

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

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JULY, 1893.

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THE DROUGHT OF 1893.

It is, of course, impossible to deal exhaustively with so great a subject as the recent drought in the few pages of this magazine which can be devoted to it. We have therefore decided upon giving facts rather than description, and that necessarily makes the present number much fuller of tables than usual. It will be seen that we have given the daily fall for the four months of March, April, May, and June at twelve widely spread stations—seven in England, one in Wales, and two each in Scotland and in Ireland.

According to these returns, the only partial droughts at these stations exceeding 45 consecutive days were at—

Stowell Rectory, Somerset	74 days.
Hesley Hall, Tickhill.....	76 „
Sedgebrook, Northampton	77 „
Reigate, Surrey	77 „
Diss, Norfolk	80 „

But the following letter from Mr. Bicknell shows that at some places the fall on or about May 16th was not heavy enough to break the drought, and that at his station the partial drought lasted 110 days; and but for the above-mentioned rain of May 17th, a similar or even slightly greater duration would have been recorded for London, Reigate, Northampton, and other places. Mr. Bicknell's Beckenham station is not far from Greenwich, and we have therefore worked up the figures as published in the weekly returns of the Registrar General, and it appears that the fall there in the 113 days (March 2nd to June 22nd) was only 1·12 in., giving the longest partial drought on record in this country.

110 DAYS OF PARTIAL DROUGHT.

To the Editor of the Meteorological Magazine.

SIR,—The fall of over half-an-inch of rain on the night of the 22nd and 23rd inst., has at length put an end to the extraordinary drought of the last four months.

The following table shows the total from 4th March to 21st June (both included), to have been only 0·67 in., falling on 16 of the 110 days :—

1893.	in.	days.	1893.	in.	days.
March 4 ...	·01		May 1 ...	·01	
„ 13 ...	·02		„ 16 ...	·03	
„ 15 ...	·03		„ 17 ...	·13	
„ 16 ...	·04		„ 18 ...	·03	
	— ·10	..... 4	„ 19 ...	·01	
			„ 23 ...	·04	
			„ 29 ...	·11	
				— ·36	..... 7
April 16 ...	·02		June 4 ...	·04	
„ 20 ...	·04		„ 6 ...	·09	
„ 29 ...	·02			— ·13	..... 2
	— ·08	..... 3	Total ...	<u>0·67</u>	<u>16</u>

Yours truly,
PERCY BICKNELL.

Foxgrove, Beckenham, 25th June, 1893.

THE DROUGHT IN 1844.

To the Editor of the Meteorological Magazine.

SIR,—Permit me to point out what appears a small discrepancy. On page 65 of the *Met. Mag.* for June, you give the rainfall for Greenwich for 1844 as follows :—

April 0·23 May 0·15

On page 11, *British Rainfall*, 1879, the rainfall for 1844 is given as follows, viz. :—

April 0·35 May 0·30

or a total in one case of 0·38 and in the other of 0·65, which would considerably alter the comparison on page 65 of *Met. Mag.* for June.

Your truly,
CHARLES L. BROOK.

Harewood Lodge, Meltham, Yorkshire.

[WE regret very much that Mr. Brook is right, and that the Greenwich publications misled us. We took the figures given on page 65 from Mr. Glaisher's table in the *Proc. Met. Soc.*, Vol. V. (1871), pages 94 to 98, and took the further precaution of checking them against the volume of the *Greenwich Observations* for the year, where the readings are printed in extenso. But on re-examination we find that these are the readings of the gauge on the top of the Library! There was a gauge on the ground, and it gave the larger values of 0·35 and 0·30 in. as correctly given in *British Rainfall*, 1879, but that gauge was read only at the end of the month! It is a great pity that amid the millions of figures issued from Greenwich, there is nowhere a systematic statement of the record of each gauge from its erection to its abandonment.—ED.]

MARCH, 1893.

	<i>Surrey, Reigate, Holmets.</i>	<i>Northampton, Pitsford, Sedgebrook.</i>	<i>Norfolk, Diss.</i>	<i>Somerset, Templecombe, Stowell Rec.</i>	<i>Worcester, Tenbury, Orleton.</i>	<i>Nottingham, [Tickhill], Hesley Hall.</i>	<i>Lurham, Barnard Castle, Whorlton.</i>	<i>Cardigan, Aberystwith, Gogerddan.</i>	<i>Edinburgh, Blacket Place.</i>	<i>Inverness, Loch Ness, Dunnadrochit.</i>	<i>Tipperary, Henry Street.</i>	<i>Cavan, Lough Sheelin, Arley.</i>
1	in. ·35	in. ·01	in. ·20	in. ·17	in. ·12	in. ·15	in. ...	in. ·04	in. ·37	in. ·07	in. ·06	in. ·06
2	...	·05	·01	·09	·10	...	·37	·13	...	...	·11	·30
3	·06	...	·06	·11	·07	·08	·04	·23	·07	·03	...	·08
4	...	...	·01	...	...	...	...	·02	·04	·01	...	·02
5	...	...	...	·01	...	...	...	...	...	·01	...	·01
6	...	...	...	·06	·05	·03	·03	·30	·08	·01	...	·01
7	...	...	...	·02	·01	...	...	·04	...	...	·05	·01
8	...	...	...	...	...	...	...	...	...	·02	...	...
9	...	...	...	·02	...	...	...	...	...	·22	..	...
10	...	...	...	...	...	...	...	...	...	·02	...	...
11	...	...	...	·01	...	...	...	...	...	·01	...	...
12	...	...	...	...	...	...	...	...	...	·02	...	...
13	·09	...	...	·01	...	...	...	...	...	·02	·04	..
14	·03	..	...	·03	...	...	...	...	...	·20	·01	·12
15	·07	...	...	·02	·02	·01	·09	·05	·17	·12	·05	·02
16	·06	..	·05	·14	·02	·04	·18	...	·05	·19	·02	·20
17	...	·01	·01	...	...	·02	...	·15	...	·04	·10	·01
18	...	...	·01	...	...	...	...	..	...	...	·07	·02
19	...	...	...	...	...	...	...	..	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	..	...	...	...	...	...	...	...	...
24	...	..	...	...	...	...	...	...	...	...	·03	...
25	...	...	...	...	...	...	...	...	...	·15	...	...
26	...	...	...	...	...	...	...	...	·05	...	...	...
27	...	...	...	...	...	...	·02	...	...	...	...	...
28	...	...	...	...	...	...	...	..	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	..	...	...	...	...	...	...	...	...
31	...	..	...	...	...	...	...	·10	·05	·06	·18	·15
Total	·66	·07	·35	·69	·39	·33	·73	1·06	·88	1·20	·72	1·01

APRIL, 1893.

