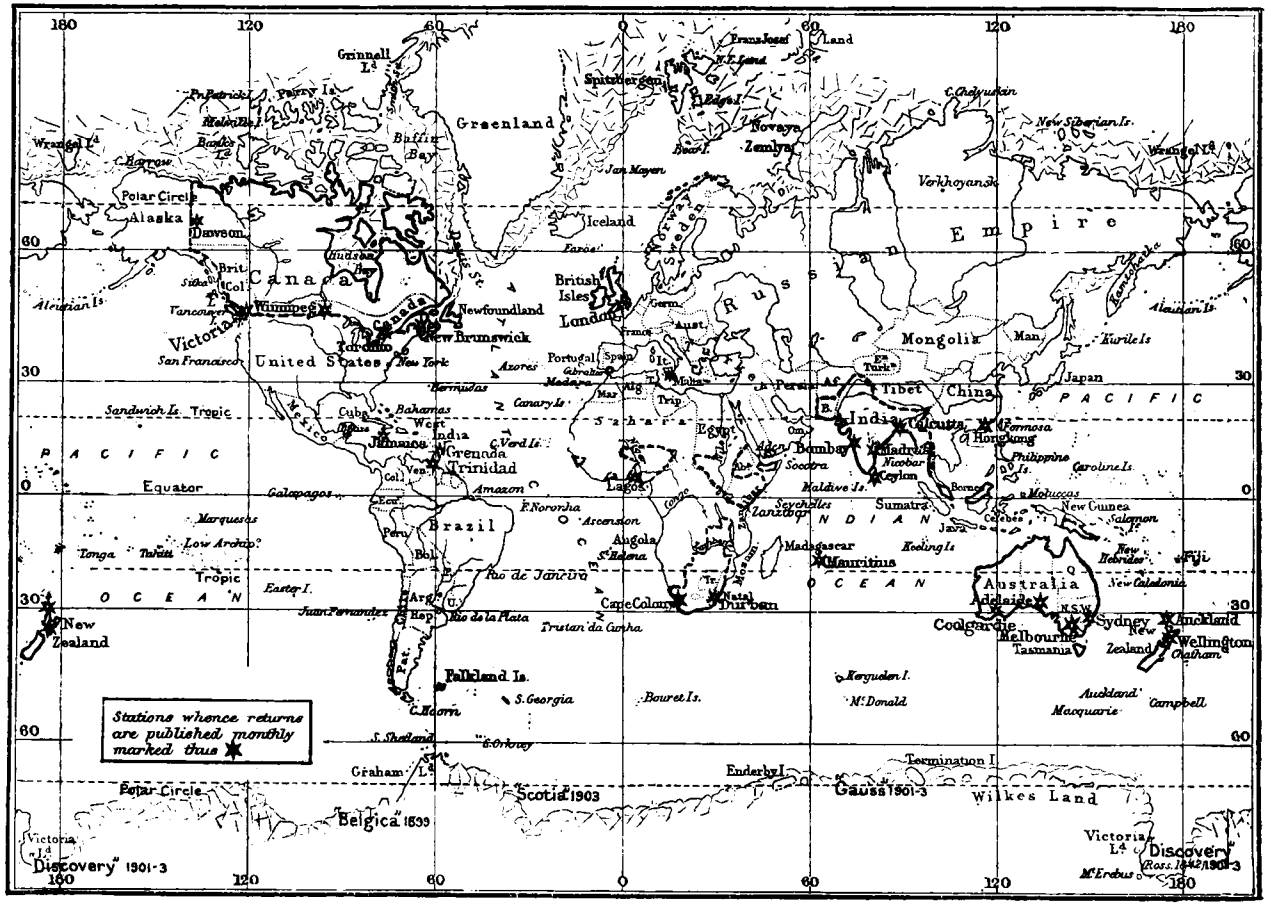


MAP OF BRITISH EMPIRE SHOWING CLIMATOLOGICAL STATIONS.

SYMONS'

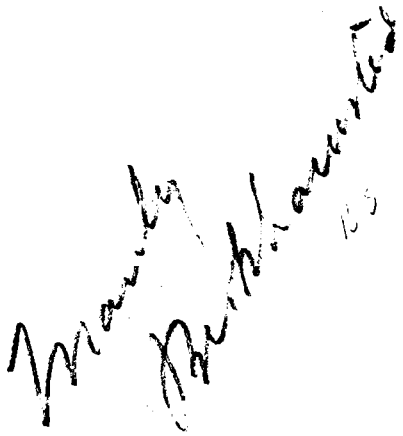
METEOROLOGICAL MAGAZINE.

Edited by HUGH ROBERT MILL, D.Sc., LL.D.

VOLUME THE THIRTY-SEVENTH.

1902.

LONDON:
EDWARD STANFORD, LONG ACRE, W.C.
1903.




SHIELD. Printer
Chelsea
Works Lancelot Place,
Brompton Road.

INDEX.

LIST OF ILLUSTRATIONS.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXXXIII.] FEBRUARY, 1902. VOL. XXXVII.

DUST SHOWERS IN THE SOUTH-WEST OF ENGLAND.

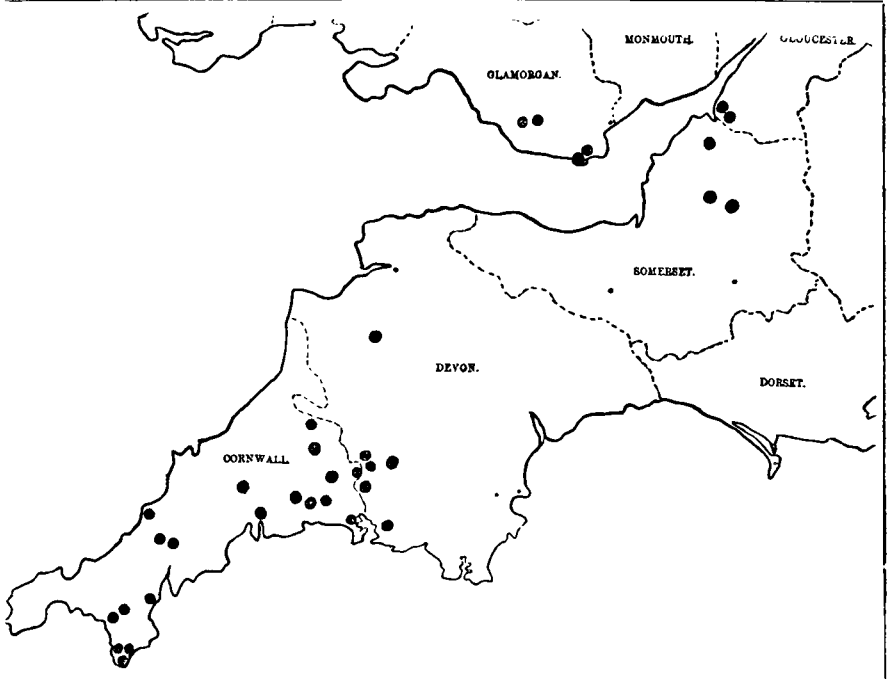
THE "blood-rains" of March last in southern Europe produced so much excitement where they fell and were commented on so fully in the daily press, that it is somewhat strange to have to record a very similar occurrence in our own country which seems to have called forth no comment whatever in any London newspaper. On January 22nd or 23rd, many people in the extreme south-west of England had their attention attracted by a peculiar deposit of reddish or yellowish dust, which lay on exposed objects or the surface of the ground, and appeared to have fallen from the sky. Such a phenomenon is not unprecedented, but it is so rare as to be worth investigating, and we publish this preliminary notice in the hope of obtaining additional information as to the extent and the nature of the showers. It would be a favour if every reader who has observed the phenomenon would write a short account, stating exactly what was seen, with date and place and any other facts bearing on the subject, and send it to Dr. H. R. Mill, 62, Camden Square, London, N.W.

The accompanying map shows by a large black dot every place at which we have ascertained that the appearance was noticed. It will be seen that the dust fell over practically the whole of Cornwall, but only attracted attention near the western border of Devon, reappearing again at a few points in Somerset, the extreme south of Gloucester and Glamorgan. There are thus two areas in which the dust fell abundantly—the Cornish area, measuring roughly 80 by 40 miles, and the Bristol Channel area, measuring perhaps 60 by 30 miles. The most northerly and easterly point in the former area, Black Torrington, is 50 miles from the nearest points in the latter area, Bridgend and Barry. Of course, the dust may have fallen in the intervening districts and have escaped notice, a probability which will appear the greater when we remember that the large unpeopled tracts of Dartmoor and Exmoor lie there. But, on the other hand, we have ascertained by enquiries specially addressed to rainfall observers, who are not likely to have overlooked so interesting an appearance, that nothing of the kind was noticed at Barnstaple, Taunton, Newton Abbott, Torquay, Portland, or North Cadbury (near Wincanton). These places are

marked on the map by a small circle. Hence, there is some evidence for believing that two different falls took place, but we cannot at present say whether they were simultaneous or successive. With regard to this question, notes as to the hour when the dust was first observed would be of value.

An enquiry addressed to Mr. Dorrien Smith, of Tresco Abbey in the Scilly Islands, elicited the fact that splashes of muddy rain had been observed there on January 21st, but no general fall of dust.

An examination of the Daily Weather Charts shows that, from the 20th to the 23rd, the weather of the south of England was controlled by a high-pressure area, the centre of which lay over the west of France and the Bay of Biscay until the 23rd, when it moved a little eastward. The wind over the whole of the west and south of England was westerly, with a southerly component, and light; and the rainfall was very slight, a little snow lying in some places.



FALLS OF DUST ON JANUARY 22—23, 1902.

The actual appearances observed may be judged from the following extracts from local newspapers, and from our correspondence:—

A correspondent of the *Western Morning News*, writing from Bere Alston, says:—"A labourer here speaks of a slight hail shower on Thursday last [23rd], which was accompanied by a dust fog. His account somewhat resembles the descriptions we have of those fine

dust showers which, at a distance of 400 or 500 miles from the coast of Africa, envelop vessels in a thick fog."

Rev. J. A. Wix, of Quethwick, speaks of a washing hung out to dry on the night of the 23rd being found next morning, "splashed to such an extent by some yellowish 'mess' that all had to be re-washed," while the cabbages were covered with a dust resembling Peruvian guano.

Mr. E. W. Waite, the Waterworks' Engineer of the Barry Urban District Council, writes us :—

"The fall of rain, ending on Thursday the 23rd at 9 a.m., was a light one, only ·03 in., the wind very light from W.N.W. The deposit, like a very fine dust, coated the iron railings and fences with a pale salmon-pink colour. I was very much struck with some ordinary wire-netting which appeared to have been painted with a brush. The deposit was particularly noticeable on Barry Island, although I found it to a lesser extent at Barry itself."

Earl Waldegrave, writing from Chewton Priory, to the *Western Daily Press*, says :—

"Wednesday the 22nd was with us very warm, with wet mist, only measuring ·02 in. of rain. Afterwards the glass and woodwork of the greenhouses and frames were covered with a rust-coloured dust, which has left stains on the paint."

Sir Edward Fry, writing to *Nature* of February 6th, from Failand, near Bristol, says :—"My men here noticed on Thursday last, the 23rd instant, that the leaves, glasses of the frames and iron-work of the gates were smeared with a reddish mud ; one hedge in particular they describe as almost covered with the substance, and the pinafores of a cottager's children which were hanging out to dry were so stained with the deposit that they had to be re-washed. When the substance fell no one here knows, nor is it clear whether it fell as dust or mud ; from the firm way in which it has attached itself to the iron-work, I should think that it fell as mud."

Dr. A. A. Rambaut, F.R.S., informs us that although no fall of dust was noticed at the Radcliffe Observatory, Oxford, a singular appearance in the sky attracted attention on the morning of January 21st, and led a workman engaged in the Observatory grounds to ask whether there was "going to be a dust-storm."

Several correspondents of the western papers suggest that an explosion of dynamite, which occurred at Nobel's Explosives Factory at Perranporth, near Truro, on January 16th, might have thrown a sufficient quantity of dust into the air to account for its fall a week later over a wide area. It seems improbable that less than several thousand—possibly hundreds of thousand—tons of dust have fallen during these showers, although as yet we have no data for a quantitative estimate, and, on enquiring as to the extent of the explosion, we have been favoured by the following interesting communication from Mr. J. V. Turner, the Works' Manager :—

"The explosion took place about 1 ft. 4 in. above ground level ;

a crater was made measuring 20 ft. by 15 ft. by 3 ft. deep, but the earth was not all dislodged. I should say that not a single atom of earth or matter was thrown outside our own property, not by many hundreds of yards. The column of smoke, fumes and *débris* did not ascend more than 100 feet high, and from eye-witnesses we know that the fumes or smoke were all condensed within a quarter of a mile from us in the direction of Truro, this would mean that the wind was N.W. at the time. The deposit referred to was perceived on the morning of January 22nd. . . . . I have often noticed such deposits off the coast of Africa whilst at a great distance from land."

Mr. Waite was good enough to send us a sample of the dust collected on Barry Island, and this we submitted to Sir John Murray, F.R.S., of the "Challenger" Expedition, and to Mr. W. E. Prior, of the British Museum, both of whom very kindly examined it microscopically. They agree in regarding it as a very fine grained inorganic dust, containing grains of quartz and portions of micaceous minerals or of felspar, with a few fragments of diatoms. Sir John Murray considers it resembles a clay coloured by the higher oxides of iron, and containing some minute magnetic spherules, possibly of cosmic origin. Mr. Prior concludes: "The dust appears to be of the same nature as the dust or so-called "blood-rain," which is often carried over from Africa to Europe, even as far north, it is stated, as Hamburg."

A memoir on the dust rains of last March, by Drs. Hellmann and Meinardus, with maps showing the distribution of the phenomenon, has reached us just in time to mention the fact here, and we hope to give some account of it next month.

We trust to the co-operation of the observers in the west of England to obtain additional information, which may enable a really satisfactory account to be given of the extent and origin of the sprinkling of yellowish-pink dust reported by so many observers.

THE HIGH PRESSURE IN JANUARY.

THE highest barometric pressure recorded in the British Isles, so far as we can ascertain, was 31·108 inches at Ochtertyre, on January 9th, 1896, at 9 a.m., this figure representing the value reduced to 32° F. and sea level. On January 31st, 1902, the pressure at Aberdeen, as given in the Daily Weather Report, was 31·11 inches, and this is possibly higher than the previous "record;" although, until the reading is given to the third decimal place, we cannot say so with certainty. Throughout January the atmospheric pressure has been unusually high over the extreme west of Europe, and we have received numerous communications on the subject. The highest readings in the south occurred in the middle of the month; those in the north, at the end. The following instances may be cited:—

At Camden Square the corrected barometer reading had exceeded 30·800 inches on only six occasions since 1859, and, observing at

9 p.m. on January 14th that this limit was being exceeded for a seventh time, Mr. SOWERBY WALLIS carried out a series of half-hourly readings until 5 a.m. on the 15th, when the maximum seemed to have passed. However, at 9 a.m., the highest reading was recorded—30·874—a value only exceeded on three previous occasions, viz. :—

30·927 in.	on	January	30th, 1896,	at 11 a.m.
30·934	,,	,,	9th, 1896,	at 9 p.m.
30·975	,,	,,	18th, 1882,	at 10.30 a.m.

The pressure remained above 30·800 inches continously for 19 hours.

Mr. G. VON U. SEARLE reports an equally high reading at West Kensington, 30·876 inches at 9 a.m. on the 15th.

Mr. E. L. M. COLVILE, at Bournemouth, carried out half hourly observations, and he reports a maximum pressure of 30·927 at 10.30 a.m. on the 15th ; the pressure at 8 a.m. having been 30·916, and at 9 a.m. 30·921. Mr. Colvile's barometer is on Fortin's pattern, and he sends us the readings corrected to 32° and sea level.

The high pressure at the end of the month was much less pronounced in the south, the maximum at Camden Square being 30·703 at 9 a.m. on the 31st. In the north, however, very high readings were the rule. Writing from Harewood Lodge, Meltham, Yorkshire, Mr. C. L. BROOK sends us a series of barometer readings from 5.30 p.m. on January 30th, when the pressure corrected and reduced was 30·734, to 10 a.m. on February 1st, when it was 30·863. The highest reading observed was 30·951 on January 31st at 11 a.m., a value only exceeded in Mr. Brook's record by 31·021 on January 9th, 1896.

The highest reading of a standard barometer of which we have heard was the 31·11 inches recorded by the Meteorological Office observer at Aberdeen at 10 p.m. on January 31st. From the Daily Weather Reports we observe that an anticyclone spreading from the south caused a rise of pressure with few fluctuations from the beginning of the month, until on the 11th the whole of the British Isles had pressures over 30 inches, and on the 14th no place had a pressure lower than 30·5 inches. There was a considerable fall of pressure from the 24th to 28th, and then a rapid recovery, until on February 1st the 8 a.m. weather chart showed the greatest concentration of air that has been observed since the great anticyclone of January 9th, 1896, when pressure over the whole of our islands exceeded 30·8 inches. On February 1st, 1902, the pressure ranged from 30·5 inches in the south of England to more than 31·0 inches over the northern half of Scotland.

The popular belief that a high barometer involves calm weather was somewhat rudely shaken by the memorable easterly gale which raged over the southern part of the North Sea and the Channel on Friday, Saturday, and Sunday (January 31st to February 2nd) as the

masses of air piled up in the north swept over the surface towards the low pressure area in southern Europe.

In referring to the occurrence of abnormally high barometric readings, Mr. Brook, of Harewood Lodge, points out that they show a tendency to occur in pairs, and cites the following examples :—

Year.	Dates.	Interval, Days.
1821	Jan. 3rd and Feb. 5th	33
1825	Jan. 9th ,, Jan. 28th	19
1834-35	Dec. 15th ,, Jan. 2nd	19
1882	Jan. 18th ,, Feb. 1st and Feb. 19th	14, 18
1896	Jan. 9th ,, Jan. 30th	21
1902	Jan. 14th ,, Jan. 31st	17

To this we may add from the Camden Square record :—

1887	Feb. 7th and April 17th	69
1891	Jan. 11th ,, Feb. 4th	24

Omitting the year 1887, the average of the eight cases shows an interval between the maxima of exactly three weeks. It must be noted, however, that since 1858 the Camden record shows 21 cases of maxima exceeding 30·7 inches, and thirteen of these were certainly unpaired.

The rainfall of January naturally falls considerably below the average in all parts of the country, except in the track of the depressions of the 1st and 28th, on account of the prevailing anticyclonic conditions, and the fact of so severe a gale as that at the end of the month being entirely without rain was very impressive to those who experienced it.

Correspondence.

INCENDIARY LIGHTNING.

To the Editor of Symons's Meteorological Magazine.

THUNDERSTORMS are rare on the Cape Peninsula, and never severe. Yesterday evening a storm passed directly over Table Mountain, and the clouds seemed to be 500 feet higher than the mountain, or about, say, 4,000 feet. The lightning was very beautiful; some flashes were momentary, others lasted an appreciable time. I saw one flash actually hit the mountain about 20 feet from the top of the precipice, and whilst the flash continued I saw the part struck grow a brilliant red. It thought at the instant it was molten rock. The glow vanished with the flash; but smoke now appeared, in fact a bush had evidently been ignited, and I had been fortunate enough to see it. Many other flashes struck the summit, but from my station I did not again see the actual point struck.

