the most westerly. In other words the area of extreme temperature was the S.E. of England. This is confirmed by the following table of additional max. readings, all believed to be from thermometers in Stevenson screens.

*Additional records of Absolute Shade Maximum in September, 1898.*

Addington Hills .....	Surrey .....	87·5	8th
Wallington .....	Surrey .....	88·9	8th
Birchington (Thor) .....	Kent .....	90·0	9th
Slough (Upton).....	Bucks ... ..	91·5	8th
Oxford (Mag. Col. Laboratory).....	Oxford .....	88·5	8th
Wisbech (Sutton Bridge) .....	Cambridge .	90·5	8th
Marlborough .....	Wilts .....	85·5	8th
Winterbourne, Steepleton.....	Dorset .....	81·0	7th
Shaftesbury .....	Dorset .. ...	83·8	7th
Ashburton (Druid House) .....	Devon .....	79·8	8th
Tavistock (Whitchurch).....	Devon .....	79·0	8th
Ross (The Graig) .....	Hereford ..	84·1	8th
Cheadle (The Heath House) .....	Stafford.....	79·4	7th
Worksop (Hodsock Priory) .....	Notts.....	85·8	17th
Chester .....	Cheshire ...	79·9	8th
Blackpool .....	Lancashire .	80·4	5th
Driffield (York Road).....	York, E. R.	84·5	17th
Llanbedr-y-Cennin .....	Carnarvon..	81·5	6th
Killarney (Woodlawn) .....	Kerry .....	80·0	5th

That the intensity of the heat in 1895 was not nearly so great as in 1898 is readily shown by the following summary of the entries in the tables for the two years, which include almost identical stations.

	Entries of	80°	85°	90°
1895 .....	74 .....	7 .....	0	
1898 .....	155 .....	52 .....	12	

It must not be forgotten that in 1898 the hot period occurred at the beginning of the month, while in 1895 it was at the extreme end.

The Camden Square records for the 40 years give as the means for September—

	9 a.m.	9 p.m.	Max.	Min.	Mean of 9 a.m., 9 p.m., M. & m.
Mean of 40 years.....	58·1	55·6	67·3	49·7	57·7
1898 .....	60·8	59·7	74·2	51·6	61·6
Excess in 1898 .....	2·7	4·1	6·9	1·9	3·9
1858 .....	61·4	58·7	70·7	53·5	61·1
1865 .....	63·9	59·7	76·4	54·5	63·6
1868 .....	61·9	58·0	71·8	50·0	60·4
1869 .....	60·0	57·4	68·4	51·9	59·4
1875 .....	61·7	58·0	70·8	52·3	60·7
1880 .....	60·3	58·2	69·7	52·8	60·3
1884 .....	60·4	58·8	68·8	52·3	60·1
1886 .....	59·8	56·8	68·7	52·5	59·5
Instances higher than 1898...	4	0	1	7	1

The eight earlier years quoted are the only instances in which the 1898 value for any one of the above columns has been exceeded, and it will be noticed that 1895 does not appear. From it we see, first, that the max. and 9 p.m. temperatures are the most remarkable, and second, that only once has there been a warmer September than that of 1898, namely in 1865. In the 40 Septembers, 1858-97, there were 39 days on which the temp. rose to, or above, 80°; six days on which it rose to 85°, and one on which it rose above 90°, the most notable being---

	Instances of 80° or above.	85° or above.	Readings of 85° or above.		Instances of 80° or above.	85° or above.	Readings of 85° or above.
1858 .....	2	1	85°·0	1880 .....	3	1	88°·3
1865 .....	10	2	85°·0, 85°·0	1895 .....	4	0	86°·1, 91°·2
1868 .....	5	2	86°·5, 91°·0	1898 .....	8	4	86°·0, 89°·0

From this it will be seen that although the absolute max. in 1898 (91°·2) is unprecedented, and that no other September has had so many days above 85°, yet in 1865 there were two more days above 80°. In 1898 the mean temp. (mean of 9 a.m., 9 p.m., max. and min.) for the seven days 3rd to 9th averaged 69°·6, for the three days 7th to 9th was above 70° and averaged 72°·3, and on the 17th also was above 70°, making a total of 4 days in the month with mean temp. above 70°, while in the whole of the 40 preceding Septembers there were only three days on which the mean temp. reached that value, September 4th, 1880, 73°·0, September 7th, 1868, 71°·7, September 8th, 1865, 70°·7.

## OBSERVERS' NOTES.

*Kensington, Edith Road, Middlesex.*—The highest temperature was  $92^{\circ}\cdot 1$  on 8th, exceeding by  $0^{\circ}\cdot 3$  even the max. of August, 1893. The mean temp.,  $63^{\circ}\cdot 7$ , is exactly the same as that of September, 1895. Ten days with max. above  $80^{\circ}$ , and eight nights with min. above  $60^{\circ}$ . September rainfall  $\cdot 40$  in., and for the nine months of the year  $10\cdot 00$  in.—much the lowest recorded in 15 years.

*Haslemere, Hazelhurst, Surrey.*—The max. temp. reached  $86^{\circ}$  on 8th, and  $80^{\circ}$  or upwards on seven days; the mean max. for the seven consecutive days 3rd to 9th was  $81^{\circ}$ . There is no previous record of  $80^{\circ}$  in September. Rain fell on five days; total  $2\cdot 39$  in. Absolute drought prevailed for 18 days, August 31st to September 17th; partial drought for 29 days, with  $\cdot 19$  in. of R, from August 31st to September 28th. On September 29th R began at 6 p.m., and from midnight to 5 a.m. fell in torrents; by 8 a.m. it had nearly ceased, and the total for the 14 hours was  $2\cdot 17$  in.; total for 24 hours,  $2\cdot 19$  in. Even this heavy fall did not penetrate two inches deep through the turf, so dry had it become. The previous heaviest fall in 24 hours is  $2\cdot 06$  in. on September 1st, 1896. Some houses here have been closed in consequence of empty wells and tanks.

*Chiddingfold, Surrey.*—Records for the past 20 years show no parallel to the present autumnal heat and drought.

1898. Absolute drought for 20 days, August 29th to September 18th, being unprecedented in the second half of the year.

*Periods of Great Heat in September.*

1898.				1895.			
Sept.	Max.	Min.	Mean.	Sept.	Max.	Min.	Mean.
3	79	47	63	24	78	48	63
4	80	51	65·5	25	76	53	64·5
5	80	50	65	26	79	51	65
6	81	62	71·5	27	78	50	64
7	84	55	69·5	28	77	49	63
8	82	53	67·5	29	74	49	61·5
9	79	52	65·5	30	73	49	61
Mean	80·7	52·9	66·8	Mean	76·4	49·9	63·1

The only other instance of a max. of  $80^{\circ}$  in September was in 1880,  $80^{\circ}$  on 4th. The max. quoted for September, 1895, occurred three weeks later in the year, and are, therefore, not strictly comparable with 1898.

*Hitchin, The Firs, Herts.*—From 1849 the temp. never reached  $90^{\circ}$  until the middle of August, 1893, while on the 8th of September, 1898, it rose to  $91^{\circ}\cdot 5$ . Comparing the two hot periods we have—

Average max. for 17 days in August, 1893	77·5
„ „ „ September 1898	77·1

I expected to find September, 1898, the hottest we have ever had, but 1895 just beats it.

Mean temp., September, 1895 .....	60·4
„ „ 1898 .....	60·1

This heat was accompanied by a water famine, miles and miles of country being without a drop anywhere, and people coming from all parts to the rivers here. The two driest periods of 12 months recorded in 48 years are—

August, 1867, to July, 1868 .....	Rainfall. 16·54 inches.
October, 1897, to September, 1898 .....	15·79 „

*Lowestoft, Belle Vue Park, Suffolk.*—In September rain was recorded only on 8th, ·12 in., and 27th, ·04 in., total ·16 in. ; being 2·12 in. less than the average for 20 years. In the three months July–September the total fall was only 3·22 in. on 21 days, a deficiency of 4·22 in.

*Yarmouth, Market Place, Norfolk.*—September, 1898, total rainfall ·20 in. on 5 days, being 2·44 in. less than the average. Previous driest September, 1895, ·57 in.

Total rainfall to September 30th, 1898 ...	13·11 inches.
„ „ „ 1893 ...	13·07 „

Max. temp., September, 1898, 85° on 9th, the highest since July, 1881. Mean temp. 60°·2. Mean temp., September, 1895, 60°·3.

*Garstang, Bruna Hill, Lancashire.*—I wrote you at the time *re* the high min. temp. (65°) registered here on the night of the 4th August, 1897. That reading was exceeded so late as September 17th, the min. in Stevenson screen recorded at 8 a.m. on that day being 65°·5, and the max. 78°. This reading is unprecedented in 12 years.

## METEOROLOGY IN BELGIUM.

It is nearly two years since M. Folie resigned the appointment of Director of the Brussels Observatory. It is rather more than a year since we epitomized (*Met. Mag.*, Vol. XXXII. p. 91) some articles in *Ciel et Terre*, dealing with the subject.

We are very glad to announce that by Royal decree, dated Sept. 2nd, 1898, the work of the observatory has been divided. All subjects of finance, maintenance of buildings, library, and what may be called business matters, are placed under Professor Goedseels as “Administrateur-inspecteur.” M. C. Lagrange has been appointed Scientific Director, Astronomical Department ; and M. A. Lancaster Scientific Director, Meteorological Department. We congratulate both these gentlemen on the well-earned public recognition of their services, and we hope that such funds may be placed at their disposal that the work of both departments may speedily be brought up to date and kept there.

## THE EFFECT OF LIGHTNING ON AN OAK TREE.

*To the Editor of the Meteorological Magazine.*

SIR,—Charlton Kings (Gloucestershire) was visited by three very severe thunderstorms on August 15th, 18th and 21st respectively. On September 4th I first noticed that a fine oak tree growing on the bank of a narrow stream or ditch in that parish was blasted, and the leaves over the whole of the upper two-thirds of it burnt and curled up.

On examining the tree I found two grooves cut out of the bark on opposite sides of the main stem; each passed downwards (as I found by probing) beneath the surface of the soil, and continued upwards, quite distinct from each other, to where the tree bifurcated at about 20 feet from the ground, thence each groove continued upwards, following respectively one of the principal leaders to its very top. There were thus from the top to the ground two entirely separate cuts. That on the north had removed the bark for its whole depth to the width of about  $1\frac{1}{2}$  inch, some shreds hanging detached, which were quite brittle but showed no appearance of scorching. The groove on the south side was slightly wider and of similar appearance, with one remarkable exception—that a further groove, about one inch wide, was cut out of the wood down the middle of the groove in the bark.

Whether the tree was struck by two flashes with such corresponding results, or whether one flash so entirely separated itself into two as to produce such results, the case seems sufficiently remarkable to deserve recording.

The tree stands about half-a-mile to the north of, and 550 feet below the top of, Leekhampton Hill. I am inclined to think from my observations of the three storms that this occurred during the last, but I have no evidence on the point.

JAMES G. WOOD, M.A., F.R.Met.Soc.

115, Sutherland Avenue, W., Sept. 9th, 1898.

## THE AURORA OF SEPTEMBER 9TH, 1898.

[Although we believe that this is not the time when such a phenomenon ought to have occurred, an exceptionally large spot upon the sun came into view in the early days of September, and about the date at which it became central on the sun's disc there was (as usual) a very fine aurora. We have room only for two accounts, which we have selected, one, because of the accurate details which it contains—the other because of the great experience of the writer. It was seen from almost all parts of the British Isles, and indeed from most parts of the North West of Europe. Several pages of *Ciel et Terre* are devoted to accounts of the appearance in different parts of Belgium, one of them, illustrated by a sketch, showing the appearance at 21h. 50m. (8.50 p.m.), the time of greatest brilliancy. We shall not be surprised to hear of Aurora

Australis having been seen at the same time. We have seen no account of the previous appearance of this spot, but notices of an aurora on August 16th have been published. As the rotation period of the sun is about 25 days, it follows that (August 16 + 25 =) Sept. 10 would be the theoretical date, and the 9th was not very far off.

It has been said that Auroræ produce unsettled and stormy weather—certes that has not been the case in the S.E. of England this time.—ED.]

*To the Editor of the Meteorological Magazine.*

SIR,—8.25 p.m.—Strong patches of white light noticed due north and to the west and east of north—that in the north-east the strongest.

8.30.—The patches widened out and formed into an arc, with a depression nearly in the centre, the upper edge of the band fairly well defined, but the lower edge much broken by what appeared to be the upper edge of cumulus; but this proved not to be such, for whenever the brilliancy above faded, stars could be seen in the darker space below, and when finally the display ceased, there were no clouds in the sky but a few fleecy ones of small extent. During the whole time some principal stars were visible through the arc of light.

8.32.—A brilliant meteor shot from east to west horizontally across the northern sky, almost tangentially to the arc of light.

8.35.—Streamers began to shoot upwards, principally from the extremities of the arc.

8.40.—The streamers in the N.E. became slightly pink.

8.45.—The base of the arc determined to subtend an angle at the horizon of  $135^\circ$ , of which  $80^\circ$  were to the west and  $55^\circ$  to the east of due north. The depression remained uniformly in the middle of the arc. The streamers, now very clearly defined, were not productions of radii of arc, but converging towards the zenith, which they nearly reached, presenting the appearance of the ribs in the groined roof of an apse.

8.55.—A brilliant pink and broad streamer from the extreme west of the arc assumed and retained for some minutes the form of a fluted spiral column.

9.5.—The arc suddenly contracted itself so that its base subtended an angle of  $110^\circ$  only, the depression at the same time disappearing and the arc becoming regular throughout. Directly this was established only one streamer was visible—a broad, pink band, sloping from the vertical slightly to the right, and stretching well above the Pole Star, which was seen exactly in the centre of the band. This band distinctly moved eastward, for without changing its form or width, its western edge gradually approached, and in about two minutes passed eastwards of, the Pole Star.

For some minutes there was a constant variation in the position and number of the streamers and little or no colour, but all streamers

now assumed the direction of radii of the circle of which the arc was part.

9.15.—Two strong flickers of light like “sheet” lightning were succeeded by the fading out of all the streamers and a diminution of the “arc” light; but the aurora did not entirely disappear for some hours. At 10 o'clock it looked like a luminous haze or cloud over the water.

The weather preceding this display has been remarkable all over England, and will, no doubt, be fully recorded. A few notes of the local conditions may be useful:—

Sept. 7th.—Intensely hot day. Somewhat cloudy in afternoon. Hazy, with electrical clouds in the offing.

Sept. 8th.—Thick mist in the morning, cleared by midday under a hot sun; but about 5 p.m. clouds of mist rolled in from the sea and enveloped from time to time even low hills. Still very warm.

Sept. 9th.—Cloudy morning, with fresh wind from S.E. Sun broke through at times, and very hot. 2.30 to 3.30 p.m., drizzling fine rain or Scotch mist from S.W., afterwards cloudy and threatening. Clouds on hills at 700 feet level. Just before sunset temperature fell considerably, with a little rain. The clouds then lifted regularly all along the western and northern horizon just enough to show the sun setting a brilliant yellow into the ocean, without any bank of clouds. Lundy Island and the coast of Glamorganshire became suddenly visible, and so remained until it was dark. At 10 p.m. the wind had veered to N., and barometer, which before was falling, had risen .1 since 6 p.m. Stars brilliant, and the lights on Welsh coast very distinct.

JAMES G. WOOD, M.A., F.R.Met.Soc.

*Ilfracombe, Devon, September 9th, 1898.*

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*To the Editor of the Meteorological Magazine.*

SIR,—On Friday last, September 9th, an aurora was well observed here, which was probably the most brilliant, if not the most highly-coloured which has been seen since August 12th, 1880, not to go further back to the grand displays of 1847 and 1870–1871. It was preceded by a magnificent sunset, the sky carmine to the zenith, and fine masses of clouds to the eastward being illumined with a pink light similar to that of snowy Alpine peaks, changing later to a deep copper shade.

At 9 p.m. a large arch was seen spanning the northern horizon, a little to the west of north and at an altitude of about 20°. The centre was dark and apparently transparent. Streamers were continually shooting upwards for fully 60° in height.

The light given out was equal to that of a full moon, and was generally white, although with a tint of red occasionally. After midnight the exhibition gradually died away.—Yours, &c.,

HENRY SOUTHALL, F.R.Met.Soc.

*The Graig, Ross, September 12th, 1898.*

# RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858-97.

## SEPTEMBER.

ELEMENTS.	MONTHLY MEANS OR TOTALS.						ABSOLUTE READINGS.							
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	MEANS 9 A.M. AND 9 P.M.				EXTREMES AT 9 A.M. AND 9 P.M.						
				Mean.	Highest Month.		Lowest Month.		Highest.	Lowest.		Mean of all Highest.	Mean of all Lowest.	
					Value.	Date.	Value.	Date.		Value.	Date.			
Barometer ..... (cor. & red.)	1 29.970	2 30.255 1865	3 29.757 1859	5 29.971 29.970	6 30.260 30.250	7 1865 1865	8 29.747 29.766	9 1859 1896	10 30.532 30.523	11 16th, 1870 12th, 1888	12 28.731 28.959	13 25th, 1896 22nd, 1863	14 30.398 30.376	15 29.438 29.465
{ Dry Bulb..... { Therm.	56.8	61.8 1865	53.2 1877	58.1 55.6	63.9 59.7	1865 1865	54.7 51.7	77.0 71.8	8th, 1865 4th, 1880	43.1 39.5	27th, 1861 21st, 1872	66.5 64.1	49.0 46.9	
	67.3	..	..	..	76.4	1865	62.8	91.0	7th, 1868	50.1	24th, 1872	77.1	58.2	
{ Max. .... { Min. .... { Wet Bulb..... { Shade	49.7	..	..	..	54.5	1865	45.6	64.2	5th, 1880	33.0	23rd, 1872	59.4	39.1	
	54.0	58.0 1865	50.3 1877	54.7 53.4	59.1 56.8	1865 1865	51.1 49.5	67.5 67.0	8th, 1865 6th, 1866	40.8 37.3	26th, 1885 21st, 1872	62.6 61.7	46.5 44.8	
Solar Rad., black ...	102.0	...	...	...	108.7	1872	93.6	1894	131.8	13th, 1872	55.6	29th, 1871	120.4	70.4
Solar Rad., bright..	75.7	...	...	...	82.6	1895	71.6	1894	93.3	12th, 1889	56.2	21st, 1880	86.8	61.4
Grass Minimum ...	45.4	...	...	...	49.2	'65, '71	41.3	1863	62.3	6th, 1861	27.7	30, '63; 27, '85	56.8	34.1
Soil, 1 foot .....	57.5	...	...	...	60.3	1875	55.4	1877	65.8	5th, 1880	49.4	28th, 1885	61.0	53.3
Cloud .....	5.6	7.1 1869	2.1 1865	5.9 5.3	7.9 7.7	1881 1864	2.3 1.8	1865 1865	10 10	Every year Every yr. but '65	0 0	Various Various	10.0 9.9	0.2 0.0
Rainfall .....	2.39	5.51 1896	.55 1865	1.26 1.13	3.32 2.78	1885 1896	.17 .04	1890 1895	1.24 .96	6th, 1895 29th, 1871	.00 .00	Every year Every year	.50 .38	.00 .00

Max. Rainfall in 24 hours, 1.66 in., 26th, 1859.      Mean max. daily fall, .69 in.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1898.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
England, London .....	66·5	8	28·9	6	58·0	39·9	39·0	77	109·9	23·5	1·01	12	5·4
Malta .....	77·6	1	48·3	6	68·5	56·0	54·0	85	149·6	42·5	1·95	5	5·3
Cape of Good Hope ...	81·5	22	38·0	7	68·0	53·0	51·4	82	...	...	3·37	8	2·6
Mauritius .....	84·6	4	68·3	2	81·9	73·6	69·3	78	133·6	61·4	4·82	20	6·6
Calcutta .....	103·4	8	67·8	13	94·4	76·2	72·5	68	157·2	64·3	1·04	4	2·1
Bombay .....	92·2	3	75·0	9	89·2	78·7	74·6	74	143·5	66·7	·00	0	1·9
Ceylon, Colombo ...	94·2	1	73·3	12	89·8	76·2	74·6	81	157·5	69·5	22·81	24	6·6
Melbourne .....	85·9	1	41·2	21	67·3	50·3	47·6	68	138·9	36·3	1·68	12	5·9
Adelaide .....	85·7	13	45·0	24	70·3	52·9	48·9	65	144·8	34·6	3·41	13	5·8
Sydney .....	83·0	3	48·5	22	64·5	57·3	51·1	73	132·3	38·7	·58	9	4·0
Wellington .....	71·6	3	41·0	20	63·3	51·2	49·9	76	124·0	30·6	5·63	12	4·7
Auckland .....	74·0	14	45·0	24	67·6	54·6	51·8	72	133·0	42·0	·97	8	4·7
Jamaica, Kingston .....	88·9	9	67·3	4	85·9	69·7	66·9	74	...	...	·17	4	4·2
Trinidad .....	92·0	28a	62·0	16	88·7	68·6	69·6	74	165·0	61·0	1·17	8	...
Grenada .....	86·0	29	71·8	11	83·6	73·7	66·7	65	148·0	...	1·66	12	2·0
Toronto .....	67·1	15	15·7	5	51·5	35·2	29·1	58	87·0	11·8	1·76	7	4·7
New Brunswick, Fredericton .....	60·7	12	3·6	5	47·7	28·1	24·3	59	...	...	4·23	11	6·0
Manitoba, Winnipeg British Columbia, Esquimalt .....	68·5	14	—9·0	1	51·3	25·3	...	...	...	...	·98	5	4·7
	66·2	30	30·4	2	55·4	38·2	40·0	81	...	...	·88	10	5·9

a—and 29. b—and 24.