	<i>Surrey,</i> Reigate, Holmfels.	<i>Northampton,</i> Pitstord, Sedgebrook.	<i>Norfolk,</i> Diss.	<i>Somerset,</i> Templecombe, Stovell Rev.	<i>Worcester,</i> Tenbury, Orleton.	<i>Nottingham,</i> [Tinkhill] Hesley Hall.	<i>Durham,</i> Barnard Castle, Whorlton.	<i>Cardigan,</i> Aberystwith, Gogerddan.	<i>Edinburgh,</i> Blacket Place.	<i>Inverness,</i> Loch Ness, Drumadrochit.	<i>Tipperary,</i> Henry Street.	<i>Cavan,</i> Lough Sheelin, Arley.
1	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
242	..02	..	..40	..	..02	..	..01
3
4
5
676	..	..
7
8
9
1006	..	..
11
1202	..	..	..
1301	..	..	..	..	..	..	..	..	..
1403	..	..
1558	..40	..	..01
16	..05	..15	..07	..02	..10	..18	..31	..10	..31	..	..30	..56
1701	..	..	..08	..09	..05	..	..22	..05	..16	..14
1801	..	..27	..01	..01	..01
1907	..05	..	..
2012	..	..	..	..	..05	..	..02	..06	..	..
2115	..
2201	..	..	..	..	..	..	..02	..03
2302	..	..	..	..	..	..	..	..
24
25
26
2702	..	..	..01	..	..
2808	..04	..10	..06
2904	..01	..09	..08	..01	..09	..	..07	..08	..06	..02
3001	..	..03	..03	..	..04	..	..20
Total	..05	..32	..09	..14	..69	..30	..56	..53	1..64	1..61	..80	1..04

MAY, 1893.

	<i>Surrey, Reigate, Holmfels.</i>	<i>Northampton, Pitsford, Sedgebrook.</i>	<i>Norfolk, Diss.</i>	<i>Somerset, Templecombe, Stowell Rec.</i>	<i>Worcester, Tenbury, Orleton.</i>	<i>Nottingham, Pickhill, Hesley Hall.</i>	<i>Durham, Barnard Castle, Whorlton.</i>	<i>Cardigan, Aberystwith, Gogerddun.</i>	<i>Edinburgh, Blacket Place.</i>	<i>Inverness, Loch Ness, Drumnadrochit.</i>	<i>Tipperary, Henry Street.</i>	<i>Cavan, Lough Sheelin, Arley.</i>
1	in. ...	in. ...	in. .06	in. .01	in. .07	in. .06	in. .02	in. .17	in. ...	in. ...	in. .02	in. .22
2	... ..	.05	.02	...	.10	.05	.14	.18	.15	.02	...	.07
3	... ..	.04	...	...	...	...	...	...	.02	.07	...	...
4	... ..	...	...	...	...	...	...	...	...	...	...	...
5	... ..	...	...	...	...	...	...	...	...	...	...	...
6	... ..	...	...	...	...	...	...	...	...	...	...	...
7	... ..	...	...	...	...	...	...	...	...	...	...	...
8	... ..	...	...	...	...	...	...	...	...	...	...	...
9	... ..	...	...	...	...	...	...	...	...	...	...	...
10	... ..	...	...	...	...	...	...	...	...	.06	...	...
11	... ..	...	...	...	...	...	...	...	.02	.14	...	...
12	... ..	...	...	...	...	...	...	...	...	.04	...	...
13	... ..	...	...	...	...	...	...	...	...	...	...	...
14	... ..	...	...	.02	.02	...	...	.12	...	...	...	...
15	... ..	.15	...	.02	.52	...	...	.62	...	...	...	...
16	.01	.08	...	.13	.18	.04	.09	.21	...	.01	.57	.11
17	.04	1.03	.33	.21	.20	.81	1.25	.17	.51	.09	.28	.05
18	.43	.04	...	.50	.62	.09	.17	.06	...	.23	.53	.20
19	.08	.11	...	.15	.22	.38	.23	.15	.08	.07	.53	.71
20	.05	.07	.08	.01	.17	.03	.09	.27	.21	.07	.07	.62
21	.04	...	.52	...	...	...	.02	...	.06	...	.07	.15
22	...	...	.03	.03	.01	...	...	.07	.01	.03	.03	.28
23	...	...	...	.06	...	.01	.02	...	...	.06	.13	.06
24	...	...	...	.01	...	...	...	...	...	.04	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	.01	...	...
28	...	...	.01	...	...	.20	.01	...	.29	.01	...	...
29	.12	.04	.21	...	...	.25	.03	...	.02	...	.23	.05
30	...	...	.01	...	...	...	...	...	...	.08	...	...
31	...	...	.02	...	...	...	...	...	...	...	...	...
Total	.77	1.61	1.29	1.15	2.11	1.92	2.07	2.02	1.37	1.03	2.46	2.52

JUNE, 1893.