R. T. A. INNES.

Royal Observatory, Cape of Good Hope, 26th Oct., 1901.

DEFINITION OF A RAINY DAY.

To the Editor of Symons's Meteorological Magazine.

Is it not about time that the definition of a *rainy day*, as a day on which ·01 in., or more, of moisture is deposited, should be altered? For it contains an absurdity. How many days on which ·01 in. only of moisture is deposited in the gauges have one drop of real rain? I venture to say not 10 per cent. The deposition on all the other occasions is due either to wet fogs, or to dew. Now how misleading this is! You tell a man, for instance, that in November last there were fifteen rainy days, and he will laugh in your face, and naturally too, for there were only seven days throughout the month on which the measurement was more than ·01 in.; on almost, if not all the others, the moisture was caused entirely by dew. And yet all these ·01 in.. days get added in when considering the climate of any place, so that it is not only certain that all places appear much rainier that they ought in meteorological records, but also that those places in valleys, by rivers &c., that have copious and frequent dews, appear the wettest of all; and not only so, but the dryer and more settled their weather, the more rainy they appear, because it is just under those conditions that dew forms most copiously. Hence it is quite conceivable that such a place might have an entirely rainless month with thirty *rainy* days. Which is absurd.

Now, how much more true it would be to give as a definition of a *rainy* day, *one on which ·02 in. or more of moisture is deposited.* This quantity of dew is hardly ever measured, and the few occasions on which it is would about balance those few days on which ·01 in. of rain only really does fall. We should then know truly on how many days per month, or per year, rain *does* fall at any given place, which at present we certainly cannot do. Of course the dews would be measured and added into the monthly totals in the ordinary way, but would no longer be able to convert a large proportion of our most beautiful days and nights into *rainy* ones.

I hope that by means of your influential paper, you may be able to effect this much-needed reform.

ALBT. E. WATSON, B.A., F.R.Met.Soc.

[We hope that our paper may be influential for the good of meteorology, but we trust that it will not, by publishing the foregoing letter, lead to any departure from the accepted definition of a rainy day (or a rain day, as the Meteorologieal Office call it, with less room for ambiguity). We need only refer readers curious on the subject to the long and careful discussion which led Mr. Symons to adopt the minimum value for a day on which measurable rain falls. The word "rain" is used in relation to measurement, as a contraction for "any form of aqueous precipitation or condensation from the atmosphere," and dew has no more right to be excluded than snow. In India a rainy day is officially defined as one on

which at least ·10 in. of rain falls; in Scotland we have heard a shepherd indignantly repel the suggestion that a day on which half-an-inch fell was rainy, though he "wadna say it was no a bit saft." We cannot satisfy everyone, but by stating the definition adopted we can at least deceive no one.—ED. *S.M.M.*].

ROYAL METEOROLOGICAL SOCIETY.

THE Annual General Meeting of this Society was held on Wednesday, January 15th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. W. H. Dines, B.A., President, in the chair.

Mr. F. C. Bayard read the Report of the Council for the past year, which showed that the Society was in a satisfactory condition, there being an increase of 28 in the number of Fellows. The Council had willingly accepted the transfer of the Symons's Memorial Fund, subject to the recommendations of the subscribers as to the award of the medal. After adopting the regulations respecting the award, the Council at their meeting on November 20th designated Dr. Alexander Buchan, F.R.S., as the first recipient of the medal. The Society's Howard Silver Medal has been awarded to Cadet C. de V. Le Sueur, of H.M.S. *Worcester*, for the best essay on "The Meteorology of the Antarctic regions."

The Report having been adopted, and the usual votes of thanks passed, the President proceeded to read from the Council minutes the formal statement of Dr. Buchan's services to meteorology, and then with a few appropriate words presented to him the Symons's Gold Medal, a photograph of which appeared in our number for January.

The President in his Address dwelt with the "Theory of Probability applied to various Meteorological problems." He considered that for all practical purposes weather conditions may be looked upon as purely accidental, and that we may apply to them the laws of chance. They are not by any means in reality a matter of chance, for although we cannot discover it, there is doubtless a cause for each kind of weather, normal or abnormal. At the present time the work of forecasting weather conditions in the British Isles involved estimating various degrees of probability, and foretelling that sort of weather which, on the whole, seemed to be the most likely. Forecasting was based upon the probable course of barometric depressions, and it was hardly too much to say that if we could have barometric charts covering a large area of the temperate latitudes drawn for them a month in advance, we could foretell the weather for that month with very fair accuracy. With regard to the question —How long a time is required to obtain a true average? he had come to the conclusion that 10 years temperature observations give a mean of which the probable error is a little under one degree, 30 years reduce this to half a degree, 50 years to one-third of a degree, and 100 years to one-quarter of a degree. After dealing with

barometer observations and rainfall, he proceeded to speak of weather almanacs, cycles, &c. Mr. Dines, in conclusion, said, "Meteorology is far more than a statistical science, and is very closely dependent upon theoretical mechanics and thermodynamics, and in the application of these subjects to meteorology lies the best hope of its advance. Unfortunately this application often requires the possession of very exceptional mathematical skill, and but few of those who possess the skill have been willing to turn their attention to the subject. But with the comparatively limited knowledge of mathematics to which I can lay claim, it is possible to answer many meteorological questions, and also, I am afraid it must be added, impossible not to see that many current explanations of meteorological phenomena are in fundamental opposition to well established mechanical and dynamical laws."

A vote of thanks having been passed to the President for his address, the scrutineers of the ballot announced that the following gentlemen had been elected the Officers and Council for the ensuing year :—

President.—Mr. W. H. Dines, B.A. *Vice-Presidents.*—Capt. M. W. C. Hepworth, Mr. R. Inwards, Mr. Baldwin Latham, and Mr. E. Mawley. *Treasurer.*—Dr. C. Theodore Williams. *Secretaries.*—Mr. F. C. Bayard and Dr. H. R. Mill. *Foreign Secretary.*—Dr. R. H. Scott, F.R.S. *Council.*—Mr. R. Bentley, Capt. W. F. Caborne, C.B., Capt. A. Carpenter, R.N., D.S.O., Mr. R. H. Curtis, Mr. H. N. Dickson. Mr. W. Ellis, F.R.S., Mr. C. Hawksley, Pres.Inst.C.E., Mr. J. Hopkinson, Mr. H. Mellish, Sir J. W. Moore, M.D., Mr. W. N. Shaw, F.R.S., and Capt. D. Wilson-Barker.

The above meeting was preceded by a brief ordinary meeting, at which the following were elected Fellows of the Society :—J. T. Abraham, F. Armstrong, W. J. Brown, H. L. Cannon, W. T. Creswell, W. H. Curtin, F. A. De La Motte, C. W. Edwards, W. S. Harmer, H. L. Jaques, I. P. Jones, C. H. Lawton, F. B. Lewis, D. M. Nesbit, H. M. H. Newby, the Hon. Lady Peek, A. E. Powell, J. F. Stow, F. D. Stuart, S. Walkden, H. W. S. Walwyn, and S. S. Wherley.

REVIEWS.

Meteorologische Optik. [Meteorological Optics.] *Von* J. M. PERNTER. I. *Abschnitt.* Wien und Liepzig, W. Braumüller. 1902. Size $10 \times 6\frac{1}{2}$. Pp. 1-54, Illustrations.

THIS book, which is being issued in parts, deals with a subject which, as the author observes, the meteorologist usually leaves to the physicist, and the physicist to the meteorologist. The distinguished Director of the Imperial and Royal Meteorological Institute in Vienna has worked through all the available data, and now publishes, after revision, the substance of the lectures delivered by him in the Universities of Innsbrück and Vienna. Part I. deals with the

apparent form of the vault of the heavens, the apparent size of the sun, moon and stars at different altitudes, and the oval form of lunar and solar halos, a form which probably few casual observers have detected. He points out that no one who sees the sun or moon larger at the horizon than on the meridian sees the sky as a hollow hemisphere, but always as a flattened vault, and, by this fact, he explains the whole group of phenomena. He points out that the direction of the line of vision has everything to do with the conception formed in the mind of the figure of the sky.

Ice Caves and Frozen Wells as Meteorological Phenomena. By H. H. KIMBALL. Reprinted from the "Monthly Weather Review" for August, 1901. Size 9 × 6. Pp. 16. Plates.

PERMANENT ice caves or frozen wells are explained thus—"The cold air of winter circulates to unusual depths below the surface and freezes the small quantity of water with which it comes in contact. In summer this subterranean circulation of the air ceases, and heat finds its way to the ice only by the slow process of conduction."

Regenkarte der Provinzen Brandenburg und Pommern, u.s.w. [Rainfall maps of the provinces of Brandenburg and Pomerania, &c.] *Von* PROFESSOR DR. G. HELLMANN. Berlin: 1901, Dietrich Reimer (Ernst Vohsen). Size 10½ × 7. Pp. 40. Map.

HAVING commenced his series of rainfall maps of North Germany in the extreme east, Professor Hellmann has now reached the central group of provinces containing Berlin, a region of monotonous surface, with little variety of configuration beyond what is supplied by the low hills of the Baltic Lake Ridge. The map shows the average rainfall for 1891-1900. A small area in the centre, in the valley of the Oder, has a rainfall very slightly under 20 inches, while in the extreme east, the extreme south and the extreme west, the rainfall on other small areas slightly exceeds 26 inches; the whole resembling, so far as the total annual fall is concerned, the portion of England between the North Downs and the Yorkshire Wolds. Speaking generally, the rainfall was smaller in amount and the extremes were more pronounced the further the stations lay from the North Sea or the Baltic coast. A comparison of a few long-period sets of observations showed that the decade 1891-1900 had a rainfall very close to the average, and the examination of the long records (for 45 years) showed, as the average of five stations, a variation of the yearly total between 130 and 65 per cent. of the average. Professor Hellman deals at considerable length with maximum falls on rainfall days and heavy falls in short periods, on the importace of which to engineers, farmers and all out-door workers, he lays just stress. The greatest fall in 24 hours recorded at any of the 308 stations considered was 5·87 in., which fell at Sommerfeld on July 7th, 1899, while only twelve stations showed a

maximum fall greater than 2·85 in. in the ten years. Classifying the falls in short periods, he shows that the average fall per minute is twice as great for falls lasting from 46 to 60 minutes, and four times as great for falls lasting less than 15 minutes, than it is for falls exceeding three hours in duration.

METEOROLOGICAL NEWS AND NOTES.

A MEMORIAL METEOROLOGICAL STATION is proposed to commemorate the late eminent physicist, Dr. J. P. Joule, at Sale, near Manchester. It is proposed to erect a tower 40 or 50 feet in height provided with a combined public clock and meteorograph, and a set of the ordinary meteorological instruments. The tower will be erected in a public park, but we hope that the rain-gauge may be provided with a place apart, and not accommodated on the top of the tower

THE COCOS KEELING ISLANDS in the middle of the Indian Ocean, formerly one of the most desolate of British possessions, are now linked by the new cable with Cape Colony and Australia, and the *Melbourne Argus* states that arrangements have been made by the Telegraph Company to forward meteorological observations free of charge, so that Australia may profit to the full by this tropical advance-guard. This stands in cheerful contrast with the action of the British Post Office, which charges a rate of postage on meteorological observations exactly double that for any other description of copy for the press.

AN ASPIRATION METEOROGRAPH has been devised by Herr Assmann, in order that the self-recording instruments enclosed in the "Meteorological Pillars," so common in German towns, may show the real condition of the air, and not that of the hot-house atmosphere of the glass case in which they are contained. The barograph, thermograph, and hygrograph, are arranged to write on one sheet, and a strong current of the outer air is drawn through the small glass case in which they are enclosed, the current being kept up by a small electric fan. The apparatus is described and figured in *Das Wetter* for November, 1901.

ERRATUM.

Vol. **36**, p. 202, last column of Table, lines 2 and 3 *should read*, 70·4 and 30·4 respectively, *not* 91·8 and 5·7 as given.

ERRATA IN 1900.—SUPPLEMENTARY TABLE.

						in.		in.
VI.	Clifton, Pembroke Rd.,	Aug.,	total	rain	*should be*	2·48,	*not*	2·34.
XIV.	Glasgow, Queen's Park,	,,	,,	,,		4·36,	,,	4·42.
XVII.	Forres, H.R.S., ...	Sept.,	,,	,,		1·90,	,,	1·85.
XXI.	Gorey, Courtown House,	April	,,	,,		1·53,	,,	1·28.
,,	,, ,, ,,	July	,,	,,		2·89,	,,	2·83.
XXIII.	Horn Head	Nov.	,,	,,		6·20,	,,	6·14.

JANUARY, 1902.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1890-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	·76	— ·95	·18	1	11	52·9	10	23·8	15	10	13
II.		Tenterden	·99	— 1·00	·36	1	12	51·0	1, 2	25·5	15	8	16
,,		Hartley Wintney	·81	— 1·14	·28	26	7	55·0	5	20·0	15	9	13
III.		Hitchin	·53	— 1·18	·13	4	8	52·0	4, 10	22·0	15	12	...
,,		Winslow (Addington)	·49	— 1·22	·14	26	9	54·0	21	19·0	15	11	16
IV.		Bury St. Edmunds (Westley)	·91	— ·78	·27	1	10	52·0	10*a*	24·5	30	9	...
,,		Norwich (Brundall)	1·18	...	·26	29	17	52·4	4	25·4	30	11	16
V.		Winterborne Steepleton	1·08	...	·30	1	10	51·3	2	21·2	15	10	17
,,		Torquay (Cary Green)	1·32	...	·47	1	13	56·0	2	28·9	15	2	10
,,		Polapit Tamar [Launceston]..	2·40	— ·93	·54	26	13	51·9	2	19·4	15	9	10
VI.		Stroud (Upfield)	1·18	— 1·03	·35	1	12	51·0	4, 10	24·0	14	12	...
,,		Church Stretton (Woolstaston)	1·51	— ·95	·29	27	14	56·0	10	22·5	30	11	13
,,		Worcester (Diglis Lock)	·77	— 1·09	·29	26	17	...	...	...	...	...	...
VII.		Boston	·80	— ·58	·39	4	8	56·0	7	25·0	29	...	...
,,		Hesley Hall [Tickhill].....	·73	— ·68	·15	3	9	53·0	9. 10	25·0	15	12	...
,,		Derby (Midland Railway).....	·93	— ·67	·21	26	13	53·0	21	21·5	15	14	...
VIII.		Manchester (Plymouth Grove)	2·49	+ ·17	·70	27	18	53·0	8	23·0	29	14	14
IX.		Wetherby (Ribston Hall) ...	1·04	— ·62	·60	1	6	...	...	...	...	...	...
,,		Skipton (Arncliffe)	...	...	...	...	...	...	...	...	...	...	...
,,		Hull (Pearson Park).	1·15	— ·52	·16	1	17	52·0	9, 10	23·0	27	14	18
X.		Newcastle (Town Moor)	·89	— ·92	·23	20	13	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	12·55	— 2·30	2·18	20	22	51·0	3	20·4	14*b*	11	...
XI.	WALES.	Cardiff (Ely).....	2·24	— 1·32	·48	26	18	...	...	...	...	...	...
,,		Haverfordwest	2·68	— 1·94	·39	1	16	51·9	2	23·3	15	6	11
,,		Aberystwith (Gogerddan) ...	3·23	— 1·02	·67	26	17	50·0	9, 10	18·0	14	12	...
,,		Llandudno.....	2·32	— ·21	·31	3, 10	21	53·5	3	27·0	14	4	...
XII.	SCOTLAND.	Cargen [Dumfries]	2·84	— 1·74	·66	1	9	52·0	3	19·0	14	10	...
XIII.		Edinburgh (Royal Observatory)	·89	...	·32	20	10	53·4	3	21·4	30	12	12
XIV.		Colmonell	5·30	+ ·46	1·34	20	16	52·0	3	20·0	30	10	...
XV.		Tighnabruaich	5·57	...	·85	23	19	47·0	3	17·0	29	13	...
,,		Mull (Quinish).....	5·71	— ·52	1·33	1	21	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·03	— 1·27	·39	2, 5	12	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·00	— 1·53	·30	1	14	53·6	6	16·8	31	13	...
XVII.		Braemar	2·33	— ·45	·64	4	18	48·2	16	3·0	27	16	22
,,		Aberdeen (Cranford)	1·87	— ·85	·50	1	20	53·0	6	10·0	30	19	...
,,		Cawdor (Budgate)	1·60	— ·62	·37	19	16	...	..	...	...	...	...
XVIII		Strathconan [Beauly]	5·83	+ 1·29	1·65	6	10	..	...	...	...	...	...
,,		Glencarron Lodge.....	12·42	+ 2·03	2·97	19	27	56·5	2	12·9	30	13	...
XIX.		Dunrobin	2·18	— ·44	·37	19	17	52·2	3*d*	15·0	27	...	...
,,		S. Ronaldshay (Roeberry) ...	2·93	— ·36	·40	5	25	50·0	6, 7	22·0	29	13	...
XX.	IRELAND.	Darrynane Abbey.....	1·34	— 3·92	·33	23	18	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	1·98	— 1·54	·46	1	13	52·0	2	22·0	15	9	...
,,		Broadford (Hurdlestown) ...	3·42	+ ·29	·55	24	23	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	2·21	— ·86	·54	1	13	...	...	...	...	...	...
,,		Dublin (Fitz William Square)	1·61	— ·53	·69	10	12	55·6	3	26·9	30	7	12
XXII.		Ballinasloe	3·42	— ·02	·60	10	23	62·0	3, 22	22·0	26*c*	12	...
,,		Clifden (Kylemore)	6·38	— 1·59	1·34	23	20	...	...	...	...	...	...
XXIII		Seaforde.....	2·09	— 1·32	·53	26	15	52·0	3, 22	20·0	29	12	13
,,		Londonderry (Creggan Res.).	2·93	— ·73	·35	26	20	...	...	...	...	...	...
,,		Omagh (Edenfel)	3·29	— ·22	·45	9	21	51·0	2	21·0	30	11	17

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

a—and 21. *b*—and 30. *c*—and 31. *d*—and 20.