## REMARKS.

MALTA.—Mean temp. 60°·0, or 0°·4 above the average. Mean hourly velocity of wind 12·7 miles, or 1·1 above the average. Mean temp. of sea 62°·0. TS on 29th; L on 4th. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·0 above, of dew point 1°·1 above, and rainfall ·67 in. below, their respective averages. Mean hourly velocity of wind 14·0 miles, or 3·3 above average; extremes, 29·7 on 9th and 2·0 on 30th; prevailing direction E.S.E. and E. by S. L and T on 23rd. A. WALTER.

CEYLON, COLOMBO.—Mean temp. of air 82°·3, or 0°·4 above, of dew point 0°·4 above, and rainfall 11·75 in. above, the average. TSS on 16 days; L on 3 days. H. O. BARNARD.

Adelaide.—Mean temp. 2°·5 below, and rainfall 1·66 in. above, their respective averages for 41 years. C. TODD, F.R.S.

Sydney.—Temp. 0°·1 below, humidity 4·9 below, and rainfall 5·00 in. below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—The early part of the month was stormy from N.W., then followed fine weather until the middle of the month, when rain came on, and it continued showery until the 24th; the last part was fine. TS on 21st; fog on 17th. Temp. 0°·2 above, and rainfall 2·10 in. above, their respective averages. R. B. GORE.

Auckland.—An unusually dry April, the rainfall being considerably less than one-third of the average. Mean temp. slightly under the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 2·1 miles. Rainfall one-sixth of the average. The Island rainfall for the month is about the average. R. JOHNSTONE.

TRINIDAD.—Rainfall ·86 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,  
SEPTEMBER, 1898.

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.
I.	Uxbridge, Harefield Pk..	·46	XI.	Builth, Abergwesyn Vic.	2·37
II.	Dorking, Abinger Hall .	1·01	„	Rhayader, Nantgwillt ...	1·84
„	Birchington, Thor .....	·43	„	Lake Vyrnwy .....	2·32
„	Hailsham .....	1·03	„	Corwen, Rhug .....	1·77
„	Ryde, Thornbrough .....	1·00	„	Criccieth, Talarvor .....	2·38
„	Emsworth, Redlands ...	1·73	„	I. of Man, Douglas .....	2·47
„	Alton, Ashdell .....	1·04	XII.	Stoneykirk, Ardwell Ho.	4·22
III.	Oxford, Magdalen Col..	·34	„	New Galloway, Glenlee	4·13
„	Banbury, Bloxham .....	1·07	„	Moniaive, Maxwelton Ho.	3·46
„	Northampton, Sedgebrook	·48	„	Lilliesleaf, Riddell .....	1·32
„	Stamford Duddington...	·36	XIII.	N. Esk Res. [Penicuik]	4·25
„	Alconbury .....	·20	XIV.	Glasgow, Queen's Park..	3·99
„	Wisbech, Bank House...	·20	XV.	Inverary, Newtown .....	10·14
IV.	Southend .....	·17	„	Ballachulish, Ardsheal...	9·60
„	Harlow, Sheering.....	·24	„	Islay, Gruinart School...	3·50
„	Colchester, Lexden .....	·32	XVI.	Dollar .....	6·58
„	Rendlesham Hall .....	·44	„	Balquhidder, Stronvar...	7·39
„	Scole Rectory .....	·21	„	Coupar Angus Station...	2·33
„	Swaffham .....	·26	„	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	1·88	XVII.	Keith H.R.S.....	2·86
„	Bishop's Cannings .....	·98	„	Forres H.R.S. ...	2·82
„	Blandford, Whatecombe .	1·31	XVIII.	Fearn, Lower Pitkerrie..	3·96
„	Ashburton, Holne Vic...	1·53	„	N. Uist, Loch Maddy ...	...
„	Okehampton, Oaklands.	1·26	„	Invergarry .....	4·27
„	Hartland Abbey .....	1·75	„	Aviemore H.R.S. ....	3·89
„	Lynton, Glenthorne ...	1·60	„	Loch Ness, Drumnadrochit	2·76
„	Probus, Lamellyn .....	1·22	XIX.	Invershin .....	3·82
„	Wellington, The Avenue	1·26	„	Durness .....	5·21
„	North Cadbury Rectory	1·55	„	Watten H.R.S.....	2·85
VI.	Clifton, Pembroke Road	1·30	XX.	Dunmanway, Coolkelure	6·22
„	Ross, The Graig .....	·46	„	Cork, Wellesley Terrace	2·79
„	Wem, Clive Vicarage ...	·69	„	Killarney, Woodlawn ..	4·71
„	Wolverhampton, Tettenhall	·56	„	Caher, Duneske .....	3·50
„	Cheadle, The Heath Ho.	1·00	„	Ballingarry, Hazelfort...	3·13
„	Coventry, Priory Row ..	·65	„	Limerick, Kilcornan ...	2·95
VII.	Grantham, Stainby .....	·59	„	Broadford, Hurdlestown	3·88
„	Horncastle, Bucknall ...	·40	„	Miltown Malbay .....	3·59
„	Worksop, Hodsock Priory	·52	XXI.	Gorey, Courtown House	2·01
VIII.	Neston, Hinderton .....	1·33	„	Athlone, Twyford .....	3·21
„	Southport, Hesketh Park	1·48	„	Mullingar, Belvedere ...	3·75
„	Chatburn, Middlewood.	1·24	„	Longford, Currygrane...	...
IX.	Melmerby, Baldersby ...	·60	XXII.	Woodlawn .....	3·14
„	Scarborough, Observat'y	·16	„	Crossmolina, Enniscooe ..	2·95
„	Middleton, Mickleton ...	·88	„	Collooney, Markree Obs.	3·23
X.	Haltwhistle, Unthank...	·90	„	Ballinamore, Lawderdale	...
„	Bamburgh .....	·63	XXIII.	Warrenpoint.....	3·66
„	Duddon Valley, Ulpha School	4·00	„	Seaforde.....	3·62
„	Keswick, The Bank .....	2·14	„	Belfast, Springfield .....	4·09
XI.	Llanfrechfa Grange .....	2·60	„	Bushmills, Dundarave..	5·06
„	Llandovery .....	1·63	„	Stewartstown .....	5·16
„	Castle Malgwyn .....	1·63	„	Killybegs .....	4·38
„	Brecknock, The Barracks	·71	„	Horn Head .....	4·01

## SEPTEMBER, 1898.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which ≥ 0.1 or more fell.	TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours		Max.		Min.					
				Dpth	Date					Deg.	Date	Deg.	Date
								inches.	inches.				
I.	London (Camden Square) ...	·33	— 2·18	·20	29	4	91·2	8	36·8	29	0	0	
II.	Tenterden ...	·77	— 2·14	·41	29	6	88·0	9	37·0	29	0	1	
III.	Hartley Wintney ...	·82	...	·71	29	5	89·0	8	44·0	28	0	7	
III.	Hitchin ...	·31	— 2·19	·27	29	3	90·0	8	34·0	23b	0	...	
IV.	Winslow (Addington) ...	·41	— 2·26	·31	29	4	91·0	8	30·0	26	3	4	
IV.	Bury St. Edmunds (Westley) ...	·20	— 2·50	·11	29	4	81·0	8	41·0	29	0	...	
V.	Norwich (Brundall) ...	·17	...	·10	18	4	89·0	9	35·7	29	0	2	
V.	Winterbourne Steepleton ...	1·80	...	1·36	29	7	81·0	7	31·1	25	1	8	
VI.	Torquay (Cary Green) ...	·80	...	·58	29	6	76·3	8	46·2	29	0	0	
VI.	Polapit Tamar [Launceston]..	1·71	— 2·00	·59	17	12	80·6	6	35·3	1, 26	0	0	
VI.	Stroud (Upfield) ...	·78	— 2·13	·61	29	6	83·0	8	40·0	24	0	...	
VII.	Churchstretton (Woolstaston) ...	·60	— 1·90	·30	29	7	81·0	7	40·0	24b	0	2	
VII.	Worcester (Diglis Lock) .....	·61	— 1·83	·50	29	6	...	...	...	...	...	...	
VII.	Leicester (Rotherby Hall) ...	·42	...	·37	29	3	86·0	18	28·0	29	3	1	
VIII.	Boston ...	·27	— 2·50	·20	29	3	90·0	8	35·0	29	0	...	
VIII.	Hesley Hall [Tickhill].....	·51	— 1·65	·41	29	5	87·0	17	34·0	29	0	...	
VIII.	Manchester (Plymouth Grove) ...	·54	— 2·93	·16	29	8	85·0	5, 7	36·0	24	0	4	
IX.	Wetherby (Ribston Hall) ..	1·13	— 1·33	·90	29	5	...	...	...	...	...	...	
IX.	Skipton (Arncliffe) .....	3·03	— 1·73	·91	29	14	...	...	...	...	...	...	
X.	Hull (Pearson Park) ...	·26	— 2·18	·18	29	3	85·0	17	37·0	28c	0	0	
X.	Newcastle (Town Moor) .....	·61	— 2·17	·30	7	5	...	...	...	...	...	...	
XI.	Borrowdale (Seathwaite).....	10·98	— 75	2·29	29	16	...	...	...	...	...	...	
XI.	Cardiff (Ely).....	2·57	— 1·17	1·48	29	9	...	...	...	...	...	...	
XI.	Haverfordwest .....	2·03	— 2·37	·75	29	9	77·0	6	37·7	26	0	3	
XII.	Aberystwith (Gogerddan) ...	2·04	— 2·23	·98	29	7	82·0	5, 7	...	...	...	...	
XII.	Llandudno.....	1·56	— ·66	·51	29	9	81·0	5a	43·0	25	0	...	
XII.	Cargen [Dumfries] .....	3·33	— 23	·86	29	9	80·0	6	35·0	29	0	...	
XIII.	Edinburgh (Blacket Place)...	2·21	...	·75	29	14	82·8	5	39·2	24	0	0	
XIV.	Colmonell .....	3·92	...	·94	29	15	83·0	4	34·0	24	0	...	
XV.	Tighnabruaich .....	7·54	...	1·44	1	18	71·0	6	41·0	24	0	...	
XV.	Mull (Quinish).....	7·05	+ 2·02	1·11	27	20	...	...	...	...	...	...	
XVI.	Loch Leven Sluices .....	3·60	+ ·81	1·60	30	11	...	...	...	...	...	...	
XVI.	Dundee (Eastern Necropolis) ...	1·95	— ·56	1·05	29	15	82·9	4	38·0	23	0	...	
XVII.	Braemar .....	2·53	— ·33	·49	8	15	80·0	4	29·8	23	1	10	
XVII.	Aberdeen (Cranford) .....	1·62	...	·60	1	15	82·0	4	32·0	18	1	...	
XVIII.	Cawdor (Budgate) .....	3·34	+ ·59	·54	1	13	...	...	...	...	...	...	
XVIII.	Strathconan [Beaul] .....	4·61	+ ·93	·80	30	10	...	...	...	...	...	...	
XIX.	Glencarron Lodge.....	9·43	...	1·22	1	21	80·6	6	34·0	25	0	...	
XIX.	Dunrobin .....	3·84	+ 1·25	·70	29	13	73·0	6	39·0	19	0	...	
XX.	S. Ronaldshay (Roeberry) ...	4·74	+ 2·08	·98	3	18	71·0	5, 6	43·0	19	0	...	
XX.	Darrynane Abbey .....	5·23	...	1·20	8	19	...	...	...	...	...	...	
XXI.	Waterford (Brook Lodge) ...	2·69	— ·23	·70	26	13	75·0	15	37·0	28	0	...	
XXI.	O'Briensbridge (Ross) .....	3·93	...	·77	8	14	...	...	...	...	...	...	
XXII.	Carlow (Browne's Hill) .....	2·20	— ·62	·62	8	14	...	...	...	...	...	...	
XXII.	Dublin (FitzWilliam Square) ...	1·45	— ·52	·52	8	13	77·8	6	43·0	25	0	0	
XXIII.	Ballinasloe .....	3·34	+ ·55	·64	7	19	74·0	4, 5	40·0	29	0	...	
XXIII.	Clifden (Kylemore) .....	5·57	...	1·17	28	16	...	...	...	...	...	...	
XXIII.	Waringstown .....	5·79	+ 2·63	1·42	27	15	82·0	7	37·0	22	0	2	
XXIII.	Londonderry (Creggan Res.) ..	4·21	+ ·43	1·36	29	20	...	...	...	...	...	...	
XXIII.	Omagh (Edenfel) .....	4·12	+ ·74	·94	27	16	80·0	4	35·0	20	0	0	

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

a—and 6, 16. b—and 25. c—and 30.

# METEOROLOGICAL NOTES ON SEPTEMBER, 1898.

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.

**TENTERDEN.**—The R of the twelve months ending September, is only 18·08 in. being the least in 35 years and ten inches less than the average, and the fall in July, August and September is only 2·68 in., there having been only three other years with less than five inches in that period. Only four other years have had less than one inch in September, 1865, 1886, 1891 and 1895. There were 9 days with max. temp. above 80°, but the mean max. temp. is 1°·5 lower than that of September, 1895. Duration of sunshine 234 hours; on 4th 11 hours 30 min., and on 16th 11 hours 25 min. were registered. Partial drought for 40 days with 37 in. of R ended on 17th.

**HARTLEY WINTNEY.**—Another remarkable month for great heat and drought. The driest September since 1890, making, with the two preceding months, a very long and severe drought. Mean max. temp. 75°·6, mean min. 55°·5. Aurora visible on 9th. Remarkably clear and starlight nights until 29th. Frosts on the last 8 days. Ozone on 8 days. R of the first 9 months of the year 7·76 in. below the average. R for September 1·31 in. below the average.

**WINSLOW, ADDINGTON.**—In no other September since observations began in 1871 has there been so small a rainfall or a continuance of weather so exceptionally hot. There were two hot periods, the first from 3rd to 9th, giving 7 consecutive days with temp. of 80°, or above, and an average max. of 83°; the second from 14th to 17th, 4 consecutive days, with 80° and upwards, making a total of 11 days above 80°; equalled since 1871 only in July, 1887. Towards the end the nights were cold.

**BURY ST. EDMUNDS, WESTLEY.**—The month was very dry and hot, being the driest September since 1865, when only 11 in. of R fell. Water is very scarce in many villages in West Suffolk, and the outlook for winter sheep feed is very bad. Grand aurora on 9th.

**NORWICH, BRUNDALL.**—The warmest and driest September recorded here, the 9th being the hottest day since August 8th, 1893. Aurora on 9th.

**WINTERBOURNE STEEPLTON.**—Unusually hot and dry. Mean temp. 57°·9. The max. 81° on 7th was equalled only on August 15th. The weather was remarkably fine almost throughout, which intensified the effect of the absence of R. Until the last week of the month, there had been no week with an inch of R since May 21st, and there had been four rainless weeks. H and T on 28th.

**TORQUAY, CARY GREEN.**—R 1·62 in. below the average. Mean temp. 61°·8, or 3°·9 above the average. Duration of sunshine 213 hours 25 min., or 55 hours 40 min. above the average; no sunless day.

**POLAPIT TAMAR.**—A very dry month. The first 16 days were generally very hot and dry, with only 10 in. of R. Easterly winds or breezes prevailed.

**WOOLSTASTON.**—Very dry, and for the first three weeks intensely hot and sultry, followed by a few bitterly cold days, with sharp frosts on the ground. Want of water was much felt, the streams and brooks having almost disappeared. Mean temp. 59°·8.

**MANCHESTER, PLYMOUTH GROVE.**—Fine summer weather from 4th to 9th and 15th to 17th and on the whole, fine Autumn weather during the remainder. The driest September in the 31 years recorded. Mean temp. 55°·5.

**NEWCASTLE, TOWN MOOR.**—The smallest monthly rainfall recorded in September since 1895 when 44 in. fell on 5 days.

## WALES.

**HAVERFORDWEST.**—One of the finest, driest, and warmest Septembers on record. There were 9 days on which the temp. rose to 70°, or above, and much more than the average of brilliant sunshine. From 24th to 30th there was a considerable fall of temp., with E. and N.E. winds and cold nights. A

gale of some violence occurred on 29th with heavy R. Crops were good and well saved and there was plenty of grass in most places. R from January 1st to September 30th only 24·15 in.

GOGERDDAN.—A very fine September after a very wet August. Plenty of grass and good root crops.

### SCOTLAND.

CARGEN [DUMFRIES].—Although the mean temp. of the month has been four times exceeded in 39 years, the average of the six days 3rd to 8th ( $66^{\circ}\cdot3$ ) is unprecedented. A sudden change to lower temp. occurred on 22nd and continued until the close, the mean from 22nd to 30th being  $48^{\circ}\cdot7$ , while from 1st to 21st it was  $60^{\circ}\cdot3$ . On seven days the max. temp. exceeded  $70^{\circ}$ . The max. temp. ( $80^{\circ}$  on 6th) has only once been exceeded, namely, on September 4th, 1880, when  $80^{\circ}\cdot4$  was registered. Of the 3·33 in. of R, 2·24 in. fell on 11th, 17th and 29th. The total R for the nine months of the year is 1·09 in. above the average. Duration of sunshine 17 hours above the average. Pastures were never more luxuriant.

EDINBURGH, BLACKET PLACE.—The heat wave lasted from the 2nd to the 17th, the mean temp. being  $63^{\circ}\cdot3$ , or  $8^{\circ}\cdot2$  above the average of the period for 100 years. On 4th, 5th and 6th the shade temp. exceeded  $80^{\circ}$  each day, and the mean temp. was  $70^{\circ}\cdot7$ , or  $14^{\circ}\cdot7$  above the normal. Rainfall 24 per cent. below the average, and sunshine slightly below the normal. The min. temp.,  $62^{\circ}\cdot0$  on 3rd, is the highest in September for 57 years; and the max.,  $82^{\circ}\cdot8$  on 5th, is the highest in September since 1838. The mean min. temp. for the week ending 9th is  $59^{\circ}\cdot8$ . L on 7th. Brilliant aurora on 10th.

COLMONELL.—R 10 in. below, and mean temp.  $3^{\circ}\cdot8$  above, the average of 22 years. Very brilliant aurora on 9th.

TIGHNABRUACH.—The rainfall was excessive and very bad for harvest operations. Mean temp.  $3^{\circ}$  above that of September, 1897.

MULL, QUINISH.—Very warm and wet, with the wind from S.E. to S.W. continuously.

ABERDEEN, CRANFORD.—Charming weather throughout, and very warm. Water in many places very scarce. Brilliant aurora on 9th.

S. RONALDSHAY, ROEBERRY.—Warm and wet. Mean temp.  $53^{\circ}\cdot7$ , or  $2^{\circ}\cdot2$  above the average of 8 years.

### IRELAND.

WATERFORD, BROOK LODGE.—Aurora at night on 9th. Much L at night on 16th. T and H on 28th.

O'BRIENSBRIDGE, ROSS.—With a full rainfall there were many fine, bright days. Altogether a favourable harvest month. Brilliant aurora on 10th.

DUBLIN, FITZWILLIAM SQUARE.—A warm, dry, summer-like month. Mean temp.  $60^{\circ}\cdot2$ , being  $4^{\circ}\cdot4$  above the average, but  $1^{\circ}\cdot2$  below that of the wonderful September of 1865. High winds on 9 days, reaching the force of a gale on 18th, 29th and 30th. Fog on 4th, 15th and 25th. Solar halos on 7th and 8th, lunar halos on 28th and 30th. L on 16th. Magnificent aurora on 9th. R for the nine months ending September 30th 17·97 in.

WARINGSTOWN.—The wettest September on record, but a wonderfully good harvest.

OMAGH, EDENFEL.—Notwithstanding a rainfall about one-fourth above the average, and 16 rainy days, the month was the finest September recorded, surpassing even those of 1868 and 1893. The R mostly fell at night, and with temp. on seven days above  $70^{\circ}$ , and on the 4th as high as  $80^{\circ}$  (a point never before reached in September), a large proportion of the days were as perfect as weather could be, the atmosphere being frequently remarkably clear. Harvest correspondingly excellent.

# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CCCXCIV.]

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## THE BRITISH ASSOCIATION AT BRISTOL, 1898.

WE have added the date to the above title because we have already (Vol. X., p. 117 *et seq.*) chronicled one Bristol meeting, and there must not be confusion between the meetings of 1875 and of 1898.

Although the total number of persons attending the recent meeting was considerably above that in 1875, the number of meteorologists present was about the same as in that year.

The majority of the papers were taken in Section A (*President*, Prof. Ayrton, F.R.S.), and on the Saturday, but a few were taken in E (*Geography*).

### *Report of the Committee on the Climate of Tropical Africa.*

This report contained, as usual, abstracts of observations from various stations, which had been received by the Committee; but it was noteworthy in that the Committee appear to have decided that in future, observers must provide their own instruments. Several large organizations for the collection of meteorological data in Central Africa having been started, the pioneer work of this Committee seems to have brought forth excellent fruit, the credit of which is largely due to the Chairman, Mr. E. G. Ravenstein, F.R.G.S., and to Mr. H. N. Dickson, the Secretary.

### *Report of the Committee on Ben Nevis Observatory.*

The Committee was appointed, as in former years, for the purpose of co-operating with the Scottish Meteorological Society in making meteorological observations at the two Ben Nevis Observatories.

The hourly eye observations by night as well as by day, which are a speciality of the Ben Nevis Observatory, were made with complete regularity during the year 1897 by Mr. Angus Rankin, the superintendent, and his assistants.

As stated in our last Report, the observations at the intermediate station on Ben Nevis, at a height of 2,322 feet, were resumed in the summer months. The observations were made from July 19th to September 30th, by Messrs. T. S. Muir of the Royal Hill School of Edinburgh, Alexander Drysdale, B.Sc., Dollar, and A. Aitken. By

the great enthusiasm and self-denial of the observers, aided by several self-recording instruments the gift of Mr. J. G. Buchanan, a valuable, complete series of hourly observations has been obtained. Hence, for the first time, complete series of hourly observations have been secured at heights of 42 feet, 2,322 feet, and 4,407 feet, the three places being in the same line, and differing but little in horizontal distance from each other. These hourly observations from the three Observatories on Ben Nevis are really indispensable data in investigating the problems relating to the vertical gradients of the temperature, pressure, and humidity of the atmosphere and its movements.