	<i>Surrey, Reigate, Holmets.</i>	<i>Northampton, Pitsford, Sedgebrook.</i>	<i>Norfolk, Diss.</i>	<i>Somerset, Templecombe, Stowell Rec.</i>	<i>Worcester, Tenbury, Orleton.</i>	<i>Nottingham, Treckhill, Hesley Hall.</i>	<i>Durham, Barnard Castle, Whorlton.</i>	<i>Cardigan, Aberystwith, Gogerddan.</i>	<i>Edinburgh, Blacket Place.</i>	<i>Inverness, Loch Ness, Drumnadrochit.</i>	<i>Tipperary, Henry Street.</i>	<i>Cavan, Lough Sheelin, Arley.</i>
1	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
2	...	...	...	...	13	...	...	...	...	...	02	04
3	03	...	...	05	...	...	13	...	03	02	21	07
4	...	02	32	08	07	30	09	25	...	40	14	30
5	...	..	...	16	05	...	...	10	09	21	...	19
6	04	...	...	01	...	...	09	...	...	...	...	06
7	...	...	...	...	05	...	...	...	01	01	..	...
8	...	...	...	...	...	...	01	...	...	01	...	...
9	...	...	...	...	...	...	...	...	...	...	...	43
10	...	...	...	...	...	...	...	..	...	...	...	...
11	...	...	...	...	..	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	04	...	...	...	36	...	...	...	...
14	...	...	06	01	67	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	04	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	01
17	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	09	...	...
19	...	...	46	...	...	...	10	...	..	02	...	...
20	...	...	01	...	...	...	...	...	...	...	..	...
21	...	...	07	...	...	01	...	45	...	27	...	...
22	25	34	39	17	31	17	14	29	100	39	03	15
23	01	17	02	50	02	15	15	15	88	32	09	10
24	04	...	...	11	01	02	03	...	01	11	11	12
25	01	...	...	10	...	...	...	40	20	01	...	04
26	09	10	13	10	27	57	19	23	12	...	85	20
27	25	01	07	14	03	...	02	37	06	28	20	29
28	...	...	01	10	03	02	02	...	04	20	30	49
29	...	...	...	05	...	...	...	...	...	...	...	..
30	...	...	...	01	...	...	...	...	...	...	..	...
Total	72	64	154	163	164	124	100	260	248	234	195	249

RAINFALL IN 1893.

To the Editor of the Meteorological Magazine.

SIR,—The amount and distribution of rain in this district during the last six months have been so different from what I understand has occurred in England, that I think it may interest you to receive a summary of it up to the present time.

The older people in the district tell me that they do not remember so “soft” a spring.

Month.	Rainfall. in.	No. of days on which rain fell.	Longest interval without rain.
January	4·78	21	5 days
February	7·38	22	3 „
March	4·55	21	5 „
April	3·34	12	8 „
May	2·96	16	6 „
June	1·12	10	8 „

24·13 in. 102 days.

Yours truly,

W. D. ANDERSON, M.D.

Ardsheal, Ballachulish, Argyleshire, July 10th, 1893.

THE SUMMER OF 1615.

To the Editor of the Meteorological Magazine.

SIR,—The following extract from Lyson’s “Derbyshire,” p. 304, taken from the parish register of Youlgreave, about three miles from Bakewell, may, at the present time, be of interest :—

“1615. A dry Summer.

“There was no rayne fell uppon the earth from the 25th day of March till the 2d day of May, and then there was but one shower ; after which there fell none tyll the 18th day of June, and then there fell an other ; after y^t there fell none at all till the 4th day of August, after which tyme there was sufficient rayne uppon the earth ; so that the greater part of this land, especially the South p^t were burnt upp both corne and hay. An ordinary sumer load of Hay was at 2*l*., and little or none to be gott for money.

“This p^t of the peake was very sore burnt upp, onely Lankishyre and Cheshyre had rayne ynough all summer ; and both corne and hay sufficient.

“There was very little rayne fell the last winter but snowe only.”

I remain, yours truly,

C. MURRAY AYNLEY.

St. Elmo, Southsea, July 6th, 1893.

REVIEWS.

The Mechanics of the Earth's Atmosphere. A collection of translations by CLEVELAND ABBE. Smithsonian Institution, Washington: 1891. Large 8vo, 324 pages.

Smithsonian Meteorological Tables. [Based on Guyot's *Meteorological and Physical Tables.*] Smithsonian Institution, Washington: 1893. Large 8vo, lix.—262 pages.

WE are very glad to see the Smithsonian Institution once more devoting some of its great powers to the publication of meteorological works. It is not easy to imagine two more solid foundations for future work than the above.

Professor Abbe's volume is a series of excellent translations of eighteen memoirs on, or closely related to, the mechanics and dynamics of the air, and may be said to embody the views of most of the greatest authorities upon the subject. This is a strong expression, but when we state that the list includes Bezold, Ferrel, Hagen, Helmholtz, Hertz, Kirchoff, Margules, Oberbeck, and Rayleigh, we know that we have proved our point. The papers are quite sufficiently difficult for all but advanced students, even in the translation which Prof. Abbe has now given to the world; in their original German their readers among English-speaking people must have been still more limited.

As regards the second work, it has the great recommendation of convenient size and many of the merits of its predecessors—the various editions of Guyot, so dear to meteorological workers; but, as stated in the Preface, it is not a re-issue of Guyot, but a new work set up *de novo* and corrected to the very last moment. Happily, in many cases the corrections are unimportant; for instance, Table 10 for reducing barometer readings to 32° is entirely reset, but at all ordinary temperatures the change is either *nil* or $\cdot 001$ in., and as far as we can see, the values given in the Royal Society Report in 1840 are in no case more than $\cdot 003$ in. in error. Would that all readings were as accurate as those old tables!