SUPPLEMENTARY TABLE OF RAINFALL, JANUARY, 1902.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	·85	XI.	Castle Malgwyn	2·22
II.	Dorking, Abinger Hall .	·98	,,	Builth, Abergwesyn Vic.	4·30
,,	Sheppey, Leysdown	·58	,,	Rhayader, Nantgwillt ...	...
,,	Hailsham	1·44	,,	Lake Vyrnwy	4·29
,,	Crowborough.....	1·58	,,	Ruthin, Plâs Drâw	1·53
,,	Ryde, Beldornie Tower..	·83	,,	Criccieth, Talarvor	2·22
,,	Emsworth, Redlands ...	1·08	,,	I. of Anglesey, Lligwy..	2·61
,,	Alton, Ashdell	1·12	,,	Douglas, Woodville.....	2·41
,,	Newbury, Welford Park	·93	XII.	Stoneykirk, Ardwell Ho.	2·29
III.	Oxford, Magdalen Coll..	·62	,,	Dalry, Old Garroch	5·30
,,	Banbury, Bloxham	·94	,,	Montaive, Maxwelton Ho.	3·20
,,	Pitsford, Sedgebrook ...	1·06	,,	Lilliesleaf, Riddell	1·62
,,	Huntingdon, Brampton.	·69	XIII.	N. Esk Res. [Penicuick]	2·70
,,	Wisbech, Bank House...	·77	XIV.	Glasgow, Queen's Park..	3·47
IV.	Southend	·54	XV.	Inveraray, Newtown ...	7·10
,,	Colchester, Lexden	·40	,,	Ballachulish, Ardsheal...	9·63
,,	Saffron Waldon, Newport	·60	,,	Islay, Eallabus..... ...	3·70
,,	Rendlesham Hall	·63	XVI.	Dollar.....	2·79
,,	Swaffham	1·02	,,	Balquhidder, Stronvar...	7·99
V.	Salisbury, Alderbury ...	·76	,,	Coupar Angus Station...	1·12
,,	Bishop's Cannings	1·18	,,	Blair Atholl	2·07
,,	Blandford, Whatcombe	1·19	,,	Montrose, Sunnyside ...	·85
,,	Ashburton, Druid House	2·91	XVII.	Keith H.R.S.....	1·02
,,	Okehampton, Oaklands.	3·34	XVIII.	Fearn, Lower Pitkerrie..	1·17
,,	Hartland Abbey	2·16	,,	S. Uist, Askernish	...
,,	Lynmouth, Rock House	2·58	,,	Invergarry.....	2·23
,,	Probus, Lamellyn	2·60	,,	Aviemore, Alvie Manse.	2·41
,,	Wellington, The Avenue	1·67	,,	Loch Ness, Drumnadrochit	2·58
,,	North Cadbury Rectory	1·13	XIX.	Invershin	2·13
VI.	Clifton, Pembroke Road	1·91	,,	Bettyhill	1·80
,,	Ross. The Graig	·78	,,	Watten H.R.S.....	2·09
,,	Snifnal, Hatton Grange	1·03	XX.	Dunmanway, Coolkelure	5·75
,,	Wem, Clive Vicarage ...	1·28	,,	Cork, Wellesley Terrace	1·64
,,	Cheadle, The Heath Ho.	1·41	,,	Killarnev, District Asyl.	3·27
,,	Coventry, Priory Row ..	1·20	,,	Caher, Duneske	...
VII.	Market Overton	·90	,,	Ballingarry, Hazelfort...	2.76
,,	Grantham, Stainby	·70	,,	Miltown Malbay	2·75
,,	Horncastle, Bucknall ...	·75	XXI.	Gorey, Courtown House	1·29
,,	Worksop, Hodsck Priory	·84	,,	Moynalty, Westland ...	2·94
VIII.	Neston, Hinderton	1·81	,,	Athlone, Twyford	3·16
,,	Southport, Hesketh Park	2·38	,,	Mullingar, Belvedere ...	2·94
,,	Chatburn, Middlewood.	4·17	XXII.	Woodlawn	3·42
,,	Duddon Val., Seathwaite Vic.	7·06	,,	Westport, Murrisk Abbey	4·72
IX.	Baldersby	·72	,,	Crossmolina, Enniscoe ..	4·99
,,	Scalby, Silverdale	...	,,	Collooney, Markree Obs.	3·83
,,	Ingleby Greenhow Vic..	1·26	XXIII.	Enniskillen, Model Sch.	...
,,	Middleton, Mickleton ...	1·68	,,	Warrenpoint.....	3·19
X.	Bellingham	2 16	,,	Banbridge, Miltown.....	1·94
,,	Bamburgh	1·23	,,	Belfast, Springfield	2·40
,,	Keswick, The Bank	4·12	,,	Bushmills, Dundarave..	3·20
XI.	Llanfrechfa Grange	2·17	,,	Stewartstown	2·43
,,	Treherbert, Tyn-y-waun	5·54	,,	Killybegs	5·26
,,	Llandovery	2·70	,,	Horn Head	4·63

METEOROLOGICAL NOTES ON JANUARY, 1902.

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.

ENGLAND.

LONDON, CAMDEN SQUARE.—Dry and rather mild, with no severe frost and no S, except a shower on 26th, which did not lie. Unsettled and showery weather prevailed until the 12th. Frost from 12th to 15th, and on 19th. Rainy from 22nd to 24th, and alternate frost and thaw till the end. Mean temp. 41°·1, or 3°·0 above the average. Mean barometer 30·172, or 0·190 in. above the average.

ABINGER HALL.—Very dry, but somewhat fickle as regards temperature. The winter aconite and some Olympian primroses were in bloom.

TENTERDEN.—Dry, with but little frost. Duration of sunshine 63 hours. S on 30th; fog on 12th.

HARTLEY WINTNEY.—A black January; little R and many mild days, with light westerly winds. Fog from 17th to 19th. No severe weather and absence of frosts till 26th. Ozone on 15 days, mean 6·5. Daisy and violet in flower on 5th, snowdrop on 18th; brimstone butterfly seen on the wing on 6th.

WINSLOW, ADDINGTON.—The early part was mild with high wind. No frost till 13th. The end of the month was extremely cold, with rough E. and N.E. winds. R the smallest since January, 1880, when ·45 in. fell.

PITSFORD, SEDGEBROOK.—Very changeable, with several spells of severe frost. R ·60 in. below the average. Mean temp. 39°·5. S on 26th.

NORWICH, BRUNDALL.—Very mild till 24th; winterly during the last week. Thick fog on 17th. L on 25th. Snowdrop in bloom on 2nd, winter aconite on 6th, and crocus on 12th.

WINTERBORNE STEEPLETON.—Generally fine, with high temp. in the early part. From 13th to 20th, and from 25th to 31st, were cold.

TORQUAY, CARY GREEN.—R 1·98 in. below the average. Mean temp. 3°·4 above the average. Duration of sunshine 6·5 hours below the average; 13 sunless days. Mean amount of ozone 4·8; highest 9·0 on 2nd, with W. wind, lowest 1·0 on 15th and 19th, with N. wind, and on 23rd with W. wind.

POLAPIT TAMAR [LAUNCESTON].—A very calm dry period prevailed from 6th to 20th. Thick fog on 17th.

LYNMOUTH, ROCK HOUSE.—Dull, with very few sunny days. Wind during the last three days very strong, varying between N. and E., but no snow.

NORTH CADBURY RECTORY.—The first 13 days were extremely mild. The last two days were cold, though not with very low minima. No heavy R, and only one slight shower fell between 5th and 20th. Some S on 24th.

ROSS, THE GRAIG.—The spell of warm weather which set in on December 29th continued, with one or two severe frosts, until January 28th. The R was about one-quarter of the average, balancing the surplus last month. The amount of bright sunshine was much above the average, and white almond was in blossom on 22nd.

CHURCH STRETTON, WOOLSTASTON.—Violent westerly gales on 20th, and two succeeding days. Very changeable on the whole. S on 25th and 29th.

HULL, PEARSON PARK.—Generally overcast or cloudy, but with a small R, and fairly even and high temp. until 26th, after which there were frost and S.

WALES AND THE ISLANDS.

ABERYSTWITH, GOGERDDAN.—Rather wet, but a few hard seasonable frosts.

DOUGLAS, WOODVILLE.—Very like January, 1901; damp with comparatively little R. Cold generally, with several slight frosts. High winds on 10 days; reaching the force of a gale on 8. S and H on 6 days. Mild from 19th to 22nd.

SCOTLAND.

LILLIESLEAF, RIDDELL.—Max. temp. varied from 49° to 28°. R ·26 in. below the average.

COLMONELL.—Mean temp. 5°·3 below average of 26 years. H and S on 24th.

TIGHNABRUAICH, CRAIGANDARAICH.—Half the month was of a spring-like temperature, the remainder decidedly wintry, with S on 4 days.

INVERARAY, NEWTOWN.—The frost at the end of the month was the most severe for years, the temp. falling to zero in the Castle gardens. S on 4 days.

COUPAR ANGUS.—Min. temp. 9°·0 on 31st, max. bar. 31·15 on 31st.

MONTROSE, SUNNYSIDE.—Remarkably dry. Fine from 15th to 24th, cold later.

DRUMNADROCHIT.—The great feature of the month was the very keen frost which prevailed from 26th to the end. S on 11 days. T on 4th.

S. RONALDSHAY, ROEBERRY.—Very changeable. Two S storms, from 10th to 14th, and from 25th to end. Mean temp. 37°·7, or 0°·7 below average.

IRELAND.

DARRYNANE ABBEY.—Very dry; warm and foggy to 12th, and 19th to 24th. Gale and showers of H and frozen S on 24th and 25th. S on 28th and 29th.

WATERFORD, BROOK LODGE.—The driest January since 1896. Fog on 22nd and 23rd; S on 24th and 25th; H on 24th.

DUBLIN, FITZWILLIAM SQUARE.—Very mild and open, with predominant W. and S.W. winds, and a moderate R. First passing frost on 14th; persistent "cold snap" from 24th to 31st, with H, sleet and S. Mean temp. 43°·0, or 1°·6 above the average. High winds on 13 days, reaching the force of a gale on 3. S or sleet fell on 4 days, and H on one. Fog on 6 days.

COLLOONEY, MARKREE OBSERVATORY.—R below, and temp. above, the average, but little bright sunshine. S on 3 days.

OMAGH, EDENFEL.—Mild and wet for the first 10 days, followed by a dry period, with sharp night frosts, then 10 days still milder and wetter, giving way on 24th to S storms and frost of considerable intensity.

GENERAL WEATHER IN GLEN NEVIS, JANUARY, 1902.

By R. C. MOSSMAN, F.R.S.E.

Deduced from observations at 9 a.m. and 9 p.m.	*Ben Nevis.*	*Achariach.*	*Fort William.*
Height	4407 feet.	150 feet	42 feet
Rainfall	24·75 ins.	11·02 in.	9·46 in.
No. of days	26	27	26
Max. fall in 24 hours	2·46 in., 4th	2·19 in., 23rd	2·42 in., 19th
Highest temp. in shade	36°·5, 3rd	53°·5, 3rd	51°·2, 6th
Lowest ,, ,,	6°·0, 26th	6°·3, 30th	11°·9, 31st
Mean temp(Mean daily max. & min.)	23°·6	38°·2	38°·0
Temp. in shade below 32°	on 31 nights	11 nights	12 nights
Below 32° on grass	?	13	13
Bright sunshine	32·4 hours	0·0 hours*	27·7 hours
Sunless days	20	31	21
Mean relative humidity	89	83	84
Mean amount of cloud	8·6	8·2	8·0

* No possible sunshine; sun cut off all month by surrounding hills.

Highest barometric pressure at Achariach corrected to 32° and reduced to mean sea level, 31·097 in., at 10.30 p.m. on 31st.

Rainfall at head of Glen Nevis, and 357 feet above the sea, 10·13 in.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1901.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	85·3	9	45·2	28	74·8	53·9	52·5	69	134·8	40·1	1·79	9	5·0
Malta	93·8	1	64·4	8	86·2	70·9	67·8	73	148·7	62·5	·16	1	1·3
Lagos, W. Africa	86·0	30*a*	71·0	2	82·8	76·6	73·3	83	144·0	71·0	7·65	17	4·8
Cape Town	88·0	20	38·2	26	66·4	49·7	49·4	72	...	...	·58	11	4·3
Mauritius	78·0	4*b*	57·1	11	75·0	62·4	59·1	74	136·0	47·5	2·41	23	6·1
Calcutta	93·2	21	75·5	13	88·4	78·8	78·0	85	150·9	74·2	13·30	13	8·4
Bombay	86·6	27	75·2	29	84·1	77·4	76·0	87	136·5	74·3	14·27	29	8·9
Colombo, Ceylon	90·0	14	75·5	15	88·5	78·0	74·4	80	151·0	73·0	·46	10	4·5
Melbourne	65·0	15	33·9	2	56·8	44·1	43·3	79	123·4	26·0	1·89	9	8·0
Adelaide	72·2	15	35·2	1	61·1	43·8	43·3	73	130·5	26·1	1·19	13	6·1
Sydney	73·2	16	39·5	3	60·4	47·1	44·7	80	117·0	30·3	4·75	16	4·7
Wellington	59·3	31	32·0	7	54·3	41·4	38·3	71	102·0	23·0	3·55	13	4·1
Auckland	62·0	22	39·5	17	57·0	48·5	41·3	67	127·0	37·0	3·22	13	5·3
Jamaica, Halfway Tree	94·0	16	70·0	30	87·9	72·0	71·5	80	...	...	2·81	12	3·4
Trinidad	90·0	3,4	67·0	2	85·1	71·3	74·8	86	164·0	59·0	7·53	17	...
Grenada	87·2	19	71·0	16*c*	83·5	74·5	72·1	80	150·2	...	9·90	27	3·6
Toronto	87·4	22	49·7	9	78·2	59·9	61·6	80	110·2	46·0	3·86	10	5·2
St. John, N.B.	81·0	31	52·0	19	70·3	56·6	57·3	81	...	...	1·47	11	5·3
Winnipeg, Manitoba	92·0	16	39·5	8	77·7	51·4	...	...	...	...	1·70	11	3·8
Victoria, B.C.	79·2	15	48·2	20	69·6	52·4	..	...	...	...	·00	0	2·3

a—and 31. *b*—and 21. *c*—and 20.

REMARKS.

MALTA.—Mean temp. of air 77°·5, or 0°·4 below the average. Mean hourly velocity of wind 8·2 miles, or 0·9 above the average. Mean temp. of sea 78°·5. TS on 5th; L on 4 days. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·3, and of dew point 0°·3, and R ·03 in. below their respective averages. Mean hourly velocity of wind 12·1 miles, or 0·2 miles below the average; extremes, 31·3 on 10th and 1·8 on 19th; prevailing direction E.S.E. T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air 82°·4 or 1°·8 above, dew point 74°·4 or 1°·3 above, and R ·46 inches or 3·33 in. below, their respective averages. Mean hourly velocity of wind 7·6 miles; prevailing direction S.W. W. C. S. INGLES.

Adelaide.—Mean temp. of air 1°·5 below the average. Very cold at night, mean minima having been only twice lower in 44 years. Good rains over Northern agricultural and pastoral areas, but deficient over S. parts. Adelaide 1·20 in. under 44 years' average. C. TODD, F.R.S.

Sydney.—Mean temp. of air 1°·1 below, R 1·60 in. above, and humidity 5·9 above their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Generally fine in early and most of latter parts of month; but showery during the middle; prevailing N.W. and S. winds moderate. H on 3 days; fog on 21st. Smart shock of earthquake on 12th at 1.52 a.m. R. B. GORE.

Auckland.—Mean temp. close to the average, R 1·00 in. below the average. Showery and unsettled in early part of month, fine and dry later. T. F. CHEESEMAN.

TRINIDAD.—R 2·79 in. below the 30 years' average. J. H. HART.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXXXIV.] MARCH, 1902. VOL. XXXVII.

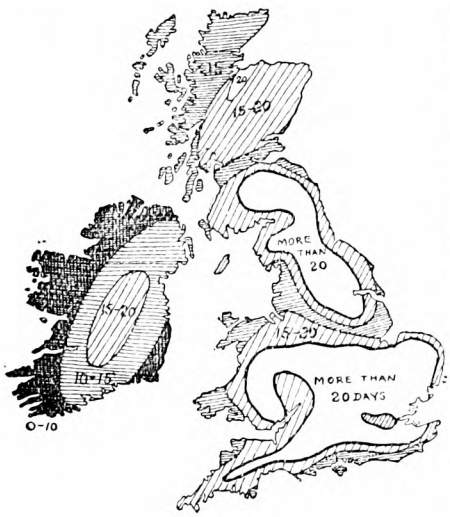
THE COLD FEBRUARY OF 1902.

THE excessive and long-continued cold of February, 1895, following, as it did, an exceptionally cold January was so very unusual that it forms a "record" not likely soon to be surpassed. But with this exception the recent frost was the most prolonged and severe which has been experienced in February for half a century. It affected the whole of the British Isles, and was accompanied by a heavy snowfall in the north and west, but in the south-east the period of frost was characterised by an almost entire absence of precipitation. The rain that accompanied the milder weather of the last week did not nearly make up the monthly average, so that an unusually dry February has followed an unusually dry January as it did last year.

The duration of the frost may be measured by the number of nights during which the temperature in the shade fell below the freezing point, even though during the day a maximum reading of several degrees above the freezing point was attained. The last week of the month appears to have been free from frost almost everywhere, and in most places the cold weather set in on the 1st, so that speaking generally the frost may be said to have lasted for three weeks. On the coast the influence of sea-winds naturally shortened the period; at Torquay 9 days, at Steyning 11 days, at Eastbourne, Lynmouth, and Haverfordwest 12 days, were the smallest numbers reported to us in Great Britain; while Rendlesham Hall, Suffolk, Goldsborough Hall, Yorkshire, and West Linton, Peebleshire, with 24 days, and Market Overton with 23, showed the longest duration. The accompanying sketch map, which shows diagrammatically the number of days of frost in different parts of the country, is compiled from about 100 well distributed returns.

It distinguishes the regions where the duration of the frost was less than 10 days by a very dark shading, those where it was from 10 to 15 and from 15 to 20 days respectively are lighter, and where the duration exceeded 20 days the map is left unshaded. The data for Scotland are not so full as for England, and it is possible that the western islands had less than 10 days' frost, while the central region of the northern Highlands very likely had more than 15.

The greatest cold experienced occurred in the first week throughout Scotland, and about the middle of the month in most parts of England. The following table shows all the cases of lowest minima for the month, indicating 20 or more degrees of frost, which have been reported by our correspondents, or published with dates in the Daily or Weekly Weather Reports. We believe that all the temperatures quoted are readings of accurate thermometers properly exposed so as to give the temperature of the air; but on this point we cannot speak with certainty. We do not quote the temperatures mentioned in newspapers, several of which were at or below zero. The order of stations in the table is that used in *British Rainfall*.