Messrs. Muir and Drysdale have undertaken, under the superintendence of the Directors, the laborious work of discussing these observations, and at the Meeting of the Scottish Meteorological Society, Mr. Muir submitted an exhaustive preliminary report. Among the important results either disclosed or indicated in the discussion, may be noticed the relations which prevail between different vertical distributions of temperature and pressure on the one hand, and cyclones and anticyclones on the other, thus:—When the reduced barometer at the Ben Nevis Observatory, for a series of observations, comes out higher than that of Fort William, then the accompanying disturbance of temperature takes place in the lower half of the mountain, that is, below the intermediate station, and denotes the approach of an anticyclone. Conversely, when the reduced Ben Nevis Observatory barometer reads lower than that of Fort William, then the disturbance of temperature takes place in the upper half of the mountain, and denotes the approach of a cyclone.

In the further prosecution of this line of research, it has been arranged that in the summer of 1898, in addition to the hourly observations, the observers make out-door temperature and eye observations at different heights above and below the level of the intermediate station. The observer takes with him a dry and a wet bulb sling thermometer with which the temperature and humidity are observed. Special attention is given to the particular height where at the time the more rapid changes of temperature and humidity occur, which are such striking features on the slopes of Ben Nevis, of the cyclones and anticyclones as they sweep past the mountain. These observations will continue to be made for some time at short intervals, to which are added eye observations, such as mist and haze as they appear or disappear; of marked changes of wind, both direction and force; of the heights of the clouds on the neighbouring heights and mountains, of the rainfall, &c.

Mr. Omond has undertaken a discussion of the hourly observations at the three observatories, carried out in sequence from day to day, with the view of ascertaining, among other points, the times which elapse between the first appearance of the indications of a cyclone or anticyclone, and its actual arrival in the British Islands.

*Report of the Committee on Meteorological Photography.*

Mr. A. W. Clayden stated that the work of previous years on the photographic determination of cloud altitudes had been continued, using two cameras, one at each end of an east-west line 200 ft. long, and taking simultaneous photographs of clouds near the sun, each negative containing an image of the sun itself. The results show the existence of greater cloud altitudes in hot weather under thunder-storm conditions than at other times. In such circumstances clouds may occur at five or six different levels, extending as high as 17 miles. Alto-cumulus and cirro-cumulus clouds are much higher at the margins of anticyclones than generally supposed. A rise of cloud planes takes place in hot weather, also during the morning and early afternoon, while the lowest altitudes are found during cyclones. The Committee purpose to move the present installation to a neighbouring site, with a north to south base, so that observations may be taken in the early morning and late afternoon.

In the discussion which followed, Mr. G. J. Symons reminded the Section that the Committee would be glad to receive any photographs of exceptional meteorological phenomena.

*Report of the Committee on Seismological Investigations.*

A voluminous report on this subject was presented by Professor John Milne. It showed the great progress made by the establishment of earthquake-observing stations round the world, and some of the results of the observations made. There was an interesting chapter on the effect of earthquake disturbances on magnetic instruments. It was found that when a great earthquake has originated, for example, in Japan, seismographic records indicate that about 16 minutes later Europe has felt the shock, and it might be imagined that one observatory has practically been subjected to as much movement as any other. The effect on magnetic needles at various observatories has, however, been very different. This could be accounted for in various ways, which were discussed at length. To explain the fact that magnetic storms and perturbations often precede large earthquakes and appear rarely to precede small ones, we may assume that the earthquake is preceded by chemical, physical, or mechanical changes in the constitution of the materials where it originates. All that we are certain about is, that with many earthquakes there have been enormous mechanical displacements of material, sufficiently large to disturb the Pacific Ocean for a period of twenty-four hours. Other earthquakes from submarine centres which have not disturbed oceans, but have created equally large earth waves, indicate equally large subterranean reliefs in strain, and material readjustments. These large earthquakes, originating beneath the bottom of the steeper slopes of the earth's surface, suggest that at such places a secular flow in subterranean material may be in progress, accelerations in which result in violent shaking,

which, as it radiates, is transformed into slow earth waves. Near to the scene of such subterranean changes, prior to and at the time of the same, magnetic perturbations should be observable. In Japan such appears to have been the case. In regard to the velocity with which preliminary tremors may be supposed to be transmitted through the earth, such data as have been collected apparently show that this varies with the square root of the average depth of the chord along which we may suppose them to have travelled. In conclusion, Prof. Milne showed photographs of many Continental seismological observatories, and contrasted the splendid provision made for seismological observations by Italy and Germany, with the damp and unhealthy stable which alone he was able to provide in the Isle of Wight.

Mr. G. J. Symons, F.R.S., said the absence of any provision by the Government for these important observations was disgraceful, and subsequently Professor Barrett moved and Mr. Symons seconded, "That the Committee of the Section be requested to consider the advisability of urging her Majesty's Government to place at the disposal of the Seismological Committee of the British Association a suitable building for housing the apparatus for continuous seismological observations." This was agreed to. In the course of the discussion great credit was given to Professor Milne for the enthusiastic and able way in which he conducted these investigations. One speaker thought that the result of the investigations was very important to geologists. If a vibration originating in Japan was so soon felt in Europe it would show that the earth was composed of very dense material, that the earth must be tolerably solid, and that the cavernous theory was not tenable. In proposing a vote of thanks, the President mentioned that Professor Milne was devoting his life to the solution of a problem which was of world-wide importance.

*Report of the Committee for the Establishment of a Meteorological Observatory on the Top of Mount Royal, Montreal.*

The Committee desire this year to present an *interim* report, and to ask for re-appointment, with a further grant of £50. The object of the establishment of the observatory on the top of the mountain was to obtain simultaneous records of temperature, humidity, &c., for comparison with those taken at the College Observatory at the foot. The distance between the two stations is rather more than a mile, and the difference of altitude nearly 600 feet. A line consisting of four insulated copper wires was erected to connect the two observatories. As a preliminary experiment, an electrical thermometer was set up on the wooden tower on the summit of the mountain, and connected through the line to a recording instrument in the College Observatory. No difficulty was encountered in obtaining continuous records of the temperature on the summit in this manner.

It is hoped that interesting results may be obtained by comparing continuous records of temperature at stations differing so considerably in altitude within a short distance of each other. The work has not yet progressed for a sufficient length of time to enable the Committee to report any general results, but the success of the method has been established, and it is intended, if possible, to extend further the method to the recording continuously at a distance of wind velocity and direction, barometric pressure and humidity. The intensity of sunshine has been recorded for some months at the observatory by means of similar instruments, and it is hoped to demonstrate the possibility of obtaining complete and accurate records of *all* necessary meteorological data from a distant observatory in a more or less inaccessible situation (such as that on the summit of Ben Nevis), without the necessity of employing a special observer to make daily visits to the station.

*A Quantitative Bolometric Sunshine Recorder.* By Professor H. L. CALLENDAR, M.A., F.R.S.

This instrument is essentially a recording bolometer, in which the difference of temperature between a blackened and a bright platinum thermometer of equal resistance is recorded in pen and ink in the form of a continuous curve on a revolving drum. It differs from ordinary sunshine recorders in giving a strictly quantitative record of the quantity of heat received by the earth's surface, and not merely the number of hours of bright sunshine.

The sensitive part of the instrument, which is exposed to the radiation to be measured, consists of a pair of differential platinum thermometers wound on flat plates of mica, the one black and the other bright, and placed side by side in a horizontal plane so as to record the vertical component of the sunshine, on which the quantity of heat received by the surface of the earth mainly depends. The instrument gives a complete record of the character of the sunshine, as well as of its intensity. The passage of small clouds, which would leave no trace on an ordinary burning glass or photographic record, is very clearly shown. It is also found that, when the sky is obscured by clouds of sufficient thickness to prevent any trace of burning on the ordinary cards, a very considerable percentage of the sun's heat may still penetrate.

The recording apparatus used is identical with that required for records of temperature, pressure, voltage, &c., and may be located in any convenient situation, at any required distance from the bolometer. It has been in use for more than a year at McGill College, Montreal, for obtaining records of sunshine, temperature, &c., and has been in regular operation at a distance of more than a mile from the Observatory, where the recording apparatus is kept under the charge of the usual observatory assistants.

*Exploration of the Upper Air by Means of Kites at Blue Hill Observatory, Mass., U.S.A. By DR. A. LAWRENCE ROTCH.*

Since the account presented at Toronto great progress has been made. The Hargrave kite has been perfected by making it larger, more rigid, and relatively lighter, and by concaving the surfaces exposed to the wind the vertical component of the latter has been increased. In general, these kites, with a short line, rise from 50 to 60 degrees above the horizon, and pull about one pound per square foot of lifting surface in a wind blowing 20 miles an hour. Elastic bridles diminish the angle of incidence of the wind as its pressure increases, and thereby enable the kites to fly in gales. A meteorograph made by Mr. Fergusson, which records the pressure, temperature, and humidity of the atmosphere and the velocity of the wind, weighs but three pounds. Since the use of wire and more efficient kites, the mean height of the flights has been increased to more than 7,000 ft. during the past few months. On six occasions 10,000 ft. was reached, the *maximum* altitude attained being 11,440 ft. on August 26th, 1898.

Mr. Shaw remarked that it was a pity that this subject was not more taken up in England. Professor Boys said he had used kites both in Ireland and England, and had now one at the Victoria Rooms, which he should be glad to exhibit in suitable weather. The President suggested that Professor Boys should fly his kite at the garden party at Clifton College on Monday afternoon.

*A new form of American kite by Professor SCHUSTER, F.R.S.*

(No abstract received).

*Analogies between the Yearly Ranges of some Meteorological and Magnetic Phenomena. By Dr. VAN RIJCKEVORSEL.*

This is the second part of a paper read at the Toronto meeting, in which it was shown how similar the yearly temperature curves are for a large part of Europe, and how the anomalies which these curves show may contribute in a large degree to the discovery of their origin.

In the diagram accompanying the present paper are plotted down six annual curves for temperature, air-pressure, rainfall, magnetic declination, and for the vertical and horizontal components of the earth's magnetic force. A portion of these curves are for Greenwich, others for two different stations in the Netherlands. It is now shown that all these curves, however dissimilar in their general directions, are exactly alike in their anomalies. Except in a very small number of instances, where the data at hand were not yet sufficient to make the phenomenon appear, every maximum or minimum in one curve seems to have its exact counterpart in every other curve, be it meteorological or magnetic. This is even the case for very small accidents of a curve, so that it is probable that it will ultimately prove to be true for every single feature of these curves, however insignificant.

These facts, in the first place, show once more how all the phenomena on the earth must be, to a large extent, governed by one and the same potent cause. But they also seem to give a valuable method for discovering, if not always the cause of meteorological phenomena, yet of the centre on the globe from which such a cause emanates.

It is also shown how the cause of a certain minimum in the temperature curves, indicating a sudden cooling in the last days of June all over the British Isles and part of western Europe, whatever it may be, must have its seat to the west or north-west of the coast of Scotland, and at no great distance.

*The Rainfall of the South-Western Counties of England.* By JOHN HOPKINSON, F.R.Met.Soc., Assoc.Inst.C.E.

The counties here considered as south-western are Monmouth, Hereford, Worcester, Gloucester, Wilts, Dorset, Somerset, Devon, and Cornwall. They cover an area of 11,273 square miles, which is between one-fourth and one-fifth that of England, and nearly one-tenth that of the British Isles. The mean monthly rainfall for the ten years 1881 to 1890 at 72 stations in these counties has been calculated, and the mean annual rainfall at 113 stations, being one to the nearest 100 square miles in each county. Thus, for example, the annual rainfall of the smallest county, Monmouth (496 square miles), is deduced from the records of five stations, and that of the largest, Devon (2,586 square miles), from the records of twenty-six stations.

The annual means at the 113 stations are :—

Monmouth (5 stations)	.....	36·19 in.
Hereford (9 „ )	.....	28·64 „
Worcester (7 „ )	.....	27·02 „
Gloucester (13 „ )	.....	29·39 „
Wilts (14 „ )	.....	29·71 „
Dorset (10 „ )	.....	33·53 „
Somerset (16 „ )	.....	35·54 „
Devon (26 „ )	.....	37·24 „
Cornwall (13 „ )	.....	42·48 „

The mean for the whole area being 34·08 in.

The mean annual rainfall at 12 stations (every county being represented by one or two) was as follows :—

1866-70	.....	35·76 in.	1881-85	.....	38·25 in.
1871-75	.....	39·02 „	1886-90	.....	33·07 „
1876-80	.....	40·15 „	1891-95	.....	34·84 „

(To be continued.)

## WRAGGE'S AUSTRALASIAN WEATHER GUIDE.

*To the Editor of the Meteorological Magazine.*

SIR,—While thanking you for your very kind notice with reference to my “Almanac,” I nevertheless regret that you should have done me an injustice by intimating that no reports have been issued from

this office except charts. I also much deplore your remarks *re* high level stations, and honestly tell you that I consider that you have not been by any means fair to my old friend Dr. Buchan. Our publications are issued monthly, and you will find them all in the rooms of the Royal Meteorological Society, the Royal Society, Burlington House, London, the Royal Geographical, and kindred Societies. Although I should be willing to supply you with our publications privately, I cannot do so, since our funds are limited, and I am not authorised to incur more than a certain amount of postage. Kindly publish this letter in the *Meteorological Magazine*.

Yours faithfully,

CLEMENT L. WRAGGE,

*Brisbane, August 30th, 1898.*

Govt. Meteorologist for Queensland.

[We print the above as requested, though we doubt its utility, as there is not a word in it which contradicts anything stated on p. 87, as Mr. Wragge would have seen had he done us the honour of reading the review carefully. Dr. Buchan was not even mentioned, and certainly would not be, in these pages, without the respect due to his life-long work; but we have no wish to occupy space upon the subject, and therefore afford Mr. Wragge the above last word.—ED.]

## LUNAR RAINBOW.

*To the Editor of the Meteorological Magazine.*

SIR,—The weather on Sunday evening, October 30th, 1898, was wild and squally in this district, and there was heavy rain between 6 and 6.40 p.m. The moon then came out in a clear opening between passing clouds, and on looking up I thought, from the stormy appearance of the sky, and the fact that a little rain still continued falling, that the conditions were favourable to the production of a lunar rainbow. I got on higher ground and scanned the western sky, where I immediately saw a bright, though incomplete bow. Only the right side of the arch was visible, and there was a faint supplementary fragment. The appearance reminded me forcibly of the curved train of a bright comet. After a duration of about five minutes, the phenomenon disappeared, the moon became hidden by clouds, and further showers of rain ensued.

About two miles west of my position, viz. : at Clifton Down, the rainbow appears to have been much better seen by Mr. A. H. Parkinson, who says that at 6.40 p.m. his attention was arrested by a small portion of a lunar rainbow, which in about three minutes had developed into a complete arch, and remained visible in that form for about three-quarters of a minute. The right side of it was the more conspicuous, displaying the prismatic colours, while the remainder was almost white. The secondary bow also appeared, but was exceedingly faint.—Yours sincerely,

W. F. DENNING, F.R.A.S.

*Bishopston, Bristol, November 5th, 1898.*

# THE DROUGHT.

*To the Editor of the Meteorological Magazine.*

SIR,—Five months ago (p. 55) you were good enough to publish in your Magazine the rainfall for Worthing, showing the great deficiency which was manifest up to the end of April last. The decess is now much more marked, and the past twelvemonths form the driest period since observations were begun here in 1852.

There have been drier months in previous years—as in September, 1865, when only 0·10 in. of rain was registered.

There have been drier quarters—as in the second quarter of 1893, when only 0·95 in. of rain was recorded ; but for the past 47 years there has never been so long a period during which dry weather has prevailed.

The mean rainfall for Worthing in the first nine months of the year is 18·47 in. In six of these years the fall has been less than 13·5 in., and in six other years the fall has been over 21 in. :—

SIX DRY YEARS, Jan. 1st to Sept. 30th.			SIX WET YEARS, Jan. 1st to Sept. 30th.		
		Fall in inches.			Fall in inches.
1854	.....	12·60	1852	.....	21·83
1855	.....	11·60	1856	.....	22·10
1858	.....	12·00	1860	.....	25·90
1870	.....	13·11	1877	.....	21·30
1887	.....	13·15	1879	.....	29·55
1898	.....	11·45	1894	.....	25·01

Thus 1898 not only stands out prominently with the lowest fall, but it followed upon the dry autumn of 1897, so that the past twelvemonths show the fact more clearly when thus compared :—

Last 3 months of		Fall.	First 9 months		Fall.	Total fall in 12 consecutive months.	
of		in.	of		in.	in.	
1853	...	9·30	1854	...	12·60	21·90	
1854	...	7·50	1855	...	11·60	19·10	
1857	...	7·60	1858	...	12·00	19·60	
1869	...	7·38	1870	...	13·11	20·49	
1886	...	11·89	1887	...	13·15	25·04	
1897	...	5·58	1898	...	11·45	17·03	

This amount of 17·03 in. is 10·92 in. below the mean of 1852-96 ; and as there was also a decess from May 1st to September 30th last year, the actual loss in the past 17 months is equal to nearly 13 in. :—

		Fall.	Mean Fall.	Decess at end of
		in.	in.	in.
1897.	May 1st to Sept. 30th .....	8·82	10·86	2·04
„	Oct. 1st to Dec. 31st .....	5·58	9·48	5·94
1898.	Jan. 1st to March 31st.....	3·18	6·05	8·81
„	April 1st to June 30th .....	5·90	5·28	8·19
„	July 1st to Sept. 30th .....	2·36	7·14	12·97
Total for 17 months		25·84	38·81	12·97

Yours faithfully,

*Worthing, October 15th, 1898.*

C. KELLY, M.D.

P.S.—The fall in October was 4·26 in., or 0·37 in. above the average, but this still leaves a decess of 12·60 in.

## THE EFFECT OF LIGHTNING ON AN OAK TREE.

*To the Editor of the Meteorological Magazine.*

SIR,—Mr. Wood's interesting letter of September 9th led me to seek for the oak in question, which he mentioned in your last number (p. 136) as having been struck by lightning during one of the August storms. Although I was unaware of the occurrence, in spite of the fact that I live in the immediate vicinity, I soon found it, and was surprised to find that though a fine tree, yet it was not the highest tree around, for there were others taller in close proximity; neither was it isolated in any way, for it was growing on the side of a ditch, with other trees. It stood therefore considerably lower than other solitary trees in the adjoining field. There is more than one solitary oak in that field larger than the one struck, and standing on higher ground, and therefore one would have thought more likely to attract the lightning. I mention these facts only for what they are worth, and as illustrating the apparently extraordinary capriciousness of the electric discharge in the objects on which it strikes.

Yours faithfully,

LLEWELLYN EVANS.

*Cheltenham, November 10th, 1898.*

[Possibly there was more water in the ditch near that tree than near the others.—ED.]

## SOME HEAVY RAINS—OCTOBER 15TH–18TH, 1898.

[No returns quoted unless the aggregate for the four days reached 4·00 in., or the fall on some one day exceeded 2·00 inches.]

COUNTY.	STATION.	Fall on the				Total.
		15th. in.	16th. in.	17th. in.	18th. in.	
<i>Devon</i> .....	Druid House, Ashburton .....	1·19	1·62	1·36	·37	4·54
	Mamhead Rectory, Dawlish...	1·70	1·65	1·72	·48	5·55
	Polapit Tamar, Launceston...	·30	1·50	1·61	·92	4·33
	Oaklands, Okehampton .....	·44	·87	1·62	1·42	4·35
	Horwood, Bideford .....	—	—	2·25	—	—
<i>Cornwall</i> ...	Athenæum, Barnstaple.....	·02	·58	2·13	1·46	4·19
	Lamellyn, Probus .....	·61	1·65	1·82	·14	4·22
	Green Bank, Liskeard ... ..	·23	1·16	2·85	·24	4·48
	Penleat, Altarnon.....	·27	1·61	2·44	1·42	5·74
<i>Gloucester</i> ..	Wickwar Rectory .....	—	·60	1·22	2·21	—
<i>Monmouth</i> .	Shirenewton Hall, Chepstow	—	1·62	1·74	2·01	—
	Llanfrechfa .....	·11	1·73	1·10	1·52	4·46

N.B. — indicates no information, *not* no rain.

# RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858-97.

## OCTOBER.

ELEMENTS.	MONTHLY MEANS OR TOTALS.										ABSOLUTE READINGS.					
	MEANS 9 A.M. AND 9 P.M.										EXTREMES AT 9 A.M. AND 9 P.M.					
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	Highest Month.			Lowest Month.			Mean of all Highest Lowest.	Highest.			Lowest.		
				Mean.	Value.	Date.	Value.	Date.	Date.		Value.	Date.	Value.	Date.	Date.	Date.
Barometer ..... (cor. & red.)	1 29.906	2 30.189 1897	3 29.576 1859	5 29.906 29.906	6 30.188 30.191	7 1897 1897	8 29.597 29.554	9 1859 1859	10 30.683 30.662	11 31st, 1891 30th, 1891	12 28.640 28.774	13 16th, 1886 31st, 1859	14 30.447 30.428	15 29.247 29.274		
{ Dry Bulb.....{	49.2	54.4 1861	44.6 1887	49.6 48.8	54.8 53.9	1861 1861	44.7 44.0	1887 1881	67.5 64.5	15th, 1862 19th, 1864	29.6 30.9	28th, 1890 27th, 1895	60.5 59.2	36.9 37.9		
{ Max. ....{	57.5	..	..	..	64.4	1861	52.6	1881	80.9	4th, 1859	37.2	24th, 1859	68.1	47.3		
{ Min. ....{	43.3	..	..	..	48.1	1861	38.9	1888	60.5	15th, 1862	23.8	28th, 1890	54.5	31.4		
{ Wet Bulb.....{	47.4	53.0 1861	42.3 1887	47.7 47.1	53.4 52.5	1861 1861	42.4 42.1	1887 1887	62.1 62.1	4th, 59; 15th, 62 1st, 1861	28.6 30.5	28th, 1890 26th, 1869	58.1 57.2	35.8 36.7		
Solar Rad., black .....	81.3	..	..	..	89.1	1877	75.5	1875	116.9	4th, 1879	46.0	20th, 1880	107.4	53.7		
Solar Rad., bright..	62.3	..	..	..	67.0	1893	58.3	1880	86.8	1st, 1886	42.0	26th, 1895	76.5	49.1		
Grass Minimum .....	39.0	..	..	..	44.3	1874	33.1	1888	58.3	3rd, 1862	16.8	28th, 1890	52.0	26.6		
Soil, 1 foot .....	50.2	..	..	..	53.2	76, 86	46.8	1888	59.8	2nd, 1895	41.0	30th, 31st, 95	55.3	45.0		
Cloud .....	6.1	7.5 '82, '94	5.0 1893	6.4 5.8	8.5 7.4	1894 1889	4.0 4.0	1893 1892	10 10	Every year Every year	0 0	Various Various	10.0 10.0	0.1 0.1		
Rainfall .....	2.71	6.22 1865	5.6 1897	1.26 1.45	3.59 3.33	1880 1865	2.3 2.07	1884 1897	1.09 .91	31st, 1892 12th, 1873	.00 .00	Every year Every year	.42 .46	.00 .00		

Max. Rainfall in 24 hours, 1.35 in., 30th, 1894.

Mean max. daily fall, .66 in.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1898.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
England, London .....	75·2	23	34·6	13	61·1	45·4	44·0	74	118·1	30·8	2·27	21	7·1
Malta.....	83·1	26	52·8	3	73·5	58·2	55·1	71	144·7	45·4	·05	1	3·1
<i>Cape of Good Hope</i> ...	79·9	20	41·1	17	64·3	50·2	48·4	83	...	...	4·06	14	5·8
<i>Mauritius</i> .....	80·0	14	64·4	31	76·8	69·0	65·6	80	125·7	57·0	8·32	16	6·6
Calcutta.....	103·2	18	70·8	27	96·0	77·9	73·4	66	157·8	68·7	4·06	5	3·7
Bombay.....	94·9	28	79·4	12	91·1	81·5	76·2	73	145·5	72·8	·16	2	2·7
Ceylon, Colombo .....	90·6	13	72·0	3	88·0	78·4	75·3	81	154·0	69·5	5·80	22	6·1
<i>Melbourne</i> .....	69·4	30	35·0	26	60·0	43·7	44·1	75	131·0	30·2	2·09	10	6·3
<i>Adelaide</i> .....	70·4	29	37·9	25	62·0	46·3	44·3	73	132·4	23·2	3·80	13	4·2
<i>Sydney</i> .....	66·8	22	42·4	25	61·7	51·0	47·2	80	114·1	34·9	10·52	19	5·3
<i>Wellington</i> .....	71·0	9	36·5	27	58·6	47·7	46·7	79	105·0	26·0	5·96	17	5·0
<i>Auckland</i> .....	68·0	2	40·0	31	63·6	51·1	47·4	70	120·0	36·0	3·67	18	5·3
Jamaica, Kingston.....	89·1	5	69·2	7	86·0	72·4	71·3	75	...	...	9·66	8	...
Trinidad .....	95·0	11	63·0	10a	92·3	71·1	70·2	71	165·0	60·0	1·49	6	...
Grenada.....	87·6	30	71·2	10	84·4	75·2	70·1	69	148·0	...	·77	9	2·5
Toronto .....	74·0	31	37·4	6	64·3	46·4	46·6	72	97·5	23·0	2·31	7	5·4
New Brunswick, Fredericton .....	76·8	22	25·2	4	64·3	41·4	38·3	53	...	...	1·53	7	6·0
Manitoba, Winnipeg }	82·7	24	25·8	5	68·4	37·9	...	...	...	...	·39	3	4·8
British Columbia, Esquimalt .....	82·5	25	30·5	6	63·1	44·3	44·8	76	...	...	·60	8	5·2

a—and 11.

## REMARKS.

MALTA.—Mean temp. 64°·5, or 0°·5 above average. Mean hourly velocity of wind 11·0 miles, or 1·0 above average. Mean temp. of sea 67°·0. L on 9th. J. F. DOBSON.

*Mauritius*.—Mean temp. of air 0°·2 below, of dew point 1°·3 above, and rainfall 3·88 in. above, their respective averages. Mean hourly velocity of wind 12·9 miles, or 2·6 above average; extremes, 27·8 on 3rd and 0·0 on 1st; prevailing direction E.S.E. and E. by S. T on 23rd; L and T on 24th. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 82°·7, or 0°·2 above, of dew point 0°·2 above, and rainfall 6·31 in. below, the averages. TSS on 6 days. H. O. BARNARD.

*Adelaide*.—Mean temp. 3°·4 below the average, and the lowest on record for May. Rainfall ·97 in. above the average. C. TODD, F.R.S.

*Sydney*.—Temp. 2°·0 below, rainfall 5·36 in. above, and humidity 4·9 above, their respective averages. Weather still dry in the S.W. districts.—H. C. RUSSELL, F.R.S.

*Wellington*.—Fine weather up to the 8th, then wet to the 15th, and showery from the 21st to the end of the month; altogether a wet month. T on 3 days; H on 3 days; foggy on 4 days. Earthquakes on 3rd, 8th, and 16th. R. B. GORE.

*Auckland*.—A showery month, rain being registered on 18 days, but the total more than ·50 in. below the average of 31 years. Mean temp. almost exactly the same as the average. T. F. CHEESEMAN.

TRINIDAD.—Rainfall 2·16 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,  
OCTOBER, 1898.

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.
I.	Uxbridge, Harefield Pk..	2·86	XI.	Builth, Abergwesyn Vic.	8·77
II.	Dorking, Abinger Hall .	3·83	,,	Rhayader, Nantgwillt ...	8·55
,,	Birchington, Thor .....	1·74	,,	Lake Vyrnwy .....	5·79
,,	Hailsham .....	3·35	,,	Corwen, Rhug .....	5·24
,,	Ryde, Thornbrough .....	3·94	,,	Criccieth, Talarvor .....	5·77
,,	Emsworth, Redlands ...	3·75	,,	I. of Man, Douglas .....	4·58
,,	Alton, Ashdell .....	4·74	XII.	Stoneykirk, Ardwell Ho.	2·64
III.	Oxford, Magdalen Col..	4·33	,,	New Galloway, Glenlee	4·26
,,	Banbury, Bloxham .....	4·02	,,	Moniaive, Maxwelton Ho.	3·75
,,	Northampton, Sedgebrook	2·35	,,	Lilliesleaf, Riddell .....	4·09
,,	Stamford Duddington...	2·63	XIII.	N. Esk Res. [Penicuik]	5·15
,,	Alconbury .....	2·27	XIV.	Glasgow, Queen's Park..	3·97
,,	Wisbech, Bank House...	2·78	XV.	Inverary, Newtown .....	5·79
IV.	Southend .....	1·67	,,	Ballachulish, Ardsheal...	5·20
,,	Harlow, Sheering.....	4·32	,,	Islay, Gruinart School ...	2·44
,,	Colchester, Lexden .....	1·97	XVI.	Dollar.....	5·36
,,	Rendlesham Hall .....	1·39	,,	Balquhidder, Stronvar...	6·84
,,	Scole Rectory .....	1·81	,,	Coupar Angus Station...	5·21
,,	Swaffham .....	2·38	,,	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	...	XVII.	Keith H.R.S.....	3·38
,,	Bishop's Cannings .....	4·73	,,	Forres H.R.S. ...	2·21
,,	Blandford, Whatcombe .	4·07	XVIII.	Fearn, Lower Pitkerrie..	2·97
,,	Ashburton, Holne Vic ...	7·26	,,	N. Uist, Loch Maddy ...	...
,,	Okehampton, Oaklands.	8·17	,,	Invergarry .....	4·08
,,	Hartland Abbey .....	6·11	,,	Aviemore H.R.S. ....	1·81
,,	Lynton, Glenthorne ...	9·40	,,	Loch Ness, Drumnadrochit	2·68
,,	Probus, Lamellyn .....	7·82	XIX.	Invershin .....	5·47
,,	Wellington, The Avenue	4·77	,,	Durness .....	3·51
,,	North Cadbury Rectory	4·02	,,	Watten H.R.S.....	2·77
VI.	Clifton, Pembroke Road	5·85	XX.	Dunmanway, Coolkelure	10·28
,,	Ross, The Graig .....	4·46	,,	Cork, Wellesley Terrace	7·37
,,	Wem, Clive Vicarage ...	4·20	,,	Killarney, Woodlawn ..	7·24
,,	Wolverhampton, Tettenhall	2·58	,,	Caher, Duneske .....	3·64
,,	Cheadle, The Heath Ho.	2·76	,,	Ballingarry, Hazelfort...	2·41
,,	Coventry, Priory Row ..	2·88	,,	Limerick, Kilcornan ...	4·91
VII.	Grantham, Stainby .....	2·96	,,	Broadford, Hurdlestown	2·61
,,	Horncastle, Bucknall ...	2·26	,,	Miltown Malbay .....	4·85
,,	Worksop, Hodsock Priory	2·40	XXI.	Gorey, Courtown House	4·06
VIII.	Neston, Hinderton .....	3·32	,,	Athlone, Twyford .....	2·59
,,	Southport, Hesketh Park	3·46	,,	Mullingar, Belvedere ...	2·85
,,	Chatburn, Middlewood.	3·93	,,	Longford, Currygrane...	...
IX.	Melmerby, Baldersby ...	2·69	XXII.	Woodlawn .....	2·99
,,	Scarborough, Observat'y	3·87	,,	Crossmolina, Enniscoe ..	3·92
,,	Middleton, Mickleton ...	5·43	,,	Collooney, Markree Obs.	2·55
X.	Haltwhistle, Unthank...	6·72	,,	Ballinamore, Lawderdale	...
,,	Bamburgh .....	2·80	XXIII.	Warrenpoint.....	4·94
,,	Duddon Valley, Ulpha School	6·39	,,	Seaforde.....	4·18
,,	Keswick, The Bank .....	5·69	,,	Belfast, Springfield .....	3·91
XI.	Llanfrechfa Grange .....	7·51	,,	Bushmills, Dundarave..	2·10
,,	Llandovery .....	5·85	,,	Stewartstown .....	4·43
,,	Castle Malgwyn .....	6·55	,,	Killybegs .....	4·08
,,	Brecknock, The Barracks	4·66	,,	Horn Head .....	4·60

## OCTOBER, 1898.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		Days on which -01 or more fell.	Max.		Min.			
				Dpth	Date		Deg.	Date	Deg.	Date.		
											inches.	inches.
I.	London (Camden Square) ...	2·96	+ ·07	·84	29	13	71·1	3	40·2	2	0	0
II.	Tenterden .....	2·54	— 1·49	·84	29	17	66·0	3	39·0	11a	0	0
III.	Hartley Wintney .....	3·75	...	1·30	17	16	69·0	3	43·0	11	0	6
III.	Hitchin .....	2·46	— ·61	·53	29	18	68·0	3	33·0	8	0	...
IV.	Winslow (Addington) .....	3·17	+ ·08	·48	16	16	68·0	2, 3	33·0	1	0	3
IV.	Bury St. Edmunds (Westley) .....	1·83	— 1·44	·40	29	18	63·0	4	40·0	11	0	...
V.	Norwich (Brundall) .....	2·48	...	·44	11	15	68·0	2	37·0	2	0	3
V.	Winterbourne Steepleton ...	4·93	...	·99	18	22	67·0	3	31·4	13	1	6
"	Torquay (Cary Green) ...	5·88	...	1·31	16	18	68·9	21	42·2	2	0	0
"	Polapit Tamar [Launceston]..	8·37	+ 3·44	1·61	17	25	66·0	2	32·0	12	1	2
VI.	Stroud (Upfield) .....	4·50	+ 1·47	1·82	18	16	65·0	3, 21	36·0	31	0	...
"	Church Stretton (Woolstaston) ..	6·09	+ 2·32	1·36	17	24	66·0	2	41·0	13b	0	...
"	Worcester (Diglis Lock) .....	2·90	+ ·07	·72	18	22	...	...	...	...	...	...
VII.	Leicester (Rotherby Hall) ...	...	...	...	...	...	...	...	...	...	...	...
"	Boston .....	2·82	— ·29	·75	30	17	70·0	3	36·0	11	0	...
"	Hesley Hall [Tickhill] .....	2·45	— ·65	·49	16	19	68·0	3	32·0	14	1	...
VIII.	Manchester (Plymouth Grove) ..	3·62	+ ·25	·59	20	18	68·0	3	35·0	12	0	2
IX.	Wetherby (Ribston Hall) ..	5·08	+ 1·95	1·26	18	15	...	...	...	...	...	...
"	Skipton (Arnccliffe) .....	7·59	+ 1·56	1·41	30	17	...	...	...	...	...	...
"	Hull (Pearson Park) .....	3·19	— ·46	·85	18	19	66·0	2, 3	33·0	11	0	2
X.	Newcastle (Town Moor) .....	4·86	+ 1·74	1·58	17	16	...	...	...	...	...	...
"	Borrowdale (Seathwaite) .....	10·65	+ ·06	2·26	30	15	...	...	...	...	...	...
XI.	Cardiff (Ely) .....	6·50	+ 1·96	1·10	7	22	...	...	...	...	...	...
"	Haverfordwest .....	6·58	+ 1·43	1·48	28	23	67·6	2	34·3	12	0	3
"	Aberystwith (Gogerddan) ...	5·43	+ ·08	·78	18	19	69·0	3	...	...	...	...
"	Llandudno .....	4·28	+ ·89	·83	28	19	67·0	3	41·0	13	0	...
XII.	Cargen [Dumfries] .....	4·48	+ 1·22	·84	17	13	75·0	4	36·0	13	0	...
XIII.	Edinburgh (Blacket Place) ...	3·70	...	1·10	17	14	70·2	4	40·0	24	0	...
XIV.	Colmonell .....	2·34	...	·47	30	13	77·0	4	32·0	11	1	...
XV.	Tighnabruaich .....	5·26	...	1·04	25	18	62·0	5	35·0	17c	0	...
"	Mull (Quinish) .....	3·93	— 1·36	·75	31	16	...	...	...	...	...	...
XVI.	Loch Leven Sluices .....	5·70	+ 2·74	2·50	18	14	...	...	...	...	...	...
"	Dundee (Eastern Necropolis) ..	5·00	+ 2·76	2·50	17	21	70·1	2	36·7	12	0	...
XVII.	Braemar .....	6·43	+ 2·82	1·52	17	20	73·8	3	29·2	11	2	12
"	Aberdeen (Cranford) .....	3·67	...	·76	18	18	75·0	2, 4	32·0	31	1	...
"	Cawdor (Budgate) .....	2·04	— ·69	·92	30	19	...	...	...	...	...	...
XVIII.	Strathconan [Beauly] .....	3·75	— ·90	·70	31	10	...	...	...	...	...	...
"	Glencarron Lodge .....	7·41	...	1·17	17	18	74·5	5	32·6	29	0	...
XIX.	Dunrobin .....	...	...	...	...	...	...	...	...	...	...	...
"	S. Ronaldshay (Roeberry) ...	3·86	+ ·13	1·06	19	19	65·0	3, 4	38·0	18d	0	...
XX.	Darrynane Abbey .....	6·03	...	·89	13	25	...	...	...	...	...	...
"	Waterford (Brook Lodge) ...	6·06	+ 2·24	1·29	13	21	70·0	3	32·0	12	1	...
"	O'Briensbridge (Ross) .....	2·36	...	·55	8	18	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill) .....	3·36	+ ·07	·80	8	22	...	...	...	...	...	...
"	Dublin (Fitz William Square) ..	3·58	+ ·20	·81	17	19	64·8	3	40·0	12	0	0
XXII.	Ballinasloe .....	2·87	— ·12	·53	8	21	66·0	10	32·0	12	1	...
"	Clifden (Kylemore) .....	6·13	...	1·07	13	25	...	...	...	...	...	...
XXIII.	Waringstown .....	2·79	+ ·08	1·32	17	17	72·0	4, 5	35·0	10e	0	4
"	Londonderry (Creggan Res.) ..	3·42	— ·25	1·23	17	22	...	...	...	...	...	...
"	Omagh (Edenfel) .....	3·80	+ ·70	1·30	17	20	63·0	4	34·0	10f	0	4

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

a—and 13. b—and 14. c—and 18. d—and 19. e—and 11, 12, 13. f—and 11, 19, 27.

# METEOROLOGICAL NOTES ON OCTOBER, 1898.

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.

TENTERDEN.—Another warm month; mean max. temp.  $59^{\circ}\cdot6$ , or  $1^{\circ}\cdot4$  higher than in 1897 and 1893; mean min.  $48^{\circ}\cdot7$ , or  $3^{\circ}\cdot0$  above that of last year. There were 14 days with max. temp. above  $60^{\circ}$ , and like 1897 none under  $50^{\circ}$ . Duration of sunshine 102 hours 25 mins. The rainfall from 16th to 20th greatly helped the grass and filled up cisterns, but not the ponds or springs, and even the heavy rain of the 29th had no effect on a well, which having fallen 7 inches each month since July, is now down to the same level as before the March snow. Fog on 10th, 11th, 13th, 15th, and 21st. L and distant T on 29th.

HARTLEY WINTNEY.—The great drought which continued through August and September did not terminate until the 9th, after which R fell almost daily; the amount on 17th being the heaviest fall since July 29th, 1894. Total R  $\cdot32$  in. above the average. Cold E. winds prevailed at the beginning of the month, but the latter half was exceedingly mild. L on 11th, S.S.W. gale on 30th; fog on 10th and 21st; ozone on 10 days. Swallows left on 10th.

WINSLOW, ADDINGTON.—During the month much needed R fell, doing a great deal of good. The weather was mild throughout, and some days were warm and summerlike. The max. temp. rose to, or above,  $60^{\circ}$  on 14 days.

BURY ST. EDMUNDS, WESTLEY.—Mild and warm, with R in small quantities on 18 days. The want of water continued, many deep chalk wells being nearly dry. Distant T on 29th.

NORWICH, BRUNDALL.—Very mild, the mean temp. being about  $5^{\circ}$  above the average, while the max. reached, or exceeded,  $60^{\circ}$  on 17 days. Apparently the mildest October since 1876. Fog, T and L on 11th; L on 17th; sharp TS at 11.30 p.m. on 29th.

WINTERBOURNE STEEPLTON.—The main features of the month were, the break up of the long drought, and the high temperature. Nearly 5 inches of R fell, whereas the average of the previous 9 months is only about 1.75 in. The total for the year is still very deficient, being only 20.34 in., while for the previous 5 years the mean is 28.26 in. In consequence the springs are lower than they have been for many years. The mean temp. was  $53^{\circ}\cdot1$ , or  $5^{\circ}\cdot0$  above the average of five Octobers, while the mean min. is  $6^{\circ}\cdot0$  above average. Fog on 7th and 10th.

TORQUAY, CARY GREEN.—Rainfall for the month 1.73 in. above, and for the first 10 months of the year 7.14 in. below, the average. Mean temp.  $56^{\circ}\cdot7$ , or  $5^{\circ}\cdot5$  above the average. Duration of sunshine 89 hours 40 mins., or 24 hours 45 mins. below the average. Eight sunless days.

POLAPIT TAMAR.—Exceptionally wet throughout, and the heaviest total R for any month in 18 years. General absence of stormy or frosty weather. Fog on 5 days.

WOOLSTASTON.—Very wet, with no frost. Mean temp.  $51^{\circ}\cdot3$ .

MANCHESTER, PLYMOUTH GROVE.—For the first ten days fine autumn weather prevailed; dense fog occurred on 12th, and the last fortnight was unsettled and mostly wet and stormy. Mean temp.  $52^{\circ}\cdot8$ .

ARNCLIFFE VICARAGE.—Unusually mild, with no frost. Dahlias in bloom on 31st.

## WALES.

HAVERFORDWEST.—The fine weather of September continued to October 12th; on 13th a wet, stormy period set in, and continued to the end of the month. Very heavy R fell on 28th and 29th, 2·18 in. Great absence of sunshine from 13th to 31st. The month was generally mild, and there was abundance of grass.

ABERYSTWITH, GOGERDDAN.—The last fortnight was very wet, sunless and close.

## SCOTLAND.

CARGEN [DUMFRIES].—The month was remarkable for exceptionally high mean temp.,  $51^{\circ}4$ , which is  $2^{\circ}4$  higher than the average for May, and has only once been exceeded in October in 39 years. From the 1st to 16th R fell on only one day; while out of the remaining 15 days, 12 were wet. The duration of sunshine was slightly below the average. The absolute absence of frost during the autumn had an extraordinary effect on vegetation, blossom appearing on pear trees, rhododendrons, &c., while dahlias and begonias are still in full bloom. The R of the first 10 months of the year exceeds the average by 1·08 in.

EDINBURGH, BLACKET PLACE.—Very mild. The mean of the day temp. is  $2^{\circ}5$  above, and of the night temp.  $5^{\circ}1$  above, the average. The mean temp.,  $51^{\circ}0$ , is the highest in October since 1857, and has been surpassed in only 6 years since 1764. Sunshine below the average, and rainfall 54 per cent. above the average. Dense fog on 5th and 29th. The max. temp.,  $70^{\circ}2$ , on 4th, is the highest in October since 1845.

COLMONELL.—Rainfall 2·49 in. below the average of 22 years. Mean temp.  $52^{\circ}2$ , or  $6^{\circ}2$  above the average of 22 years, and the highest in that period.

