Symons's Meteorological Magazine.

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THE NEW VOLUME.

In commencing our forty-eighth volume we may fitly throw a glance behind. It reveals in our past history much cause for satisfaction, and conscious as we are of many shortcomings, we cannot but feel that the *Magazine* would not have so far surpassed the fated span of other journals of the same character unless it had some special fitness for survival. The circulation has not grown rapidly, yet each year has numbered a few more subscribers than the last. We have never made an appeal to popular fancy or to the interests of the high specialist, but have striven rather to follow the middle course of endeavouring to supply those interested in making meteorological observations with information as to the current progress of meteorological research and literature expressed as simply as is compatible with accuracy. In addition, we offer so far as our space permits a perfectly open channel for the exchange of opinion on meteoro logical matters, barring only the palpably absurd or paradoxical.

It is a source of great satisfaction that a journal so humble in its aims and so unpretentious in appearance should receive the support of eminent meteorologists of all countries, so that in every volume there is something of permanent value that cannot be found elsewhere. The new volume will contain a series of important articles by Mr. R. C. Mossman, of which the first appears in the present number. The labour involved in dealing with the correlating of observations in distant places is only partly revealed in the articles themselves, but it is safe to say that there are few students of meteorology so enthusiastic as to undertake the drudgery necessary to produce such results.

SOUTHERN HEMISPHERE SEASONAL CORRELATIONS.

By R. C. MOSSMAN, F.R.S.E.
(of the Argentine Meteorological Office).

(First Article).

THE subject of synchronous compensation between the types of seasons at places situated in different parts of the Earth, and of the relation that exists between the sequence of weather at one place with the weather following at another place, even when the two localities are situated at a great distance from one another, is one that has of late years received increasing attention at the hands of meteorologists. Hildebrandsson, among a score of workers at this fascinating class of research, stands pre-eminent for his numerous contributions. In four papers on the "Centres of Action of the Atmosphere," he has given a large number of examples of this species of weather correllation, most of which refer to places in the northern hemisphere, where we possess many of the long and homogeneous series of observations so necessary for this form of research. In his fourth and last memoir * Hildebrandsson has carried his investigations into the southern hemisphere, being hampered considerably by the absence of data from regions where the southern "centres of action" are located. Having of late began to collect data for South America with the object of preparing a general memoir on the climatology of that Continent, a considerable mass of material is already available for testing whether the South American weather sequences show as pronounced resemblances or contrasts when compared with data from other regions, as do those in the northern hemisphere. Cordoba in the Argentine Republic, it would appear, is the only station in South America with a long record situated in an "action centre," most other places referring to regions located in a transitional zone. While for the purposes of the present inquiry there is a lack of data from pronounced "action centres," still many of the stations are so placed that they serve as an index of the pulsations taking place in the neighbouring foci of cyclonic and anti-cyclonic activity. As will be apparent later, some of the correllations obtained lend considerable support to the opinion expressed by other workers that the action centres of the globe are mutually associated, and that abnormal conditions in one hemisphere are inter-twined, not only with simultaneous but in many cases subsequent exceptional features in the other half of the earth.

RELATION BETWEEN NILE FLOOD AND MAY TO AUGUST RAINFALL AT SANTIAGO (CHILE).

The height of the Nile flood, as has been shown by Captain Lyons,† is dependent on the June to September rainfall in Abyssinia. A

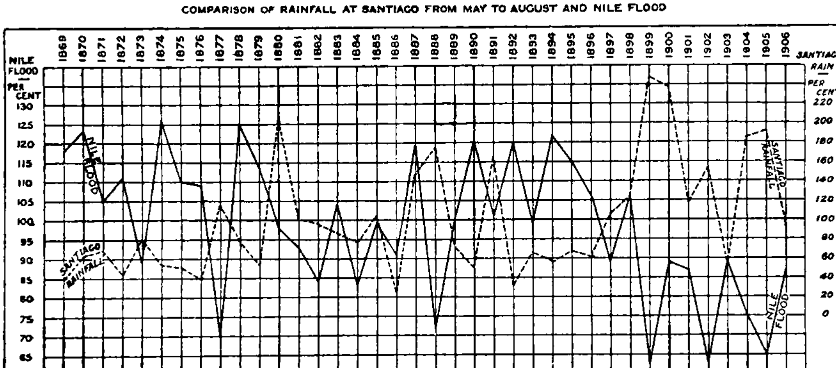
* Reviewed along with third paper in this Magazine, Vol. **45**, p. 236.
† *Quar. Jour. Roy. Met. Soc.*, Vol. **36**., p. 215.

relation is apparent if we compare the volume of the water passing Aswan between July 1st and October 31st with the corresponding southern winter rainfall of Santiago de Chile (Lat. 33° 27′ S., Long. 70° 42′ W., height 1,703 feet above sea). The data utilised for the Nile represent the ratios of the annual floods to a mean flood during the years 1869 to 1906. They are given in Captain Lyons' publication "The Rains of the Nile," 1906. The rain data for Santiago (see table) are taken from the series of volumes and reports issued by that observatory or from the reports of the recently established Meteorological and Geophysical Institute. The mean rainfall during the four months May to August at Santiago during the 38 years 1869-1906 is 11·82 inches, or 81 per cent. of the total annual fall. The relation between the Nile floods and the Santiago rainfall for each year from May to August in this period is as follows, the normal being taken as equal to 100 :

Year.	Nile.	Santiago.	Year.	Nile.	Santiago.	Year.	Nile.	Santiago.	Year.	Nile.	Santiago.
1869	118	39	1879	114	54	1889	100	72	1899	63	248
1870	123	63	1880	98	206	1890	120	51	1900	89	237
1871	105	69	1881	93	101	1891	101	166	1901	87	118
1872	111	44	1882	84	96	1892	120	32	1902	63	153
1873	84	81	1883	104	87	1893	99	66	1903	89	55
1874	126	54	1884	83	78	1894	122	58	1904	75	185
1875	110	52	1885	99	106	1895	115	67	1905	65	192
1876	109	39	1886	91	25	1896	106	62	1906	87	92*
1877	70	116	1887	119	148	1897	89	107			
1878	125	78	1888	72	175	1898	106	126			

These results are graphically shown in the following diagram :

COMPARISON OF RAINFALL AT SANTIAGO FROM MAY TO AUGUST AND NILE FLOOD



* It may be of interest to give the ratio which the Santiago rainfall during the last six years (period May to August), bears to the normal, 1869-1906. The values are 1907, 64 % ; 1908, 51 % ; 1909, 48 % ; 1910, 76 % ; 1911, 38 % ; 1912, 86 %. We should, therefore, expect the Nile Floods of these years to be above normal, except possibly in the year 1907 when many well established correlations broke down.

The co-efficient of correlation deduced from these figures is 0·62* and the probable error 0·07.

The diagram shows that there is on the whole a strongly pronounced opposition between the height of the Nile flood and the winter rainfall at Santiago. During certain groups of years the opposition is relatively weak but in general the two curves present a strong contrast to each other. The winter rainfall at Santiago in common with other stations between the parallels of 32° and 39° south latitude especially on the littoral, varies with the position of the South Pacific high pressure area. Antarctic observation notably these of the "Belgica" in 1898-1899, and of Dr. Charcot in the years 1904, and 1909, show an undoubted see-saw movement of pressure at this season between the South Pacific anti-cyclone and the corresponding low pressure area, situated at the latitude of the Antarctic Circle in the southern extension of the South Pacific, known as the Bellingshausen Sea.† In some years this low pressure belt is deflected to the west owing to the extension northward of a portion of the Antarctic anti-cyclone over Graham's Land which is located on the Cape Horn meridian. Under these conditions cyclonic systems instead of pursuing their normal path south of Cape Horn approach the coast of Chile in low latitudes bringing increased rainfall and high temperatures due to the prevailing northerly winds, over the Santiago region. On the other hand, when the South Pacific anticyclone is south of its normal position, the Antarctic anticyclone recedes, the cyclonic area to the west of Graham's Land is deepened, so that the storm centres pass far to the