Seeing the degree of precision here adopted, we are rather surprised to find Guyot's table (D XXVI.) not merely robbed of its difference column, but entirely shorn of the third decimal and packed into half of page 119. We are inclined to agree with the Meteorological Council in regarding the thousandths of an inch of barometrical pressure as unimportant, and Table 33 looks as if Prof. Langley thought so too, but if so, why give Table 10 in such detail? The answer occurs to us, "Because, although $\cdot 01$ in. is near enough for meteorological work, for tracing storm paths, and such like matters, $\cdot 01$ in. means 10 ft. of altitude, and for hypsometric work greater precision is necessary." This may be the reason for the detail in Table 10, but if so, it is a strong argument for Table 33 having been given in its original form.

Table 46 is, we think, new. It is introduced by the following paragraph:—

REDUCTION OF SNOWFALL MEASUREMENT.

“The determination of the water equivalent of snowfall has usually been made by one of two methods—(a) by dividing the depth of snow by an arbitrary factor ranging from 8 to 16 for snow of different degrees of compactness; (b) by melting the snow and measuring the depth of the resulting water. The first of these methods has always been recognized as incapable of giving reliable results; and the second, although much more accurate, is still open to objection. After extended experience in the trial of both these methods, it has been found that the most accurate and most convenient measurement is that of weighing the collected snow, and then converting the weight into depth in inches. The method is equally applicable whether the snow as it falls is caught in the gage, or a section of the fallen snow is taken by collecting it in an inverted gage.”

“TABLE 46. — *Depth of water corresponding to the weight of snow (or rain) collected in an 8-inch gage.*

“The table gives the depth to hundredths of an inch, corresponding to the weight of snow or rain collected in a gage having a circular collecting mouth 8 inches in diameter—this being the standard size of gage used throughout the United States.

“The argument is given in avoirdupois pounds, ounces and quarter ounces in order that it shall be adapted to the customary graduation of commercial scales.”

In the first place, we are glad of the incidental remark as to the “standard size of gauge used throughout the United States.” Very little information as to the patterns of rain-gauge used in the United States is to be found in any publication we have ever seen, and in bygone years some very extraordinary patterns were used. This paragraph implies a much improved state of affairs, though we suppose that even the “standard” gauges are in many cases on roofs. However, our subject now is snow, not rain. We are not sure that Mr. Curtis (who signs the Introduction) is right as to the superiority of “weighing” over “melting,” and we are certain that the use of a Sidebottom snow-gauge is the best plan. It is all very well saying that it is easily done in any laboratory, but every observer has not a laboratory, and by the time that the snow, ice, and water are all scraped out of the gauge into the scale pan some error will have crept in; and if it be suggested that the snow need not be disturbed, but the gross weight taken, and then the weight of the empty can allowed for, we think that there will be both more trouble and more liability to error than by the addition of a known quantity of hot water.

Tables 64 to 69 inclusive are extremely handy, more so than those in the *Tables Météorologiques Internationales*, and than any that we have ever seen. We notice that occasionally the third decimal differs from the International Tables, thus proving the accuracy of

both, and that the Smithsonian ones have been worked independently because the difference is due to the following different values being taken :—

<i>Tables Internationales</i>	1 millimetre = 0·03937079 inch.
Smithsonian Tables	1 „ = 0·03937 inch.

It is these 79 hundred millionths of an inch which occasionally toss the last figure up in the International Tables.

In Table 92 there is some terrible mistake which we cannot understand. It is not a misplaced decimal, not the misprint of a square mile for an acre, but the values are all about 4,000 times too small. Nearly thirty years ago, in *British Rainfall*, 1865, Appendix page vi., we gave a table headed, “On the weight and bulk of rain,” in which, among other data, we gave—

1 inch over one acre = 22623 gallons, or 101 tons weight.

Table 92 is said to be computed on the assumption that—

1 inch over one acre = 5·828648 gallons, or 16·65328 tons per square mile.

though how these extraordinary figures have been arrived at we cannot imagine.

Rejecting the fractions of a gallon and reducing all the values to the fall over an acre, we have—

	One inch over an acre equals		
	Gallons.		Tons.
<i>British Rainfall</i> , 1865	22623	.....	101
Smithsonian Tables	6	.....	0·03

When, in 1865, working our table, we took the contents of an Imperial gallon as 277·268 cubic inches, we see that in the present work the value of 277·463 has been adopted. Having this, the calculation is very simple :—

An acre contains 6,272,640 square inches.

One inch of rain over an acre is therefore 6,272,640 cubic inches.

An Imperial gallon contains 277·463 cubic inches.

Then—
$$\frac{6,272,640}{277·463} = 22607 \text{ gallons per acre.}$$

which differs from our former value by only the 16 gallons, which represent the difference between 277·268 in. and 277·463 in.

And so with respect to the weight in tons per square mile, adopting their own constant it works out to about 64,640 tons, whereas they give 16½.

We very much regret that such an error should have slipped into a work of great importance and utility—a work which, as far as we have tested it, is in other respects absolutely perfect.

ROYAL METEOROLOGICAL SOCIETY.

THE last meeting of this Society for the present session, was held on Wednesday evening, June 21st, at the Institution of Civil Engineers, 25, Great George-street, Westminster. Dr. C. Theodore Williams, President, in the chair.

Mr. R. H. Scott, F.R.S., read a paper on "Fifteen Years Fogs in the British Islands, 1876-1890," which was a discussion of the fog observations made at the stations which appear in the *Daily Weather Report*. The winter is the foggiest season, and the greatest numbers of fog observations are reported from London, Yarmouth, Oxford and Ardrossan. In the summer half-year the fog prevalence attains a local maximum in two different districts, viz.: at Scilly, St. Ann's Head, and Roche's Point, in the South-West; and at Sumburgh Head and Wick in the North. These are evidently sea fogs, accompanying warm weather. Mr. Scott has made a collation of the observation of fog and the force of the wind, and finds that fog almost invariably occurs only with calm or very light winds. The author says that it seems to be generally assumed that fogs in London are increasing in frequency and in severity. From the observations, it appears that there is no trace of a regular increase, either in the monthly or in the annual curve. All that can be said, is, that taking the three lustral periods of 5 years each, the last of these, 1886-90, comes out markedly the worst, the successive totals being 262, 250, and 322. A long and animated discussion followed, in which the following gentlemen took part:—The President, Admiral Maclear, Honourable F. A. Rollo Russell, Dr. Marcet, Rev. Clement Ley, Messrs. R. H. Curtis, Gaster, Bruce, Brodie, Dixon, Symons, Inwards, and Marriott. The discussion turned chiefly upon the definition of fog, dew and mist, and it is not an exaggeration to say, that there was no agreement whatever among the various speakers. The question of the "personal equation" of the observers was also referred to, and more than one speaker called attention to the extremely discordant results for neighbouring stations.