Minimum temperatures in February, 1902, showing over 20° of frost :—

Div.	Place.	Height above Sea. feet.	Min. temp. °	Date.
II.	Sheppey (Newhouse Leysdown)...	50	10·0	15th
,,	Newbury (Welford Park)	335	12·0	16th
,,	Maidenhead (Cookham Vic.)	90	7·0	16th
IV.	Rendlesham Hall	88	7·0	16th
,,	Bury St. Edmunds (Westley)	226	4·8	16th
V.	Alderbury	263	8·0	2nd
VI.	Ross (The Graig)	213	11·4	13th
,,	Wem (The Clive Vicarage)	299	12·0	12th, 13th
VII.	Loughborough (Forest Road)	147	9·0	12th, 13th, 14th
,,	Boston	25	12·0	12th
,,	Horncastle, Hemingby.....	158	4·0	12th
,,	Worksop (Hodsock Priory).....	56	5·2	12th
,,	Hesley Hall [Tickhill]	61	10·0	12th
VIII.	Neston (Hinderton)	215	4·8	11th
IX.	Goldsborough Hall	—	5·0	12th
X.	W. Hartlepool (Bradgate)	100	5·0	12th
,,	Beltingham Vicarage	—	2·0	13th
,,	Penrith (Newton Reigny)	—	4·0	13th
XI.	Aberystwith (Gogerddan)	80	11·0	13th
,,	Brecknock (Llandefaelogfach).....	660	12·0	14th
,,	Abergwesyn Vicarage	904	6·0	11th
XII.	Dalry (The Old Garroch).....	432	7·5	14th
,,	Lilliesleaf (Riddell)	550	9·0	8th
XIII.	West Linton (Rutherford Ho.) ...	970	8 0	9th, 10th, 14th
XIV.	Colmonell (Clachanton)	140	8·0	9th
,,	Glasgow (Queen's Park	144	10·0	13th
XVI.	Balquhidder (Stronvar)	422	9·0	13th
,,	Coupar Angus.....	183	10·0	1st
XVII.	Crathes (Pinewood)	—	10·2	1st
,,	Braemar	1114	0.0	14th

Div.	Place.	Height above Sea. feet.	Min. temp. °	Date.
XXII.	Nairn (School House)	84	7·0	1st
XVIII.	Glencarron Lodge.....	504	10·9	14th
XIX.	Lairg	385?	--2·0	14th
,,	Wick	77	10·0	2nd
XXII.	Collooney (Markree Obs.)	130	12·0	12th
XXIII.	Omagh (Edenfel)	280	4·0	11th

It will be observed that the lowest reading was —2° at Lairg and the next 0° at Braemar. The mean temperature of the month appears to have been from 3° to 5° below the average in all parts of our islands; and for England at least this degree of cold has not been approached since 1895. The meteorological correspondent of the *Scotsman* states that in Scotland February, 1900, was colder than that just passed.

At Camden Square the temperature averages were as follows, comparing the month of February in 1902 with that in 1895, and with the average for 40 years.

February.	Mean of 9 a.m. & 9 p.m.	Average. Max.	Min.	Absolute Min.
1902	35·2	40·5	30·9	15·8
1895	28·8	36·1	22·5	7·3
Mean 1858-97	39·5	45·5	34·7	—

The only cases in the Camden Square record of a lower minimum than 15·8 in February, are 15·4 in 1865, and 7·3 in 1895. The record at Greenwich Observatory shows the following lowest minima in February :—

Year	1841	1845	1847	1855	1895	1902
Temp.	12·4	7·7	11·2	11·1	6·9	14·3

From the innumerable newspaper cuttings that have reached us we observe that more than a foot of snow fell in many parts of the north and middle of England, causing much obstruction to street traffic in Liverpool and Manchester. Much snow also occurred in the hilly districts, to the great anxiety of sheep-farmers; while in Orkney snow, which is rare in those islands, absolutely put a stop to inland communications for a considerable time. Much lamentation arose over the stoppage of hunting and football throughout England, only partially assuaged by the jubilation over the exceptional opportunities for curling in the northern kingdom, and for skating throughout the whole country. Skating began on the 9th in the midlands, and was general by the 13th, although the London parks were not opened until the 15th; and on the 21st or 22nd it had ceased, we hope, for the season. The canals of the fen district afforded some splendid stretches of ice, one of as much as 16 miles, from Peterborough to March; and even the largest of the English lakes were frozen from end to end. How they appeared may be gathered from the following poetic description telegraphed on the 15th by Canon Rawnsley, to *The Times*:—

"To-day, from sunrise to sunset, the beauty of Derwentwater has been beyond words. The snow-clad hills shone in silver mail; Skiddaw seemed purple, washed with ivory. The ice in good condition, and the lake from end to end shone like beaten gold. Towards sundown the lake mirror changed from gold to steel and blue, and in the afterglow dark figures of skaters appeared to flit upon a faint lilac floor, that seemed in parts to swim with lucent amber. The frost continues. Apart from skating the beauty of the scene was an experience for life."

ROYAL METEOROLOGICAL SOCIETY.

THE February meeting was held on the 19th ult. at the Society's rooms, 70, Victoria Street, Westminster, Mr. W. H. Dines, B.A., President, in the chair.

The following gentlemen were elected Fellows of the Society:—Mr. E. H. Culley, M.A., Mr. A. E. Hepburn, Mr. J. Hepper, Mr. E. Hoddinott, Mr. J. A. Just, Dr. R. F. Rand, Mr. M. A. Robinson, Mr. J. L. Scott, F.R.A.S., Mr. C. F. Wood, and Mr. N. Wrigley.

Mr. E. Mawley, F.R.H.S., read his "Report on the Phenological Observations for the year 1901." He showed that as affecting vegetation the weather was chiefly remarkable for the scanty rainfall during the growing period of the year. The deficiency was not confined to any part of the British Isles, but was more keenly felt in the English counties than in either Scotland or Ireland. Wild plants came into flower very late, but not quite as late as in the previous phenological year, which was exceptionally backward. The following table shows the mean dates of the flowering of plants in the English districts for each year, from 1891 to 1901, together, with the departures from the average.

Years.	S.W.		S.		MIDLANDS.		E.		N.W.	
	Day of Year.	Var. from Aver.	Day of Year.	Var. from Aver.	Day of Year.	Var. from Aver.	Day of Year.	Var. from Aver.	Day of Year.	Var. from Aver.
		days.		days.		days.		days.		days.
1891	144	+11	144	+16	150	+11	147	+11	150	+ 8
1892	139	+ 6	138	+ 4	144	+ 5	143	+ 7	147	+ 5
1893	118	—15	122	—12	125	—14	123	—13	128	—14
1894	126	— 7	130	— 4	135	— 4	127	— 9	137	— 5
1895	139	+ 6	138	+ 4	141	+ 2	138	+ 2	144	+ 2
1896	125	— 8	128	— 6	132	— 7	130	— 6	134	— 8
1897	130	— 3	132	— 2	136	— 3	132	— 4	142	av.
1898	133	av.	135	+ 1	138	— 1	136	av.	141	— 1
1899	136	+ 3	136	+ 2	141	+ 2	138	+ 2	145	+ 3
1900	142	+ 9	141	+ 7	144	+ 5	143	+ 7	152	+10
1901	138	+ 5	139	+ 5	141	+ 2	139	+ 3	144	+ 2

— signifies *early*, and + *late*.

The swallow, cuckoo, and other spring migrants were, as a rule, rather behind their usual dates in reaching these Islands.

The crops of wheat, barley and oats, were all, more or less, above average in Scotland and Ireland. On the other hand, in England, although there was a fair yield of wheat, that of barley and oats was very deficient. Hay was everywhere a small crop, and especially so in the southern districts of England. Beans, peas, turnips, swedes, mangolds and potatoes were all more or less under the average in England, but either good or fairly good elsewhere. The yield of hops proved very abundant. Apples, pears and plums were below the average, but the small fruits, as a rule, yielded well. Taking farm and garden crops together, there has seldom been a less bountiful year.

A brief discussion followed the reading of the Report, in which Mr. F. C. Bayard, Mr. A. Brewin, Mr. B. Latham, Mr. C. Harding, Mr. R. Inwards, and Dr. H. R. Mill took part, and Mr. Mawley replied.

Correspondence.

ATMOSPHERIC TRANSPARENCY.

To the Editor of Symons's Meteorological Magazine.

SEEING in your January number an abstract of observations of "Atmospheric Transparency" made at Haslemere by the Hon. F. A. Rollo Russell, I think it may be of interest, mainly as showing the effect produced by London smoke, to give the result of some observations made at a point about as far to the north-east of London, as Haslemere is to the south-west. For some years past I have noted atmospheric transparency, or visibility daily, at 9 a.m., and I find that out of 196 occasions on which "great" or "very great" visibility has been recorded, the distribution according to wind and direction is as follows :—

The form N.—E. is used to indicate wind from any direction between N. and E., and similarly for the other quarters.

Wind ...	N.—E.	S.—E.	S.—W.	N.—W.	ALL.
Visibility...	85	32	16	63	196

The percentages of days with each wind on which great invisibility was noted were as follows :—

Wind ...	N.—E.	S.—E.	S.—W.	N.—W.
Visibility ...	15·4	5·7	2·5	6·8

The falling off with S.—W. winds needs no explanation, while the decided superiority of N.—E. winds to all others as regards visibility, is, I think, in great measure due to the not infrequent occurrence, especially during April, May and June, of periods of four or five days with E. or N.E. winds, great dryness, low temperature, and remarkable transparency of the atmosphere.

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

Fennes, Braintree, 6th February, 1902.

DEFINITION OF A RAINY DAY.

To the Editor of Symons's Meteorological Magazine.

REFERRING to Mr. Watson's letter in the *Meteorological Magazine* for February, I once, if my memory serves me, when I lived at Beckenham, Kent, registered ·04 inch, from a dense wet fog and mist, not a drop of actual rain. C. S. PRINGLE.

Whitekirk, Southbourne, 18th February, 1902.

I WAS much interested in reading Mr. Watson's letter on "The Definition of a Rainy Day" in the February number. Much importance cannot at present be attached to the number of rainy days given in meteorological records for two reasons. (1.) Because, as Mr. Watson clearly shows, the number of days is no guide to the climate of any place, since it includes days on which the precipitation consisted wholly of wet fog or dew. (2.) Because, owing to the possible error in the first division of the scale of the ordinary measuring jar, and the uncertainty of reading correctly to three places of decimals, the number of deposits of ·01 inch (with its adopted equivalent of ·005 inch) counted as rainy days, may be more or less than the truth, so that results may be incomparable, both in respect to the number of rainy days, and to the determination of periods of drought.

Though it may not be desirable to depart from the accepted definition of a rainy day carefully decided on by Mr. Symons, might not the results be made more comparable if observers possessing certified rain gauges, were required to test all amounts that may affect the value of ·01 inch (or ·02 inch if that minimum was adopted), by the use of a grain-divided test jar; and if the number of rainy days in "British Rainfall" thus tested, were specially marked?

E. L. M. COLVILE, F.R. Met. Soc.

Bournemouth, February 28th, 1902.

[It would certainly be desirable if all rain gauge readings, especially of small amounts, were taken to three places of decimals, even if, as Mr. Colvile suggests, a special measuring glass were to be used for the purpose. But the first requisite in rainfall work is comparability, and the average observer cannot or will not devote the necessary time and attention to his readings to make the third decimal worth having. Hence, we trust to the much easier reading to two places, and the comfortable doctrine of chances assures us that in the course of a year the number of small falls less than ·005 inch, which are not recorded, balances the number of small falls between ·005 inch and ·01 in. which are entered as ·01 inch.—ED. *S.M.M.*]

THE HIGH PRESSURE IN JANUARY.

To the Editor of Symons's Meteorological Magazine.

MAY I point out a mistake at the top of page 6 of the last number number of the Magazine: January 3rd, 1821, should be January 23rd, and the interval 13 days. If this is my error I apologize.

I do not think 30·7 in. should be reckoned an abnormal pressure. I find 34 occasions on which this pressure was exceeded in my register of 23½ years, but only five exceeded 30·85, and these all appear in the list on page 6.

Howard mentions a pressure of 30·89 on February 7th, 1798. (See page 62, Vol. 1, 1833, edition). This is higher than anything in his regular tables; has it been compared with other registers?

CHARLES L. BROOK.

Harewood Lodge,
March 3rd, 1902.

[The slip occurred between Mr. Brook's MS., which was correct, and the printed page which was in error, so the direction of the apology has to be reversed, and we express our regret. Applying the correction the average interval becomes 18 days instead of 21. We used 30·700 inches for reference, because Mr. Symons originally selected that value as the limit, above which frequent readings of the barometer should be taken, and it has only been exceeded 21 times in 45 years at Camden square.—ED. *S.M.M.*]

REVIEWS.

Report on the Water Supply of the County of Essex. By JOHN C. THRESH, D.Sc., M.D., D.P.H., Chelmsford 1901. Size 8½ × 5½. Pp. xvi. + 168.

THE subject dealt with in this work is so vitally important that we should like to see a similar summary prepared for each county of the three kingdoms. Criticism is disarmed by the statement that it was drawn up hurriedly, and our comments are intended rather as suggestions than as strictures. We have most felt the want of guidance as to the arrangement of the matter, and although we have read nearly every word of the book, it would puzzle us to turn up the information as to any specific place.

The first thirteen pages are devoted to introductory matter, including a map of the county, with symbols representing various waterworks. Then come general principles of water supply, combined with much information as to the geology of the county, followed by a detailed summary of the water supplies of the county arranged in districts, those with, and those without an organized water supply being put together in an order which may be clear to local residents, but to which we have failed to find any key. We should like to suggest that the districts be arranged in some simple order such as

N to S or E to W in separate lists of those with, and those without public supplies. This, with an index of place-names, would allow of the information as to any place being found very readily.

The author, while urging the importance of purity, realizes the difficulty, if not the practical impossibility, of obtaining a supply free from suspicion at reasonable cost in many country districts, and we are not sure that the real interests of the community have not sometimes suffered through experts striving after an ideal and unattainable standard, as, for instance, when a Royal Commission stigmatized rain water as water which has washed a more or less dirty atmosphere laden with animal and excrementitious germs, &c. Yet this atmosphere is the one which we all breathe, and we never saw it suggested that everyone should wear a respirator.

Reference is made to the unsatisfactory state of the law as to underground water, but we have seen in many recent sessions a tendency of Parliamentary committees to override the common law. We are glad to see, in reference to wells in the chalk, that the common fallacy that an unlimited supply can be obtained from this source is disproved, though perhaps it might have been combated more strongly.

Another important matter referred to, is the absence of information as to the minor streams of the counties, their character, sources, gradients and flow, and we fear that the same might be said with too much truth of the larger streams also. Personally, we should have greater respect for the County Councils, if they devoted more of their funds to obtaining such information and less to opposing before Parliamentary committees other public bodies seeking to obtain supplies of this prime necessary for the communities dependent upon them.

Perhaps we are likely to be hypercritical in the matter of rainfall, and the amount of space that could be devoted to it is naturally insufficient to deal adequately with so important a matter, but we should like to have seen a word of warning against the information given, being accepted as sufficient. The record for 20 years in the neighbourhood of Chelmsford given on page 4, cannot be taken as representing the mean of the county, while the average of ten years gives a very poor representation of the monthy distribution. At least, five times that period would be required to give an even approximately true monthly mean.

Der Grosse Staubfall vom 9 bis 12 März 1901 in Nordafrika, Süd und Mitteleuropa. [The great Dust-fall of March 9—12, 1901, in North Africa, and in South and Central Europe.] *Von* G. HELLMANN *und* W. MEINARDUS. Berlin, Asher & Co., 1901. Size 13 × 10. Pp. 94. Maps. Price 8m.

WE are indebted to the authors of this memoir for a masterly investigation into the remarkable falls of dust or "blood rain" which were observed over a great part of Europe a year ago, and are

recalled to our attention by the similar phenomenon in the south-west of England to which we referred in these pages last month. Professors Hellmann and Meinardus treat the problem of the falls of dust under the heads of Extent and distribution of the deposit, Meteorological conditions associated with the phenomenon, and Nature of the dust. A short account of a minor dust-fall ten days later is added, and the memoir concludes with a summary of results, a map showing all the places in central and northern Europe where the dust was reported, a map of the rainfall of the same area, and a series of synoptic weather charts showing the distribution of pressure and winds at sea-level, and at a height of 8000 feet once or twice daily for each of the days referred to. The letters of a large number of observers are quoted, some of them containing exceedingly vivid descriptions. The dust rain was reported from 347 places in northern and central Germany, as well as from innumerable points in Italy, Austria-Hungary, and a few in Denmark and Russia. We have reason to believe that it extended also to the British Isles, although, in so attenuated a form, that the fact had not been brought to the attention of the authors.

The region affected by the great fall of March, 9th to 12th, extended from the deserts of Algeria to the Danish islands, over more than 25° of latitude from south to north, that is a distance of about 1800 miles. Some dust also fell in the provinces of Kostroma and Perm in Russia, which lie more than 2500 miles from southern Algeria. The whole of the intervening distances were not visited by the dust; none fell over the greater part of South Germany or the northern states of Austria, and, except for the isolated Russian fall, the dust was only reported from places between 7° and 20° E. long. The total land area on which the dust fell is estimated at about 300,000 square miles, to which may be added 150,000 square miles of the Mediterranean sea; and the weight of the dust which fell in Europe probably amounted to 1,800,000 tons, of which only one-third fell north of the Alps, the intensity of the fall diminishing steadily from south to north. The date of the appearance of the dust was also later from south to north. Dust-storms raged in the south of Algeria from March 8th to 10th, in Sicily and Italy it appeared on the 10th during the forenoon, it reached the Eastern Alps at night, central Germany on the forenoon of the 11th, north-west Germany on the same afternoon and evening, and Denmark before daybreak on the 12th. The average rate at which the dust was carried from south to north in Europe seems to have been about 43 miles an hour. The dust fell dry from the reddish-yellow clouds in Algeria, Tunis, and parts of Italy, but further north it was only brought down with rain or snow.

From the examination of a very large number of specimens, it was proved that the dust was not volcanic, but was composed of very fine particles of sand and clay, the particles being appreciably smaller in the dust collected in the north than in that from the south of

Europe; thus, in Palermo, Sicily, the average diameter of the grain, was $\frac{1}{2000}$ inch, while near Hamburg it was $\frac{1}{4000}$ inch, or only half as much.

The meteorological conditions which accompanied the dust showers were very interesting. Simultaneously with the fall of the dust, a barometric depression moved from Tunis, in Africa, almost due north across Europe to the Baltic shores. It seems probable that the depression was over the Sahara on March 9th, while it certainly lay over Tunis on the 10th, and reached Denmark on the 12th. This indicates a general movement of the lower and middle air from south to north, while the isobars calculated for 8000 feet by Köppen's method from the data of the various high-level observatories in Europe, showed conditions favourable for a northerly current at that elevation also. The absence of dust from South Germany is attributed to the fact that no rain fell there while the dust was passing in the upper air; the very rare occurrence along the Rhine valley and the western border of Germany, where there was heavy rain or snow, is explained by the current of northward flowing dust-laden air not extending so far to the west.

One interesting feature of this research is the proof that not only a centre of low pressure, but a mass of air was transported from the Sahara to northern Europe with the speed of an express train, while the fact that the dust fell mainly on the eastern side of the path of the depression, seems to suggest that the cyclonic circulation was not completed by air of the same origin; but, that while the eastern side drew its supply from the current flowing from the south, the western side of the cyclone throughout its progress was fed by air from a northerly or westerly source.

BOOKS RECEIVED.

Bolton. Annual Report of the Museums and Meteorological Observatory for 1901. By W. W. Midgeley, F.R.Met.Soc., Bolton, 1902. Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. 16.

The Weather of 1901 at Hodsock Priory, Worksop. By Henry Mellish. Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. 12.