* We can carry the comparison of the relation of the Nile Flood—Santiago rainfall back to 1849 by means of the data giving the mean reading of the gauge at the Delta Barrage for the months July to October (see Craig—"A Meteorological Triangle," *Quar. Jour. Roy. Met. Soc.*, Vol. **36**., p. 352). Previous to 1867 only the mean *annual* totals of Santiago rainfall are available, but as four-fifths of the yearly quantity falls from May to August, the data are fairly comparable with the Nile data. There are no annual rain totals for Santiago in 1851 and 1852, and no Nile data for 1859, but taking the 17 years common to both series in the period 1849-1868, we obtain a negative correlation co-efficient of 0·66, and a probable error of 0·09. The Santiago rain totals for these years are taken from the following publication, issued by the Santiago Observatory, viz. :—"*Seccion de Meteorologia*, Santiago de Chile, 1901, p. 117." The ratios referred to the means of the 17 years, 1849-50, 1853-58, 1860-68, are as follows :—

Year.	Nile.	Santiago.	Year.	Nile.	Santiago.	Year,	Nile.	Santiago.
1849	97	81	1857	93	58	1864	102	140
1850	96	141	1858	89	158	1865	96	66
1853	106	54	1860	98	131	1866	112	42
1854	111	118	1861	117	93	1867	97	61
1855	86	139	1862	100	107	1868	80	152
1856	107	140	1863	112	22			

† See papers by the writer in *Scottish Geographical Magazine*, August, 1910 and pp. 411-416 and *Journ. Scot. Met. Soc.* Vol. **15**, pp. 317-318.

Rainfall at Santiago, Chile, 1867–1911.

YEAR.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	YEAR.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1867	...	...	...	·10	1·21	3·14	3·71	·71	·02	...	·26	·22	9·37
1868	...	...	...	·92	·69	2·93	5·62	2·12	9·83	1·10	...	·35	23·56
1869	...	...	·39	...	1·72	·06	1·65	1·19	·51	·35	...	...	5·87
1870	...	...	·20	...	·92	4·44	2·01	·11	·03	·34	...	...	8·05
1871	...	·70	·83	·53	2·13	2·28	2·71	1·06	1·37	·23	...	...	11·84
1872	...	...	·12	...	1·72	1·46	·29	1·76	·87	...	...	...	6·22
1873	...	·06	...	·43	1·01	1·54	3·35	3·67	1·31	...	...	·24	11·61
1874	...	...	·09	...	1·83	3·59	·47	·50	1·39	·67	1·84	...	10·38
1875	·02	·65	...	·02	4·28	·68	1·17	...	...	...	·21	2·37	9·40
1876	...	...	·54	·36	1·49	·83	·61	1·67	·76	1·60	·13	...	7·99
1877	·07	·03	...	5·14	1·96	·94	10·40	·46	3·86	2·70	·01	...	25·57
1878	·15	·44	·98	4·37	3·60	2·88	1·83	·93	·45	...	·15	...	15·78
1879	...	...	...	...	1·40	2·92	·85	1·21	...	·13	...	...	6·51
1880	...	·08	·02	·32	1·13	9·24	10·59	3·52	·33	·40	·07	...	25·70
1881	·23	...	...	1·00	2·46	3·43	3·58	2·46	2·90	·79	·51	...	17·36
1882	...	·06	...	...	1·59	1·29	6·32	2·18	·34	...	·18	...	11·96
1883	·46	...	·02	·01	4·71	3·30	1·80	·48	3·03	·57	...	...	14·38
1884	...	...	1·06	1·28	·25	2·43	1·93	4·59	1·22	·35	·28	1·87	15·26
1885	·02	·04	...	·12	6·12	·31	4·30	1·84	1·89	·95	·06	...	15·65
1886	...	...	...	...	·56	·50	·71	1·23	·39	·11	·21	1·28	4·99
1887	...	·57	...	·03	·15	6·29	·12	10·96	2·31	1·13	·62	...	22·18
1888	...	...	...	·60	1·08	5·00	6·24	8·36	3·65	1·61	·76	...	27·30
1889	·06	...	...	·24	1·77	·84	4·02	1·89	·02	·12	·01	·08	9·03
1890	·09	...	·06	1·52	·21	1·50	2·49	1·90	·93	·05	...	·01	8·76
1891	...	...	...	·94	4·62	5·88	8·95	·25	...	3·33	·11	·12	24·20
1892	...	...	...	...	·35	·45	1·00	1·95	·16	·27	·70	...	4·88
1893	...	...	...	·16	2·30	2·07	2·28	1·13	·04	...	·99	·46	9·43
1894	·02	...	·61	·46	2·22	1·54	1·04	2·03	·59	·04	·05	...	8·60
1895	·01	...	·74	·43	·06	·34	1·63	5·91	1·76	·33	·21	·01	11·43
1896	...	...	·03	·10	·05	1·25	4·04	1·94	2·71	·24	...	...	10·36
1897	·08	·02	·18	·01	8·13	1·78	2·06	·77	·32	·60	...	...	13·95
1898	...	...	·01	1·82	1·17	9·57	2·58	1·67	·91	1·20	·62	·09	19·64
1899	...	·01	·04	·02	1·42	9·27	6·33	12·31	·66	·39	...	...	30·45
1900	...	·02	·85	·09	4·83	5·13	13·89	4·27	·76	2·42	...	...	32·26
1901	...	·02	·19	·02	2·80	4·32	2·67	4·16	·01	·80	·02	·01	15·02
1902	...	·18	·21	·02	4·13	5·92	7·35	·70	·32	·25	·84	...	19·92
1903	·01	...	·03	·83	1·05	3·92	1·51	·02	·04	·24	·01	...	7·66
1904	...	·04	1·42	·23	9·14	3·08	6·76	2·90	·81	·64	·12	1·89	27·03
1905	...	...	·10	·08	6·13	7·32	7·07	2·20	·86	·33	·01	·13	24·23
1906	·03	·32	...	·02	4·42	1·60	1·42	3·47	·26	...	·01	...	11·55
1907	...	·03	...	·69	2·19	3·15	1·35	·83	1·79	·37	·01	·19	10·60
1908	·02	·05	...	1·67	1·17	3·28	·34	1·23	·20	...	...	...	7·96
1909	...	...	...	·07	·43	3·50	·87	·83	1·26	·18	·01	·12	7·27
1910	...	...	·41	·62	·04	6·24	1·43	1·25	·04	·13	·31	·20	10·67
1911	...	...	...	·83	1·02	1·78	1·18	·46	·62	·01	...	·80	6·70
Mean	·03	·07	·20	·58	2·26	3·18	3·39	2·34	1·14	·56	·21	·23	14·19

south. At Santiago under these conditions dry weather accompanied by radiation cold, prevails.

Until quite recently there was no suitably placed station in the South Pacific by which to determine the relations obtaining from season to season between the South Atlantic and South Pacific high pressure belts. There is a short and in the past not very reliable record from Juan Fernandez, which last year has been equipped with a very complete set of instruments by the Chilian Meteorological Office, and is now in radiographic communication with the mainland. This, along with the observations at a new station on Easter Island (Lat. 27° S., Long. 109° W.), should give us full and immediate information regarding the seasonal oscillations in the position of the South Pacific anti-cyclone. When these data come to be compared in a few years time with data from St. Helena, I have little doubt that the chain linking up the rainfall of Abyssinia with the Antarctic circulation will be complete. If this can be established then the matter becomes of great interest to the student of Antarctic meteorology and glaciology, since from the records of the Nileometers, which embrace centuries of observation, it will be possible to obtain some idea of the sequence of weather changes since the time of the Pharoahs in the far South Pacific during the austral winter months.

ROYAL METEOROLOGICAL SOCIETY.

THE annual general meeting of the Royal Meteorological Society was held on January 15th, at the Surveyors' Institution, Westminster, Dr. H. N. Dickson, President, in the chair.

In submitting their report for the year 1912 the Council noted that the roll of Fellows was slightly diminished. Deep regret was expressed for the loss of the Society's Treasurer, Dr. C. Theodore Williams. The co-operation with the Meteorological Office, foreshadowed in the report for 1911, was stated to be in operation, the *Monthly Weather Report* now taking the place of the *Meteorological Record* for the publication of the observations. The Society's staff were at present engaged in the preparation of a series of normal values of the climatological elements of the British Isles. The work on barometric pressure was well advanced. Mr. Marriott had lectured on behalf of the Society at numerous Scientific and Literary Institutions and Schools during the year. Special emphasis was laid on the researches in the upper atmosphere, which had been continued and extended.