A paper on "Upper Currents of Air over the Arabian Sea," by Mr. W. L. Dallas, F.R.Met.Soc., of the Indian Meteorological Office, was also read, in which it is shown that there exists a regular arrangement in the vertical succession of the upper currents, and that the Doldrum region, and not the geographical equator, is really the dividing line between the currents of the northern and southern hemispheres.

Mr. E. D. Archibald, M.A., F.R.Met.Soc., gave an address on "Australian Climate and Weather," dealing at some length with the different climates of the various Colonies of the Continent, and also of the North and South Islands of New Zealand. His paper was illustrated by a number of lantern photographs.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1893.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver. Cloud
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth. inches	Days.	
	Temp. °	Date.	Temp. °	Date.									
England, London	52·7	31	15·4	5	40·0	30·9	32·8	0-100 89	69·1	10·0	1·44	17	7·3
Malta.....	65·4	10	39·0	19	57·7	46·6	43·8	81	106·5	36·5	6·64	20	5·7
<i>Cape of Good Hope</i> ...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Mauritius</i>	85·4	18	67·6	31	82·9	73·1	70·6	81	141·0	60·4	12·55	25	6·9
Calcutta	79·9	16a	45·9	28	74·7	54·1	54·0	72	133·6	39·0	·70	2	1·8
Bombay	86·8	9	61·1	31	81·1	66·3	62·4	68	132·7	51·7	·00	0	0·7
Ceylon, Colombo	91·0	4	68·5	31	87·5	71·6	69·6	76	155·5	60·0	5·40	10	3·2
Melbourne.....	95·5	26	45·1	25	76·6	55·2	52·4	63	144·6	34·2	·19	4	5·2
Adelaide	105·6	3	52·8	24	84·0	60·1	50·3	47	166·4	43·5	·03	4	4·0
Sydney	88·2	13	57·5	16	75·3	63·3	60·6	72	150·7	46·2	4·57	19	5·2
Wellington	82·0	24	44·5	8	69·9	55·6	53·1	71	150·0	39·0	3·37	15	5·0
Auckland	81·5	26	54·0	6	73·4	60·9	60·8	81	143·0	40·0	5·05	15	5·8
Jamaica, Kingston.....	90·8	15	65·3	9	85·6	67·3	64·4	73	...	...	·38	2	2·6
Trinidad	88·0	b	63·0	5, 8	85·8	65·5	67·4	78	143·0	59·0	3·43	13	...
Toronto	39·8	29	—17·8	11	21·5	6·4	12·3	85	...	—22·0	2·99	24	7·0
New Brunswick, Fredericton	50·8	2	—22·5	23	18·9	—3·8	7·0	82	...	...	3·81	9	4·0
Manitoba, Winnipeg }	25·0	8	—42·5	26	1·9	—21·6	...	...	...	...	1·88	16	5·0
British Columbia, }	51·3	1	—1·5	31	40·5	31·2	34·2	89	...	...	4·56	18	7·0
Esquimalt													

a 17th and 18th. b Various.

REMARKS.

MALTA.—Atmospheric pressure was unusually low, and the rainfall nearly double the average. TSS on 3 days; H on 8 days. Mean temp. 51°·1. Mean hourly velocity of wind 11·4 miles. J. SCOLES.

Mauritius.—Mean temp. of air 0°·8 below, mean dew point 0°·8 above, and rainfall 5·41 in. above, their respective averages. Mean hourly velocity of wind 11·9 miles, or 0·7 mile above average; extremes, 37·3 on 27th, and 2·2 on 24th and 29th; prevailing direction, E.S.E. to E. T on 3 days, L on 8th, T and L on 4 days. From the 18th to the 28th two cyclones passed at safe distances from the island one from N. to E. and S.E., and the other from N. to N.W. and W. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on the 14th and 26th; L alone was seen on the 19th and 22nd. F. C. H. CLARKE, Lt.-Col. R.E.

Melbourne.—Distant T on the 13th and 19th; L on the 18th.

R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 2°·5 below the average of 36 years. Very little rain fell, the total being ·82 in. below the average. C. TODD, F.R.S.

Sydney.—Mean temp. 2°·1 below the average of 35 years; humidity 0·4 below, and rainfall ·89 in. above, the average. Very heavy gale from S.S.W. to S.E., January 1st to 3rd. H. C. RUSSELL, F.R.S.

Wellington.—The early part of the month was showery, then fine from 6th to 15th, with N.W. winds, strong on 11th and 12th; from 16th to 18th heavy E, and the remainder of the month fine, with intervals of showery days, and strong winds from N.W. on 20th, 21st and 24th. Earthquakes on 13th, at night (slight E. to W.), and on 28th, at 6·4 a.m. (slight from S.E.) R. B. GORE.

Auckland.—An unusually wet January, the rainfall being nearly double the average of 26 years. Barometrical pressure and mean temp. close to the average.

T. F. CHEESEMAN.

SUPPLEMENTARY TABLE OF RAINFALL, JUNE, 1893.