TIGHNABRUACH.—The first half of the month was anticyclonic, the latter half cyclonic, with heavy rainfall. A severe N.E. gale did much damage in the middle of the month.

ABERDEEN, CRANFORD.—A severe gale from 15th to 20th caused many shipwrecks on the N.E. coast.

S. RONALDSHAY, ROEBERRY.—The first half of the month was very fine, the last half wet and stormy. Mean temp.  $49^{\circ}5$ , or  $3^{\circ}2$  above the average of 8 years.

## IRELAND.

DARRYNANE ABBEY.—A wet, but mild month; leaves still on the trees at the end.

WATERFORD, BROOK LODGE.—The wettest October since 1875. Weather very broken all through, and a good deal of fog in the early part. Mean temp.  $52^{\circ}9$ .

O'BRIENSBRIDGE, ROSS.—Very cold and stormy from the 13th to the end.

DUBLIN, FITZWILLIAM SQUARE.—Singularly mild. The first 12 days were generally fine and dry; but from the 13th R fell on 18 consecutive days. Mean temp.  $52^{\circ}8$ , or  $3^{\circ}1$  above the average. High winds on 10 days, reaching the force of a gale on 15th and 16th. Fog on 8 days. Lunar halo on 26th. L on 11th.

OMAGH, EDENFEL.—The remarkable mildness of the autumn was maintained, practically without interruption, throughout. Neither the max. temp., nor the mean ( $50^{\circ}0$ ) have been reached before in October, since records began in 1864. Mean temp.  $4^{\circ}1$  above the average. Dahlias and begonias were unscathed on November 6th, and although the autumn tints were magnificent, many trees were comparatively green at the close. Swallows did not leave until the 6th.

# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CCCXCV.]

DECEMBER, 1898. [PRICE FOURPENCE,  
or 5s. per ann. post free.

ADMIRAL FITZROY.

## THE GENESIS OF METEOROLOGY.

[THE following long and anonymous article, which appeared under the above headings in the *Dundee Advertiser* of October 31st, contains so many items of general interest that we have decided upon reprinting it, without, however, assuming responsibility for all the statements. Occasionally the writer has been misled, and where we have noticed this we have put a correction as a foot note. But we do not presume to imply that we have verified every statement, quite the contrary, and in the interest of truth we hope that any of our readers who notice other errors will mention them.--ED.

The science of modern meteorology may be said to have been founded by Admiral Robert FitzRoy<sup>(1)</sup>. He was the son of General Lord Charles FitzRoy, second son of the third Duke of Grafton, and was born in June 1805. He entered the Navy in 1819, and became Lieutenant on board the "Adventure" in 1824. Through the death of Commander Stokes in 1828 he was promoted to the command of the "Beagle," and during the three succeeding years he completed the survey of the coasts of Patagonia and Terra del Fuego. He also commanded the "Beagle" during her famous voyage round the world in 1831-36, with Charles Darwin as naturalist; and it was during this voyage that Darwin conceived his idea of the origin of species. On FitzRoy's return he, in conjunction with Captain King, published in 1839 his *Narrative of the Surveying Voyages of the "Adventure" and the "Beagle,"* in which he displayed considerable ability as an observer of Nature, though Darwin's *Journal of a Voyage round the World* necessarily became the classic record of this wonderful expedition. In 1841 FitzRoy was elected M.P. for Durham, and held that seat till 1843, when he was appointed Governor of New Zealand. For two years he kept this important

(1) Too sweeping an assertion.

position, but his endeavours to conserve the rights of the Maoris against the European settlers made him very unpopular, and in 1845 he resigned the Governorship and returned to England, having been practically recalled by the Government out of deference to the clamour of the Colonists. In 1846 he published his *Remarks on New Zealand*, in which he indicated the best policy for developing that important Colony. He resigned active service in 1850, and shortly afterwards was advanced to the rank of Vice-Admiral. His principal work was accomplished after 1854. In that year he was appointed meteorological statist to the Board of Trade, and in that office he carried out systematical investigations in meteorology, and devised the system of storm-signals which is still worked with great advantage to navigators. At first his storm-code was ridiculed as the revival of an effete fad among weather-prophets, but it was soon found that prophecy as to weather which was founded on accurate data such as his meteorological reports afforded was not to be despised. The system was speedily adopted, not only in this country but also on the Continent. The FitzRoy barometer, by which approaching storms may be foretold, is regarded as one of the triumphs of the nineteenth century<sup>(2)</sup>. Admiral FitzRoy prosecuted his barometric studies with great energy. In 1863 he published his *Weather Book*, a work which contained the results of observation spread over many years. The labour entailed in the production of this work was so great that his mind gave way, and on 30th April, 1865, he committed suicide during a fit of mental depression<sup>(3)</sup>. The storm-glass, or FitzRoy barometer, devised by him, will always be associated with his name. But though it was unquestionably invented by him without the least suspicion that it had been anticipated, it is not the less a fact that a similar weather-glass with camphor was constructed in London a century before FitzRoy's was designed<sup>(4)</sup>. In 1649 Périer, the brother-in-law of Blaise Pascal (1623-1662), while engaged making experiments with Pascal to determine the weight of the atmosphere, enunciated the theory of "meteorological correspondences" by which storms could be foretold, which was identical with that of FitzRoy.

*Ancient Weather Prophets.*—Observations for the purpose of forecasting the weather are probably as old as the history of man, and traditional maxims on this subject exist in all savage nations. The

<sup>2</sup> No. The barometers called "FitzRoy barometers" were, we think, only brought out after his death; certainly he would have been horrified at the tiny tubes with which some of them are furnished.

<sup>3</sup> No. It was not the compilation of the *Weather Book*, but general worry, and the absence of fresh air and exercise which produced the catastrophe.

<sup>4</sup> The "storm-glass" and the "FitzRoy barometer" are two totally different things, and FitzRoy devised neither. He knew of the "storm-glass" and bestowed on it far too much time, but he never claimed to have devised it; on the contrary, he says in the *Weather Book*, "Considerably more than a century ago, what were called 'storm-glasses' were made in this country. Who was the inventor is now very uncertain; but they were sold on Old London Bridge at the sign of the *Looking Glass*."

Egyptians and the Hindus were acquainted with the periodicity of wind-storms at a very remote time, and allusions to what we now call the "trade-winds" are to be found in ancient Sanscrit writings and in Egyptian hieroglyphs. From Egypt the knowledge of meteorology was carried to Greece, and Democritus (460 B.C.—360 B.C.) was well acquainted with the theory of the winds held by the Eastern nations. Archimedes (287 B.C.—212 B.C.) was renowned as a weather-prophet able to foretell storms by the appearance of the sun, and by studying the phases of the moon. The study of atmospheric currents was so general at the beginning of the Christian era that Pliny (23 A.D.—79 A.D.) refers to the works of more than twenty authors devoted to this subject. The surest proof, however, of the skill of early agriculturists in forecasting the weather is afforded by Virgil (70 B.C.—19 B.C.). His *Georgics* is full of weather-wisdom, strikingly similar to that of the time before FitzRoy had made meteorology a definite science, and had systematised observations over a wide area. The following passage is only one of many in the *Georgics* bearing on this subject :—

If to the swift-speeding Sun, and moons  
That follow in their cycle, thou shalt look,  
Ne'er thee to-morrow's hour shall lead astray,  
Nor by the crafts of cloudless night shalt thou  
Be tricked. What time the Moon first gathers in  
Returning fires, if she shall have embraced  
The sable ether with a darkling horn,  
Immense for tillers, and the deep, will rain  
Be brewing. But if she a maiden red  
Have o'er her visage poured, there will be wind.  
But if at her fourth rise—for that will prove  
The most unerring counsellor—undimmed,  
Nor with blunt horns, through heaven shall she career,  
Both all that day, and those which shall arise  
Therefrom to the completion of the month  
From rain and tempests will be free.

The last portion of the quotation is very remarkable. It is a distinct anticipation of the famous meteorological law discovered and announced by Marshal Bugeaud (1784—1849) in November 1841, and afterwards confirmed by M. de Conninx, to the effect that if the moon be clear and with upturned horns on the fourth day, the rest of the month will be free from wind and rain<sup>(5)</sup>. According to Dr. J. W. Draper (1811—1882), author of that remarkable work, *The Intellectual Development of Europe*, the Arabs in the eleventh century were deep students of atmospheric phenomena. Alhazen (died 1038) knew that the pressure of the atmosphere lessened according to the height of the observer above the sea level; and estimated the difference of weight of a body in a condensed and in a rarefied atmosphere. He understood the Greek theory as to wind-currents, and dimly outlined the modern method of weather-forecasting by comparing the incidence of storms in different areas. The foretelling of stormy weather in

<sup>5</sup> But had not Virgil adopted the idea from Aratus?—See *Met. Mag.*, vol. ii. (1867), p. 92.

connection with meteoric showers was described by Virgil, and indicated by Milton in *Paradise Lost*, centuries before it was scientifically explained by M. Coulvier-Gravier<sup>(6)</sup>. From the Middle Ages the 10th of August has been regarded with special attention, as it has been noticed that meteor-showers on that day prelude a period of stormy weather. In the same way brilliant aurora-borealis displays frequently foretell storms, possibly because they show electrical disturbances in the atmosphere, which always accompany severe tornadoes. Sir Humphrey Davy's theory that the aurora is simply a manifestation of free electricity in a rarefied atmosphere is sufficient to explain the storms which usually follow exceptional displays of "the borealis race."<sup>(7)</sup> It will be seen from this outline of weather-wisdom that the prophet who forecasts storm or sunshine is not a modern innovation, though he has reduced his methods to a scientific basis.

## THE BRITISH ASSOCIATION AT BRISTOL, 1898.

(Concluded from p. 151.)

*The Classification of Polydiurnal Weather Types in relation to the Prolongation of the Daily Forecast in Western Europe.*

By DOUGLAS ARCHIBALD, M.A., F.R. Met. Soc.

The results of modern meteorological investigation, whether official or amateur, statistical or synoptic, have shown the existence of specific types of weather embracing wide areas and intervals of time varying from several days to months, and seasons which tend to produce persistence or recurrence of the more ephemeral changes connected with the passage of the smaller, temporary, and movable cyclonic and anticyclonic systems.

These large weather types may be roughly classified as:—  
(1) Seasonal or  $x$  monthly, and (2)  $y$  daily.

The former appear, both in their normal and abnormal forms, most clearly in tropical countries, such as India, where the  $y$  daily changes are small and where the Summer season is always characterised by the formation of a permanent cyclonic area over Persia and North-West India, with subsidiary low pressure troughs over the Ganges basin, round which the so-called S.W. monsoon circulates with a complete reversal of pressure conditions at the opposite season.

These conditions in their normal form are evidently the result of seasonal actions due to the direct influence of the sun on the Asiatic continent and Indian Ocean, and stated thus, may be predicted to recur and form a large proportion of the seasonal forecast every year.

When, however, we descend from the general to the particular we find each year's S.W. and N.E. monsoon differ from that of every other year.

<sup>6</sup> But does anybody now believe in it?

<sup>7</sup> But where is proof to be found that they "usually follow"?

Superposed on the regular normal  $x$  monthly type is what may be termed the yearly seasonal abnormal type, or  $z$  annual variation of the  $x$  monthly type, corresponding to which both the intensity and shape of the seasonal cyclone and anticyclone and the accompanying weather vary. Such type, however, once initiated at the critical commencing month of the season, is found to persist more or less all through. This is the practical basis of the seasonal or  $x$  monthly weather forecast of the Indian Service, so ably worked by Mr. Eliot, F.R.S., at Simla.

In Europe the seasonal type, though still manifest, is not large enough in comparison with the  $y$  daily changes to enter in at present as a specific factor in the forecast.

On the other hand, the restriction of the forecast to 24 or 36 hours is unnecessarily arbitrary in view of the study of  $y$  daily types foreshadowed by the late Honourable Ralph Abercromby and laboriously carried out by Professor Köppen and Professor J. Van Bebber in their recent discussion of "Die isobaren Typen des nordatlantischen Ozeans und West-Europas." [Hamburg, 1895.]

Abercromby, in his "Principles of Forecasting by means of Weather Charts," published by the Meteorological Council, classifies weather types under four heads—northerly, southerly, easterly, and westerly.

Professors Köppen and Van Bebber recognise twenty specific types of  $y$  daily weather.

A comparison of these with Abercromby's shows them to be all included in one or other of his four primary headings, of which they form specific sub-types.

The investigation further shows that :

- (1) They admit of being more scientifically classified under the heads O oceanic, K continental, L littoral, P peripheral, N northerly, and S southerly. Sub-variations are denoted by suffixes, thus :  $O_s$ ,  $O_k$ ,  $O_l$ ,  $O_n$ , &c.
- (2) Certain groups occur preferably at each season, *i.e.*, the seasonal type or tendency partly controls the formation of the  $y$  daily types.
- (3) The intensity and paths of travelling high and low pressure systems vary with each type and season.
- (4) Their effect in raising or lowering temperature and otherwise materially altering the weather is specifically shown by comparisons at such places as Hamburg and Munich.
- (5) Their average duration is found to be about four days, and this figure is remarkably constant on the average for all the twenty species.
- (6) There appears to be a fairly definite tendency on the part of certain types to succeed other types or to recur, such recurrence in some cases approximating to the seasonal permanence exhibited in the tropics.

In fine, a science of weather types is growing up by which even now the weather may, with due regard to a sudden change of type, be provisionally forecasted in general terms, and particularly for agricultural purposes, for *half a week or more*.

The present daily forecast in England is admirable for the purpose for which it was primarily instituted, viz., storm warning.

For agricultural purposes it is too short, while its assumption of precision in the matter of rainfall for each sub-division is not always warranted by the results. The author, therefore, suggests that in view of the hopefulness of the field unlocked by Professors Köppen and Van Bebber, steps be taken to compare the past weather maps of the British office with the types they have determined, and that a supplemental forecast be presently attached to the daily forecast, giving a more general forecast of conditions likely to continue for three or four days, based on the ascertained presence of a certain type over Western Europe and as far over the Atlantic as can be determined through the aid of arriving ship's logs.

It would further be of primary importance in carrying out such extension of the forecast on the basis of the study of the position and movement of the barometric action-centres, to be able to have telegraphic communication with places situated near the normal position of the centres of such action-centres. Iceland, the Azores, West Russia, and Eastern Germany and Austria would appear to be the most important for such purposes.

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*The Great Assam Earthquake of June 12th, 1897, by R. D. OLDHAM.*

The author said that this earthquake was the largest and, with a few possible exceptions, the most violent of which there was any record. The area over which the shock was sensible was not less than 1,750,000 square miles, while the focus occupied an area of 200 miles in length and 50 miles in width. If it had happened in England not a house would have been left standing between Manchester and London. Landslips on an unprecedented scale were produced in the Garo and Khasia hills and in the Himalayas north of Lower Assam. A number of lakes had been produced by changes of level due to the earth movements by which the earthquake was caused, and the mountain peaks had been moved both vertically and horizontally. Monuments of solid stone, and forest trees had been broken across by the violence of the shaking they had received. Communications of all kinds were interrupted; bridges were overthrown, displaced, and in some cases thrust bodily upwards to a height of as much as 20 ft., while the rails on the railways were twisted and bent. Earth fissures were formed over an area larger than the United Kingdom, and sand rents, from which sand and water were forced in streams to a height of 3 ft. to 5 ft. above the ground, were opened in incalculable numbers. The loss of life was

comparatively small, owing to the time of day at which the earthquake occurred—5 o'clock in the afternoon—and the damage done was reduced by the fact that there were no large cities within the area of *maximum* violence ; but in extent and capacity of destruction, as distinguished from destruction actually accomplished, this earthquake surpassed any of which there was historical record, not even excepting the great earthquake of Lisbon of 1755. At the conclusion of the paper, which was copiously illustrated, he mentioned that the Government of Assam, the whole of whose offices were destroyed, were able to announce within five days that everything was in full swing again ; and as to the railways, on which (for a length reaching as far as from Bristol to London and on to Dover) traffic was at first entirely suspended, in three weeks trains were running to their original timing.

## REVIEW.

*Congrès National d'Hygiène et de Climatologie médicale de la Belgique et du Congo. Seconde Partie. Congo (climat, constitution du sol et hygiène de l'état indépendant).* Hayez, Bruxelles. 1898. Roy. 8vo. 646 pages, map, diagrams, and plates.

WE do not remember having seen Part I., but the above, Part II., is very welcome.

To those who recollect the maps of Africa issued even within the last fifty years, this bulky volume is very startling. Here is a nearly complete record of meteorological observations at sixty-five stations with names unknown, to  $\frac{99}{100}$ ths of the population of the world, and for the very area marked upon the maps of our youth as "Unexplored," we now have a map with all the rivers, villages, and towns duly named, and in the text, details of the climate, geology, food supplies, drainage, population, occupations, &c.

It is impossible to review such a book, it must have taken months to compile ; how can a reviewer verify all the facts in a few days ?

All that we can do is to indicate roughly the contents, and to record our opinion that *quâ* the portion of Africa between 4° N. and 12° S., and from the Atlantic to 30° E., it is indispensable to all who want to understand the country, whether from a physical or a commercial standpoint.

The book is based upon the replies to a series of questions sent by a committee of the *Soc. Roy. de Médecine publique de Belgique* to the principal Europeans residing in (or near) the Congo State. First come essays, meteorology by MM. Lancaster and Meuleman ; geology by M. Cornet ; diseases and statistics ; and hygiene by MM. Bourguignon, Dreypondt, and Firket ; and after these come reports upon the individual stations arranged alphabetically.

The importance of the article upon climate will be realised when it is remembered by whom it was written, and that it occupies nearly 150 pages besides numerous diagrams. All interested in Tropical climate must read it.

# PUBLICATIONS OF THE ROYAL ALFRED OBSERVATORY, MAURITIUS.

IN accordance with the notice on p. 89 of the present volume, applications were received from the following institutions and persons, and their requests have been complied with as far as possible. Nearly a hundred-weight has been sent off to the undernoted, in the order of their application:—

New Hampshire State Library, Concord, U.S.A.

Roy. Meteor. Soc., London.

J. Baxendell, Esq., F.R.A.S., Observatory, Southport.

Kew Committee, Kew Observatory, Richmond, Surrey.

A. L. Rotch, Esq., Blue Hill Observatory, Mass., U.S.A.

Prof. Stupart, Meteorological Office, Toronto.

C. Stewart, Esq., Meteorological Commission, Cape Town.

A. J. Hale, Esq., Barrington Road, Crouch End, N.

Librarian, Johns Hopkins University, Baltimore, U.S.A.

Dr. L. Swift, Lowe Observatory, Echo Mountain, California.

Prof. Dr. Hellmann, Margarethenstrasse, Berlin.

Kansas University, Kansas, U.S.A.

Librarian, Linen Hall Library, Donegal Square, Belfast.

Hofrath Dr. J. Hann, Graz, Austria.

I. F. H. Carr Gregg, Esq., Birchwood, Burgess Hill, Sussex.

E. W. Ellerbeck, Esq., F.R.A.S., Observatory, Scarborough.

F. Campbell Bayard, Esq., LL.M., Pres. R. Met. Soc., Wallington.

There are still many copies for some years, and one or more for each year mentioned below. As will be seen, no consecutive sets can be supplied, but anyone interested in the subject has only to write for whatever he or she wishes, and to pay carriage if the latter exceeds a few pence.

## REPORTS.

1878, 1879, 1881, 1882, 1883, 1884, 1885, 1887, 1888, 1889, 1890, 1891, 1894.

## RESULTS.

1872, 1877, 1878, 1879, 1880, 1881, 1882, 1884, 1885, 1889, 1890, 1891, 1892, 1893, 1894, 1895.

I cannot undertake to store these reports indefinitely; nearly six months' notice has been given, and I shall part with all not applied for early next year.

*Copies of the Report for 1877 and of the Results for 1861, 1863, 1864 and 1865 are much needed.*

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## THE METEOROLOGICAL SOCIETY OF THE MAURITIUS.

Nothing has yet been settled respecting the back issues of this Society, which are much wanted in Europe. I am quite ready to assist, but it rests with the authorities in Mauritius.

62, Camden Square, N.W.

G. J. SYMONS.

## THE DROUGHT AND THE COLOURS OF FLOWERS.

THE REV. W. WILKS made the following observations on the colouration of flowers of the present season. Similar changes were recorded in *Nature* last year by Mr. Hughes-Gibbs of Tarrant Gunville, Dorset:—"All through the exceptionally hot weather of the end of July and August, all scarlet flowers had a tinge of dull brown in them, pink had a shade of orange, yellow was very yellow, white was creamy. This was very marked—*e.g.*, in Dahlias. Thus, Fire King and Sunset, ordinarily two bright clear scarlet flowers, had a distinct dull brown tint overlying and spoiling utterly the usual scarlet, so much so, that having been away from home the first three weeks of the heat, I thought on my return that the Dahlias must have somehow got wrongly named. But now that the weather is cooler, the bright scarlet has come back, and the dull brown tint has gone, and all is as usual. The only shades of colour the heat seemed (to me) to suit, were the salmons, and they have been very fine and intense, having a sort of glow added to them."

*Journal of Horticulture.*

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## ROYAL METEOROLOGICAL SOCIETY.

THE opening Meeting of the Session was held on Wednesday evening, November 16th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. F. C. Bayard, LL.M., President, in the chair.