The President, in moving the adoption of the Report, expressed his opinion that the diminution in numbers indicated no lack of interest. The liberal supply of papers and discussions were, he said, sufficient to guarantee the health of the Society. He considered that advance in system, rather than new discoveries, had been the noteworthy feature of the meteorology of the year. He felt justified in believing in a new wave of popular interest in the subject, especially in a spontaneous increase in agricultural interest. The Report was adopted and a special vote of thanks was passed to the President for his untiring efforts during two critical years of office.

The following gentlemen were elected to serve on the Council for the 1913 session. *President:* Mr. C. J. P. Cave; *Vice-Presidents:* Dr. Chree, F.R.S., Dr. H. N. Dickson, F.R.S.E., Mr. R. H. Hooker, Capt. H. G. Lyons, D.Sc., F.R.S.; *Treasurer:* Mr. F. Druce; *Secretaries:* Mr. F. Campbell Bayard, LL.M., Commr. W. F. Caborne, C.B.; *Foreign Secretary:* Dr. R. H. Scott, F.R.S.; *Councillors:* Mr. C. L. Brook, Mr. W. W. Bryant, Mr. E. Gold, Mr. R. Inwards, Mr. Baldwin Latham, C.E., Mr. R. G. K. Lempfert, Lt.-Col. H. Mellish, Col. H. E. Rawson, C.B., Mr. C. Salter, Capt. A. Simpson, Sir J. W. Towse, and Commr. D. Wilson-Barker, F.R.S.E.

A paper on "The Snowfall of the United States," by C. F. Brooks, was read in the absence of the author. The author pointed out that until 1883 but little attention was given to the subject of snowfall, but more recently the great interest in water supply from snowfall led Professor Bigelow to experiment with various forms of snow bins in the mountains of Wyoming. The number of reporting stations varied in different years, but for the 15 years dealt with by the author, July, 1895 to June, 1910, reports were available from nearly 3,000 stations, of which 159 had a continuous record for the 15 years. The effects on snowfall of land relief, prevailing winds, storm frequency, and proximity to the Great Lakes, are very apparent. The prevailing westerly winds from the Pacific Ocean bring a snowfall in many places of over 400 inches per year on the western slopes of the Sierra Nevada and Cascade ranges. The dry interior basin to the leeward has little snow, but on the Rocky Mountains as much as 300 inches per year falls in Southern Wyoming and 400 inches in some places in Colorado. The dry western prairies suffer a deficient fall, but on nearing the Great Lakes the fall increases, from 80 to more than 100 inches falling annually on their south-east shores. The Gulf Stream shows its influence as far as Cape Hatteras by bending the lines of equal snowfall far to the north.

In the course of an interesting discussion Mr. Gold said that he considered the most important information would be the depth of snow on the ground at various dates rather than the aggregate depth of snowfall. Mr. Hooker drew attention to the fact that the observations provided the necessary data for testing the accuracy of the assumed ratio 1:10 used for converting the depth of snow to its rainfall equivalent. Mr. Baldwin Latham gave examples of the inaccuracy of measuring snow by a rain gauge and was of opinion that with wet snow a ratio of even 1:5 might hold.

The following new Fellows were elected: Messrs. C. A. A. Barnes, W. G. Kendrew, R. T. Lennon, John Rees, J. H. Robinson, E. H. Sills G. I. Taylor.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

A RAINFALL QUERY.

I SHALL state your correspondent's query somewhat more definitely than he has done, and for convenience shall use metric measures as I have no graphic means at hand for the calculation, whereas for metric measures Neuhoff's modification of Hertz's diagram, given in the Abhandlungen des K. Preuss. Met. Instituts, Bd. I. No. 6. p. 273, is very convenient. The equivalent English measures are given in brackets.

A kilogram (2·2 lbs) of dry air at 15°·C (59° F) and 760 mm. sea-level (29·92 in.) contains enough moisture, 10·6 g. (164 gr.), to saturate it. It is carried up a mountain 2,400 m. (7,826 ft.) high, along a slope of 1 vertical to 5 on the slant (this will save fractions), at a velocity of 30 km. (about 20 miles) per hour: find the precipitation on the mountain.

The following table from Neuhoff's diagram gives the successive states :—

Height.		Time	Temperature.		Specific humidity.		Loss of moisture.		Pressure.		Vol-ume.
m.	(ft.)	min.	°C.	(°F.)	g.	(grains)	g.	(grains)	mm.	(in.)	m^3
0	(0)	0	15·0	(59·0)	10·6	(164)	0·0	(0·0)	760·0	(29·92)	·830
300	(978)	3	13·6	(56·5)	10·0	(154)	0·6	(9·3)	734·0	(28·90)	·850
600	(1957)	6	12·1	(53·8)	9·4	(145)	1·2	(18·5)	709·0	(27·91)	·890
900	(2935)	9	10·6	(51·0)	8·8	(136)	1·8	(27·8)	684·3	(26·94)	·922
1200	(3913)	12	9·0	(48·2)	8·2	(127)	2·4	(37·0)	660·0	(25·98)	·956
1500	(4891)	15	7·4	(45·4)	7·6	(117)	3·0	(46·3)	636·5	(25·06)	·990
1800	(5870)	18	5·8	(42·4)	7·1	(110)	3·5	(54·0)	613·5	(24·15)	1·027
2100	(6848)	21	4·2	(39·6)	6·6	(102)	4·0	(61·7)	591·8	(23·30)	1·066
2400	(7826)	24	2·6	(36·6)	6·2	(96)	4·4	(67·9)	570·5	(22·46)	1·106

One kilogram of dry air at 0° and 760 mm. pressure, measures 0·773 cubic metres and 0·816 at 15°; and 10·6 g. water vapour at 15° occupies the same space as 10·6 × $\frac{8}{5}$g. of dry air, *i.e.*, 0·014 cubic metre. Hence the volume of the damp air at 15° and 760 mm. is 0·830 cubic metre. We shall suppose this volume to be in the shape of a vertical prism whose base is 1 metre square and altitude 83·0 centimetres, or if we neglect the small change of volume as the condensed water falls away from the mixture, we may take this 83·0 cm. as the equivalent depth of the prism at sea-level, and 15°. The successive volumes are given in the last column of the table.

The horizontal distance corresponding to 1,500 m. along the slope of the hill is 1,470 m. ($\frac{1}{5}$ = sin 11° 32′; cos 11° 32′ = 0·98), and the air is carried over this distance in 3 minutes. Thus in rising say from 900 m. to 1,200 m. it loses 0·6 g. moisture in 3 minutes, over an area of 1470 square-metres, which is at the rate of 288 g. per day, or practically ·0002 mm. of rain. If, however, the kilogram we are studying is not an isolated mass, but forms part of a continuous succession of similar masses, each will deposit its quota, and there will be 1,470 in all. The result would be a rainfall of 0·288 mm. per day, and this from a prism 0·830 mm. deep at the start. To obtain 1 mm. of rain (0·04 in.), a column of height 2·86 m. (9·30 ft.), would have to be moved. Since, however, not all the condensed moisture is deposited as rain, in practice the column required would have to be increased in the ratio of the water condensed to the rain that falls, which recent work in Germany shows to be about 10 to 1. The water which does not fall to the ground as rain is retained as cloud in the moving air through which it drops comparatively slowly. So when the summit of the mountain is reached some of the drops which are still falling are carried on past the crest and give precipitation on the lee side of the mountain.

Provided all the water has been removed from the air when it begins its descent, there will be no more condensation. For the air will be heated just as much by compression in the descent as it was cooled by expansion in the ascent, and in addition will retain the heat liberated by the condensation of 4·4 g. of vapour, in the case in point. In practice, however, only a part of the water is removed or say 2·0 g. leaving 2·4 g. in a state of suspension as "Scotch mist." In this case the air on its descent would repeat the operations of ascent in the reverse order till it reached 1,200 m., when all the retained water would be re-evaporated, and the equivalent latent heat absorbed. There would still, however, be the latent heat corresponding to the lost 2·0 g. and from 1200 m. down the air would describe the following set of conditions.