[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.			
II.	Dorking, Abinger Hall.	·83	XI.	Builth, Abergwessin Vic.	3·97
„	Birchington, Thor	·55	„	Rhayader, Nantgwillt..	3·90
„	Brighton, Prestonville Rd	...	„	Corwen, Rhug	2·29
„	Hailsham	·73	„	Carnarvon, Cocksidia ...	2·62
„	Ryde, Thornbrough	1·56	„	I. of Man, Douglas	1·41
„	Alton, Ashdell	·82	XII.	Stoneykirk, Ardwell Ho.	1·67
III.	Oxford, Magdalen Col...	·67	„	New Galloway, Glenlee	2·03
„	Banbury, Bloxham	·97	„	Melrose, Abbey Gate...	2·24
„	Northampton, Sedgebrook	·64	XIII.	N. Esk Res. [Penicuik]	4·70
„	Alconbury	·72	„	Edinburgh, Blacket Pl..	2·48
„	Wisbech, Bank House..	1·62	XIV.	Glasgow, Queen's Park.	2·40
IV.	Southend	·64	XV.	Islay, Gruinart School..	1·43
„	Harlow, Sheering	·59	XVI.	Dollar	2·05
„	Colchester, Lexden	·64	„	Balquhiddel, Stronvar..	2·51
„	Rendlesham Hall	·75	„	Coupar Angus Station..	1·87
„	Diss	1·54	„	Dunkeld, Inver Braan..	2·29
„	Swaffham	1·23	„	Dalnaspidal H.R.S. ...	2·34
V.	Salisbury, Alderbury...	·69	XVII.	Keith H.R.S.	2·08
„	Bishop's Cannings	2·34	„	Forres H.R.S.	2·34
„	Blandford, Whatcombe.	1·31	XVIII.	Fearn, Lower Pitkerrie.	·96
„	Ashburton, Holne Vic...	1·64	„	Loch Shiel, Glenaladale	...
„	Okehampton, Oaklands.	·74	„	N. Uist. Loch Maddy ...	2·10
„	Hartland Abbey	1·07	„	Invergarry	1·05
„	Lynmouth, Glenthorne.	·64	„	Aviemore H.R.S.	2·55
„	Probus, Lamellyn	1·05	„	Loch Ness, Drumnadrochit	2·34
„	Wincanton, Stowell Rec.	1·63	XIX.	Invershin	1·40
„	Weston-super-Mare	·72	„	Scourie	1·65
VI.	Clifton, Pembroke Road	1·20	„	Watten H.R.S.	1·05
„	Ross, The Graig	1·08	XX.	Dunmanway, Coolkelure	2·86
„	Wem, Clive Vicarage ...	1·66	„	Fermoy, Gas Works ...	1·24
„	Cheadle, The Heath Ho.	1·40	„	Killarney, Woodlawn ...	1·52
„	Worcester, Diglis Lock	·89	„	Tipperary, Henry Street	1·95
„	Coventry, Coundon	1·11	„	Limerick, Kilcornan ...	1·22
VII.	Ketton Hall [Stamford]	1·00	„	Ennis	1·40
„	Grantham, Stainby	·82	„	Miltown Malbay	1·11
„	Horncastle, Bucknall ...	1·59	XXI.	Gorey, Courtown House	1·60
„	Workshop, Hodsck Priory	·93	„	Mullingar, Belvedere...	2·15
VIII.	Neston, Hinderton	2·09	„	Athlone, Twyford	2·67
„	Knutsford, Heathside...	1·62	„	Longford, Currygrane...	2·68
„	Lancaster, Rose Bank...	1·61	XXII.	Galway, Queen's Coll...	2·06
„	Broughton-in-Furness..	1·58	„	Crossmolina, Enniscoee..	2·12
IX.	Ripon, Mickley	1·60	„	Collooney, Markree Obs.	2·54
„	Scarborough, South Cliff	1·65	„	Ballinamore, Lawderdale	2·65
„	East Layton [Darlington]	1·08	XXIII.	Lough Sheelin, Arley ..	2·49
„	Middleton, Mickleton..	1·25	„	Warrenpoint	1·86
X.	Haltwhistle, Unthank..	2·32	„	Seaforde	·99
„	Bamburgh	1·11	„	Belfast, Springfield	1·30
„	Newton Reigny	2·11	„	Bushmills, Dundarave...	1·57
XI.	Llanfrechfa Grange	·90	„	Stewartstown	2·64
„	Llandovery	2·43	„	Buncrana .....	...
„	Castle Malgwyn	1·52	„	Lough Swilly, Carrablagh	1·92

JUNE, 1893.