Hertfordshire Maps: a descriptive catalogue of the Maps of the County, 1579–1900, by Herbert George Fordham. First part. From *Trans. Hertfordshire Nat. Hist. Soc.* Vol. 11. Pt. 1. 1901. Size $10 \times 7\frac{1}{2}$. Pp. 32. *Illustrations.*

Die Alpen in Eiszeitalter [The Alps in the Ice Age] von Dr. Albrecht Penck und Dr. Eduard Brückner. Lieferung 1. Leipzig, Tauchnitz, 1901. Size $10\frac{1}{2} \times 7\frac{1}{2}$. Pp. 112. *Illustrations.*

The Rosarians' Year Book for 1902. Edited by the Rev. H. H. D'Ombrain. London, Bemrose and Sons. 1902. Size $7\frac{1}{2} \times 5\frac{1}{2}$. Pp. 58. *Plate.*

Actas, Resoluciones y Memorias del Primer Congrese Meteorologico Nacional iniciado por la Sociedad cientifica "Antonio Alzate" [Transactions of the First Mexican Meteorological Congress.] Mexico, 1901. Size $9\frac{1}{2} \times 7$. Pp. 274. *Illustrations.*

Brief Sketch of the Meteorology of the Bombay Presidency for 1900-01. By E. A. Kenyon. [No publisher, place or date.] Size 13 × 8½. Pp. 16.

On the seasonal variation of Atmospheric Temperature in the British Isles . . . . By W. N. Shaw, F.R.S., and R. Waley Cohen. From the Proceedings of the Royal Society. Vol. **69**. Size 8½ × 5½. Pp. 26.

Remarks on the objects for which the Meteorological Society of Mauritius was established. By T. F. Claxton. (Proc. Met. Soc. Mauritius, 1901). Size 8½ × 5½. Pp. 12.

The Mean Temperature of the Atmosphere and the Causes of Glacial Periods. By H. N. Dickson, B.Sc. From the "Geographical Journal" for November, 1901 Size 9⅓ × 5½. Pp. 8.

Report on the Rainfall of Hertfordshire in the year 1900. By John Hopkinson. From *Trans. Hertfordshire Nat. Hist. Soc.* Vol. **11**. Hertford, 1901. Size 8½ × 5½. Pp. 12.

Meteorology in Mysore for 1900. By John Cook. Director of Meteorology in Mysore. Bangalore, 1901. Size 12 × 10. Pp. 56.

Indian Weather Review. Annual Summary for 1900. By John Eliot, F.R.S. Calcutta, 1901. Size 14 × 10½. Pp. 150. *Plates.*

Meteorological Observations made at the Adelaide Observatory and other places in South Australia during the year 1898, under the direction of Charles Todd, K.C.M.G., F.R.S. Adelaide, 1901. Size 13 × 8½. Pp. 192. *Maps.*

Hourly Means of the Readings obtained from the self-recording instruments at the five observatories under the Meteorological Council. London, 1901. Size 12 × 10. Pp. 240.

METEOROLOGICAL NEWS AND NOTES.

THE HIGHEST BAROMETER READING yet recorded in the British Isles appears to be that taken at Aberdeen on January 31st of the present year, referred to in our February number, on page 4. We are informed by the Meteorological Office that the true reading was 31·113 in., which is ·005 in. higher than the previous highest, which was 31·108 in., recorded at Ochtertyre, on January 9th, 1896.

MR. W. N. SHAW, F.R.S., delivered two remarkable lectures at the Royal Institution, on February 25th and March 4th, his subject being the temperature of the atmosphere, its changes and their causes. He dealt at some length with the extreme variation of temperature which has been recorded in nature, and this he stated to be 212° Fahrenheit on the surface of the Earth, or 222° if the records obtained by the meteorographs attached to unmanned baloons are considered. He showed a series of experiments illustrating the formation of halos by the sun shining through a cloud composed of ice-crystals, the formation of a cloud by the expansion of saturated air, and the cooling effect produced by chilled air flowing down a hillside into a valley with a narrow outlet.

HANN'S "CLIMATOLOGY," is, we are happy to learn, being translated by Professor R. De C. Ward, of Harvard University, and the first volume will be published in the course of the present year. The second and third volumes will not be translated at present, but the first will be a very great acquisition to the scanty collection of meteorological text-books in the English language.

FEBRUARY, 1902.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1890-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	No. of Nights below 32°. On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·13	— ·34	·34	24	11	52·7	28	15·8	16	16	22
II.		Tenterden	1·32	— ·38	·30	6	15	53·5	28	14·0	16	...	...
,,		Hartley Wintney	·87	— ·76	·23	26	9	52·0	27*b*	14·0	16	21	21
III.		Hitchin	1·18	— ·28	·27	24	11	53·0	28	16 0	16	21	...
,,		Winslow (Addington)	1·14	— ·32	·31	24	12	54·0	28	15·0	16	20	21
IV.		Bury St. Edmunds (Westley)	·98	— ·56	·29	14	10	53·0	28	4·8	16	22	...
,,		Norwich (Brundall)	·77	...	·23	26	14	54·0	28	14·0	16	20	23
V.		Winterborne Steepleton	2·47	...	·91	22	12	49·7	26	20·0	12*e*	19	21
,,		Torquay	1·61	...	·47	23	9	54·2	24	26·1	14	9	19
,,		Polapit Tamar [Launceston]..	1·74	— ·87	·46	23	12	52·9	28	15·7	14	20	21
VI.		Stroud (Upfield)	1·02	— ·90	·27	22*a*	10	55·0	28	21·0	13	20	...
,,		Church Stretton (Woolstaston)	·93	— 1·07	·34	26	13	50·0	28	21·0	14	21	25
,,		Worcester (Diglis Lock)	1·40	— ·11	·38	23	13	...	...	...	...	...	...
VII.		Boston	1·24	— ·11	·26	23	10	55·0	28	12·0	12	15	...
,,		Hesley Hall [Tickhill].....	1·18	— ·27	·28	26	14	53·0	28	10·0	12	20	...
,,		Derby (Midland Railway).....	1·54	+ ·09	·45	24	12	54·0	28	15·0	12*f*	18	...
VIII.		Manchester (Plymouth Grove)	1·25	— ·61	·30	9, 24	9	55·0	28	17·0	13	14	16
IX.		Wetherby (Ribston Hall) ...	1·28	— ·16	·30	26	10	...	...	...	...	...	...
,,		Skipton (Arncliffe)	1·74	— 3·08	·59	24	11	...	...	...	...	...	...
,,		Hull (Pearson Park).	1·33	— ·39	·32	24	16	48·0	23*c*	13·0	12	19	26
X.		Newcastle (Town Moor)	1·29	— ·18	·25	7	15	...	...	..	...	...	...
,,		Borrowdale (Seathwaite).....	3·57	— 8·20	·84	27	9	49·0	23	12·5	10	20	...
XI.	WALES.	Cardiff (Ely).....	1·82	— 1·07	·60	27	13	...	...	...	...	...	...
,,		Haverfordwest	2·25	— 1·09	·69	23	12	52·3	28	18·9	14	12	20
,,		Aberystwith (Gogerddan) ...	1·40	— 1·75	·35	19	7	60·0	28	11·0	13	19	...
,,		Llandudno.....	1·64	— ·31	·45	10	14	59·2	25	23·5	14	12	...
XII.	SCOTLAND.	Cargen [Dumfries]	2·94	— ·72	·81	8	7	50·0	25	6·0	11*f*	15	...
XIII.		Edinburgh (Royal Observatory)	·82	...	·31	28	11	49·2	24	21·0	14	16	18
XIV.		Colmonell	1 82	— 1·59	·47	22	11	47·0	23	8·0	9	17	...
XV.		Tighnabruaich	2·18	...	·40	24	13	44·0	23	20·0	12	16	...
,,		Mull (Quinish).....	2·57	— 1·82	·55	15	13	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·24	— 1·54	·46	25	8	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·30	— ·83	·50	24	10	46 6	23	16·7	14	16	...
XVII.		Braemar	·79	— 1·79	·33	24	10	46·8	24	0·0	14	11	22
,,		Aberdeen (Cranford)	1·22	— 1·19	·44	24	18	45·0	23	14·0	1	15	...
,,		Cawdor (Budgate)	1·28	— ·66	·52	6	12	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	1·70	— 2·49	...	...	...	...	...	...	...	...	...
,,		Glencarron Lodge.....	2·25	— 5·07	·57	8	13	52·4	24	10·9	14	14	...
XIX.		Dunrobin	1·10	— 1·32	·18	8	11	46·0	23*d*	18·0	1	17	...
,,		S. Ronaldshay (Roeberry) ...	1·16	— 1·40	·36	20	18	45·0	22	20·0	10	13	...
XX.	IRELAND.	Darrynane Abbey.....	3·84	— ·18	·73	16	16	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	3·95	+ 1·04	·91	16	12	53·0	28	19·0	12*g*	10	...
,,		Broadford (Hurdlestown) ...	2·37	+ ·15	·64	16	14	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	2·73	+ ·18	·74	26	12	...	...	...	...	...	...
,,		Dublin (Fitz William Square)	1·75	— ·20	·92	26	10	54·4	28	22·0	12	10	11
XXII.		Ballinasloe	2·36	— ·07	·58	26	12	65·0	28	16·0	14	18	...
,,		Clifden (Kylemore)	5·30	— ·61	1·01	21	13	...	...	...	...	...	...
XXIII		Seaforde.....	4·17	+ 1·38	1·45	7	10	51·0	28	16·0	13	10	12
,,		Londonderry (Creggan Res.).	1·41	— 1·30	·31	16	17	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·79	+ ·19	·92	7	13	53·0	28	4·0	11	14	21

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

a—and 26. *b*—and 28. *c*—and 24, 28. *d*—and 24. *e*—and 16. *f*—and 13. *g*—and 14.

SUPPLEMENTARY TABLE OF RAINFALL, FEBRUARY, 1902.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	1·35	XI.	Castle Malgwyn	2·02
II.	Dorking, Abinger Hall .	1·32	,,	Builth, Abergwesyn Vic.	2·46
,,	Sheppey, Leysdown	1·45	,,	Rhayader, Nantgwillt ...	2·24
,,	Hailsham	1·53	,,	Lake Vyrnwy	1·93
,,	Crowborough.....	1·92	,,	Ruthin, P âs D âw	1·54
,,	Ryde, Beldornie Tower..	1·47	,,	Criccieth, Talarvor	1·26
,,	Emsworth, Redlands ...	2·08	,,	I. of Anglesey, Lligwy..	1·42
,,	Alton, Ashdell	1·17	,,	Douglas, Woodville.....	3·66
,,	Newbury, Welford Park	1·37	XII.	Stoneykirk, Ardwell Ho.	2·66?
III.	Oxford, Magdalen Coll..	1·13	,,	Dalry, Old Garno h	3·75
,,	Banbury, Bloxham	1·55	,,	Monaive, Maxwelton Ho.	2·93
,,	Pitsford, Sedgebrook ...	1·71	,,	Lilliesleaf, Riddell	1·81
,,	Huntingdon, Brampton.	1·08	XIII.	N. Esk Res. [Penicuick]	1·35
,,	Wisbech, Bank House...	1·21	XIV.	Glasgow, Queen's Park..	1·65
IV.	Southend	1·72	XV.	Inveraray, Newtown ...	1·23
,,	Colchester, Lexden	·86	,,	Ballachulish, Ardsheal...	2·10
,,	Saffron Waldon, Newport	·94	,,	Islay, Eallabus..... ...	2·30
,,	Rendlesham Hall	·64	XVI.	Dollar.....	1·68
,,	Swaffham	1·13	,,	Balquhidder, Stronvar...	2·03
V.	Salisbury, Alderbury ...	2·06	,,	Coupar Angus Station...	1·07
,,	Bishop's Cannings	1·10	,,	Blair Atholl	·91
,,	Blandford, Whatcombe	2·17	,,	Montrose, Sunnyside ...	1·69
,,	Ashburton, Druid House	3·24	XVII.	Keith H.R.S.....	·29?
,,	Okehampton, Oaklands	1·80	XVIII.	Fearn, Lower Pitkerrie..	·85
,,	Hartland Abbey	1·25	,,	S. Uist, Askernish	1·77
,,	Lynmouth, Rock House	1·36	,,	Invergarry.....	·88
,,	Probus, Lamellyn	2·25	,,	Aviemore, Alvie Manse.	·82
,,	Wellington, The Avenue	1·73	,,	Loch Ness, Drumnadrochit	1·13
,,	North Cadbury Rectory	1·01	XIX.	Invershin	·39
VI.	Clifton, Pembroke Road	·95	,,	Bettyhill	2·84
,,	Ross, The Graig	1·01	,,	Watten H.R.S.....	1·51
,,	Shifnal, Hatton Grange	1·21	XX.	Dunmanway, Coolkelure	7·91
,,	Wem, Clive Vicarage ...	1·13	,,	Cork, Wellesley Terrace	5·92
,,	Cheadle, The Heath Ho.	1·90	,,	Killarney, District Asyl.	4·08
,,	Coventry, Priory Row ..	1·61	,,	Caher, Duneske	3·39
VII.	Market Overton	1·62	,,	Ballingarry, Hazelfort...	1·86
,,	Grantham, Stainby	1·40	,,	Miltown Malbay	1·75
,,	Horncastle, Bucknall ...	1·21	XXI.	Gorey, Courtown House	2·41
,,	Worksop, Hodsock Priory	1·41	,,	Moynalty, Westland ...	3·01
VIII.	Neston, Hinderton	2·11	,,	Athlone, Twyford	2·37
,,	Southport, Hesketh Park	1·40	,,	Mullingar, Belvedere ...	2·50
,,	Chatburn, Middlewood.	1·38	XXII.	Woodlawn	2·52
,,	Duddon Val., Seathwaite Vic.	4·64	,,	Westport, Murrisk Abbey	2·77
IX.	Baldersby	1·37	,,	Crossmolina, Enniscoe ..	2·79
,,	Scalby, Silverdale	1·78	,,	Collooney, Markree Obs.	2·09
,,	Ingleby Greenhow Vic..	1·40	XXIII.	Enniskillen, Model Sch.	...
,,	Middleton, Mickleton ...	·87	,,	Warrenpoint.....	4·04
X.	Beltingham	1·12	,,	Banbridge, Miltown.....	2·46
,,	Bamburgh	1·15	,,	Belfast, Springfield	2·50
,,	Keswick, The Bank	1·91	,,	Bushmills, Dundarave..	1·42
XI.	Llanfrechfa Grange	2·26	,,	Stewartstown	1·99
,,	Treherbert, Tyn-y-waun	3·94	,,	Killybegs	1·66
,,	Llandovery	1·25	,,	Horn Head	1·91

METEOROLOGICAL NOTES ON FEBUARY, 1902.

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.

ENGLAND.

LONDON, CAMDEN SQUARE.—Dry and cold. A bitter N.E. gale on 1st was followed by S showers on 2nd and 3rd. Gloomy weather prevailed, with darkness on 5th and 8th, till the commencement of the frost on 9th. Thaw on 18th, the remainder was cloudy, whilst practically the whole of the month's R fell during the last week. Mean temp. 35°·5, or 4°·3 below the average.

TENTERDEN.—Very cold except the last week; several days with S. On 16th the lowest temp. for seven years occurred, grass 5°·5, ground 8°·0, and screen 14°·0 Duration of sunshine 81·5 hours.

SHEPPEY, LEYSDOWN.—Very fine with little wind. Sharp frosts from 10th to 15th, the temp. falling to 10°. About two inches of S on 14th.

CROWBOROUGH.—Continuous frost, with a slight thaw on 6th, lasting from January 29th till 20th. By a curious coincidence there was a similar frost from January 29th to February 21st in 1901. S fell on eight days, the heaviest fall being on 6th. There were ten days without any sunshine.

HARTLEY WINTNEY.—For the first fortnight the wind was N.W. to N.E. and bitterly cold; frost every night until 23rd. The last two days were mild and springlike. Fog from 20th to 23rd; ozone on five days with a mean of 4·0.

WINSLOW, ADDINGTON.—The max. temp. was very low; from 2nd to 6th between 30° and 34°. Frost every night till 20th, and intense from 10th to 17th.

PITSFORD, SEDGEBROOK.—R ·18 in. below the average of ten years. S on 2nd and 7th. Mean temp. 34°·1. T on 28th.

NORWICH, BRUNDALL.—Uniformly cold and wintry till 22nd. The exposed thermometer fell below 20° on eight successive nights between 10th and 18th; on 16th as low as 7°·8. Mean temp. 34°·9. S on five days.

TORQUAY, PIER.—R 1·12 in. below the average. Mean temp, 3°·7 below the average. Duration of sunshine 11·6 hours; twelve sunless days. Mean amount of ozone 3·7, highest 7·5 on 23rd with S.S.E. wind, lowest 1·0.

POLAPIT TAMAR [LAUNCESTON].—Rather dry and very cold. Grass frosts daily from 1st to 19th, the min. being 12°·5 on the 14th.

LYNMOUTH, ROCK HOUSE.—A spell of cold weather lasted from 2nd to 21st inclusive. Fine lunar rainbow, with distinct colour, on 22nd.

NORTH CADBURY RECTORY.—Gale on 1st; extreme gloom and low maxima, but no frost, till 7th; frost and brilliant sunshine till 17th, gloomy till 20th with slow and dry thaw, then much milder with wind and rain to the end.

CLIFTON, PEMBROKE ROAD.—Frost without intermission till 20th. Some bright sunshine from 10th to 17th. R 1·45 in. below the average. S on three days.

ROSS, THE GRAIG.—The drought which set in on January 5th continued till February 21st, 48 days yielding ·63 in. or 10 per cent. of the average. The mean temp. of the 28 days ending February 21st was 11° lower than that of the preceding 28 days. The last week in February was 13°·3 warmer than the previous week. S on four days.

MANCHESTER, PLYMOUTH GROVE.—The first part was very wintry. Heavy S on 8th and dense fog on 13th, 14th, 15th and 18th. From 21st onward the weather was mild with some sunshine.

WALES AND THE ISLANDS.

HAVERFORDWEST.—The cold weather of the last days of January was prolonged with keen E. wind till 8th, when S covered the country; the frost increased in severity and continued till 20th. Cold R with gloom till 27th.

ABERYSTWITH, GOGERDAN.—A dry month, very wintry, with little S, though it lay a long time.

DOUGLAS, WOODVILLE.—Wintry weather during the first fortnight with severe frosts; daily S storms from 7th to 12th; but an unusual amount of bright sunshine. The second fortnight was very wet. Min. on grass 8°·0 on 12th.

SCOTLAND.

DALRY, THE OLD GARROCH.—Cold, frosty and snowy, without much wind. Five inches of S on 7th.

COUPAR ANGUS.—Remarkable for low night temp., bright sunshine and bracing atmosphere. A change to higher temp. on 20th brought clouds and damp, which continued to the end. R ·80 in. below the average. Mean temp. 32°·5.

WATTEN, H.R.S.—Much S in the first half, lying 12 to 14 inches deep, and drifting little. Gentle thaw during the latter half.

S. RONALDSHAY, ROEBERRY.—Very cold and snowy. Total R 1·24 in. below the average of 35 years. Mean temp. 35°·0, or 3°·8 below the average.

IRELAND.

CORK, WELLESLEY TERRACE.—R 2·54 in. above the average. Mean temp. 5°·5 below the average, that of the first 15 days being 31°·3, and that of the last 13 days, 43°·0. Fog on and about 17th.