Height (metres).	Temperature. °C.	°F.	Relative humidity.
1200	9·0	(48·2)	100
900	12·2	(54·0)	84
600	15·3	(59·6)	71
300	18·4	(65·2)	61
0	21·3	(70·4)	51

This is the explanation of the *föhn* wind, and of the dryness and warmth of the sheltered side of mountains.

If the speed of the current is changed, the rate at which the air mounts from one altitude to another changes and the rate of loss of water changes in the same ratio. If the speed is reduced to 15 km. (10 miles) per hour, the above losses will take place in double the time, and the daily rainfall will be halved. As the drops fall at the same rate, but are carried forward at half the speed, the rainfall on the lee side will extend to only half the distance that it did in the earlier case.

J. I. CRAIG.

"RAINFALL" OR "PRECIPITATION."

MAY I suggest that instead of using the word "Rainfall" we should use "Precipitation" whenever we refer to a rainfall record which includes the fall of snow, hail, etc., in addition to actual rain.

Of course, the word "Rainfall" has included almost all forms of precipitation for a great number of years but this is not, perhaps, a very satisfactory reason why we should still adhere to what may be called a "terminological inexactitude."

JAS. B. ESPINER, F.R.Met.Soc.

Ivy House, West Witton, Leyburn, Yorks., 5th February, 1913.

THE WEATHER OF JANUARY 11th, 1913.

THE easterly gale so disastrous round our coasts, of Saturday, January 11th, which brought such a severe blizzard in the more northern portions of the kingdom with such huge drifts, especially in Dumfriesshire, occasioned an icy rain in the south of England with weather of the worst possible description. Walking out on deserted Hampstead Heath that afternoon in a driving fog and a high gale slashing pellets of ice into my face, in a heavy gloom unrelieved by the snow which, as I suspected, would be falling a little farther north in the Midlands, it struck me most forcibly as about the most gruesome type of winter day one could well imagine. A rook or two walking about in a sodden field was all the bird life in evidence in such conditions.

L. C. W. BONACINA.

January, 22nd, 1913.

METEOROLOGICAL NEWS AND NOTES.

PHOTOGRAPHY IN NATURAL COLOURS has secured an interesting record in a fine picture of red snow taken by Mr. Ford A. Carpenter and published by him in the Transactions of the San Diego Society of Natural History (Vol. 1., 1911, p. 108). The photograph, which is an extremely beautiful one, shows an effect very similar to snow reflecting a red sunset, and it was taken on July 13th, 1911, from the Vogelsang Pass at an elevation of 10,000 feet, in the Sierra Nevada of California, above the Little Yosemite Valley. The appearance, as is well known, is due to the minute alga known as *Sphærella* (formerly styled *Protococcus*) *nivalis*. The photograph, so far as we are aware, is unique.

ERRATUM.—In the remarks on the Weather of December, published in our last issue, it was incorrectly stated that in London the total rainfall on Christmas Day and Boxing Day "was the heaviest recorded at such a time for at least 40 years past." The statement should read, "was the heaviest recorded since the year 1886, when the rainfall and heavy snowstorms of Boxing Day yielded 1·82 in. at Brixton.

Charles Theodore Williams, M.D., M.V.O.

AUGUST 29TH, 1838—DECEMBER 15TH, 1912.

THE death on December 15th, 1912, of Dr. C. Theodore Williams, takes from our midst one of the foremost leaders of thought in connection with the relation of meteorological and climatological science with the health of the community. Dr. Williams was probably best known as a distinguished physician and authority on the treatment and prevention of tuberculosis. He leaves numerous memorials in the hospitals and sanatoria, the institution of which he so actively and brilliantly promoted during his long and useful career.

It was chiefly in connection with the climatic treatment of consumption that Dr. Williams became prominent in meteorological circles, and his numerous writings and lectures on the subject brought him a high reputation. Dr. Williams shared with the late Mr. G. J. Symons the distinction of having twice occupied the presidential chair of the Royal Meteorological Society. He held this office for the first time during 1892 and 1893, and on the death of Mr. Symons in 1900 was again elected, in order to carry out the responsible and arduous task of piloting the Society through the unusual activity of its Jubilee year. He was the Honorary Treasurer of the Society from 1898 to the day of his death, with the exception of the period of his Presidency, and all who have had the privilege of sitting on the Council, of which he was an *ex-officio* member, will long remember the help and the wise advice which he was always ready to give, and which his wide experience rendered so valuable.

Léon Philippe Teisserenc de Bort.

NOVEMBER 5TH, 1855—JANUARY, 1913.

WE learn with the deepest regret of the death, at the age of 57, of the distinguished French meteorologist M. Léon Teisserenc de Bort, whose brilliant work had placed him in the front rank of modern scientific investigators.

M. Teisserenc de Bort's connection with official meteorology dates from 1880, when he entered the Bureau Central Météorologique, under the directorship of Mascart. He remained an official of that Institute till 1892, after which date he retained only the honorary position of meteorologist, and carried his activities into a wider circle. His greatest contributions to meteorological knowledge, and they are very great ones, were in connection with upper air research, carried on largely at the specially erected observatory at Trappes, near Paris, of which he was the founder. His well-known chart of the mean pressure distribution, at a height of 4000 metres, marked a distinct advance towards the ultimate solution of one of the most difficult and at the same time one of the most urgent of the problems which engage the attention of meteorologists to-day. The development of observational work by means of kites, and more recently by means of *ballons sondes*, owes much to his energies, and his association with the late Professor Lawrence Rotch was productive of far reaching and extremely useful results. M. Teisserenc de Bort was a pioneer of the movement towards world-meteorology, which we are convinced will prove one of the greatest triumphs of our science in the early part of the twentieth century, and he recognised to the full the value of co-operative work in carrying out meteorological investigations.

In 1908 the Royal Meteorological Society awarded to M. Teisserenc de Bort the Symons Gold Medal, in recognition of his eminent services to the science of meteorology, and his presence in London on that occasion added greatly to the pleasure with which we saw that distinction conferred.

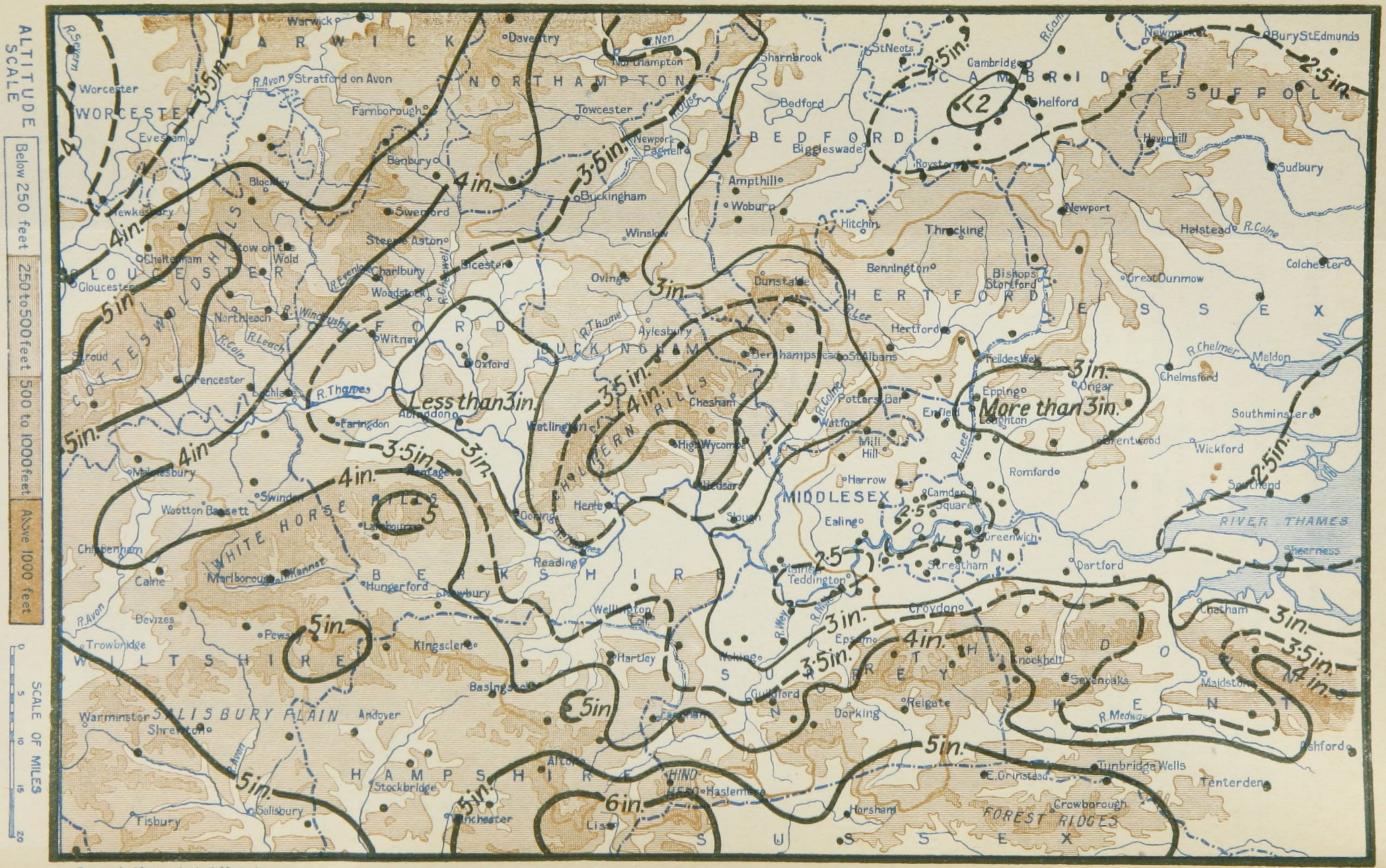
SCOTTISH METEOROLOGICAL SOCIETY.