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.	Difference from average 1880-9.	Greatest Fall in 24 hours		Max.	Min.		In shade.	On grass.				
				Dpth	Date		Deg.				Date.			
												inches.	inches.	in.	Deg.	Date	Deg.	Date.
I.	London (Camden Square) ...	·73	— 1·28	·24	22	9	90·4	19	38·3	1	0	0		
II.	Maidstone (Hunton Court)...	1·05	— ·57	·61	22	10	...	...	...	...	...	...
III.	Strathfield Turgiss	·80	— 1·00	·21	22	14	90·3	19	32·9	1	0	2		
III.	Hitchin	·78	— 1·08	·29	22	7	86·0	19	37·0	2	0	...		
IV.	Winslow (Addington)	·76	— 1·10	·37	22	7	88·0	19	33·0	1	0	1		
IV.	Bury St. Edmunds (Westley)	1·41	— ·38	·76	19	8	79·0	16 ^a	42·0	1,3	0	...		
V.	Norwich (Cossey)	1·41	— ·14	·50	22	8	88·0	20	...	...	...	...
V.	Weymouth (Langton Herring)	·59	— 1·64	·19	26	5	83·0	19	45·0	1	0	...		
"	Torquay (Cary Green)	·71	...	·27	26	6	79·2	19	46·0	1	0	0		
"	Bodmin (Fore Street)	1·06	— 1·69	·27	22	9	...	...	...	...	...	...
VI.	Stroud (Upfield)	1·41	— ·98	·34	14	10	86·0	18 ^a	...	...	0	...
"	Church Stretton (Woolstaston)	1·79	— ·76	·30	14	13	78·5	18	43·0	1	0	0		
"	Tenbury (Orleton)	1·64	— ·97	·67	14	11	85·5	17	34·2	1	0	1		
VII.	Leicester (Barkby)	·73	— 1·62	·25	22	7	89·0	19	36·0	11	0	0		
"	Boston	1·19	— ·70	·35	19	9	85·0	19	40·0	1,3	0	...		
"	Hesley Hall [Tickhill]	1·24	— ·68	·57	26	7	87·0	18	39·0	1,12	0	...		
VIII.	Manchester (Plymouth Grove)	1·52	— 1·13	·70	26	10	90·0	18	42·0	1	0	0		
IX.	Wetherby (Ribston Hall) ...	·98	— ·91	·40	27	7	...	...	...	...	...	...
"	Skipton (Arncliffe)	2·87	— ·49	·68	23	11	...	...	...	...	...	...
"	Hull (Pearson Park)	1·20	— ·55	·53	26	8	84·0	19	39·0	2	0	0		
X.	Newcastle (Town Moor)	1·03	— ·61	·28	23	10	...	...	...	...	...	...
"	Borrowdale (Seathwaite)	6·11	— ·47	1·43	28	13	...	...	...	...	...	...
XI.	Cardiff (Ely)	·72	— 1·71	·24	22	8	...	...	...	...	...	...
"	Haverfordwest	1·33	— 1·23	·78	27	6	85·6	19	35·3	2	0	0		
"	Aberystwith, Gogerddan	2·60	...	·45	21	9	86·0	17	33·0	1	0	...		
"	Llandudno	2·14	+	·37	·69	26	7	74·0	18	43·2	1	0	...	
XII.	Cargen [Dumfries]	2·07	+	·12	·48	23	10	83·0	18	39·0	5	0	...	
"	Jedburgh (Sunnyside)	2·50	+	·76	·90	23	10	87·0	18	40·0	3	0	0	
XIV.	Old Cumnock	1·74	— ·12	·47	23	10	...	...	...	...	...	...
XV.	Lochgilphead (Kilmory)	1·09	— 2·01	·30	6	7	...	...	38·0	1	0	...
"	Oban (Craigvarren) .....	...	...	...	...	...	...	...	...	...	...	...
"	Mull (Quinish)	·65	— 2·64	·15	3	12	...	...	...	...	...	...
XVI.	Loch Leven Sluices	3·10	+	1·35	1·30	25	5	...	...	...	...	...
"	Dundee (Eastern Necropolis)	2·05	+	·55	·85	22	11	86·0	18	42·3	2	0	...	
XVII.	Braemar	2·73	+	·74	·90	22	11	82·5	18	35·4	1	0	0	
"	Aberdeen (Cranford)	3·95	...	1·83	22	12	77·0	16	44·0	9	0	...		
XVIII.	Strome Ferry	1·91	— 1·15	·67	28	13	...	...	...	...	...	...
"	Cawdor [Nairn]	3·14	+	1·74	1·12	22	14	...	...	...	...	...
XIX.	Dunrobin	1·34	— ·68	·44	4	9	79·5	18	45·0	23	0	...		
"	S. Ronaldsay (Roeberry)	·55	— 1·21	·18	22	11	72·0	16	44·0	2	0	...		
XX.	Darrynane Abbey	1·73	...	·71	26	11	...	...	...	...	...	...
"	Waterford (Brook Lodge) ...	1·66	— ·41	1·12	26	8	81·0	19	40·0	1,2	0	...		
"	O'Briensbridge (Ross)	1·92	...	·41	27	11	79·0	18	50·0	24 ^c	0	...		
XXI.	Carlow (Browne's Hill)	1·62	— ·22	·63	25	11	...	...	...	...	...	...
"	Dublin (Fitz William Square)	1·72	+	·06	·49	26	12	74·7	19	46·9	23	0	0	
XXII.	Ballinasloe	2·29	— ·01	1·01	9	12	77·0	17 ^b	42·0	23	0	...		
"	Clifden (Kylemore)	4·73	...	1·21	28	15	...	...	...	...	...	...
XXIII.	Waringstown	1·80	— ·27	·26	28	12	86·0	18	44·0	3	0	0		
"	Londonderry (Creggan Res.) ..	1·94	— ·48	·38	27	13	...	...	...	...	...	...
"	Omagh (Edenfel)	1·87	— ·60	·65	27	14	79·0	18	44·0	6,11	0	...		

a And 19. b And 18. c And 25.

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

METEOROLOGICAL NOTES ON JUNE, 1893.

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.

STRATHFIELD TURGISS.—Distant TS on the 14th and T on the 20th.

HITCHIN.—The hottest month since July, 1868. Mean temp. $60^{\circ} \cdot 0$.

ADDINGTON.—A very fine month, but deficient in E, the fall being the least recorded in June with the exception of 1874, when only $\cdot 62$ in. was recorded. Very high day temp. from 14th to 19th, the shade max. ranging from 80° to 88° . The nights were cool throughout. Pastures are very much dried up, and the hay crop is very light; indeed, many fields that were shut up for hay are thrown open for the cattle again; a poor look-out for the coming winter.

BURY ST. EDMUNDS.—A hot, dry month. Severe TS on 19th, but the rain did not extend far. The drought has apparently set in again worse than ever.

LANGTON HERRING.—On only five days did R fall, this being the driest June in 19 years, with the exception of 1887, when the fall was $\cdot 36$ in. on three days. The hottest June for 19 years (with the exception of June, 1878, the mean temp. of which was $0^{\circ} \cdot 2$ higher), the shade max. on 19th being the highest recorded in June in 19 years, and the highest on any day since July, 1885. Fogs on 6th, 26th, and 27th. High winds on 23rd, 24th, and 28th. T on 15th. Distant T on 16th and 26th. During the last four months only $2 \cdot 19$ in. of R has fallen, the deficit being $5 \cdot 42$ in.