DARRYNANE ABBEY.—Very cold to 13th, with S from 6th to 9th. Hard frost 8th to 14th. The rest of the month was mild and wet.

MILTOWN MALBAY.—Cold, with little rain; but agricultural work hampered by 8 days of S, with severe frosts at night, followed by thaw and dripping R.

DUBLIN, FITZWILLIAM SQUARE.—For the third time in succession February proved cold, and distinctly colder than January. The "cold snap" which set in on January 24th lasted till February 21st. The mean temp. of the week ending 15th was as low as 31°·4. Monthly mean temp. 39°·3, or 3°·5 below the average. Fog on 10 days. S or sleet on 7th and 8th: H on 8th.

COLLOONEY, MARKREE OBSERVATORY.—R below the average, but little bright sunshine. Sharp frosts every night from 9th to 15th. S on 5 days.

STEWARTSTOWN, THE SQUARE.—The deepest fall of snow for 66 years, yielding 1·00 in., occurred on 7th.

OMAGH, EDENFEL.—Cold and dry at first, with sharp night frosts. On 7th the heaviest S fall for many years took place, averaging 6 inches, with drifts reaching to as many feet. A temp. of zero on the surface of the S was reached on 11th; but the heavy coating of S saved vegetation from much damage.

GENERAL WEATHER IN GLEN NEVIS, FEBRUARY, 1902.

By R. C. MOSSMAN, F.R.S.E.

Deduced from observations at 9 a.m. and 9 p.m.	*Ben Nevis.*	*Achariach.*	*Fort William.*
Height	4407 feet.	150 feet	42 feet
Rainfall	3·36 ins.	1·76 in.	1·10 in.
No. of days	13	15	14
Max. fall in 24 hours	0·59 in., 16th	0·40 in., 5th	0·18 in., 5th
Highest temp. in shade	37°·1, 2nd	51°·5, 24th	54°·6, 24th
Lowest ,, ,,	8°·1, 11th	7°·7, 14th	11°·2, 14th
Mean temp(Mean daily max. & min.)	22°·2	34°·6	35°·4
Temp. in shade below 32°	on 28 nights	14 nights	14 nights
Below 32° on grass	?	15	15
Bright sunshine	64 hours	11·3 hours	62·2 hours
Sunless days	12	14	12
Mean relative humidity	74	78	81
Mean amount of cloud	7·7	7·2	6·6

Rainfall at head of Glen Nevis, and 357 feet above the sea, 1·72 in.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPTEMBER, 1901.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	77·6	8	40·4	16	68·0	50 6	51·2	78	121·0	31·8	1·62	6	5·2
Malta	90 3	4	60·7	2	84·2	68·7	67·8	74	149·6	56·5	·19	2	2·7
Lagos, W. Africa	87·0	26*a*	72·0	11*d*	83·5	77·2	74·2	84	150·0	53·6	15·94	21	5·8
Cape Town	84·5	27	42·1	10*e*	65·8	51·1	49·3	70	...	...	1·99	10	4·1
Mauritius	80·8	23	55·3	28	77·5	62·0	59·0	70	150·2	48·0	·98	10	4·8
Calcutta	94·0	16	74·1	30	88·9	78·0	76·7	82	148·0	72·8	19·08	12	6·5
Bombay	89·1	30	73·3	12	86·7	77·8	75·4	81	142·7	69·6	1·81	8	5·3
Colombo, Ceylon	90·7	10	74·5	16	88·3	78·2	73·6	78	151·0	71·0	3·93	15	6·1
Melbourne	76·1	13	40·0	17	63·7	48·5	45·1	73	138·0	32·0	1·47	11	6·9
Adelaide	83·5	13	41·0	9	67·4	50·2	46·4	65	134·0	34·1	1·48	15	5·8
Sydney	87·2	14	45·8	10	70·0	53·9	50·0	69	132·5	36·2	2·42	11	4·4
Wellington	68·5	16	39·0	9	58·6	46·9	44·2	73	113·0	30·0	5·32	16	4·8
Auckland	...	...	...	...	...	...	...	...	...	...	·85	12	...
Jamaica, Halfway Tree	90·0	11	70·0	24	86·0	71·7	71·9	81	...	...	10·79	15	5·1
Trinidad	92·0	14*b*	70·0	sev.	88·8	71·9	73·2	75	164·0	65·0	4 26	10	...
Grenada	89·0	10*c*	72·0	2	85·3	75·9	73·2	80	154·0	...	8·29	21	2·5
Toronto	86·0	7	35·6	19	70·7	52·5	54·5	79	109·0	30·9	3·05	10	4·4
St. John, N.B.	80·3	5	40·0	26	62·0	50·1	52·0	74	...	...	3·35	12	4·5
Winnipeg, Manitoba	89·3	3	26·0	28	63·0	41·1	...	...	...	...	3·80	17	5 9
Victoria, B.C.	75·2	18	39·3	30	62·8	49·3		...	...	...	·90	8	5·1

a—and 21, 24. *b*—and 27. *c*—and 24. *d*—and 19. *e*—and 17.

REMARKS.

MALTA.—Mean temp. of air 75°·6, or 0°·6 above the average. Mean hourly velocity of wind 8·6 miles, or 0·9 above the average. Mean temp. of sea 78°·0. L on seven days. J. F. DOBSON, S.J.

Mauritius.—Mean temp. of air 0°·5, of dew point 0°·9, and R ·41 in. below their respective averages. Mean hourly velocity of wind 12·1 miles, or 0·2 mile above average; extremes, 27·9 on 25th and 2·0 on 19th; prevailing direction E. by S. to S.E. by E. T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air 82°·5 or 1°·7 above, dew point 0°·4 above and R 1·05 in. below, their respective averages. Mean hourly velocity of wind 7·4 miles; prevailing direction S.W. W. C. S. INGLES.

Adelaide.—Mean temp. of air 1°·7 above the average and the highest since 1887. R ·24 in. below average. The R over the state was satisfactory, though somewhat irregular inland. C. TODD, F.R.S.

Sydney.—Mean temp. of air 3°·1 above, R ·58 in. below, humidity 0·9 below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Mean temp. of air 1°·9 above, and R 1·06 in. above, their respective averages. A showery month, especially during the latter part. Prevailing winds S. and N.W. and often strong. Earthquake on 19th at 10.30 p.m. slight. R. B. GORE.

TRINIDAD.—R 3·27 in. below the 30 years' average. J. H. HART.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXXXV.] APRIL, 1902. VOL. XXXVII

THE SUN PILLAR OF MARCH 6TH.

THE letters appearing in our Correspondence pages—a few out of the many communications we have received on the subject—are sufficient to show that the sun pillar seen on March 6th was an exceptionally brilliant example of a very beautiful phenomenon. Although rather rare, sun pillars have been seen frequently, and the following instances were recorded in the volumes of this Magazine for the years in which they occurred:—April 4th, 1871, at Sidmouth; May 28th, 1900, at North Cadbury; September 6th, 1900, at Hereford; and 25th June, 1901, at Portland. As in other cases, the sun pillar of March 6th appeared to have been most strikingly visible in the south-west of England; but it was also reported from many points along the south coast and from a few in the interior of the country.

There seems to be no doubt as to the nature of the phenomenon, for, although its singular form and close apparent connection with the sun suggest that it may have a solar or cosmical origin, its real affinity is to the halo rather than the solar corona and the zodiacal light. In Vol. 26 (1891) of this Magazine the Rev. A. K. Cherrill discussed the theory of the origin of halos and sun pillars at some length. In *Knowledge* for 1895 a sun pillar seen in Cumberland on January 30th of that year is described and figured, and a clear account of the theory of its formation is given by the Rev. S. Barber. This theory, which has been generally accepted for more than half a century, is referred to in all text-books on meteorology which treat of sun pillars and halos. Briefly it is that the effect of a luminous shaft is given by reflection from the under surfaces of minute crystals of ice floating horizontally. Such minute crystals form cirrus cloud, and may occasionally descend into strata of the air lower than the usual lofty home of this most airy and graceful of cloud forms. The result is precisely similar, as Mr. Barber points out, to the formation of a long shaft of light by the reflection of the moon on the rippled surface of the sea. A halo, such as those figured in Dr. Buchan's "Handy Book of Meteorology," referred to in Mr. Fox's letter, is

the result of the refraction of sunlight passing through ice crystals, and thus differs in its mode of production from a sun pillar.

Although not common phenomena, sun pillars are probably less rare than is generally supposed. In addition to those referred to above as having occurred in recent years, a fine example was observed and successfully photographed by Captain Wilson-Barker, at Greenhithe, on June 14th, 1901.

Correspondence.

CONSPICUOUS SUN-PILLAR.

To the Editor of Symons's Meteorological Magazine.

A VERY fine specimen of a sun-pillar was visible here last evening (March 6th). At 6.10 it shot upwards 10° perpendicularly above the horizon, and its colour was yellow tinted with orange. At 6.25, when its altitude had lessened to 5°, it showed a remarkably intense rosy tint. At 6.32 it had diminished to about 3°, and at 6.40 scarcely a trace was left. I do not remember noticing one of these sun-pillars where the colours were so brilliant. Is the first actually recorded instance of a sun-pillar the following by Rev. W. Derham, at Upminster, Essex, in 1707? "On the afternoon of Thursday, April 3rd, 1707, I perceived in the west, a quarter of an hour after sunset, a long slender pyramidal appearance, perpendicular to the horizon. The base of this pyramid I judged to be the sun, then below the horizon. Its apex reached 15° or 20° above the horizon. It was throughout of a misty red colour, and when I first saw it, pretty vivid and strong, but the top part much fainter than the bottom nearer the horizon."

S. J. JOHNSON, F.R.A.S.

Melplash Vicarage, Bridport, 7th March, 1902.

I AM sending you cuttings from yesterday's and to-day's *Western Morning News* respecting the beam of light which was seen by many persons here. It was a very unusual phenomenon, and an explanation in the *Meteorological Magazine* would be valued I feel sure. Is it connected with a parhelion, or of the nature of the upright beam shown in Fig. 58, page 319, of Buchan's Handy Book of Meteorology, 2nd edition?

W. L. FOX.

Carmino, Falmouth, 10th March, 1902.

THE solar phenomenon was particularly well seen at Newquay, and its appearance corresponded in every particular with the descriptions published in the newspapers. I noticed it first about 5.30 p.m. The column was perfectly vertical, and of uniform breadth, if anything slightly diminishing as it extended upward.

Its appearance did not at all correspond to the usual description of the zodiacal light, but it closely resembled the streamers often seen in a fine display of northern lights.

The band of light was perfectly steady, and I did not notice any marked variations in intensity during the time I was able to watch it.

A. HARDWICK, M.D.

Island House, Newquay, Cornwall, 10th March, 1902.

THE "Solar Phenomenon" described in yesterday's *Times* was visible here also, but unfortunately it was not till quite near its end that I saw it. At about 6.25 p.m. I noticed, however, a diffused light round about it (though the pillar was itself distinct) of a bluish crimson colour. There was a bank of clouds in the west, and as the pillar was "withdrawn" it was traceable in places through the cloud.

The postman who first noticed it may be able to send you a good description of the appearance.

AGNES FRY.

Failand House, Failand, near Bristol, 11th March, 1902.

WHILST doing my round, which is a rural postman's, I noticed the strange phenomenon in the sky at Failand which has been written about in the chief London papers. About 6.20, or before, I noticed in the sky a narrow pillar, which was of deep crimson colour. I had noticed the phenomenon somewhat earlier, when it appeared much lighter, the colour gradually deepening to a rich red. The sunset was brilliant, and at first I thought this was the outcome of the solar phenomenon.

W. C. GABBITASS.

Fishpond Cottages, Abbots Leigh, near Bristol, 11th March, 1902.

[See article on p. 33.—ED. *S.M.M.*]

WANTED, AN INTERNATIONAL GLOSSARY.

To the Editor of Symons's Meteorological Magazine.

A WANT felt during a recent short holiday in France leads me to make an enquiry. Do you, or do any of your readers, know of any comprehensive source from which one can obtain the exact equivalent in, say, the chief European languages of English meteorological terms? For any one language, of course, a dictionary can be consulted, and in it one can find a more or less accurate translation of any term; but I suggest that (if such a work is not in existence) what is needed is a small book giving in as many languages as possible the foreign equivalents of English words and phrases used in meteorology. It should be written by a meteorologist.

FRANCIS DRUCE.

65, Cadogan Square, S. W., 1st April, 1902.

[We have not been able to find any such glossary as Mr. Druce refers to; we believe that it does not exist, and we quite agree that

such a work would be extremely useful. It seems to us that the International Meteorological Committee might very appropriately take action in the matter, as it is essential that the synonyms should be officially approved for each language.—ED. *S.M.M.*]

THE DEFINITION OF A RAINY DAY.

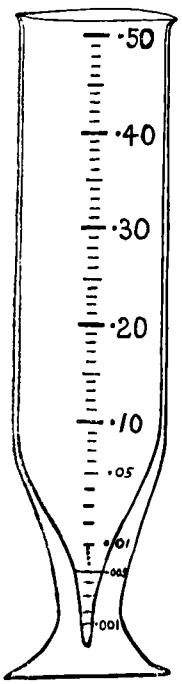
To the Editor of Symons's Meteorological Magazine.

REFERRING to your comments on my letter in the February number, I cannot help thinking that it is a mistake to depend upon the doctrine of chances for comparability of results amongst rainfall observers. While the law of probability might have an equalizing effect in balancing the plus and minus differences due to the uncertainty of estimating ·005 in. in a correctly divided measuring glass, it would not prevent a cumulative error from arising if the jar is not correctly divided. And even a small error at ·005 in. of the scale will lead to a considerable difference in the number of rainy days reported for a year, or in the occurrence or length of droughts.

A glance through the columns of *British Rainfall* will show that in towns where there are several observers, a great disparity exists in the number of rainy days recorded, partly arising, no doubt, from the use of uncertified gauges, but probably mostly due to the faulty scale-division at ·01 in. It is probable that all observers in important health resorts would be willing to adopt a special test-glass for small amounts.

E. L. M. COLVILE, F.R.Met.Soc.

Bournemouth, March 31st, 1902.



WITH regard to the measurement of small rainfalls, how would it do to make the measuring glass somewhat like the annexed sketch, so as to admit of the first hundredth of an inch being sub-divided into two-thousandths, or even one-thousandths, of an inch? The chief objection seems to be that the measure would be more easily broken.

JOHN AITKEN, F.R.S.

Ardenlea, Falkirk, 18th March, 1902.

[It is interesting to notice that Professor Hellmann's rain gauges, used officially in Prussia, are furnished with measuring glasses, constructed on the principle suggested by Mr. Aitken. The external diameter, however, is uniform, making them stronger, and not weaker, than ordinary glasses. The first ·10 mm. is fifteen times as long as the others, and can readily be sub-divided to read to hundredths of a millimetre, or less.—ED. *S.M.M.*].

THE RAINFALL OF MADEIRA.

MR. HENRY MERCER BELL, the British Vice-Consul in Madeira, has been kind enough to send us a register of rainfall which he has kept at Funchal at a point 250 feet above sea-level and 4 feet above the ground, from September, 1895. The monthly totals for each year, the number of rainy days for each year, and the average monthly falls and number of rainy days for the six years, together with the absolute maximum daily falls recorded in each month, are given in the following tables :—

Rainfall at Funchal, Madeira.

MONTHS.	1896.	1897.	1898.	1899.	1900.	1901.	Average, 1896-1901.
	in.	in.	in.	in.	in.	in.	in.
January	3·48	4·83	3·18	2·78	1·07	6·46	3·63
February ...	2·63	·02	·12	6·96	4·45	8·32	3·75
March.....	1·45	·00	3·33	3·84	3·79	3·09	2·58
April	·32	1·66	·54	·08	2·64	3·29	1·42
May.....	·00	2·31	·53	·81	·21	·71	·76
June	1·51	·02	·24	·16	·10	·10	·36
July	·00	·09	·00	·02	·75	·06	·15
August	·00	·00	·17	·14	·00	·05	·06
September...	·16	·12	1·71	·58	3·53	·12	1·04
October	8·74	9·85	1·27	6·36	2·07	·66	4·82
November ...	6·66	4·06	2·01	1·29	·13	12·36	4·42
December ...	1·75	3·16	7·54	7·29	·00	3·18	3·82
Year	26·70	26·12	20·64	30·31	18·74	38·40	26·81
Per cent. of aver.	100	97	77	113	70	143	100

Number of Rainy Days and Max. Falls at Funchal, Madeira.

MONTHS.	1896.	1897.	1898.	1899.	1900.	1901.	Average	Max. Fall in 24 hours.	
								in.	Year.
January	14	15	6	7	3	15	10	1·86	1901
February ...	7	1	2	15	12	10	8	2·38	1901
March.....	6	0	14	9	10	6	7	1·68	1901
April	1	2	5	2	8	6	4	1·66	1901
May.....	0	11	3	3	2	4	4	·61	1897
June	4	1	3	1	2	1	2	·90	1896
July	0	2	0	1	3	1	1	·63	1900
August	0	0	1	1	0	1	1	·17	1898
September...	3	2	5	7	6	2	4	2·45	1900
October	8	14	4	15	10	6	10	2·57	1897
November ...	7	11	6	4	2	22	8	2·45	1901
December ...	5	12	5	15	0	12	8	2·37	1898
Year	55	71	54	80	58	86	67	...	...
Per cent. of aver.	82	106	81	119	87	128	100		

The wettest month recorded was October, 1895, with a fall of 18·43 in. on 24 days (the amount being practically the same as that for the whole year 1900), and with a maximum fall on one day of 3·10 in. October is on the average the wettest month, though closely followed by November; while August is the driest month, the aggregate for the six Augusts being only ·36 in. falling on three days. In fact, July and August are practically rainless. It will be observed that although individual months vary greatly in their amount of rain, the year is on the average divided sharply into a wet and a dry season of equal length. For the six years in question the average rainfall was 26·81 in., falling on 67 days; the dry season, April to September, having only 3·79 in., falling on 16 days; while the wet season, October to March, had 23·02 in., falling on 51 days. The six dry months thus had 14 per cent. of the total rain and 24 per cent. of the rainy days; the six wet months 86 per cent. of the rain and 76 per cent. of the rainy days, the winter rain being the more intense as well as the more abundant. The wettest year had 43 per cent. more rain and the driest 30 per cent. less rain than the average of the six.

We believe that Mr. Bell's records represent the actual rainfall conditions of Funchal with considerable accuracy, though on account of the steep slope of the land round the bay the local differences must be well marked.

We may remind our readers that the climate of Madeira, while uniform and free from extremes as regards temperature, is remarkable for its high humidity even in the dry season. The peculiarities of the climate are very far from having been fully investigated, although Dr. Mason's hygrometric investigations there sixty years ago first brought the wet and dry bulb thermometer into general use for measuring relative humidity; and Professor Piazzi Smyth in his racy little monograph "Madeira Meteorologic" called attention in his own characteristic way to the unique problems presented by the climate of the island where, as Ogilby observed in 1670, "the air keeps so even a temperature that neither heat nor cold invade it with excess.'