THE annual business meeting of the Society was held in the Goold Hall, 5, St. Andrew's Square, Edinburgh, on the 10th December, Professor A. Crum Brown, F.R.S., President, in the chair.

The Report from the Council was adopted. A considerable shrinkage had occurred in the membership of the Society, due largely to the deaths of subscribers of long standing, and but for a considerable demand for the Society's publications, there would have been a serious deficit for the financial year ending 30th June last. The expenditure of the Society had been reduced to the lowest possible limit, but it would exceed the income for the current year unless there was a large accession of new members. In March, 1912, the Council had lodged an application with the Registrar General for Scotland for a grant sufficient to defray the entire cost of the reports supplied to him by the Society. That application was forwarded by the Registrar General to the Scottish Office, and by the Secretary of State for Scotland to the Treasury. The Council had so far not received a reply to their application, but were aware that it had been under consideration.

The following were appointed Office-bearers and Council for the ensuing twelve months:—*President:* Mr. J. Mackay Bernard, F.R.S.E.; *Vice-Presidents:* Dr. C. G. Knott, Sec.R.S.E. and Mr. Gilbert Thomson, F.R.S.E.; *Council:* Mr. H. M. Cadell, F.R.S.E., Sir A. Buchan-Hepburn, Bart., Mr. G. G. Chisholm, Mr. M'C. Fairgrieve, F.R.S.E,, Prof. A. Crum Brown, M.D., LL.D., F.R.S., F.R.S.E., Mr. J. R. Milne, D.Sc., F.R.S.E., Mr. T. S. Muir, Prof. R. A. Sampson, D.Sc., F.R.S., F.R.S.E., Mr. James Watt, W.S., F.R.S.E.; *Hon. Secretaries:* Mr. R. T. Omond, F.R.S.E. and Mr. E. M. Wedderburn, W.S., F.R.S.E.; *Hon. Treasurer:* Mr. W. B. Wilson, W.S.

THAMES VALLEY RAINFALL — JANUARY, 1913.



Symons's Meteorological Magazine.

Watershed of River Thames above Teddington, and River Lee above Feildes Weir

Rainfall Stations reporting

Isohyetals.

Thereafter Dr. J. R. Milne, Lecturer on Natural Philosophy, the University, Edinburgh, communicated a paper on "Atmospheric Cooling," in which he described some important experiments at which he had been at work for some time. It was well known that the effect on the human body of any given temperature might be different at different times. A very considerable degree of cold could be endured on a calm day which would be intolerable with a strong wind, and high temperatures could be endured comfortably in a dry atmosphere which would become exceedingly trying when the air was humid. The aim of the experiments had been to measure the rate at which heat was given out under different conditions, and so far the experiments had taken account of temperature and wind velocity. The apparatus used had been finally adopted after many preliminary trials. A small cylinder of thin copper with a blackened hemispherical top was placed on the tower of the University Laboratory, the cylindrical part being insulated with plaster of Paris and the top alone exposed. This vessel was filled with paraffin oil, and the amount of electrical energy necessary to maintain the oil at blood heat was continuously recorded, as were the velocity of the wind and the air temperature. The results of the experiments were indicated in a general way by means of lantern slides.

Prof. Sampson, F.R.S., congratulated Dr. Milne on opening up an interesting field for research. He disliked the term "psuchrainometer," which had been applied to the apparatus used. Dr. C. G. Knott, Principal Crichton Mitchell and others took part in an interesting discussion, and Dr. Milne in reply said that he had selected the least objectionable of the terms which had been suggested to him by a competent philologist to describe an instrument designed to measure the rate of cooling.

In reply to a question Mr. A. Watt made some remarks on the phenomenon of "glazed frost," of which an example had occurred in Edinburgh and elsewhere on the forenoon of December 3rd. A period of extremely severe frost came to a sudden end with a slight fall of rain, and immediately the streets became covered with a thin sheet of ice. Whilst such an ice sheet might be to some extent due to the freezing of the rain owing to the coldness of the ground, a sheet of any considerable thickness could be formed only if the rain were super-cooled, suddenly freezing on touching any solid object.

THE WEATHER OF JANUARY.

During the beginning of the month a southerly to south-westerly type of pressure distribution prevailed over the United Kingdom, and gales occurred frequently on the western and north-western coasts, and at times on the southern, eastern and north-eastern coasts also. Temperature was above the average practically everywhere, and on the 4th the maxima reached 50° or above at many stations in the south and east of England and at Dublin. Gales continued along the western coasts during the commencement of the second week and temperature remained high, readings of 45° to 50° being general between the 7th and 9th. On the 7th 55° was reached at Crieff and 56° at Gordon Castle. A small secondary depression developed over the east of England on the 11th, and was accompanied by heavy rain in the southern counties and much snow in the north and central parts of Great Britain. A depth of 12 inches was reported in many places, and 17½ inches at Crieff. Pressure increased on the 12th, and the day was fine in the south and south-east of England, but snow fell in the east and north. Thick fog prevailed in London and at some places in the Midlands and north of England on the 13th, and temperature remained low. The lowest temperatures of the month were recorded on this and the following day when shade minima of 16° were registered at Buxton and Nottingham, 15° at Marchmont, 13° at Harrogate, 11° at West Linton, and 10° at Newton Rigg. Unsettled conditions continued generally, and on the 18th a depression moved eastward from Denmark and temperature remained below 40° at stations in the north and east of England, but rose to nearly 50° in the south-west of the British Isles. Dull wet weather was experienced generally during the days following, and temperature seldom rose above the normal. During the night of the 22nd, however, a decided rise took place, and readings a little over 50° were recorded on the 23rd at many places in the south and west, though the maxima were below 40° in the north and north-east, and only 35° was reached at Nairn. A steady increase of pressure over the kingdom on the 25th with winds from some northerly point resulted in lower temperatures, and frosts occurred in most places during the night. Anticyclonic conditions prevailed on the 26th, and pressure exceeded 30·3 inches over a large area. As this system passed away to Germany temperature rose briskly in the west and south, and reached 50° at Valencia and Scilly and 52° at Jersey. Temperature fluctuated generally on the 27th and 28th, and the weather was of a changeable character with rather frequent and heavy rain. A rise in temperature occurred in most parts of the kingdom on the 29th or 30th, and on the latter day the shade maxima ranged from 55° at Killarney and 53° in the Midlands and south-west of England to a trifle below 50° in Scotland and the north-east of England.