TORQUAY, CARY GREEN.—There was no day during the month without sunshine, the total duration being 294 hours, equal to 60 per cent. of the possible amount; the greatest daily amount was 14 hours on the 30th, equal to 89 per cent. of the possible duration.

BODMIN, FORE STREET.—Very dry and fine until the 12th and 13th, when a little R fell, then dry again to the 22nd, and showery to the 29th. Very hot on the 17th, 18th, and 19th. The drought broke up on the 22nd, and the rain was very acceptable and much needed for all crops.

STROUD, UPFIELD.—Distant T and L at noon on 4th. TS from 2.40 p.m. to 3.10 p.m. on 14th; $\cdot 30$ in. of R fell in half an hour, and a house near was struck by L. TS from 4.40 to 6 p.m. on 15th, with very vivid L.

WOOLSTASTON.—A dry, hot month, very little R falling till the 14th, when there was a heavy storm of T and L, and it became intensely hot for some days; from the 22nd to 28th R fell daily. The hay crop is almost a complete failure. Mean temp. $58^{\circ} \cdot 5$.

ORLETON.—A very fine, hot, dry month, with the exception of a few days from the 8th to the 12th inclusive, the mean temp. of the whole, being $1^{\circ} \cdot 3$ above the average of 32 years. A very large proportion of bright sunshine occurred, as in the three previous months, and many very hot days. Very dry, most of the R falling in heavy storms. Heavy TS on the 14th. T on 2nd, 3rd, and 19th. Fog on 7th.

BARKBY.—Very hot and very dry. The different kinds of flowers quite three weeks in advance of average time. Hay crops very deficient, about one-fourth of the average. Total rainfall for the half-year, $7 \cdot 05$ in.

MANCHESTER.—Summer weather prevailed up to the 19th; on the 20th it was dark and gloomy till noon, and the rest of the month was changeable. The 25th was cold and windy. Mean temp. $61^{\circ} \cdot 5$. T on 3rd and 4th.

WALES.

HAVERFORDWEST.—A very fine month, the temp. above the average. Very droughty up to the 27th, when a heavy fall of R took place, only to be followed by increasing heat and return of drought. A great fall of temp. took place about the 20th, followed by R. TSS occurred in several parts of the country, and considerable rainfalls, but unfortunately not in this locality. Prevailing winds N.N.W., E., and S.E.

SCOTLAND.

CARGEN.—The mean temp. of the month ($59^{\circ} \cdot 3$) is $2^{\circ} \cdot 9$ above the average. This has only once been slightly exceeded in the past 34 years, the mean temp. of June, 1865, being $59^{\circ} \cdot 4$. Considerable variations of temp. took place, the mean of the five days (15th to 19th) being $66^{\circ} \cdot 2$, while for the five days 22nd to 26th it was $53^{\circ} \cdot 1$. A very heavy H storm was experienced in the district on the 9th, but was not felt at this station. At The Grove the hailstones were lying 4 to 6 inches deep after the storm. The winds during the month were exceptionally light, and only on the 27th was anything like a strong breeze experienced. The hours of sunshine were considerably above the average. T and L occurred on the 8th and 9th, and T was heard on the 14th. Crops generally are looking well and in an unusually advanced state, more particularly the root crops, which present a very promising appearance. The rainfall for the first six months of the year is $4 \cdot 14$ in. below the average.

JEDBURGH.—The temp. was high throughout the month. The R towards the end, which was much needed, freshened all crops. Pastures which were getting dried up are now fresh and healthy; cereals look well, also turnips.

MULL, QUINISH.—The smallest rainfall in June since 1874, when $\cdot 52$ in. was recorded. The drought has done no harm here; hay is in first-rate order, and strawberries are finer than for some years past.

BRAEMAR.—T and heavy R on 8th, the shower covering a radius of only 3 miles; $\cdot 82$ in. fell in half an hour.

ABERDEEN.—Exceptionally dry till the 20th, followed by considerable rains.

ROEBERRY.—The driest June since 1871. Mean temp. in shade, $53^{\circ} \cdot 9$.

IRELAND.

DARRYNANE ABBEY.—A very hot month, without measurable R between the 5th and 22nd.

WATERFORD, BROOK LODGE.—But for the heavy rainfall on the 26th, this would have been the driest June since 1887. The temp. was much higher than for some years, so that fruit ripened much earlier. The hay crop is very short, and turnips are likely to be a failure. Thick fog on the 7th, 8th, 9th, 10th, and 15th, and T on the 9th.

O'BRIENSBRIDGE, ROSS.—Brilliant summer weather, with high temp., up to the 24th, then lower temp. and useful R. Severe T and L for two hours on the 11th, and T and L on 14th.

DUBLIN.—The fourth month in succession with a mean temp. above the average and a rainfall below the average. The month did not "break the record" as regards either high temp. or scanty rainfall, but was in all respects most favourable. R fell freely from the 3rd to the 6th inclusive, and from the 22nd to the 28th inclusive, but the weather was otherwise dry, except for local thunder-showers on the 15th. Mean temp. $59^{\circ} \cdot 9$, $2^{\circ} \cdot 1$ above the average. High winds were noted on 7 days, but the force of a gale was attained only on the 28th. The temp. reached or exceeded 70° in the screen on 5 days, compared with 17 days in 1887, only 1 day in 1888, 10 days in 1889, only 2 days in 1890, 6 days in 1891, and 4 days in 1892. T was heard on the 15th. A solar halo was seen on the 11th.

EDENFEL.—With the exception of an insignificant break during the first week, and a rather more decided one during the last, the weather of June was as perfect as that of its predecessors since the 1st of March. The timely and sufficient rains in the period alluded to have still further aided the prolific vegetation of the year; a full average hay harvest has been secured in perfect order, and the crops to follow give an equal promise of a full and early return.