A Report on experiments upon the exposure of anemometers at different elevations, was presented by the Wind Force Committee. The experiments have been carried out by Mr. W. H. Dines and Capt. Wilson-Barker, on board H.M.S. "Worcester," off Greenhithe. Five pressure-tube anemometers were employed, the first being at the mizzen royal masthead; the second and third at the ends of the mizzen topsail yardarm; and the fourth and fifth on iron standards 15 feet above the bulwarks. The results show that the ship itself affected the indications of the lower anemometers, while some low hills and trees, which are a quarter of a mile away from the ship, to the south and south-west, also affected the wind velocity from those quarters. The Committee are of opinion that the general facts deducible from these observations bearing on the situation of instruments for testing wind force are: (1.) That anemometers must have a fairly clear exposure, and for a mile at least all round, there should be no hills, or anything higher than the position of the instruments. (2.) That on a ship the instrument should be 50 feet above the hull, but on land it will generally be necessary to carry the instrument somewhat higher, to be determined entirely by the local conditions. (3.) That no other form of anemometer offers such advantages as the pressure-tube, from the fact that it can be run up and secured easily

at this height above a building, and that the pipes and stays can be so slight as to offer no resistance to the wind, or cause any deflecting currents.

Capt. D. Wilson-Barker read a Paper giving the results of some observations which he had made on board ship with several patterns of hand anemometer with the view of comparing the estimated wind force with that indicated by the different instruments.

Mr. W. Marriott exhibited some lantern slides, showing the damage caused by the tornado which burst over Camberwell about 9.30 p.m. on October 29th. The damage was confined to an area of about half a square mile, and within that space, chimney-stacks were blown down, houses unroofed, trees uprooted, and windows broken.

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### BRITISH RAINFALL.

GREATLY to my regret, I have recently found that three observers have continued to use gauges, rusty, worn out, and quite unworthy of them.

I do not think that any reader of this Magazine would allow his instruments to become dilapidated, but one cannot tell, and there can be no harm in mentioning the fact, and in pointing out that every observer who neglects his instruments, or is careless in reading and entering the results, is not merely useless, but depreciates the value of the whole organisation.

A new and verified gauge can now be delivered to anyone in the British Isles for 16s. 6d., therefore there can be few cases where the cost of a new gauge can compel the use of a dilapidated one. I earnestly call attention to the matter before the arrival of the new year, and also to Rules I. to IV., and XVI.

G. J. S.

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### RAINFALL IN NICARAGUA.

THE total rainfall at Rivas, near the Pacific coast of Nicaragua, was 123·43 in. in 1897. Rivas is about four miles to the west of Lake Nicaragua, and nearly on the line of the proposed Nicaragua Canal. Previous records ranged from 30 in. to 90 in. for the year. On the Atlantic side of Nicaragua, at Greytown, the total rainfall in 1890 was 320·48 in. with 274·85 in. in the Deseado Valley, twelve miles inland.

[Schott gives the mean fall at Aspinwall (Lat. 9° 23' N., Lon. 79° 53' W.) for 6 years as 121·60 in.—ED.]

# RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858-97.

## NOVEMBER.

ELEMENTS.	MONTHLY MEANS OR TOTALS.						ABSOLUTE READINGS.								
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	MEANS 9 A.M. AND 9 P.M.			EXTREMES AT 9 A.M. AND 9 P.M.			Mean of all Highest	Mean of all Lowest.				
				Mean.	Highest Month.		Lowest Month.		Highest.			Lowest.			
					Value.	Date.	Value.	Date.					Value.	Date.	
Barometer ..... (cor. & red.)	1 29.926	2 30.307 1867	3 29.678 72, '77	4 9 a.m. 9 p.m.	5 29.931 29.927	6 30.313 30.301	7 1867 1867	8 29.700 29.653	9 1872 1877	10 30.741 30.711	11 21st, 1897 21st, 1897	12 28.533 28.760	13 11th, 1891 18th, 1880	14 30.484 30.485	15 29.156 29.202
(Dry Bulb.....)	42.8	48.9 1881	36.9 1871	9 a.m. 9 p.m.	42.7 42.9	49.1 48.8	1881 1881	36.9 36.8	1871 1871	61.2 59.7	1st, 1867 7th, 1895	23.8 22.0	23rd, 1858 28th, 1890	54.8 54.3	31.2 32.3
Max. ....	48.7	..	..	..	...	54.2	1881	43.6	1871	63.9	1st, 1894	28.6	28th, 1890	58.4	38.1
Min. ....	37.7	..	..	..	...	43.3	'81, '88	32.8	1871	54.7	2nd, 1894	20.1	24th, 1858	49.6	27.2
(Wet Bulb.....)	41.4	47.2 1881	35.4 1871	9 a.m. 9 p.m.	41.3 41.4	47.2 47.1	1881 1881	35.4 35.4	1871 1871	60.2 57.5	1st, 1867 15th, 1895	23.7 20.9	23rd, 1858 28th, 1890	53.0 52.4	30.3 31.2
Solar Rad., black .....	63.6	..	..	..	...	70.5	1877	57.7	1885	98.1	1st, 1894	31.4	16th, 1887	88.0	41.9
Solar Rad., bright..	52.0	..	..	..	...	57.5	1881	47.1	1878	73.8	1st, 1894	29.1	28th, 1890	64.4	39.1
Grass Minimum .....	33.7	..	..	..	...	39.1	1888	29.2	1896	52.7	7th, 1877	15.9	19th, 1861	46.9	22.8
Soil, 1 foot .....	44.4	..	..	..	...	46.8	1881	41.2	1896	52.6	1st, 1886	36.6	30th, 1879	48.7	39.8
Cloud .....	6.6	7.8 '92, '97	5.4 1865	9 a.m. 9 p.m.	6.7 6.4	8.7 7.7	'92, '97 1875	4.9 5.2	1859 1877	10 10	Every year Every year	0 0	Various Various	10.0 10.0	0.5 0.1
Rainfall .....	2.30	4.65 1861	.53 1858	9 a.m. 9 p.m.	1.19 1.11	2.45 2.91	1888 1861	.21 .33	1871 1862	.80 .98	29th, 1874 13th, 1861	.00 .00	Every year Every year	.39 .36	.00 .00

Max. Rainfall in 24 hours, 1.42 in., 13th, 1861.

Mean max. daily fall, .58 in.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1898.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
England, London .....	77·4	18	40·1	1	68·2	50·4	48·7	71	124·8	38·6	1·11	15	6·5
Malta.....	96·3	28	56·5	2	83·4	65·6	61·8	68	153·6	48·6	·00	0	1·3
<i>Cape of Good Hope</i> ...	79·2	24	34·1	18	63·9	46·6	46·6	88	...	...	3·33	9	4·3
<i>Mauritius</i> .....	76·6	8	57·3	2	74·9	63·6	59·8	74	120·9	47·9	1·11	11	4·5
Calcutta.....	97·3	22	71·7	1	90·9	78·3	77·3	81	160·8	69·5	9·15	13	7·6
Bombay.....	92·8	3	75·2	27	87·5	79·8	77·3	82	143·3	72·2	27·21	26	7·2
Ceylon, Colombo .....	91·0	1	74·0	15 <i>b</i>	87·1	77·9	74·2	81	148·0	72·0	10·94	23	6·7
<i>Melbourne</i> .....	67·3	1	32·3	21	56·8	44·0	43·5	79	119·4	27·8	1·57	12	6·0
<i>Adelaide</i> .....	73·4	1	36·1	21	60·2	47·1	45·5	77	128·1	30·6	3·56	15	6·0
<i>Sydney</i> .....	65·8	11	41·5	28	60·2	49·1	48·0	87	110·0	32·0	6·42	16	5·1
<i>Wellington</i> .....	61·5	30	35·0	11	55·6	44·6	42·9	77	98·0	23·0	3·27	11	4·7
<i>Auckland</i> .....	68·0	23	41·5	2	59·6	47·3	44·3	71	112·0	37·0	3·98	12	4·7
Jamaica, Kingston.....	96·6	15 <i>a</i>	70·0	3	87·8	73·1	70·3	71	...	...	3·39	5	...
Trinidad .....	92·0	3	69·0	<i>c</i>	88·8	70·8	71·7	78	164·0	61·0	6·46	20	...
Grenada.....	85·4	13	70·0	19	83·2	74·4	73·0	77	144·6	...	10·09	24	3·8
Toronto .....	90·0	30	45·6	23	74·6	55·9	56·9	73	109·0	...	1·95	8	5·0
New Brunswick, Fredericton .....	81·7	26	37·0	16	70·0	49·3	49·3	68	...	...	4·81	15	6·0
Manitoba, Winnipeg British Columbia, Esquimalt.....	83·4	19	32·2	2	71·7	49·0	...	...	...	...	6·10	15	6·6
	81·3	5	42·6	4	65·9	49·1	50·5	82	...	...	1·82	12	5·9

a—and 26. b—and 16. c—several days.

## REMARKS.

CAMDEN SQUARE.—In the table for April the entries should be: dew point 39°·8; humidity 74; cloud 4·7.

MALTA.—Mean temp. 73°·4, or 1°·8 above average. Mean hourly velocity of wind 8·6 miles, or 0·1 below the average. Mean temp. of sea 70°·0. Slight earthquake about 11·5 p.m. on 2nd. J. F. DOBSON.

MAURITIUS.—Mean temp. of air 1°·0, of dew point 0°·8, and rainfall ·87 in. below, their respective averages. Mean hourly velocity of wind 11·2 miles, or 0·2 below the average; extremes, 30·8 on 7th and 2·4 on 2nd; prevailing direction E.S.E. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 81°·7, or 0°·7 above, of dew point 0°·1 above, and rainfall 2·69 in. above, their respective averages. Mean hourly velocity of wind 10·1 miles; prevailing direction S.W. TSS on 11 days. H. O. BARNARD.

ADELAIDE.—A very seasonable month. Mean temp. 0°·1 below, and Rainfall ·79 in. above the mean for 41 years. C. TODD, F.R.S.

SYDNEY.—Temp. 0°·2 above, humidity 8·5 above, and rainfall ·73 in. above, their respective averages. H. C. RUSSELL, F.R.S.

WELLINGTON.—Fine weather up to the middle of the month, with occasional showers; strong N.W. winds from 15th to 19th, reaching a gale at times; the remainder showery. H on 30th; frequent fogs; slight earthquake on 27th. Mean temp. 1°·1 above, and rainfall 1·82 below, their respective averages. R. B. GORE.

AUCKLAND.—From 1st to 22nd remarkably fine and dry. Violent N.E. gale on 23rd, with 1·89 in. of R. Then squally and stormy, with frequent heavy showers to the end. T. F. CHEESEMAN.

TRINIDAD.—Rainfall 1·58 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,  
 NOVEMBER, 1898.

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.
I.	Uxbridge, Harefield Pk..	2.12	XI.	Builth, Abergwesyn Vic.	6.00
II.	Dorking, Abinger Hall ..	4.76	„	Rhayader, Nantgwilt ...	5.22
„	Birchington, Thor .....	2.54	„	Lake Vyrnwy .....	5.02
„	Hailsham .....	3.54	„	Corwen, Rhug .....	2.54
„	Ryde, Thornbrough .....	5.30	„	Criccieth, Talarvor .....	3.40
„	Emsworth, Redlands ...	4.59	„	I. of Man, Douglas .....	4.55
„	Alton, Ashdell .....	4.85	XII.	Stoneykirk, Ardwell Ho.	3.27
III.	Oxford, Magdalen Col..	1.94	„	New Galloway, Glenlee	6.96
„	Banbury, Bloxham .....	2.84	„	Moniaive, Maxwellton Ho.	5.02
„	Northampton, Sedgebrook	1.91	„	Lilliesleaf, Riddell .....	3.19
„	Stamford, Duddington..	1.83	XIII.	N. Esk Res. [Penicuick]	7.50
„	Alconbury .....	1.15	XIV.	Glasgow, Queen's Park..	4.67
„	Wisbech, Bank House...	1.63	XV.	Inverary, Newtown .....	8.69
IV.	Southend .....	2.19	„	Ballachulish, Ardsheal...	7.45
„	Harlow, Sheering.....	...	„	Islay, Gruinart School ...	2.09
„	Colchester, Lexden .....	2.16	XVI.	Dollar .....	5.74
„	Rendlesham Hall .....	2.66	„	Balquhider, Stronvar...	10.62
„	Scole Rectory .....	2.41	„	Coupar Angus Station...	4.98
„	Swaffham .....	2.19	„	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	3.70	XVII.	Keith H.R.S.....	3.97
„	Bishop's Cannings .....	3.55	„	Forres H.R.S. ....	1.98
„	Blandford, Whatcombe ..	4.33	XVIII.	Fearn, Lower Pitkerrie..	1.77
„	Ashburton, Holne Vic...	4.27	„	N. Uist, Loch Maddy ...	...
„	Okehampton, Oaklands.	3.53	„	Invergarry .....	7.64
„	Hartland Abbey .....	2.89	„	Aviemore H.R.S. ....	2.26
„	Lynton, Glenthorne ...	6.57	„	Loch Ness, Drumnadrochit	4.00
„	Probus, Lamellyn .....	4.10	XIX.	Invershin .....	5.10
„	Wellington, The Avenue	4.73	„	Durness .....	8.19
„	North Cadbury Rectory	3.34	„	Watten H.R.S.....	4.43
VI.	Clifton, Pembroke Road	3.16	XX.	Dunmanway, Coolkelure	6.38
„	Ross, The Graig .....	1.99	„	Cork, Wellesley Terrace	2.96
„	Wem, Clive Vicarage ...	1.96	„	Killarney, Woodlawn ..	5.83
„	Wolverhampton, Tettenhall	1.68	„	Caher, Duneske .....	4.22
„	Cheadle, The Heath Ho.	2.57	„	Ballingarry, Hazelfort...	5.49
„	Coventry, Priory Row ..	2.18	„	Limerick, Kilcornan ...	4.13
VII.	Grantham, Stainby .....	2.38	„	Broadford, Hurdlestown	4.76
„	Horncastle, Bucknall ...	1.86	„	Milton Malbay .....	5.28
„	Worksop, Hodsck Priory	2.48	XXI.	Gorey, Courtown House	3.79
VIII.	Neston, Hinderton .....	1.33	„	Athlone, Twyford .....	3.83
„	Southport, Hesketh Park	3.02	„	Mullingar, Belvedere ...	5.22
„	Chatburn, Middlewood.	4.30	„	Longford, Currygrane...	...
IX.	Melmerby, Baldersby ...	3.11	XXII.	Woodlawn .....	3.90
„	Scarborough, Observat'y	...	„	Crossmolina, Ennisiscoe ..	8.12
„	Middleton, Mickleton ...	1.87	„	Collooney, Markree Obs.	3.59
X.	Haltwhistle, Unthank...	3.40	„	Ballinamore, Lawderdale	...
„	Bamburgh .....	3.25	XXIII.	Warrenpoint.....	3.04
„	Duddon Valley, Ulpha School	7.31	„	Seaforde.....	3.15
„	Keswick, The Bank .....	7.84	„	Belfast, Springfield .....	3.64
XI.	Llanfrehfa Grange .....	5.15	„	Bushmills, Dundarave..	3.34
„	Llandovery .....	4.28	„	Stewartstown .....	3.62
„	Castle Malgwyn .....	4.77	„	Killybegs .....	8.93
„	Brecknock, The Barracks	2.72	„	Horn Head .....	5.68

## NOVEMBER, 1898.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which -01 or more fell.	TEMPERATURE.						No. of Nights below 32°.	
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours		Max.		Min.		In shade.	On grass.				
				Dpth	Date							Deg.	Date	Deg.	Date.
								inches.	inches.						
I.	London (Camden Square) ...	1.94	— .72	.56	25	13	60.6	3	27.3	23	2	7			
II.	Tenterden .....	2.28	— 1.11	.56	23	17	61.7	9	26.0	30	2	9			
III.	Hartley Wintney .....	3.45	...	1.23	23	14	60.0	3	25.0	23	5	10			
III.	Hitchin .....	2.31	— .37	.44	23	16	60.0	2, 3	25.0	22	5	...			
IV.	Winslow (Addington) .....	1.82	— 1.11	.37	23	13	60.0	2	23.0	23	7	9			
IV.	Bury St. Edmunds (Westley) .....	2.33	— .22	.57	26	16	59.0	2	28.0	23	...	...			
V.	Norwich (Brundall) .....	3.00	...	.92	26	19	60.8	2	29.2	23	3	10			
V.	Winterbourne Steepleton ...	5.16	...	1.59	23	17	51.8	16	23.3	23	6	16			
"	Torquay (Cary Green) ...	3.99	...	1.10	23	14	60.9	16	32.2	29 <sup>c</sup>	0	4			
"	Polapit Tamar [Launceston]..	2.57	— 1.77	.51	22	18	60.5	11	27.1	14 <sup>d</sup>	6	8			
VI.	Stroud (Upfield) .....	2.61	— .72	.75	24	18	58.0	2, 3	28.0	22	4	...			
"	ChurchStretton (Woolstaston) .....	1.53	— 1.99	.39	24	18	59.0	16	26.0	23	6	10			
"	Worcester (Diglis Lock) .....	1.62	— 1.22	.35	25	12	...	...	...	...	...	...			
VII.	Leicester (Rotherby Hall) ...	...	...	...	...	...	...	...	...	...	...	...			
"	Boston .....	1.60	— .60	.52	26	15	60.0	2	26.0	23 <sup>c</sup>	5	...			
"	Hesley Hall [Tickhill].....	2.06	+ .04	.75	23	18	61.0	2	25.0	23	5	...			
VIII.	Manchester (Plymouth Grove) .....	1.95	— 1.05	.49	12	15	61.0	9	27.0	22 <sup>e</sup>	7	10			
IX.	Wetherby (Ribston Hall) ...	3.50	+ 1.43	.95	23	17	...	...	...	...	...	...			
"	Skipton (Arnelcliffe) .....	3.62	— 3.13	.63	2	24	...	...	...	...	...	...			
"	Hull (Pearson Park) .....	2.24	+ .23	.59	23	18	61.0	8, 15	26.0	23	5	8			
X.	Newcastle (Town Moor) .....	3.30	+ .90	.70	25	13	...	...	...	...	...	...			
"	Borrowdale (Seathwaite).....	16.85	+ 2.06	5.20?	1	20	...	...	...	...	...	...			
XI.	Cardiff (Ely) .....	5.06	+ .15	1.29	2	22	...	...	...	...	...	...			
"	Haverfordwest .....	6.09	+ .23	1.27	22	24	58.7	3	33.7	1	0	11			
"	Aberystwith (Gogerddan) ...	3.92	— 1.19	.94	4	16	58.0	11	...	...	...	...			
"	Llandudno.....	1.87	— 1.22	.38	12	20	63.0	2	29.0	23	2	...			
XII.	Cargen [Dumfries] .....	5.64	+ 1.08	2.18	1	15	58.0	2	19.0	29	7	...			
XIII.	Edinburgh (Blacket Place)...	4.11	...	.90	25	20	61.0	2	20.3	29	4	8			
XIV.	Colmonell .....	5.51	...	1.36	22	17	61.0	8	19.0	28	...	...			
XV.	Tighnabruaich .....	6.81	...	1.33	1	21	53.0	1, 2	25.0	28	6	...			
"	Mull (Quinish).....	6.10	— .89	2.01	1	20	...	...	...	...	...	...			
XVI.	Loch Leven Sluices .....	5.90	+ 1.94	1.30	2	13	...	...	...	...	...	...			
"	Dundee (Eastern Necropolis) ..	4.35	+ 1.65	1.25	23	21	59.0	2	21.0	29	6	...			
XVII.	Braemar .....	4.64	+ .06	1.23	25	18	55.0	2	8.5	29	16	26			
"	Aberdeen (Cranford) .....	4.14	...	.80	12	20	59.0	2	19.0	28	12	...			
"	Cawdor (Budgate) .....	3.11	+ .26	.78	12	17	...	...	...	...	...	...			
XVIII.	Strathconan [Beaully] .....	8.44	+ 1.88	1.60	2	14	...	...	...	...	...	...			
"	Glencarron Lodge.....	9.06	...	2.67	1	20	61.0	12	17.6	29	7	...			
XIX.	Dunrobin .....	3.82	+ .99	.77	4	18	56.0	18	23.0	29	5	...			
"	S. Ronaldshay (Roeberry) ...	6.15	+ 2.73	1.57	23	23	52.0	7 <sup>b</sup>	26.0	21	5	...			
XX.	Darrynane Abbey.....	6.60	...	1.14	23	26	...	...	...	...	...	...			
"	Waterford (Brook Lodge) ...	2.95	— .72	.50	22 <sup>a</sup>	20	59.5	2	28.0	22	4	...			
"	O'Briensbridge (Ross) .....	6.80	...	1.25	22	19	...	...	...	...	...	...			
XXI.	Carlow (Browne's Hill) .....	4.41	— 1.35	1.04	23	16	...	...	...	...	...	...			
"	Dublin (FitzWilliam Square) ..	4.44	+ 1.61	1.73	23	17	62.7	2	29.0	22	4	9			
XXII.	Ballinasloe .....	4.10	+ .19	.62	22	23	56.0	2	30.0	22	5	...			
"	Clifden (Kylemore) .....	10.48	...	1.93	22	25	...	...	...	...	...	...			
XXIII.	Waringstown .....	2.98	— .12	.42	29	18	59.0	3, 4	25.0	22	10	14			
"	Londonderry (Creggan Res.) ..	4.47	— .05	.81	24	21	...	...	...	...	...	...			
"	Omagh (Edenfel) .....	3.85	— .02	.56	3	16	58.0	2	27.0	5	...	...			

+ Shows that the fall was above the average; — that it was below it.  
 a—and 23. b—and 18, 19. c—and 30. d—and 23. e—and 29.

# METEOROLOGICAL NOTES ON NOVEMBER, 1898.

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.

TENTERDEN.—Warm and dry till the 20th, after which 1·85 in. of R fell, but the total is only two-thirds of the average. Duration of sunshine 89 hours. Gardens were gay with flowers until the 22nd. Fog on 8th, 10th, 11th, and 14th. On 3rd the shade min. was 52°, and the grass min. 51°. S on 29th.