The rainfall of the month was generally in excess of the average, except in the north of Scotland. The general fall over the great divisions of the United Kingdom expressed as a percentage of the average was as follows:—England and Wales, 174; Scotland, 98; Ireland, 179; British Isles, 155.

The duration of bright sunshine was below the average in all parts of the kingdom, the area of least deficiency being the south-east of England.

INTERNATIONAL BALLOON ASCENTS.

By W. H. Dines, F.R.S.

June 2nd, 1910.

Starting Point.	Country.	A miles.	B ° F.	C miles	D ° F.	E miles.	F
Manchester....	England	6·9	—63	10·3	—56	86	N.E.
Ditcham Park..	,, ...	6·9	—56	9·2	—54	125	N.E.byN.
Brussels	Belgium	7·4	—78	10·9	—65	44	N.E.byN.
Paris..........	France	6·9	—71	9·4	—62	82	N.E.byN.
Hamburg......	Germany....	7·0	—81	9·3	—60	56	N.E.
Lindenberg ...	,, ...	7·2	—69	9·3	—60	36	N.E.byE.
Strassburg	,, ...	7·2	—78	9·9	—62	57	N.E.byN.
Nizhni Olchedaeff	Russia	7·3	—62	10·2	—45	11	S.S.W.

On June 2nd the pressure was very irregular. A minimum had moved to the north-east, from Scandinavia, and another had come to Ireland from the north. An anti-cyclone lay over East Germany. The heights of the isothermal are very uniform, but not so the temperatures. This is unusual, for, as a rule, the height of the isothermal is very closely, but negatively, correlated with the temperature.

July 7th, 1910.

Starting Point.	Country.	A miles.	B ° F.	C miles.	D ° F.	E miles.	F
Manchester	England	7·5	—62	10·6	—56	122	S.
Paris..........	France	6·4	—58	9·6	—53	118	S.S.E.
Hamburg	Germany....	5·6	—53	8·0	—51	26	N.W.byW.
Lindenberg....	,, ...	6·6	—56	10·8	—49	28	N.W.byW.
Strassburg	,, ...	5·6	—53	8·6	—51	31	S.E.
Pavia..........	Italy........	6·2	—56	8·2	—51	57	S.E.
Nizhni Olchedaeff	Russia......	6·0	—47	10·4	—47	58	E.N.E.

An extensive anticyclone lay to the west of Europe, and a low pressure area over South Russia. Unlike the data of June 2nd, there is a uniformity of temperature, but considerable irregularity about the commencement of the isothermal column.

A Height in miles of commencement of isothermal column.
B Temperature, F°., at bottom of column.
C Greatest height of reliable record in miles.
D Temperature, F°., at greatest height.
E Distance in miles of point where balloon fell.
F Bearing of falling point from starting point.

RAINFALL TABLE FOR JANUARY, 1913.

STATION.	COUNTY.	Lat. N. ° ′	Long. W. [*E.] ° ′	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	RAINFALL OF MONTH. 1913. in.
Camden Square	*London*	51 32	0 8	111	1·83	2·57
Tenterden	*Kent*	51 4	*0 41	190	2·14	4·58
Arundel (Patching)	*Sussex*	50 51	0 27	130	2·59	...
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	2·75	...
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	1·78	2·61
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	1·89	3·14
Shoeburyness	*Essex*	51 31	*0 48	13	1·33	2·08
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·70	2·58
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	1·53	2·63
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	3·59	7·21
Rousdon [Lyme Regis]	,,	50 41	3 0	516	2·94	6·87
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·33	4·98
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·51	3·77
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·22	4·10
Boston	*Lincolnshire*	52 58	0 1	11	1·54	2·79
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·70	2·95
Macclesfield	*Cheshire*	53 15	2 7	501	2·66	3·39
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	2·55	3·80
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	6·26	8·53
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	1·89	2·36
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·70	3·77
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	1·90	5·44
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	13·44	15·68
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	3·65	7·76
Haverfordwest	*Pembroke*	51 48	4 58	90	4·69	7·91
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	3·91	6·78
Llandudno	*Carnarvon*	53 20	3 50	72	2·51	3·62
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·10	6·19
Marchmont House	*Berwick*	55 44	2 24	498	2·40	3·11
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	4·78	6·12
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·53	3·14
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	7·34	5·52
Mull (Quinish)	,,	56 34	6 13	35	5·55	6·21
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·01	3·43
Braemar	*Aberdeen*	57 0	3 24	1114	2·92	4·68
Aberdeen (Cranford)	,,	57 8	2 7	120	2·36	3·19
Cawdor	*Nairn*	57 31	3 57	250	2·28	·47
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	5·58	3·05
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	9·42	7·65
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·75	·48
Wick	*Caithness*	58 26	3 6	77	2·48	1·32
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	5·94	9·29
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·78	7·23
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	3·88	5·96
Ennistymon House	*Clare*	52 57	9 18	37	4·30	6·44
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	3·19	7·50
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·15	7·03
Dublin (FitzWilliam Square)	*Dublin*	53 21	6 14	54	2·14	5·58
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·10	6·58
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	5·35	8·11
Cong (The Glebe)	,,	53 33	9 16	112	4·79	7·99
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·87	6·88
Seaforde	*Down*	54 19	5 50	180	3·41	6·55
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·19	2·45
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·46	5·57

RAINFALL TABLE FOR JANUARY, 1913—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.				Mean Annual 1875-1909. in.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Date.	No. of Days	Aver. 1875—1909. in.	1913. in.	Diff. from Aver. in.	% of Av.		
+ ·74	140	·50	11	17	...	...	...	...	25·11	Camden Square
+2·44	214	·77	13	21	...	...	...	...	27·64	Tenterden
...	...	...	...	...	...	...	...	...	30·48	Patching
...	...	...	...	...	...	...	...	...	31·87	Cadland
+ ·83	146	·67	19	18	...	...	...	...	24·58	Oxford
+1·25	166	1·10	11	18	...	.	...	...	25·17	Croyland Abbey
+ ·75	156	·37	11	19	...	...	...	...	19·28	Shoeburyness
+ ·88	152	·64	11	18	...	...	...	...	25·40	Westley
+1·10	172	·47	29	21	...	...	...	...	23·73	Geldeston
+3·62	201	·99	4	29	...	...	...	...	38·27	Polapit Tamar
+3·93	233	·90	4	24	...	...	...	...	33·54	Rousdon
+2·65	213	1·10	4	24	...	...	...	...	29·81	Stroud
+1·26	150	·66	4	23	...	...	...	...	32·41	Wolstaston
+1·88	184	·89	10	18	...	...	...	...	28·98	Coventry
+1·25	181	·78	11	19	...	...	...	...	23·35	Boston
+1·25	173	1·07	11	19	...	...	...	...	24·46	Hodsock Priory
+ ·73	127	·67	4	15	...	...	...	...	34·73	Macclesfield
+1·25	149	·66	11	21	...	...	...	...	32·70	Southport
+2·27	136	1·61	30	23	...	...	...	...	61·49	Arncliffe
+ ·47	125	·50	5	15	...	...	...	...	26·87	Ribston Hall
+2·07	221	·98	11	21	...	...	...	...	26·42	Hull
+3·54	286	1·77	11	20	...	...	...	...	27·94	Newcastle
+2·24	117	2·11	24	22	...	...	...	..	129·48	Seathwaite
+4·11	213	1·29	4	28	...	...	...	...	42·28	Cardiff
+3·22	169	·99	22	28	...	...	...	...	46·81	Haverfordwest
+2·87	173	1·15	22	23	...	...	...	...	45·46	Gogerddan
+1·11	144	·71	11	21	...	...	...	...	30·36	Llandudno
+2·09	151	1·00	11	19	...	..	...	...	43·47	Cargen
+ ·71	130	·66	12	17	...	...	...	...	33·76	Marchmont
+1·34	128	1·09	30	22	...	...	...	...	49·77	Girvan
— ·39	89	·67	30	20	...	...	...	...	35·97	Glasgow
—1·82	75	1·17	30	22	...	...	...	...	68·67	Inveraray
+ ·66	112	1·01	30	21	...	...	...	...	56·57	Quinish
+1·42	170	·46	12	19	...	...	...	...	28·64	Dundee
+1·76	160	·64	30	21	...	...	...	...	34·93	Braemar
+ ·83	135	·61	28	18	...	...	...	...	32·73	Aberdeen
—1·81	21	·25	25	4	...	...	...	...	29·33	Cawdor
—2·53	55	·82	30	18	...	...	...	...	44·53	Fort Augustus
—1·77	81	1·28	4	14	...	...	...	...	83·93	Bendamph
—2·27	18	·14	24	5	...	...	...	...	31·90	Dunrobin Castle
—1·16	53	·25	30	15	...	...	...	...	29·88	Wick
+3·35	156	·85	2, 14	29	...	...	...	...	54·81	Killarney
+3·45	191	1·13	27	25	...	...	...	...	39·57	Waterford
+2·08	154	·96	9	27	...	...	...	...	39·43	Castle Lough
+2·14	150	·82	9	29	...	...	...	...	46·52	Ennistymon
+4·31	235	1·31	10	24	...	...	...	...	34·99	Courtown Ho.
+3·88	223	1·23	9	26	...	...	...	...	35·92	Abbey Leix
+3·44	260	1·52	10	21	...	...	...	...	27·68	Dublin
+3·48	212	·95	9	22	...	...	...	...	36·15	Mullingar
+2·76	152	·91	23	28	...	...	...	...	52·87	Enniscoe
+3·20	167	·82	23	29	...	...	...	...	48·90	Cong
+3·01	178	1·40	9	23	...	...	...	...	42·71	Markree
+3·14	192	1·16	11	24	...	..	...	...	38·91	Seaforde
— ·74	77	·52	23	21	...	...	...	...	37·56	Dundarave
+2·11	161	·70	22	22	...	...	...	...	39·38	Omagh