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on the 19th ult. at the Institution of Civil Engineers, Great George Street, Westminster, Mr. W. H. Dines, B.A., President, in the chair.

Mr. D. Buckney, Mr. A. S. Butterworth, Assoc. M. Inst. C.E., Dr. J. H. C. Dalton, and Dr. A. Thomas, were elected Fellows.

Mr. W. N. Shaw, F.R.S., read a paper entitled "La Lune mange les Nuages," the title referring to the disappearance of clouds on a clear moonlight night. The paper was in effect a note on the thermal relations of floating clouds. The author said that the result of warming a mass of floating cloud depends upon the temperature gradient for height of the air in which it floats. If the law of fall of

temperature with increase of height were the adiabatic law, a mass of air at the ground warmed ever so little above its surroundings would continue to rise until it reached the limit of the atmosphere. An inversion of the temperature gradient, on the other hand, would prevent any rise taking place, or speedily arrest it. The precise relation between changes in the temperature of a floating mass of air upon adding or removing heat, and the temperature gradient of the surrounding air, was explained by reference to Hertz's diagram of thermal lines for air. A temperature gradient represented by a line exactly parallel to a saturation line in the diagram would indicate the conditions under which a cloud might receive or lose heat and change its temperature without any evaporation or condensation taking place. He pointed out that, except in cases of inversion of the temperature gradient or of a very slight temperature gradient, meteorologists have to recognise that the ordinary relations between the increase of heat and increase of temperature in a given mass of air must be reversed; in other words, that the warming of the air by producing expansion and rising will bring about a lowering of temperature, while the cooling of the air by leading to contraction and sinking will ultimately produce a rise of temperature.

Mr. Shaw exhibited an apparatus whereby the conditions applicable in the case of a floating cloud can be experimentally realised.

The President, Dr. H. R. Mill, and Captain Wilson-Barker took part in the discussion, and congratulated the author of the paper on the interesting experiment which he showed of the formation of a cloud by warming saturated air, so as to produce expansion.

Mr. W. N. Shaw, in reply to a question, said that he was not prepared to say definitely whether the radiating or absorbing power of a cloud was greater or less than that of the surrounding air. Still, the existence of the cloud showed that there was some difference and he was inclined to think that the cloud had the greater power of absorbing heat.

Mr. F. J. Brodie read a paper on "The Prevalence of Gales on the Coasts of the British Islands during the 30 years 1871-1900." The total number of gales of all kinds dealt with during this period was 1455, the yearly average being 48·5, of which 10·6 were severe. The worst year for gales was 1883, while the quietest year was 1889. The stormiest month was January, 1890. At all seasons of the year, except summer, the prevalence of gales is greater from south-west than from any other quarter. The smallest number occurs in spring, when rather less than 20 per cent. are from south-west, more than half the storms being, however, from points between south-west and north-west. The prevalence of gales from polar directions is greatest in spring, more than 21 per cent. blowing from points between north and east. The highest wind velocities recorded during the whole period were those at Fleetwood during the westerly gales on December 22nd, 1894, and on January 12th, 1899. On

the former occasion for 9 hours the mean velocity was 64 miles per hour, and at 9 a.m. it reached a maximum of 78 miles. It appears that on the average 43 per cent. of the storm systems which visit our coasts advance from some point of the compass lying between south and south-west and travel towards some point lying between north and north-east; and 39 per cent. have an easterly motion, while less than 1 per cent. move westwards. A mean of 264 cases shows that the deep cyclonic systems which visit our islands travel on an average at the rate of 24 miles per hour; in some cases, however, the rate was not more than 8 or 10 miles, while in others it amounted to 40, 50, and even 60 miles per hour.

Mr. Brodie concluded his paper by exhibiting on the screen a series of weather maps showing the progress of some of the most notable gales during the period covered by the discussion

---

THE SCOTTISH METEOROLOGICAL SOCIETY.

THE half yearly general meeting of this Society was held in Edinburgh on March 20th, Sir Arthur Mitchell, K.C.B., in the chair. The Report from the Council of the Society, which was presented by Dr. A. Buchan, F.R.S., stated that the vacancy caused by the death of Professor Tait, one of the representatives of the Royal Society of Edinburgh, had been filled by the appointment, by the Council of the Royal Society of Edinburgh, of Professor Crum Brown. The three vacancies in the Council requiring to be filled up by the meeting were occasioned by the death of the Earl of Moray, the election of Professor Crum Brown to represent the Royal Society, and the retiring by rotation of Professor M'Kendrick. On the recommendation of the Council Professor M'Kendrick was re-elected and the Hon. John Abercromby and Professor Knott were elected to fill the vacancies.

It was stated that the second volume of the Ben Nevis Observations, being Vol. 42 of the *Transactions* of the Royal Society of Edinburgh, was approaching completion. This is the first of the three volumes, for the printing of which the Royal Societies of London and Edinburgh have each voted £500. It contains the observations made at the Ben Nevis and Fort William Observatories from January, 1888, to December, 1892. These are now in type and fill 420 pages. The remainder of the volume, consisting of discussions connected with Ben Nevis, is being rapidly pushed forward. Other discussions, by Mr. J. Aitken, F.R.S., Mr. J. Y. Buchanan, F.R.S., Dr. Herbertson, Dr. Buchan, Mr. Omond, and Mr. Mossman, are ready for the press, and will appear in the volume. Meanwhile, other large researches are being carried on in the Society's Office by Dr. Buchan and Mr. Omond, on lines already indicated to the Society, which will be communicated to future meetings.

It was further stated that experiments with kites for meteoro-

logical purposes had been carried on near Edinburgh by Mr. John Anderson for several years. He has now obtained a complete outfit, including a new kite and an oil engine of $2\frac{1}{4}$ horse power. It is proposed to test this kite, which in some respects has new features to recommend it, very thoroughly in the early summer. Thereafter it will be handed over to the ship of the Scottish Antarctic Expedition for use in the south polar regions.

A paper by Mr. John Aitken, F.R.S., on atmospheric dust, as observed by his dust-counter at Ben Nevis and in many other localities, with reference to the production of haze, was read by Mr. Omond, who also exhibited the kite referred to in the Report from the Council.

Mr. R. C. Mossman gave a preliminary report on his winter's work at Achariach, details of which we hope to publish shortly.

Mr. Andrew Watt, M.A., read a paper on the Rainfall of Ben Nevis and Fort William, in which he paid special attention to the distribution of the amount of precipitation at the High and Low Level observatories throughout the hours of the day. The curves for Fort William and Ben Nevis did not differ much, and lay midway between those for purely coastal climates, where the early morning hours are the wettest, and those for continental climates, where the early afternoon hours are the wettest. The fact that by far the greater part of the rain falling in this country is cyclonic, makes the problem very complex.

REVIEWS.

Report of the Meteorological Council for the Year ending 31st of March, 1901, to the President and Council of the Royal Society. London: Printed for His Majesty's Stationery Office. 1901. Size $9\frac{1}{2} \times 6$. Pp. 162. Price 1s. $1\frac{1}{2}$d.

THE new constitution of the Meteorological Council is now officially announced, and we reprint the following letter from Appendix I. as the best way of making it clear to our readers, it being borne in mind that the Royal Society is responsible for the nomination of the Council:—

"THE ROYAL SOCIETY,

"*March 26th*, 1901.

"SIR,—I am directed to make known to you the following decisions of the President and Council of the Royal Society in regard to the Meteorological Council and Association.

"The President and Council accept the resignation of Mr. Francis Galton as a member of Council, and, in doing so, wish to record their appreciation of his long and valuable services.

"They nominate Sir Richard Strachey, Professor G. H. Darwin, Dr. Buchan, and Mr. Shaw to be, with the Hydrographer to the Admirality, the

Directors. They further nominate General Sir Richard Strachey as Chairman.

"They have come to the conclusion that it will be desirable to appoint five other persons to bring up the number of members of the Association to ten, and for that purpose nominate as members the Earl of Rosse, Mr. J. Y. Buchanan, for a period of five years, and Mr. Dines, Professor Schuster, and Dr. R. H. Scott, for a period of three years.

"They take it for granted that these additional five members will not be often required to attend meetings of the Council; possibly one or two meetings a year, in addition to the statutory annual meeting, will be all that is desirable. And they are of opinion that these gentlemen should not receive any honorarium for their attendance. Indeed, they have reason to believe that their acceptance of an honorarium would present legal difficulties.

"I am, &c.,

"M. FOSTER, *Secretary R.S.*

"The Secretary, The Meteorological Council."

It will, of course, be understood that the volume under notice is the last Report of the old Council. As such it gives the usual clear epitome of the work of the Council under the heads of Ocean Meteorology, Weather Telegraphy and Forecasts, Climatology, Library, Miscellaneous Investigations, Publications, and Finance. It is stated that at the close of last year Mr. R. Strachan was granted an annuity under the new scheme of superannuation, after long and meritorious service. Under the head of "Ocean Meteorology," though scarcely falling within the usual acceptation of that term, we are pleased to see that the Meteorological Council has supplied six sets of meteorological instruments for use in British New Guinea, a region from which climatological observations of much importance to Australia, as well as locally, may be expected. Under "Weather Forecasts" we find that in 1900-01 the forecasts made at 8.30 p.m. were completely successful in 57 per cent. of the cases, partially successful in 27 per cent., and complete failures in only 5 per cent., while the special storm warnings were justified in 92 per cent. of the cases.

The appendices contain some new and interesting features. Amongst these is an article on "Conspicuous Meteorological Occurrences in 1900," which deals, though very briefly, with gales, heavy rains, thunderstorms, droughts, &c. Two interesting plates are given, showing the weather charts and the curves of a number of recording instruments for the heavy rain of December 30th and the thunderstorm of July 27th.

Altogether the Report shows that a large amount of excellent work is being done by the Office and made available to the public; but we confess that the small circulation of the Daily Weather Report does not indicate as much appreciation on the part of the public of the advantages offered to them as we should expect to see.

METEOROLOGICAL NEWS AND NOTES.

TYPICAL WEATHER MAPS for use in schools have been designed by Dr. R. Börnstein, of Berlin, and a set of twelve is being brought out at a very moderate price by the enterprising German map-publisher, Dietrich Reimer (Ernst Vohsen). We have not seen the maps, but their object is the praiseworthy one of familiarising children with weather types, so that they will be able to understand the daily weather charts and to follow the weather predictions with intelligence. Nothing, we may add, would help towards the improvement of the national weather services more than the creation of an army of intelligent critics in every country.

THE DAILY BAROMETER WAVE has been investigated by Dr. Oliver L. Fassig, of the U.S. Weather Bureau, in a new way, by plotting the mean departure from the daily average height of the barometer for each hour of the day on a synchronous chart which takes in the whole of N. and S. America, the Atlantic Ocean, and half of Europe and Africa. The result is to show the development and westward propagation over the American continents of an area of pressure above the normal during the forenoon, followed by the development and westward propagation of an area of pressure below the normal in the afternoon, giving place to a period of comparatively uniform distribution of pressure during the night hours, which is divisible into two minor periods. The paper, with twenty-five illustrations, appears in the *Monthly Weather Review* for Nov., 1901.

METEOROLOGICAL EXAMINATION PAPERS are comparative rarities in the educational world, because meteorology is not often taught in schools or colleges. We once gleaned a few treasures of climatic ignorance from the answers to a paper on the physical geography of India, set to scholars somewhere in the British Isles, sometime within the last ten years, and these may amuse our readers :—

"The S.W. monsoons are very hot, and circular in form."

"The climate of India is humid and equable ; in Bengal it is dry, salubrious and unhealthy."

"In Bengal it is very wet in summer, the water rising from about 200 to 220 feet."

"In some parts of India the temperature differs only about 4° between summer and winter. This of course affects the length of day and night."

To which may be added, from another paper, this practical hint to those who wish to arrive at an understanding with the weather:—

"The only means to propitiate the climate of our country would be the jointure of the British Isles to the continent."

MARCH, 1902.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1890-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·87	+ ·41	·64	14	11	62·2	31	29·5	7	3	10
II.		Tenterden	1·32	— ·37	·60	14	12	60·0	31	29·5	5	4	17
,,		Hartley Wintney	1·77	+ ·21	·60	14	9	60·0	31	25·0	7, 24	8	12
III.		Hitchin	1·15	— ·29	·49	14	11	59·0	31	29·0	22	6	...
,,		Winslow (Addington)	1·39	— ·13	·44	14	12	63·0	17	23·0	6	6	12
IV.		Bury St. Edmunds (Westley)	2·10	+ ·47	·76	1	12	60·5	18*b*	27·0	6	4	...
,,		Norwich (Brundall)	1·07	...	·31	14	15	60·0	17	26·2	6	7	17
V.		Winterborne Steepleton	2·62	...	·82	26	14	57·5	17	26·0	6	6	11
,,		Torquay	2·23	...	·44	26	13	...	...	...	...	...	...
,,		Polapit Tamar [Launceston]..	3·01	+ ·73	·92	26	20	58·2	6	23·0	6	5	8
VI.		Stroud (Upfield)	1·23	— ·45	·58	14	11	59·0	27*b*	31·0	23	3	...
,,		Church Stretton (Woolstaston)	1·52	— ·25	·72	14	11	59·0	31	30·5	24	4	13
,,		Worcester (Diglis Lock)	1·44	+ ·10	·71	14	11	...	...	...	...	...	...
VII.		Boston	·90	— ·29	·40	14	8	58·0	31	26·0	6	7	...
,,		Hesley Hall [Tickhill].....	1·54	+ ·14	·86	14	10	57·0	17*b*	28·0	6	6	...
,,		Derby (Midland Railway).....	1·41	— ·01	·60	14	15	61·0	31	29·0	23*c*	6	...
VIII.		Manchester (Plymouth Grove)	1·61	— ·46	·20	24	18	56·0	1, 2	30·0	22	3	4
IX.		Wetherby (Ribston Hall) ...	·84	— ·79	·24	24	9	...	...	...	...	...	...
,,		Skipton (Arncliffe)	2·91	— 2·21	·45	20	23	...	...	...	...	...	...
,,		Hull (Pearson Park).	·87	— ·79	·14	24	13	57·0	17	30·0	6, 7	7	12
X.		Newcastle (Town Moor)	·84	— 1·10	·40	24	12	...	...		...	...	...
,,		Borrowdale (Seathwaite).....	8·76	— 1·90	·98	8	27	53·7	17	27·8	24	5	...
XI.	WALES.	Cardiff (Ely).....	2·86	+ ·30	·55	26	15	...	...	...	...	...	...
,,		Haverfordwest	3·72	+ ·98	·87	26	17	56·5	10	28·6	24	3	10
,,		Aberystwith (Gogerddan) ...	3·20	+ ·36	·65	26	23	59·0	17	24·0	5	6	...
,,		Llandudno.....	2·18	+ ·24	·40	24	25	56·5	17	34·0	24*d*	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	2·46	— ·59	·26	3*f*	17	56·0	7*b*	25·0	24	6	...
XIII.		Edinburgh (Royal Observatory)	·82	...	·27	19	14	55·9	17	28·8	24	4	12
XIV.		Colmonell	3·55	+ ·31	·51	8	27	57·0	17	29·0	23	1	...
XV.		Tighnabruaich	4·97	...	·54	8*g*	27	51·0	17	25·0	23	7	...
,,		Mull (Quinish).....	5·78	+ 1·61	·77	19	28	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·55	— 1·03	·31	20	16	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·00	— ·98	·20	29	19	58·5	17	26·8	24	8	...
XVII.		Braemar	1·92	— ·40	·32	19	19	55·0	17	18·3	24	13	21
,,		Aberdeen (Cranford)	1·57	— ·63	·22	22	28	60·0	17	25·0	25	13	...
,,		Cawdor (Budgate)	1·92	— ·32	·38	19	20	...	..	...	...	...	...
XVIII		Strathconan [Beauly]	7·73	+ 3·51	1·00	19	14	..	...	...	...	...	...
,,		Glencarron Lodge.....	12·35	+ 5·41	1·40	19	26	52·0	1	22·4	24	8	...
XIX.		Dunrobin	2·41	— ·03	·40	21	17	58·0	17	25·0	26*d*	12	...
,,		S. Ronaldshay (Roeberry) ...	2·59	— ·10	·40	19	23	50·0	14	28·0	25	10	...
XX.	IRELAND.	Darrynane Abbey.....	2·83	— ·29	·74	26	22	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	1·80	— ·72	·46	26	13	61·0	27	30·0	24*e*	5	...
,,		Broadford (Hurdlestown) ...	3·01	+ ·81	·44	26	23	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	2·25	+ ·04	·44	26	17	...	...	...	...	...	...
,,		Dublin (Fitz William Square)	1·75	— ·07	·37	24	21	58·7	17	32·8	24	0	5
XXII.		Ballinasloe	2·64	+ ·22	·40	26	27	69·0	17	28·0	24	8	...
,,		Clifden (Kylemore)	6·70	+ 1·51	·80	22	22	...	...	...	...	...	...
XXIII		Seaforde.....	1·77	— ·64	·56	24	18	60·0	17	28·0	24	5	10
,,		Londonderry (Creggan Res.).	2·77	+ ·08	·27	25*a*	25	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·68	+ ·10	·60	24	25	56·0	17	28·0	23	5	8

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

a—and 27. *b*—and 31. *c*—and 24. *d*—and 25. *e*—and 14. *f*—and 22. *g*—and 19.