HARTLEY WINTNEY.—From 7th to 20th consisted of many calm days, with alternations of sun and fog, mildness, and little R; from 20th to the end was cold, dull, and wet. Oaks were in full leaf till 23rd, and heliotrope, dahlias, and begonias, were blooming till cut off by the frost on that day. Six hours' sunshine was recorded on 13th and on 22nd. L on 12th. Rainfall 1·06 in. above the average, and for the first 11 months of the year 4·20 in. below it.

ADDINGTON.—Generally very mild, with frequent fogs and hardly any frost until the evening of 22nd. On the morning of 23rd the ground was covered with about two inches of S, but R following, it did not remain long. Many tender plants were in flower, untouched by frost until 22nd; unusually late for dahlias, heliotrope, &c., to be seen in such fine condition. Fog on 10 days.

BURY ST. EDMUNDS, WESTLEY.—Very mild until 23rd, when the first frost cut tender plants in the gardens. The chalk wells at the close were shorter of water than had ever before been known.

NORWICH, BRUNDALL.—Very mild during the greater part of the month, the mean temp of the first 19 days being identical with that of the first 19 days of last May. A high relative humidity was recorded, the mean 9 a.m. value for the month being 94. Fog on 9th, 10th and 11th. Gales from N.W. and N. on 21st, and N.E. on 28th. H and sleet on 22nd. Incessant R on 26th.

WINTERBOURNE STEEPLTON.—In the 32 days ending November 7th R was registered on all but 4, and on 20th another wet period began, with very low bar., high wind and heavy rains, and T and H on 25th. The mean temp. 45°·4, is 1°·1 above the average of 5 years. Fog daily from 9th to 12th.

TORQUAY, CARY GREEN.—November rainfall ·08 in. above the average, but total for the first 11 months of the year 7·06 in. below it. Mean temp. 49°·4, or 2°·2 above the average. Duration of sunshine 56 hours 40 mins., being 4 hours 25 mins. below the average; 12 sunless days.

POLAPIT TAMAR [LAUNCESTON].—Though generally damp, the rainfall for the month is very small. The total R for the first 11 months of the year is 3·71 in. less than the average. The prevailing characteristic was general absence of wind. Very thick fog on 6th, slight on 26th.

WOOLSTASTON.—The first three weeks were mild, dark and damp, with a great deal of fog. A heavy gale with driving S raged on 22nd and 23rd. Mean temp. 43°·9.

BOSTON.—Weather remarkably open except at the end of the month. Mean temp. 3°·5 above the average. Plums, apples and raspberries (due to a second crop) were gathered at the beginning of the month. Thrushes singing as if it were spring.

## WALES.

HAVERFORDWEST.—The month was characterized by wet, with unusual mildness. Heavy squalls occurred on the morning of 13th, accompanied by T, L and very heavy R, and a short but severe TS on 25th, between 5 and 6.30 p.m. In the parish of Slebech, and on the Precelly range, torrents of R and H fell, doing great damage to the roads.

GOGERDDAN.—Very mild and damp, with very little sunshine. A little S on 28th.

## SCOTLAND.

CARGEN [DUMFRIES].—The weather was dull and unsettled, with exceptionally low bar. pressure. The temp. was high up to the evening of the 19th; the mean from 1st to 18th being  $46^{\circ}$ , and from 19th to 30th  $36^{\circ}$ , but was very variable during the last 12 days; the mean on 26th being  $42^{\circ}$ , and on 29th  $24^{\circ}$ . On 1st 2.18 in. of R fell, the greatest recorded, with one exception, since observations commenced in 1860; the total for the 1st and 2nd, 2.74 in., also has only once been exceeded. A large area was flooded, but the tides being "neap," there was no damage from overflow of the Nith embankments. L on 3rd. S on 22nd and 29th. E. winds prevailed on 16 days, and sunshine was conspicuously absent. Strawberries show well-developed fruit, while snowdrops have been seen in full flower bud. R for the first 11 months of the year slightly above the average.

EDINBURGH, BLACKET PLACE.—Mean temp.  $1^{\circ}6$  above, and rainfall 56 per cent. in excess of, the average. Sunshine only half the mean. TS and H on 3rd; dense fog daily from 9th to 12th; S on 22nd, 23rd and 29th.

COLMONELL.—R .30 in. more than, and mean temp.  $2^{\circ}6$  above, the average of 22 years. Many sheep on the hills covered by S on 22nd. L on 2nd.

TIGHNABRUAICH.—A wet, stormy month. Four inches of S on the ground on 22nd.

ABERDEEN, CRANFORD.—A very mild month, flowers blooming to the end in the open garden. Gales and heavy R from 22nd to 25th.

S. RONALDSHAY, ROEBERRY.—A cold, wet month. Mean temp.  $42^{\circ}2$ , or  $1^{\circ}0$  below the average of 8 years.

## IRELAND.

DARRYNANE ABBEY.—The first three weeks were mild, but from 21st to 28th was very cold. On 22nd, 23rd and 24th, 3.02 in. of R fell, accompanied by a strong N.E. gale. N.W. gale on 12th.

WATERFORD, BROOK LODGE.—S on the Comeragh mountains on 13th, and a fresh fall on 23rd.

O'BRIENSBRIDGE, ROSS.—Wild and wintry from beginning to end.

DUBLIN, FITZWILLIAM SQUARE.—Opening mild and changeable, with fresh S.W. winds, it afterwards became fine, quiet, and at times foggy. A brief period of frost on 22nd was followed by exceptionally heavy R, so that in 4 days 3.23 in. fell. High winds on 7 days, and a gale on 2nd and 3rd. Fog on 7 days. Solar halos on 1st and 22nd. H, or sleet and S, on 4 days. L on 3 days, and TS on 26th.

OMAGH, EDENFEL.—The weather continued extraordinarily fine and mild until the 22nd, when a series of violent gales from E. and N.E. completely changed its character and occasioned much damage over the country. The end of the month was finer.

# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CCCXCVI.]

JANUARY, 1899.

[PRICE FOURPENCE,  
or 5s. per ann. post free.]

## ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, December 21st, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. F. C. Bayard, LL.M., President, in the chair.

The following candidates were balloted for and duly elected Fellows of the Society:—John Alfred Curtis; John Dickinson Leigh, M.B., M.S., F.R.C.S. (Edin.); H. Bertram Nichols, A.M.I.C.E.

## WEST INDIA HURRICANE.

Capt. A. Carpenter, R.N., D.S.O., gave an account of the hurricane which caused so much devastation in the West Indies in Sept., 1898.

The cyclone, passing 18 miles south of Barbadoes, swept over the southern half of St. Vincent Island, then took a north-west direction towards Aves Island, its rate of progression being about  $7\frac{1}{2}$  miles an hour. From here it pursued a northerly course for 450 miles, passing between Puerto Rico and the Windward Islands. In lat.  $23^{\circ}$  N. it swerved to the north-west for 600 miles up to lat.  $30^{\circ}$  N., where, on the 17th, it commenced to recurve to the north-east. It was traced to lat.  $44^{\circ}$  N., long.  $42^{\circ}$  W., where it was still going strong on the 20th, having travelled 3000 miles at an average speed before recurvature of 8 miles an hour, and of 24 miles an hour afterwards.

Its diameter (taken as the limit within which there was a marked change in direction of wind) was 80 miles as it approached Barbadoes, and 170 miles after leaving St. Vincent. The actual storm centre, in which the force of wind greatly increased, was only 35 miles in diameter until St. Vincent was passed, but after that the strength of wind extended to 170 miles. The diameter of the calm vortex, or eye, of the storm was not less than 4 miles.

On nearing Bermuda the diameter of the cyclone was about 400 miles, and on passing Nova Scotia 450 miles, as depicted on the U.S. *Pilot Chart* for November.

The damage to the islands was very great. The houses of the peasantry are all of wood, and those of Europeans only of stone or brick in their lower courses.

In Barbadoes 11,400 houses were swept away or blown down. Some of these fell outward from all sides as if by an explosion from the

interior. About 115 persons were killed, and 50,000 became homeless.

At St. Vincent 6,000 houses were blown down or damaged beyond repair, 200 lives lost, and 20,000 people homeless. Not only were wooden houses blown down, but nearly all the churches and chapels were destroyed. Trees nearly a century old were uprooted, and the rain filled the mountain torrents to such magnitude that whole villages were swept away and estates wiped out beyond recognition. The high sea damaged Kingstown, and all shipping was destroyed. At the Botanic Gardens on the 11th the barometer fell from 29.539 in. at 10 a.m. to 28.509 in. at 11.40 a.m., and about 14 inches of rain fell in the 24 hours ending 9 a.m. on 12th. The rain at Fort Charlotte, overlooking Kingstown, was said to be "scalding hot" and smelt putrid, and clothes that got wet rotted after being washed. The volcano Soufrière, at the north end of the island, has been dormant since 1812. A lake, half a mile in diameter, lies in the crater. It seems possible that this water, which under a tropical sun must bear a high temperature and be somewhat foul, may have been licked up by the cyclonic whirl, and descended as stinking rain.

At St. Lucia the rain converted valleys into lakes, and an avalanche filled a valley for 3 miles, burying houses and estates. The high sea did much damage at Castries Harbour.

The same tale is told farther north, the heavy rain doing even more harm than the wind.

There was much atmospheric electricity over all the islands from the 10th to the 14th.

The surf was roaring on the east coast of St. Vincent twenty hours before the cyclonic centre reached it.

It does not appear that any of the meteorological observers have made arrangements for receiving reports of the height and direction of the ocean swell from the weather coasts during the hurricane months. The author feels sure that they lose a very valuable warning by not doing so. The following facts give another illustration of the warning thus afforded.

In August, 1880, at Port Royal, Jamaica, the author received nearly twenty-four hours' notice of the cyclone that swept over the island, wrecking every vessel except the Commodore's ship and his own little surveying schooner. None of the local folk saw anything unusual in the look of the weather, but the sea outside on the reefs was far greater than that due to the ordinary sea breeze.\*

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\* Since the above paper was read we have received the *U.S. Monthly Weather Review* for September, 1898, which contains details as to the storm warning system which the English Government ought to have established 30 years ago, but which the U.S. Government have now the honour of providing for all nations. It contains also note of the early work of the observers respecting this Hurricane, and a chart of its track, which seems to be more westerly than that described by Capt. Carpenter; in fact, more like the normal tracks in the old works of Sir W. Reid and others published in the early part of this century, but we have not Capt. Carpenter's chart before us, and we hope that we have not heard the last of this storm.—ED. M. M.

# FROST AND ANTICYCLONES.

Mr. W. H. Dines, B.A., read a paper on the connection between the winter temperature and the height of the barometer in north-western Europe.

In the spring of 1897 the author read a paper before the Society dealing with the connection between frost and anticyclonic conditions at Greenwich. The period dealt with was 1841-90 inclusive, and the statistical evidence obtained left no doubt on his mind that the current theory on the subject is radically false. In that paper it was shown that the mean height of the barometer during nearly all the noted frosts of the period was below the average, and that 16 frosts only out of 74 had been accompanied by a high barometer (above 30·20 ins.), and that, whereas the average duration of a frost was 9 days, the average of those 16 high barometer frosts was only 6 days. The present paper is a further contribution to the subject based on observations at Christiania 1868-93, Berlin 1848-93 and Geneva 1840-95, and the author sums up as follows.

"Thus the three different ways in which the question has been investigated give the same answer, namely, that the winter temperature at a place in Western Europe has no connection with the height of the barometer at that place, and that in winter it is just as likely to be cold when the barometer is below the average as when it is above the average."

These papers are an important criticism of a somewhat fundamental question and the acceptance of the author's conclusions would, as was stated in the discussion, necessitate the rewriting of nearly all the Meteorological text books. We much regret that it is impossible to do justice the paper or to report the discussion by Messrs. F. C. Bayard, C. Harding, F. J. Brodie, R. H. Scott, G. J. Symons and Major Rawson, without reproducing the diagrams which we should scarcely be justified in doing before they appear in the Quarterly Journal of the Society.

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## GODFRIDUS—THE BOOK OF KNOWLEDGE.

IN Vol. XXXI., pp. 101-106 and 114-115, we enumerated and partly described the contents of such editions of the above work as we had been able to trace, and intimated that a complete bibliography would require much work. Since then we have succeeded in purchasing several editions which at that time we had to describe on the authority of bibliographers, and we have at least three editions not quoted in that list. We do not, however, think that the time to revise and complete the account has yet come; on the contrary, it seems more remote, for one copy (of 1766) claims the parentage of Lilly the Astrologer (1602-1681), and another drops Godfridus, Melampus, Erra Pater and Lilly, and starts with a fresh title as below.

We reprint the title nearly in fac-simile in order that our readers may know the style of book for which we are searching.

*The* NEWEST, BEST,  
And Very-much Esteemed  
BOOK *of* KNOWLEDGE.

Being *Very Necessary* and *Useful* for the  
*Instruction* and *Benefit* of all Persons.

S H E W I N G

The Effects of the PLANETS and other Astronomical CONSTELLATIONS; with the Strange Events that happen to *Men, Women, and Children*, Born under them.

Together with

The *Husbandman's Practice*: Or, *Prognostication* for *Ever*. And the *Shepherd's Perpetual Calendar* for the *Weather*.

A L S O

A Brief Discourse of the Natural Causes of *Meteors*; with an Account of several Remarkable *Earthquakes, Rains, Thunders, Thunder-Bolts, Lightnings, Comets, Blazing-Stars, &c.*

A N D

*Observations* on the *Weather*, and *Signs* foretelling *Rain*.—A Brief Collection of all the *Members* of *Man* Physiognomiz'd.—*Signification* of *Moles* on *Man* or *Woman*.—*Interpretation* of *Dreams*.—And *Pythagoras's Wheel of Fortune*.

W I T H

A Particular Account of the *Earth* and *Sea*: And a Description of the most Magnificent *Temple* of *Solomon*: Also of the *Seven Wonders* of the *World*.

L O N D O N:

Printed for A. WILDE, in *Aldersgate-Street*:  
Sold also by the BOOK-SELLERS in Town and  
Country. 1764.

It is a 12mo, of 156 pages, on very poor paper, and evidently owes its preservation to having been strongly bound. It will be noticed that the title has been quite changed, and, in fact, the book is more like a popular treatise on the weather.

The following lines front the title page. *Mirabile dictu* they are not in Inwards's *Weather Lore*; perhaps Mr. Inwards will put them in his 4th edition. To us they are suggestive of the well-known lines, "The hollow winds begin to blow," &c., which are attributed to Dr. E. Darwin and to Dr. Jenner. It will be interesting to find which was published first.

*Infallible Signs of Rainy Weather, from the Observation of divers Animals.*

IF *Ducks* or *Drakes* their Wings do flutter high,  
 Or tender *Colts* upon their Backs do lie;  
 If *Sheep* do bleat, or play, or skip about,  
 Or *Swine* hide Straw by bearing on their Snout;  
 If *Oxen* lick themselves against the Hair,  
 Or grazing *Kine* to feed apace appear,  
 If *Cattle* bellow, gazing\* from below,  
 Or if *Dogs* Entrails rumble to and fro,  
 If *Doves* or *Pigeons* in the Evening come  
 Later than usual to their Dove-House Home;  
 If *Crows* and *Daws* do oft themselves be-wet,  
 Or *Ants* and *Pismires* Home a-pace do get;  
 If in the Dust *Hens* do their Pinions shake,  
 Or by their flocking a great Number make;  
 If *Swallows* fly upon the Water low,  
 Or *Wood-Lice* seem in Armies for to go;  
 If *Flies*, or *Gnats*, or *Fleas* infest and bite,  
 Or sting more than they're wont by Day or Night;  
 If *Toads* hie Home, or *Frogs* do croak amain,  
 Or *Peacocks* cry :——*Soon after look for Rain.*

REVIEW.

*Etudes internationales des Nuages.* 1896 and 1897. *Observations et Mésures de la Suède I, II.* Publication de l'Observatoire Météorologique de l'Université Roy. d'Upsala. 4to. [1898.] 134 pp., 1 plate.

ENGLAND is, we fear, being left behind as regards meteorology.

Welsh and Glaisher may be said to have originated high-class work in balloons, but what followers have they here now? The French, Germans, and Russians are devoting time and money to it, and, we believe, actually sent an aeronaut to this country.

Douglas Archibald led the way with kites years ago, but what are we now doing? It is to Lawrence Rotch and to the U.S. Weather Bureau that we have to look.

Howard started the nomenclature of clouds, Whipple worked at determining their height, and Clayden is still doing his best single-

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\* ?Grazing.

handed and at his own cost. But what have we to put by the side of the work of Hildebrandsson and Teisserenc de Bort?

Somebody ought to ponder over the explanation of these facts.

We, however, have merely to indicate the character and contents of the work before us.

In the first ten pages Dr. Hildebrandsson gives an historical sketch of cloud work, from the time (just 25 years ago) when he first organised the Swedish corps of Cirrus observers, down to the meeting of the International Conference at Paris in 1896. We see no English names quoted but those of Ralph Abercromby and Ley, and excepting Clayden, Whipple, and Wilson Barker, we remember no other Englishman who has worked regularly at the subject. In 1874 it was resolved that, "*Toutes les Institutions Météorologiques centrales sont invitées à organiser une première série d'observations et de mesures des nuages pendant une année, du 1er Mai 1896, à 1er Mai 1897.*" This volume gives the results for Upsala—time will show what other countries have done.

Part II. describes the instruments used, their position, and the methods by which the altitudes of the clouds were computed. The theodolites are much smaller than those used by M. Teisserenc de Bort at his observatory at Trappes; but Dr. Hildebrandsson seems satisfied that they were quite free from error, and as the base line was rather more than half a mile in length, the angles were usually considerable.

Part III. gives the observations *in extenso* and some summaries; we cannot go fully into these, but may note in conclusion that according to Fig. 3, when the pressure at sea-level is about 30·4 in., the cirri have an altitude of five miles; the highest seems to have been six miles at 7.5 p.m. on April 27th, 1897.

## AURORÆ AND STORMS.

*To the Editor of the Meteorological Magazine.*

SIR,—In the December number, at page 164, you put a query in a note at the foot of the page in reference to displays of the aurora, asking for proof that they foretell storms.

An old friend of mine told me 40 years ago that a relation of his, who commanded for two or three years a cruiser in the Channel, had observed that whenever an aurora appeared the wind would blow hard from the S.W. in 48 hours. I have myself verified this as the unfailing result of my own observation ever since.

Your obedient servant,

JOHN SLATTER.

*Whitchurch, Oxon., 19th December, 1898.*

# RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858-97.

## DECEMBER.

ELEMENTS.	MONTHLY MEANS OR TOTALS.										ABSOLUTE READINGS.					
	MEANS 9 A.M. AND 9 P.M.										EXTREMES AT 9 A.M. AND 9 P.M.					
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	Highest Month.			Lowest Month.			Mean of all Highest Lowest.	Highest.			Lowest.		
				Mean.	Value.	Date.	Value.	Date.	Date.		Value.	Date.	Value.	Date.	Value.	Date.
Barometer ..... (cor. & red.)	1 29.947	2 30.312 1879	3 29.481 1876	4 9 a.m. 9 p.m.	5 29.948 29.945	6 30.320 30.304	7 1879 1879	8 29.483 29.479	9 1876 1876		10 30.784 30.782	11 23rd, 15th,	12 28.398 28.323	13 4th, 8th,	14 1876 1886	15 29.174 29.200
(Dry Bulb.....)	39.3	46.2 1868	30.3 1890	9 a.m. 9 p.m.	39.0 39.6	46.1 40.4	1868 1868	29.7 30.8	1890 1890		56.0 56.5	14th, 6th,	12.1 17.3	25th, 24th,	1860 1860	26.4 27.5
Max. ....	44.0	..	..	..	..	50.7	1868	34.0	1890		58.9	5th,	24.3	31st,	1874	32.7
Min. ....	34.4	..	..	..	..	41.0	1868	25.5	1890		52.8	28th,	6.7	25th,	1860	22.9
(Wet Bulb.....)	38.1	44.9 1868	29.6 1890	9 a.m. 9 p.m.	37.8 38.3	44.6 45.1	1868 1868	29.1 30.1	1890 1890		54.8 55.8	14th, 6th,	11.9 16.9	25th, 24th,	1860 1860	25.8 26.7
Solar Rad., black...	51.8	..	..	..	..	59.1	1880	36.9	1890		87.0	10th,	24.8	31st,	1874	34.3
Solar Rad., bright..	44.9	..	..	..	..	48.3	1894	34.8	1890		62.0	5th,	26.8	21st,	1891	33.3
Grass Minimum ...	30.9	..	..	..	..	37.4	1876	22.0	1890		51.2	5th,	1.8	25th,	1860	18.5
Soil, 1 foot .....	39.9	..	..	..	..	43.0	72, '76	33.6	1879		47.9	6th,	32.7	25, 27, 28, '78		36.3
Cloud .....	6.8	8.1 76, '90	5.2 1886	9 a.m. 9 p.m.	6.8 6.7	8.6 8.1	1890 1870	5.2 5.0	1885 1886		10 10	Every year Every year	0 0	Various Various		0.6 0.2
Rainfall .....	2.13	6.25 1876	.36 1864	9 a.m. 9 p.m.	1.11 1.02	3.13 3.12	1876 1876	.19 .17	'64, '79 '64, '73		1.14 .85	24th, 26th,	.00 .00	Every year Every year		.00 .00

Max. Rainfall in 24 hours, 1.82 in., 26th, 1886. Mean max. daily fall, .54 in.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1898.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
England, London .....	82·9	15	43·9	11	73·8	53·5	51·5	0·100 69	127·7	39·1	inches 1·09	7	6·1
Malta.....	95·7	22	64·4	17	85·0	69·0	63·9	69	153·5	57·1	·00	0	1·1
<i>Cape of Good Hope</i> ...	78·4	26	34·3	9	61·9	46·7	45·1	84	...	...	6·13	13	5·3
<i>Mauritius</i> .....	76·0	15a	56·7	2	74·2	63·9	58·9	72	123·0	49·0	1·72	15	5·5
Calcutta.....	92·1	25	75·4	17	87·0	78·1	77·9	88	155·5	74·9	12·75	28	8·8
Bombay.....	86·7	4	73·7	23	84·2	77·6	76·8	87	137·5	73·2	20·72	31	9·2
Ceylon, Colombo .....	89·2	24	72·5	9	86·8	78·0	73·2	78	146·5	70·5	6·15	13	6·3
<i>Melbourne</i> .....	64·0	14	35·0	2	55·7	43·4	41·7	77	121·0	27·3	1·90	12	6·4
<i>Adelaide</i> .....	64·7	13	38·0	17	59·1	45·2	43·7	77	122·8	29·2	2·65	16	6·0
<i>Sydney</i> .....	70·1	27	40·4	20	58·7	45·3	40·0	80	144·3	28·0	3·73	10	2·9
<i>Wellington</i> .....	63·0	17	33·8	9	55·3	41·7	39·3	70	96·0	21·0	4·80	17	4·2
<i>Auckland</i> .....	62·0	26	41·0	21	58·1	49·9	45·5	78	110·0	38·0	6·18	23	6·1
Jamaica, Kingston.....	91·8	3, 29	70·3	19	88·7	72·8	70·2	70	...	...	1·63	7	...
Trinidad .....	93·0	19	68·0	11c	88·8	70·8	72·0	78	165·0	66·0	5·87	18	...
Grenada.....	84·2	1b	70·8	13	82·6	74·1	71·3	80	151·0	...	10·24	26	3·0
Toronto.....	94·0	3	43·3	11	81·5	60·2	59·9	68	123·5	33·5	·69	9	3·6
New Brunswick, Fredericton .....	93·9	3	42·5	6	78·0	51·6	56·3	62	...	...	1·38	10	4·9
Manitoba, Winnipeg ...	91·5	13	37·5	20	77·4	54·0	...	...	...	...	1·77	9	5·5
British Columbia, Esquimalt.....	79·6	30	46·2	7	69·8	50·6	54·6	85	...	...	·28	3	2·7

a—and 17. b—and 12, 22, 28. c—and 12.