SUPPLEMENTARY RAINFALL, JANUARY, 1913.

Div.	STATION.	Rain inches
II.	Warlingham, Redvers Road	4·64
,,	Ramsgate	2·74
,,	Hailsham	4·71
,,	Totland Bay, Aston House	4·65
,,	Stockbridge, Ashley	4·66
,,	Grayshott	5.57
,,	Caversham, Rectory Road	3·26
III.	Harrow Weald, Hill House	2·70
,,	Pitsford, Sedgebrook	3·51
,,	Woburn, Milton Bryant	2·94
,,	Chatteris, The Priory	2·42
IV.	Colchester, Hill Ho., Lexden	2·86
,,	Newport, Belmont House	2·76
,,	Ipswich, Rookwood, Copdock	3·33
,,	Blakeney	2·52
,,	Swaffham	3·26
V.	Bishops Cannings	4·15
,,	Winterbourne Steepleton	7·41
,,	Ashburton, Druid House	11·00
,,	Cullompton	7·07
,,	Lynmouth, Rock House	7·91
,,	Okehampton, Oaklands	7·93
,,	Hartland Abbey	6·91
,,	Probus, Lamellyn	6·31
,,	North Cadbury Rectory	5·22
VI.	Clifton, Pembroke Road	5·95
,,	Ross, The Graig	4·32
,,	Shifnal, Hatton Grange	3·41
,,	Droitwich	3·38
,,	Blockley, Upton Wold	4·36
VII.	Market Overton	3·13
,,	Market Rasen	2·92
,,	Bawtry, Hesley Hall	2·99
,,	Derby, Midland Railway	3·38
,,	Buxton	4·24
VIII.	Nantwich, Dorfold Hall	3·10
,,	Chatburn, Middlewood	4·71
,,	Cartmel, Flookburgh	4·78
IX.	Langsett Moor, Up. Midhope	4·44
,,	Scarborough, Scalby	4·51
,,	Ingleby Greenhow	4·50
,,	Mickleton	3·62
X.	Bellingham, High Green Manor	3·56
,,	Ilderton, Lilburn Cottage	3·36
,,	Keswick, The Bank	6·09
XI.	Llanfrechfa Grange	8·66
,,	Treherbert, Tyn-y-waun	15·34
,,	Carmarthen, The Friary	6·41
,,	Castle Malgwyn [Llechryd]	7·27
,,	Crickhowell, Tal-y-maes	8·50
,,	New Radnor, Ednol	4·22
,,	Birmingham WW., Tyrmynydd	8·72
,,	Lake Vyrnwy	6·52
,,	Llangyhanfal, Plâs Draw	3·13
,,	Dolgelly, Bryntirion	6·89
,,	Bettws-y-Coed, Tyn-y-bryn	6·07
XI.	Lligwy	4·01
,,	Douglas	4·64
XII.	Stoneykirk, Ardwell House	4·31
,,	Dalry, The Old Garroch	8·39
,,	Beattock, Kinnelhead	5·05
,,	Langholm, Drove Road	5·43
XIII.	Meggat Water, Cramilt Lodge	6·40
,,	North Berwick Reservoir	1·93
,,	Edinburgh, Royal Observaty.	2·28
XIV.	Maybole, Knockdon Farm	2·88
XV.	Ballachulish House	9·35
,,	Campbeltown, Witchburn	5·48
,,	Holy Loch, Ardnadam	9·78
,,	Islay, Eallabus	6·11
,,	Tiree, Cornaigmore	7·01
XVI.	Dollar Academy	3·19
,,	Balquhidder, Stronvar	...
,,	Glenlyon, Meggernie Castle	8·57
,,	Blair Atholl	4·82
,,	Coupar Angus	6·62
,,	Montrose, Sunnyside Asylum.	4·20
XVII.	Alford, Lynturk Manse	3·84
,,	Fyvie Castle	2·86
,,	Keith Station	2·12
XVIII.	Alvey Manse	1·28
,,	Loch Quoich, Loan	12·60
,,	Drumnadrochit	2·47
,,	Skye, Dunvegan	7·40
,,	N. Uist, Lochmaddy	5·41
,,	Glencarron Lodge	4·47
XIX.	Invershin	·59
,,	Melvich	1·54
,,	Loch Stack, Ardchullin	2·13
XX.	Skibbereen Rectory	8·32
,,	Dunmanway, The Rectory	11·55
,,	Glanmire, Lota Lodge, No. 1	7·65
,,	Mitchelstown Castle	7·89
,,	Darrynane Abbey	9·92
,,	Clonmel, Bruce Villa	8·52
,,	Newmarket-on-Fergus, Fenloe	6·11
XXI.	Laragh, Glendalough	14·12
,,	Ballycumber, Moorock Lodge	4·11
,,	Balbriggan, Ardgillan	5·08
XXII.	Woodlawn	6·45
,,	Westport, St. Helens	7·82
,,	Dugort, Slievemore Hotel	...
,,	Mohill Rectory	6·23
XXIII.	Enniskillen, Portora	6·30
,,	Dartrey [Cootehill]	5·56
,,	Warrenpoint, Manor House	7·06
,,	Banbridge, Milltown	2·99
,,	Belfast, Cave Hill Road	5·39
,,	Glenarm Castle	5·43
,,	Londonderry, Creggan Res.	3·11
,,	Dunfanaghy, Horn Head	5·10
,,	Killybegs	6·89

METEOROLOGICAL NOTES ON JANUARY, 1913.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—Dull, showery and mild conditions prevailed throughout, with fogs on several days. Mean temp. 41°·2 or 2°·7 above the average. Duration of sunshine 24·8* hours, and of R 68·8 hours. Evaporation ·10 in. Shade max. 52°·3 on 23rd; min. 27°·3 on 13th. F 9, f 19.

TENTERDEN.—The wettest January since 1886, when 4·97 in. of R fell. Duration of sunshine 56·0† hours. Shade max. 51°·5 on 23rd; min. 26°·5 on 13th. F 5, f 14.

TOTLAND BAY.—Only once in 25 years has the R been greater in January, viz., January, 1906, when 6·80 in. was recorded, which was also the only warmer January in the same period. Duration of sunshine 52·9* hours. Shade max., 50°·9 on 5th; min., 31°·0 on 13th. F 3, f 9.