## REMARKS.

MALTA.—Mean temp. 75°·1, or 2°·5 below average. Mean hourly velocity of wind 9·2, or 1·7 above average. Mean temp. of sea 78°·5. L on 3 days. J. F. DOBSON.

*Mauritius*.—Mean temp. of air 0°·1 above, of dew point 0°·5, and rainfall ·52 in. below, the average. Mean hourly velocity of wind 12·3 miles, or 0·5 above average; extremes, 30·5 on 27th and 2·1 on 19th; prevailing direction E.S.E. T on 22nd—the first time on record in July. The lowest barometer ever recorded in July (29·895 in.) occurred on 19th during the passage of bad weather to S. and S.E. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 81°·6, or 1°·0 above, of dew point 0°·2 below, and rainfall 1·72 in. above, average. TSS on 3 days; L on 4 days. Mean hourly velocity of wind 9·7 miles; prevailing direction S.W. H. O. BARNARD.

*Adelaide*.—Mean temp. 0°·6 above, and rainfall slightly more than, the average of 41 years. Fair during the first half, but during the latter half generally squally and showery. C. TODD, F.R.S.

*Sydney*.—Temp. 0°·4 below, humidity 3·4 above, and rainfall ·55 in. below, average. Frequent light rains, meeting all requirements for wheat and grass, but not enough for tanks and rivers. H. C. RUSSELL, F.R.S.

*Wellington*.—Showery weather up to the middle, with S.E. and N.W. winds, at times strong, then fine, bright and cold up to 22nd; from 23rd to the end wet, and strong N.W. winds on 27th and 28th. T on 7th and 28th; H on 7th and 8th; fog on 9th; S on hills on 25th and 31st. Earthquakes on 5th and 8th. R. B. GORE.

*Auckland*.—Beginning and end of the month wet and stormy, middle fine and dry. Mean temp. slightly below, and rainfall 1·25 in. above, average. T. F. CHEESEMAN.

TRINIDAD.—Rainfall 3·58 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,  
DECEMBER, 1898.

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.
I.	Uxbridge, Harefield Pk..	2·32	XI.	Builth, Abergwesyn Vic.	12·13
II.	Dorking, Abinger Hall .	3·41	„	Rhayader, Nantgwilt...	8·32
„	Birchington, Thor .....	1·29	„	Lake Vyrnwy .....	9·73
„	Hailsham .....	3·05	„	Corwen, Rhug .....	4·26
„	Ryde, Thornbrough .....	3·33	„	Criccieth, Talarvor .....	3·79
„	Emsworth, Redlands ...	3·05	„	I. of Man, Douglas .....	4·55
„	Alton, Ashdell .....	3·81	XII.	Stoneykirk, Ardwell Ho.	2·44
III.	Oxford, Magdalen Col..	2·18	„	New Galloway, Glenlee	8·41
„	Banbury, Bloxham .....	2·73	„	Moniaive, Maxwellton Ho.	6·88
„	Northampton, Sedgebrook	2·18	„	Lilliesleaf, Riddell .....	3·05
„	Stamford, Duddington..	1·96	XIII.	N. Esk Res. [Penicuik]	6·00
„	Alconbury .....	1·74	XIV.	Glasgow, Queen's Park..	6·32
„	Wisbech, Bank House...	1·84	XV.	Inverary, Newtown .....	16·24
IV.	Southend .....	1·80	„	Ballachulish, Ardsheal...	16·67
„	Harlow, Sheering.....	2·02	„	Islay, Gruinart School ...	...
„	Colchester, Lexden .....	2·36	XVI.	Dollar .....	5·31
„	Rendlesham Hall .....	3·12	„	Balquhiddier, Stronvar...	18·01
„	Scole Rectory .....	2·25	„	Coupar Angus Station...	2·75
„	Swaffham .....	2·15	„	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	2·93	XVII.	Keith H.R.S.....	3·72
„	Bishop's Cannings .....	3·20	„	Forres H.R.S. ....	3·51
„	Blandford, Whatcombe ..	4·34	XVIII.	Fearn, Lower Pitkerrie..	4·24
„	Ashburton, Holne Vic...	6·56	„	N. Uist, Loch Maddy ...	...
„	Okehampton, Oaklands..	6·80	„	Invergarry .....	17·45
„	Hartland Abbey .....	5·40	„	Aviemore H.R.S. ....	3·86
„	Lynton, Glenthorne ...	6·91	„	Loch Ness, Drumnadrochit	9·73
„	Probus, Lamellyn .....	4·65	XIX.	Invershin .....	4·76
„	Wellington, The Avenue	3·20	„	Durness .....	10·07
„	North Cadbury Rectory	2·52	„	Watten H.R.S.....	3·61
VI.	Clifton, Pembroke Road	4·49	XX.	Dunmanway, Coolkelure	8·72
„	Ross, The Graig .....	2·58	„	Cork, Wellesley Terrace	2·95
„	Wem, Clive Vicarage ...	2·44	„	Killarney, Woodlawn ..	7·66
„	Wolverhampton, Tettenhall	2·21	„	Caher, Duneske .....	2·25
„	Cheadle, The Heath Ho.	2·45	„	Ballingarry, Hazelfort...	2·42
„	Coventry, Priory Row ..	2·58	„	Limerick, Kilcornan ...	1·71
VII.	Grantham, Stainby .....	1·81	„	Broadford, Hurdlestown	2·94
„	Horncastle, Bucknall ...	1·92	„	Milton Malbay .....	5·29
„	Worksop, Hodsck Priory	2·00	XXI.	Gorey, Courtown House	2·09
VIII.	Neston, Hinderton .....	1·77	„	Athlone, Twyford .....	2·26
„	Southport, Hesketh Park	2·48	„	Mullingar, Belvedere ...	2·03
„	Chatburn, Middlewood..	5·79	„	Longford, Currygrane...	...
IX.	Melmerby, Baldersby ...	1·96	XXII.	Woodlawn .....	2·93
„	Scarborough, Observat'y	2·06	„	Crossmolina, Enniscoe ..	8·61
„	Middleton, Mickleton ...	4·31	„	Collooney, Markree Obs.	4·14
X.	Haltwhistle, Unthank...	4·58	„	Ballinamore, Lawderdale	4·10
„	Bamburgh .....	1·39	XXIII.	Warrenpoint .....	2·65
„	Duddon Valley, Ulpha School	8·35	„	Seaforde .....	2·69
„	Keswick, The Bank .....	11·52	„	Belfast, Springfield .....	2·97
XI.	Llanfrehfa Grange .....	5·28	„	Bushmills, Dundarave..	2·63
„	Llandovery .....	6·94	„	Stewartstown .....	3·01
„	Castle Malgwyn .....	6·59	„	Killybegs .....	8·19
„	Brecknock, The Barracks	5·16	„	Horn Head .....	7·13

## DECEMBER, 1898.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.						Days on which -01 or more fell.	TEMPERATURE.						No. of Nights below 32°.	
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours		Dpth	Date		Max.		Min.		In shade.	On grass.		
				Deg.	Date				Deg.	Date						
I.	London (Camden Square) ...	2.54	+	.47	.87	6	12	57.1	4	27.1	24	3	13			
II.	Tenterden .....	2.13	—	.50	.37	31	15	55.0	4, 6	26.0	31	6	11			
"	Hartley Wintney .....	2.72	...	...	.87	6	16	57.0	7	24.0	23	7	14			
III.	Hitchin .....	2.81	+	.78	.79	6	14	57.0	6	26.0	30	7	...			
"	Winslow (Addington) .....	3.18	+	.73	1.18	6	16	56.0	4, 18	25.0	31	7	12			
IV.	Bury St. Edmunds (Westley) .....	2.49	+	.25	.79	6	11	57.0	5	21.0	23	...	...			
"	Norwich (Brundall) .....	2.31	...	...	.46	6	14	56.0	4, 18	26.2	31	5	13			
V.	Winterbourne Steepleton ...	4.76	...	...	1.06	6	20	54.1	5, 26	25.0	31	6	14			
"	Torquay (Cary Green) ...	3.79	...	...	.96	27	16	56.4	5, 26	34.6	21	0	3			
"	Polapit Tamar [Launceston]..	4.73	+	.50	.82	6	24	56.9	26	27.4	21	2	7			
VI.	Stroud (Upfield) .....	3.20	+	.75	.93	6	14	57.0	8	28.0	22	5	...			
"	Churchstretton (Woolstaston) .....	2.46	—	.59	.65	26	18	56.0	5	30.0	24 <sup>c</sup>	5	14			
"	Worcester (Diglis Lock) .....	2.56	+	.58	.60	26	18	...	...	...	...	...	...			
VII.	Leicester (Rotherby Hall) ...	...	...	...	...	...	...	...	...	...	...	...	...			
"	Boston .....	1.69	—	.16	.51	9	10	62.0	11	27.0	23	8	...			
"	Hesley Hall [Tickhill].....	1.45	—	.53	.42	26	10	57.0	5	25.0	31	8	...			
VIII.	Manchester (Plymouth Grove) ..	3.27	—	.17	.90	27	21	58.0	27	30.0	23	...	...			
IX.	Wetherby (Ribston Hall) ...	2.63	+	.19	.65	29	14	...	...	...	...	...	...			
"	Skipton (Arncliffe) .....	8.92	+	2.11	1.16	26	27	...	...	...	...	...	...			
"	Hull (Pearson Park) .....	2.20	—	.07	.40	26	14	58.0	5, 6	26.0	31	6	15			
X.	Newcastle (Town Moor) .....	1.09	—	1.21	.45	29	14	...	...	...	...	...	...			
"	Borrowdale (Seathwaite).....	23.72	+	8.91	2.51	9	27	...	...	...	...	...	...			
XI.	Cardiff (Ely) .....	5.40	+	.85	1.24	6	22	...	...	...	...	...	...			
"	Haverfordwest .....	5.74	+	.75	1.53	26	24	56.0	6	33.1	30	0	8			
"	Aberystwith (Gogerddan) ...	7.43	+	2.55	2.75	26	21	54.0	5	...	...	...	...			
"	Llandudno .....	2.90	—	.06	.86	26	23	61.0	5	34.0	30 <sup>c</sup>	0	...			
XII.	Cargen [Dumfries] .....	8.00	+	3.98	1.12	26	22	56.0	11	24.0	31	4	...			
XIII.	Edinburgh (Blacket Place)...	1.91	...	...	.29	5	19	57.5	5	26.0	31	3	9			
XIV.	Colmonell .....	4.52	...	...	.62	27	28	57.0	5	24.0	29	...	...			
XV.	Tighnabruach .....	8.78	...	...	.98	4	28	50.0	4 <sup>b</sup>	28.0	29	5	...			
"	Mull (Quinish) .....	9.64	+	2.07	1.26	4	30	...	...	...	...	...	...			
XVI.	Loch Leven Sluices .....	4.40	+	1.09	1.00	4	14	...	...	...	...	...	...			
"	Dundee (Eastern Necropolis) ..	1.35	—	.73	.20	3 <sup>a</sup>	19	57.5	5	24.5	31	5	...			
XVII.	Braemar .....	5.22	+	2.75	1.37	27	25	52.1	5	16.0	31	9	21			
"	Aberdeen (Cranford) .....	2.18	...	...	.38	31	27	57.0	4	21.0	30	9	...			
"	Cawdor (Budgate) .....	4.32	+	1.86	.66	4	27	...	...	...	...	...	...			
XVIII.	Strathconan [Beaully] .....	9.44	+	3.67	1.04	10	17	...	...	...	...	...	...			
"	Glencarron Lodge .....	21.65	...	...	1.76	1	28	53.4	26	25.7	30	4	...			
XIX.	Dunrobin .....	6.24	+	2.87	.69	17	23	56.0	12	29.0	29	3	...			
"	S. Ronaldshay (Roeberry) ...	5.92	+	2.26	.71	1	29	52.0	11	30.0	29	4	...			
XX.	Darrynane Abbey .....	3.95	...	...	.58	28	26	...	...	...	...	...	...			
"	Waterford (Brook Lodge) ...	3.01	—	.63	1.02	26	19	56.0	2	23.0	20	3	...			
"	O'Briensbridge (Ross) .....	4.06	...	...	.41	26	24	...	...	...	...	...	...			
XXI.	Carlow (Browne's Hill) .....	2.00	—	1.12	.74	26	21	...	...	...	...	...	...			
"	Dublin (Fitz William Square) ..	1.07	—	1.09	.26	26	21	58.8	5	32.1	20	0	6			
XXII.	Ballinasloe .....	3.22	—	.20	.42	26	28	54.0	5, 25	31.0	20	2	...			
"	Clifden (Kylemore) .....	12.44	...	...	2.97	22	30	...	...	...	...	...	...			
XXIII.	Waringstown .....	2.69	—	.35	.46	28	20	55.0	11	45.0	10	4	6			
"	Londonderry (Creggan Res.) ..	4.54	+	.33	.87	4	27	...	...	...	...	...	...			
"	Omagh (Edenfel) .....	3.90	+	.22	.37	28	25	55.0	4, 5	27.0	29	9	9			

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

a—and 5, 26. b—and 5, 10, 11, 12. c—and 31.

## METEOROLOGICAL NOTES ON DECEMBER, 1898.

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.

TENTERDEN.—Remarkably warm for the first 19 days, then a few sharp frosts before Christmas; dry from 10th to 26th. Mean temp.  $45^{\circ}0$ , and only one day with the max. below  $40^{\circ}$ . Gales on 27th and 29th. Duration of sunshine 50 hours 40 mins.

HARTLEY WINTNEY.—The early part of the month was mild and wet, and though no R fell from 17th to 26th, the total is  $\cdot 12$  in. above the average. S.W. winds were prevalent, and a S.W. gale occurred on 27th. Ozone was registered on 11 days. Robins' and wrens' nests with eggs were found on 17th. Christmas rose, violets and wallflowers were in bloom on 18th.

WINSLOW, ADDINGTON.—A mild month, the only cold period being from the 20th to the 24th, when the day temp. was low, but the min. did not fall below  $26^{\circ}$ . On 18 days the max. ranged from  $50^{\circ}$  to  $56^{\circ}$ . The wind was very high on the 2nd, 5th and 27th.

WESTLEY, BURY ST. EDMUNDS.—The first three weeks were mild, followed by six frosty days. Violent gales occurred in the last week.

NORWICH, BRUNDALL.—Extraordinarily mild, the mean temp. of the first 18 days being as high as  $47^{\circ}5$ ; while on the 5th the max. was  $55^{\circ}6$  and the min.  $53^{\circ}6$ ; on 6th, max.  $55^{\circ}2$  and min.  $52^{\circ}4$ ; and on 18th, max.  $56^{\circ}0$  and min.  $50^{\circ}4$ . Gales from S.W. on 2nd and 27th. Distant L in N.E. on evening of 7th, L in N. on evening of 28th. H on 20th.

WINTERBOURNE STEEPLTON.—The month was wet and mild, the nights being especially warm. The mean minima in shade and on grass were  $40^{\circ}4$  and  $34^{\circ}1$  respectively, or  $5^{\circ}1$  and  $5^{\circ}0$  above their averages. Fog on 17th and 21st. H on 27th.

TORQUAY, CARY GREEN.—R  $\cdot 15$  in. above the average. Mean temp.  $48^{\circ}8$ , or  $5^{\circ}8$  above the average. Duration of sunshine 59 hours 5 mins., being 4 hours 20 mins. above the average; 9 sunless days.

POLAPIT TAMAR [LAUNCESTON].—The whole month was very wet and the first half stormy, but the temp. was high. S.W. gale at night on 26th and early on 27th. H on 7th, 28th and 31st. T at 6 a.m. on 9th.

WOOLSTASTON.—A mild, warm month, the night temperatures for the first 18 days being unusually high. A wild gale raged on 26th, and the remainder of the month was stormy. Mean temp.  $44^{\circ}3$ .

### WALES.

HAVERFORDWEST.—Extremely mild and wet, with very little sunshine, and only one day of clear sky. Up to the 18th the weather was almost continuously wet, with but one slight frost; from 19th to 23rd, colder and drier weather prevailed, but afterwards every day was wet to the end. Very high temp. prevailed throughout, and the minima on grass on 25th and 26th were  $51^{\circ}6$  and  $52^{\circ}2$  respectively, while the lowest grass min. was  $25^{\circ}0$  on 31st. Gales on 10 days. Spring flowers in bloom, and fruit trees budding.

GOGERDDAN.—Very wet and very mild throughout.

## SCOTLAND.

CARGEN [DUMFRIES].—Stormy, wet, unsettled weather characterised the month. The mean temp.,  $44^{\circ}5$ , is  $5^{\circ}9$  above the average, and the highest recorded in December since observations commenced in 1860, the nearest approach being  $43^{\circ}9$  in 1873. Frost was registered on only 4 days, and the temp. rose above  $50^{\circ}$  on 17 days. Only in 1872, 1876 and 1897 did the fall of R exceed that of December, 1898. Southerly winds were most prevalent; a severe gale blew on 5th, and stiff breezes on 3rd and 4th. The duration of sunshine, although exceeding the average of the last 3 years by 12 hours, is 8 hours less than the December mean. Pastures present quite a spring-like appearance, and snowdrops were in bloom at the end of the month.

EDINBURGH, BLACKET PLACE.—Very mild, the mean temp. ( $44^{\circ}0$ ) being  $5^{\circ}7$  above the average. The only milder Decembers since 1764 were those of 1842, 1843 and 1857, with mean temps. of  $45^{\circ}6$ ,  $47^{\circ}8$  and  $46^{\circ}5$  respectively. Duration of sunshine only one-fifth of the average; but rainfall slightly below the mean. The max. temp. on 5th,  $57^{\circ}5$ , is the highest recorded in December since 1864, while the mean temp. of the day,  $54^{\circ}0$ , is higher than any recorded in December, January or February for at least 42 years. A very heavy W.S.W. gale occurred on 27th, and a little S and sleet fell on 31st.

COLMONELL.—R  $\cdot 64$  in. below, and mean temp.  $8^{\circ}0$  above, the average of 22 years, the mean temp. being the highest recorded in that period.

TIGHNABRUACH.—The R was most persistent and excessive, and accompanied by high winds from all points of the compass.

MULL, QUINISH.—A very wet and stormy month from first to last, with gales from all points of the compass. T and L on 26th and 27th.

ABERDEEN, CRANFORD.—The month was very mild, with a strong S.W. gale on 27th.

S. RONALDSHAY, ROEBERRY.—A very rough, wet month. Mean temp.  $41^{\circ}7$ , being  $1^{\circ}9$  above the average of 8 years.

## IRELAND.

DARRYNANE ABBEY.—A dry and remarkably mild month, most of the R which fell being mere drizzle. Very strong W.N.W. gale on 27th. H on 31st.

WATERFORD, BROOK LODGE.—The month was very mild. Several unusual plants were in bloom in the garden, and the fences golden with furze bloom. W.S.W. gale on 4th, and gale from W. with H on 27th. Fog on 17th.

DUBLIN, FITZWILLIAM SQUARE.—The warmest December on record for many decades, the mean temp. being  $6^{\circ}3$  above the average. There was scarcely a trace of frost, S, sleet and H were entirely absent and S.W. or W. winds prevailed throughout. The R was not half the average, while the number of rainy days much exceeded it. Lunar halo on 28th. High winds on 22 days, reaching the force of a gale on 5. Fog on 3 days.

CLIFDEN, KYLEMORE HOUSE.—T and L on 3rd. Great R on 22nd, causing floods on that and the two following days. In the last ten days of the month  $8\cdot44$  in. of R fell.

OMAGH, EDENFEL.—Although the temp. fell to or below freezing-point on 9 nights, the cold was of the most fleeting kind, and hardly affected the continued mild character of the month and the season generally. R was frequent and heavy, accompanied mostly by strong winds, reaching the force of a gale on 27th, occasioning considerable damage over a wide area.