PITSFORD.—Mean temp. 38°·5. R 1·85 in. above the average. Shade max. 49°·1 on 7th; min. 17°·6 on 13th. F 15.

BURY ST. EDMUNDS.—Shade max. 50°·0 on 23rd; min. 26°·5 on 13th and 27th. F 12.

POLAPIT TAMAR.—A sunless, mild and very wet month. A rain spell of 34 days lasted from 22nd December to 24th January. Shade max. 52°·5 on 24th; min. 27°·1 on 14th F 4, f 13.

NORTH CADBURY.—The R and the number of rain days were each the highest for January in 17 years' record. Fierce S showers in afternoon of 31st. Vegetation most unhappily forward. Shade max. 52°·0 on 5th and 23rd; min. 28°·5 on 13th. F 5, f 15.

HODSOCK PRIORY.—An unsettled month with a good deal of S, but not much hard frost. Only once has there been less sunshine in January, viz., in 1885. Shade max. 52°·0 on 23rd; min. 12°·6 on 14th. F 16, f 19.

SOUTHPORT.—Duration of sunshine 35·0* hours, and of R 102·3 hours. Evaporation ·26 in. S.E. winds were more prevalent than in any previous January in 42 years' record. Mean temp. 39°·1. Shade max. 52°·0 on 7th; min. 23°·0 on 14th. F 9, f 16.

HULL.—Dull and gloomy, with much cloud, persistent R, and mild generally. Stormy with S on 11th. Duration of sunshine only 3·7* hours. Shade max. 51°·0 on 7th; min. 26°·0 on 13th. F 8, f 16.

LILBURN COTTAGE.—Heavy S on 11th and 12th, about 15 inches deep, but no drift.

HAVERFORDWEST.—Very mild, wet and stormy. Duration of sunshine 42·6* hours. Shade max. 63°·0 on 7th; min. 26°·7 on 14th.

LLANDUDNO.—Shade max. 54°·0 on 7th; min. 30°·0 on 14th and 26th.

CARGEN.—Constant and rapid fluctuations of bar. and ther. S 12 inches deep on 11th, with drifts 6 to 7 feet deep; traffic on road and railway seriously interfered with. Shade max. 51°·0 on 7th; min. 13°·0 on 14th. F 16.

MARCHMONT.—Duration of sunshine 20·8 hours. Shade max. 51°·0 on 7th and 8th; min. 15°·0 on 14th. F 19, 21.

INVERARAY.—S on 11th, which, though slight in the town, was heavy in the glens a few miles distant, and owing to deep drifts, the mails were stopped.

COUPAR ANGUS.—But for the soft condition of the S, all railway traffic would have been stopped for weeks. Farm work very late and little prospect of improvement.

DRUMNADROCHIT. — R 1·20 in. and rain days 8 below the average. S 7½ inches deep on 31st, being the heaviest fall here for some years.

LOCH STACK.—Duration of sunshine 31·5* hours.

WATERFORD.—The wettest January since 1873. Shade max. 52°·5 on 7th; min. 24°·0 on 26th. F 13.

DUBLIN.—Open, stormy and wet. Only in 1895 was the R of January greater. Mean temp. 43°·4. Wind chiefly S.E., S., or S.W. Shade max. 55°·4 on 7th; min. 28°·1 on 13th. F 2, f 12.

MARKREE.—Very wet, with frequent storms. Duration of sunshine 33·1 hours.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, August, 1912.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute.				Average.				Absolute.		Total Rain		Aver.
	Maximum.		Minimum.										
	Temp.	Date.	Temp.	Date.	Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	73·2	4	43·1	28	66·6	50·5	51·6	82	117·7	41·0	4·89	25	6·0
Malta	...	...	...	...	...	...	...	...	...	..	...	...	...
Lagos	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape Town	76·7	6	38·0	30	63·5	48·2	49·2	78	...	...	3·52	13	5·5
Durban, Natal ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Johannesburg	76·8	25	31·1	31	66·6	43·9	37·3	63	139·0	30·2	·00	0	0·8
Mauritius	77·2	24	55·5	24	75·1	61·4	59·1	75	143·8	49·3	1·75	18	5·9
Bloemfontein	80·3	25	28·2	14	67·5	38·2	30·4	50	...	...	·00	0	2·1
Calcutta...	92·2	31	75·5	9	88·4	78·9	78·4	87	...	74·5	10·95	19	8·8
Bombay...	87·0	22	75·4	25	84·5	77·4	76·0	85	127·3	72·6	9·70	29	8·5
Madras	102·1	5	72·1	21, 25	95·9	77·7	74·5	75	144·8	72·1	5·39	18	6·9
Kodaikanal	69·2	8	49·5	1	63·5	52·5	51·9	84	144·7	45·2	5·39	18	7·6
Colombo, Ceylon ...	86·1	7	75·6	10	86·2	78·2	73·5	75	153·4	69·6	1·40	9	7·0
Hongkong	91·2	1	75·7	26	86·7	78·3	75·9	83	143·6	...	15·72	19	7·0
Sydney	70·3	23	42·0	30	62·6	48·1	44·8	73	121·7	31·1	1·82	24	4·5
Melbourne	71·6	21	34·9	31	59·8	44·6	42·1	66	119·6	30·2	1·66	14	6·4
Adelaide	71·1	20, 25	36·[illegible]	14	61·9	46·9	45·3	71	130·0	29·2	2·12	13	6·0
Perth	76·2	28	41·4	21	65·1	49·1	48·8	73	127·2	35·4	2·69	19	5·0
Coolgardie	84·4	15	35·2	2	68·7	43·2	39·2	47	141·6	31·4	·03	1	2·3
Hobart, Tasmania ..	68·9	21	34·7	14	56·4	41·7	38·3	63	120·1	28·1	1·25	20	6·5
Wellington	62·0	25	29·2	14	54·7	41·5	40·6	75	118·0	21·0	1·57	13	5·0
Auckland	60·5	30	34·0	13	56·4	44·0	...	81	88·0	31·0	3·60	16	5·6
Jamaica, Kingston ..	95·0	5	70·9	13	90·7	74·0	70·8	74	...	...	1·13	8	4·0
Grenada	88·0	sev.	73·0	sev.	85·0	76·0	...	78	139·0	...	6·07	19	4·2
Toronto	85·0	14	42·3	30	72·3	55·5	...	...	143·8	38·0	3·97	20	5·4
Fredericton	83·8	14	40·0	17	69·7	50·4	...	81	...	...	5·72	16	6·1
St. John, N.B. ...	74·0	15	46·0	31	65·0	53·3	...	81	...	...	5·75	17	5·9
Edmonton, Alberta ...	81·2	21	36·0	30	69·4	50·4	...	79	134·3	30·0	4·31	18	5·6
Victoria, B.C.	81·8	7	41·2	28	68·3	51·4	...	76	...	...	2·26	8	4·0

Johannesburg.—Bright sunshine 310·2 hours.

Mauritius.—Mean. temp. of air 0°·3 below, and R ·73 in. below, averages. Mean hourly velocity of wind 11·6 miles, or 1·0 miles above average.

KODAIKANAL.—Bright sunshine 124 hours.

COLOMBO.—Mean temp. of air 82°·2 or 1°·6 above, of dew point 0°·2 above, and R 2·05 in. below, averages. Mean hourly velocity of wind 8·6 miles.

HONGKONG.—Mean temp. of air 81°·8. Bright sunshine 182·1 hours. Mean hourly velocity of wind 6·9 miles.

Sydney.—Mean temp. of air 0°·5 above, and R 1·45 in. below, averages.

Melbourne.—Mean temp. of air 1°·2 above, and R ·15 in. below, averages.

Adelaide.—Mean temp. of air 0°·6 above, and R ·23 in. below, averages.

Coolgardie.—Mean temp. of air 2°·7 above average.

Hobart.—Mean temp. of air 1°·0 above, and R ·57 in. below, averages.

Wellington.—Mean temp. of air 0°·3, and R 3·18 in., below averages. Bright sunshine 168·5 hours.

Auckland.—Mean temp. of air 2°·4 below average.

EDMONTON.—A damp wet month. TSS on 7 and fog on 3 days.