SUPPLEMENTARY TABLE OF RAINFALL, MARCH, 1902.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	1·81	XI.	Castle Malgwyn	3·45
II.	Dorking, Abinger Hall .	2·02	,,	Builth, Abergwesyn Vic.	4·70
,,	Sheppey, Leysdown	1·04	,,	Rhayader, Nantgwillt ...	3·55
,,	Hailsham	1·80	,,	Lake Vyrnwy	3·06
,,	Crowborough.....	1·96	,,	Ruthin, Plâs Dráw	1·70
,,	Ryde, Beldornie Tower..	1·68	,,	Criccieth, Talarvor	2·89
,,	Emsworth, Redlands ...	2·03	,,	I. of Anglesey, Lligwy..	2·14
,,	Alton, Ashdell	2·36	,,	Douglas, Woodville.....	1·93
,,	Newbury, Welford Park	1·96	XII.	Stoneykirk, Ardwell Ho.	2·05
III.	Oxford, Magdalen Coll..	1·17	,,	Dalry, Old Garroch	3·90
,,	Banbury, Bloxham	1·57	,,	Monaive, Maxwelton Ho.	3·14
,,	Pitsford, Sedgebrook ...	1·42	,,	Lilliesleaf, Riddell	1·31
,,	Huntingdon, Brampton.	1·51	XIII.	N. Esk Res. [Penicuick]	3·10
,,	Wisbech, Bank House...	·98	XIV.	Glasgow, Queen's Park..	2·39
IV.	Southend	1·20	XV.	Inveraray, Newtown ...	6·15
,,	Colchester, Lexden	1·29	,,	Ballachulish, Ardsheal...	8·30
,,	Saffron Waldon, Newport	1·17	,,	Islay, Eallabus..... ...	3·62
,,	Rendlesham Hall	1·00	XVI.	Dollar.....	1·87
,,	Swaffham	1·59	,,	Balquhidder, Stronvar...	5·83
V.	Salisbury, Alderbury ...	1·87	,,	Coupar Angus Station...	·95
,,	Bishop's Cannings	1·89	,,	Blair Atholl	1·66
,,	Blandford, Whatcombe .	2·39	,,	Montrose, Sunnyside ...	·76
,,	Ashburton, Druid House	3·12	XVII.	Keith H.R.S.....	3·33
,,	Okehampton, Oaklands.	3·52	XVIII.	Fearn, Lower Pitkerrie..	1·22
,,	Hartland Abbey	3·00	,,	S. Uist, Askernish	4·11
,,	Lynmouth, Rock House	2·87	,,	Invergarry.....	5·24
,,	Probus, Lamellyn	2·75	,,	Aviemore, Alvie Manse.	1·84
,,	Wellington, The Avenue	1·82	,,	Loch Ness, Drumnadrochit	2·71
,,	North Cadbury Rectory	1·92	XIX.	Invershin	3·87
VI.	Clifton, Pembroke Road	1·85	,,	Bettyhill	3·47
,,	Ross, The Graig	1·53	,,	Watten H.R.S.....	1·38
,,	Shifnal, Hatton Grange	1·24	XX.	Dunmanway, Coolkelure	4·05
,,	Wem, Clive Vicarage ...	1·29	,,	Cork, Wellesley Terrace	1·73
,,	Cheadle, The Heath Ho.	2·17	,,	Killarney, District Asyl.	4·72
,,	Coventry, Priory Row ..	1·77	,,	Caher, Duneske	...
VII.	Market Overton	1·08	,,	Ballingarry, Hazelfort...	2·40
,,	Grantham, Stainby	1·50	,,	Miltown Malbay	1·75
,,	Horncastle, Bucknall ...	1·54	XXI.	Gorey, Courtown House	1·70
,,	Worksop, Hodsck Priory	1·61	,,	Moynalty, Westland ...	2·36
VIII.	Neston, Hinderton	1·73	,,	Athlone, Twyford	2·00
,,	Southport, Hesketh Park	1·97	,,	Mullingar, Belvedere ...	1·84
,,	Chatburn, Middlewood.	3·27	XXII.	Woodlawn	2·53
,,	Duddon Val., Seathwaite Vic.	6·56	,,	Westport, Murrisk Abbey	4·99
IX.	Baldersby	·80	,,	Crossmolina, Enniscoe ..	5·92
,,	Scalby, Silverdale	1·64	,,	Collooney, Markree Obs.	3·04
,,	Ingleby Greenhow Vic..	1·07	XXIII.	Enniskillen, Model Sch.	...
,,	Middleton, Mickleton ...	1·83	,,	Warrenpoint.....	1·87
X.	Beltingham	2 04	,,	Banbridge, Miltown.....	1·58
,,	Bamburgh	·97	,,	Belfast, Springfield	2·46
,,	Keswick, The Bank	2·91	,,	Bushmills, Dundarave..	2·65
XI.	Llanfrechfa Grange	2·45	,,	Stewartstown	2·17
,,	Treherbert, Tyn-y-waun	5·07	,,	Killybegs	4·01
,,	Llandovery	3·58	,,	Horn Head	3·81

METEOROLOGICAL NOTES ON MARCH, 1902.

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.

ENGLAND.

LONDON, CAMDEN SQUARE.—Fog was very prevalent until the 10th, with fine intervals and little R. On 14th occurred the heaviest R of the year so far, followed by a beautiful summerlike day on 16th. From 20th showery and unsettled weather lasted until the end of the month. Sharp TS on 21st with heavy H. H on 22nd. Mean temp. 45°·1, or 3°·0 above the average.

ABINGER HALL.—Mild and open generally though the latter part was colder. Great need of R; many wells are being sunk, but the yield is small.

TENTERDEN.—A genial month, with less wind than usual and generally dry. Duration of sunshine 135 hours. S.W. gale on night of 14th, and violent N.N.W. gale on morning of 25th.

CROWBOROUGH.—On the whole distinctly mild, with several quite warm days, and except for three slight white frosts, quite free from frost and S. Much mist; slight H showers on 22nd, 23rd and 24th.

EMSWORTH, REDLANDS.—Rough weather, with great variations of temp. Gale from S.W. on 20th, and from W. on 24th.

HARTLEY WINTNEY.—A dry and warm month. Foggy and calm with dull days until 14th. The latter half was more showery; distant TS on 21st. No ozone was registered throughout.

PITSFORD, SEDGEBROOK.—Warm and pleasant, but somewhat changeable. R ·28 in. below the average. Mean temp. 44°·1.

BURY ST. EDMUNDS, WESTLEY.—Mild and very favourable to agriculture. Heavy TS on 1st.

NORWICH, BRUNDALL.—The warmest March since 1897. Mild throughout; although there were no abnormal maxima, there was an unusually large number of moderately mild days. A splendid Easter concluded a beautiful month, with but few features of the unpleasant character with which March is usually associated. L on 2nd. T and L on 21st.

BISHOPS CANNINGS.—R ·08 in. above, and rainy days 4 below, the average.

TORQUAY, CARY GREEN.—R ·31 in. below the average; mean temp. 3°·6 above the average. Duration of sunshine 43·5 hours below the average: 7 sunless days. Mean amount of ozone 5·3; max. 9·5 on 24th with S.S.W. wind, min. 1·0 on 5th, 6th, 7th and 10th.

POLAPIT TAMAR [LAUNCESTON].—Rather wet and stormy but mild. H on 22nd. Thick fog on 4 days, slight on one day.

LYNMOUTH, ROCK HOUSE.—Not very much sunshine and a good deal of fog and mist. A short period of strong N.W. winds and H storms just before and after the equinox. S.W. breezes during the last week with gale on 25th.

WELLINGTON, THE AVENUE.—Generally genial, with little of the characteristic E. winds. R slightly below the average.

NORTH CADBURY RECTORY.—A most unusual March. W. winds throughout and, till the last eight days, singularly quiet and dry. Absolutely none of the typical N.E. wind. No S.

CLIFTON, PEMBROKE ROAD.—Mild and on the whole dry, though without much sunshine. The month was marked by the absence of the keen E. winds which so often prevail at this time. A rather violent "equinoctial gale" sprang up suddenly on the afternoon of 24th. R nearly half-an-inch below the monthly average, and for the first quarter of 1902 3·17 in. deficient.

ROSS, THE GRAIG.—There were many brilliant days, but not like those of March, 1893 or 1894. No S occurred, and temp. in the screen only descended to 32° on 4 occasions, much less than the usual number. Vegetation was making rapid progress at the close.

COVENTRY, PRIORY ROW.—For the most part mild and pleasant. The ground was fairly dry and good for the spade and plough. Not so much wind or dust as March usually brings. Mild and springlike at the end.

SEATHWAITE VICARAGE.—Generally cold, with a large number of rainy days but with no heavy fall of R and less than 1½ inches of S.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE.—S.W. winds prevailed and the atmosphere was very damp. Agricultural work was much impeded, it being impossible to sow oats and prepare the land.

HAVERFORDWEST.—March came in very quietly, and continued, on the whole, calm, mild and rather damp. From 21st to 25th, however, was a rather stormy and cold period. Vegetation was generally backward.

DOUGLAS, WOODVILLE.—Generally mild until the last week, which was cold with strong N.W. winds. R below the average, though there were 19 rainy days and the ground was full of moisture, perhaps a result of the marked absence of E. winds. Hills well covered with S on 24th and 25th. Vegetation forward.

SCOTLAND.

LILLIESLEAF, RIDDELL.—An average month, with a good deal of wind and rather less R than usual. Probably also rather colder and more disagreeable than usual, with a good deal of S on 24th and 25th The frost and S came on earlier this winter and terminated later than for many years.

TIGHNABRUAICH.—A dripping month. R nearly every day. S on 25th.

BALLACHULISH, ARDSHEAL.—R 2·51 in. above the average.

MULL, QUINISH.—A very cold, wet and stormy month.

COUPAR ANGUS.—The R, which was 1·08 in. below the average, was equable but exceptionally light, this being the third month in succession with deficient R. Mean temp. 41°·5, or 3°·0 above the average, due to the mildness of the first three weeks, for severe weather ruled during the last week.

WATTEN, H.R.S.—The first week was fine. Cold winds and stormy showers of R, sleet and S during the rest of the month. Frosty nights.

S. RONALDSHAY, ROEBERRY.—A very fair month. Mean temp. 39°·5, or 0°·5 above the average of 12 years.

IRELAND.

CORK, WELLESLEY TERRACE.—The lion and the lamb appear to have lost their way as March was accompanied by neither either on coming in or going out. R ·80 in. below the average. Mean temp. 44°·0, or 1°·0 above the average, being the first month since July, 1901, with temp. reaching average.

DARRYNANE ABBEY.—Fine and mild till 18th. thereafter wet. Cold and wild 19th to 24th with H from 19th to 22nd.

WATERFORD, BROOK LODGE.—Mean temp. 46°. Max. range in 24 hours 23°. S.W. to N.W. gale on 19th and N.W. gale on 24th. H on 20th and 23rd.

MILTOWN MALBAY.—With R almost every day though of small quantity, and continuous cold biting winds, this proved the worst March for agricultural purposes for some decades. H showers from 17th to 23rd. N.W. to N. gale on 24th.

DUBLIN, FITZWILLIAM SQUARE.—Unlike March, 1900 and 1901, it was singularly mild, the mean temp. being 46°·7 or 3°·6 above the average. The only cold spell occurred from 20th to 26th inclusive. At first also the weather was dry, but from 8th onward R fell frequently though not heavily, except on 24th and 26th. W. and S.W. winds were most prevalent. Duration of bright sunshine 94 hours. More or less foggy on 6 days. High winds on 10 days reaching the force of a gale on 19th. S or sleet on 3 days and H on 5 days.

COLLOONEY, MARKREE OBSERVATORY.—Rather wetter than the average, but mean temp. 44°·7 or above the average. Bright sunshine very deficient, being only 71·6 hours. S fell on 24th.

OMAGH, EDENFEL.—During the first fortnight although R fell slightly on almost every day the weather was suitable for agricultural work, but the latter half was generally raw, cold, inclement and wet, with less vegetation apparent on April 1st than on March 1st.

KILLIBEGS.—Although the total fall was not very great R was noted on every day of the month, an unprecedented occurrence in March since the record commenced in 1886.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCTOBER, 1901.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	74·4	1	33·1	27	58·1	43·7	45·7	85	107·2	30·9	1·92	15	6·0
Malta	83·5	8	52·2	27	76·3	60·3	61·1	81	140·9	48·1	5·67	16	3·7
Cape Town	88·8	13	42·4	5	70·9	53·7	50·0	61		50·2	·76	7	4·2
Mauritius	85·7	13	58·7	10	81·4	65·7	62·7	71	147·6	65·8	·79	12	5·5
Calcutta	93·5	19	69·8	22	89·3	75·5	74·4	77	146·4	66·3	1·99	6	3·7
Bombay	93·2	31	74·5	17	87·4	77·0	75·4	82	138·0	71·0	·39	3	2·8
Colombo, Ceylon	91·8	22	72·8	28	87·9	76·9	73·7	80	151·0	32·0	3·91	13	5·7
Melbourne	83·5	19	37·2	24	65·8	48·6	48·9	80	142·9	35·3	4·31	12	6·7
Adelaide	84·8	5	41·0	2, 3	70·6	50·4	47·2	64	139·5	40·3	1·59	13	5·8
Sydney	94·3	26	48·6	2	71·1	56·4	52·5	66	144·8	...	1·90	12	5·0
Wellington	...	...	...	...	...	...	...	...	...	41·0	...	...	...
Auckland	72·0	29	44·0	9*a*	63·4	50·7	45·1	64	137·0	...	3·11	10	5·0
Jamaica, Halfway Tree	88·0	28	69·0	10	86·4	71·4	71·8	84	...	...	10·19	12	4·0
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	90·0	6	71·4	11	84·5	75·4	73·4	79	160·0	22·7	9·68	22	3·0
Toronto	72·0	23	27·8	20	58·1	39·0	41·8	76	88·0	...	·54	...	4·8
Fredericton, N.B.	69·8	31	20·9	26	55·4	35·9	37·4	71	...	...	3·40	7	4·8
Winnipeg, Manitoba	77·0	22	18·0	27	57·6	31·8	...	...	...	...	·46	7	4·3
Victoria, B.C.	69·0	22	44·2	16	60·5	48·3		...	...	...	1·65	10	6·4
Dawson, Yukon	46·8	2	−1·2	31	33·9	23·0	...	...	...	...	2·25	7	5·2

a—and 19.

REMARKS.

MALTA.—Mean temp. of air 68°·1, or 1°·5 below the average. Mean hourly velocity of wind 8·5 miles, or 0·4 below the average. Mean temp. of sea 71°·6. TSS on 13th, 21st and 26th. L on 6 days. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·5, of dew point 0°·6, above, and R ·78 in. below, their respective averages. Mean hourly velocity of wind 11·6 miles, or 0·5 miles above average; prevailing direction E. by N. to S.E. by E. No sun spots from 1st to 9th, and 13th to 27th, two on 10th to 12th, one small group consisting of from one to three spots from 28th to 31st. The spots observed on October 10th to 12th were the first since June 26th, and counting these as a group the tenth since the beginning of the year. T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air 81°·7 or 0°·9 below, dew point 0°·7 above and R 10·45 in. below, their respective averages. Mean hourly velocity of wind 5·7 miles; prevailing direction S.W. TS on 28th and 29th. W. C. S. INGLES.

Adelaide.—Mean temp. of air 1°·0 below, R ·16 in. below, their respective averages. Fine agricultural rain this month, which was the wettest October since 1894. C. TODD, F.R.S.

Sydney.—Mean temp. of air 0°·3 above, R ·88 in. below, humidity 2·1 below, their respective averages. H. C. RUSSELL, F.R.S.

Auckland.—Barometrical pressure and mean temp. both considerably above the average of the previous 33 years. Heavy falls of R on 3rd and 31st, month otherwise remarkably dry, and total fall quarter of an inch below the average. T. F. CHEESEMAN.

DAWSON.—First ice appeared on river on the 20th. R. F. STUPART.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXXXVI.] MAY, 1902. VOL. XXXVII.

ON THE USE OF OUR RAINFALL TABLES.

NEWSPAPERS, both daily and weekly, frequently contain complaints of the lack of authoritative information as to rainfall; and sometimes the Meteorological Office is blamed most unjustly for neglecting to furnish information which it was not founded to supply, nor provided with the means of obtaining.

Rainfall by its very nature occupies a place apart from the other elements of climate. It is of greater practical importance to all who live on land than either wind or warmth, and it is in many ways more necessary to ascertain its average distribution in successive months and years than it is to follow the temperature of the seasons or the variations in the direction and force of the wind. There are two problems presented by rainfall which it is well to distinguish. One is the prediction of rain, depending on observations of pressure and temperature, and with this the Meteorological Office grapples very successfully as an incident in the general weather forecasts. The other problem is the distribution of rain over the country, and the relation of the actual fall to the average for various periods. This has been the special study of the British Rainfall Organization for more than forty years, thousands of voluntary workers giving their time ungrudgingly to the unending task, and the directors and their staff subjecting every return to critical examination before accepting it for publication. Some time necessarily elapses before the whole information collected for each year can appear in the annual volume of *British Rainfall*; but each monthly number of *Symons's Meteorological Magazine* contains a set of Tables embodying the figures for 156 selected stations, so distributed as to give a true picture of the state of the British Islands as regards rainfall in the previous month.

The general public unfortunately does not know of the existence of these tables, and to the general public tables afford distasteful reading. Still the facts can be presented better in tables than in any other way, except perhaps in maps, which we could not undertake to prepare in time for the prompt publication that is essential.

A few words as to the meaning and use of the tables may not be unwelcome to new readers. For 45 of the stations quoted in the first general table we have averages for the ten years 1890-99, as ex-

plained in Vol. 36, p. 16. The average value is not printed ; but the second column of the table gives the difference in inches of the actual fall of the month from the average, the sign + signifying that the actual fall is greater than the average, the sign — that the actual fall is less than the average. The meaning of a fall of 1·50 in. and a difference from the average of —1·50, for example, is that only half the average amount of rain for the month fell ; the meaning of a fall of 3·00 in. and a difference of + 1·50 in. is that twice the average amount of rain for the month fell.

On comparing the four monthly tables for the present year it will be seen that the — sign preponderates greatly in the column of difference from the average ; but to exhibit the actual condition of the country we give on p. 59 a new table of aggregate rainfall for the current year. It consists of 51 stations distributed as uniformly as possible over the country, including the 45 stations from the ordinary table for which averages are given, together with one station from that table for which an average has been computed, and five stations from the supplementary table for which averages are available. The first column shows the difference between the total amount of rain which has fallen at each station since January 1st, 1902, and the average of the same four months for ten years (an average which for Scotland and Ireland is practically the same as the true average ; but for the greater part of England is from 5 to 10 per cent. less), the — sign signifying a deficiency, the + sign an excess of rainfall. The second column gives the amount of the total rainfall for the four months expressed as percentage of the ten years' average for the same period. Thus for each station the average value is assumed to be 100 ; when there is a deficiency of rainfall the figure is less than 100, and when there is an excess it is greater than 100. A brief summary of the state of the whole country as regards rain, such as should be found useful by the farmer, horticulturist, and everyone dependent on a fluctuating water supply, is added in order to call attention to the most important circumstances.

Correspondence.

SOLAR HALOS IN MARCH AND APRIL.

To the Editor of Symons's Meteorological Magazine.

FROM March 28th to April 25th (29 days) I noted halos, here or about Ashdown Forest, on at least 16 days, namely 28th (+ mock suns), 31st (ditto), 2nd (+ upper tangential arc, concave, seen in London), 4th (+ mock suns), 7th, 8th, 14th, 16th to 22nd (daily), 24th and 25th. The number seems to me unusual even for this time of year.

J. EDMUND CLARK.

Lile Garth, Ashburton Road, Croydon, 3rd May, 1902.

THIS morning, about 9 o'clock, from the terrace of my garden, looking east, I observed a splendid halo round the sun. The upper half appeared iridescent, the lower half became lost in the haze which grew denser a few degrees above the physical horizon—which was formed by the hill which overlooks the city on the N.E.

Not having instruments at hand I was not able to make more than an approximate calculation of the dimensions of the circle, which cannot have been very far from 20° in radius. At the extremities of the horizontal diameter two intensely luminous images of the sun were observable, their light being decomposed into all the primary colours except blue. An appendage like the tail of a comet was seen attached to both the mock suns, on the sides opposite to the real sun. The phenomenon lasted about a quarter of an hour with varying intensity.

FRANCESCO PORRO.

Genoa, March 29th, 1902.

A NEW KITE FOR METEOROLOGICAL PURPOSES.

To the Editor of Symons's Meteorological Magazine.

SOME brief description of a modified form of the Hargreave kite, which I hope may be found suitable for raising meteorological instruments, will perhaps be of interest to your readers.

The kites used at Blue Hill seem to possess everything that can be desired in the way of stability and lifting power, but unfortunately they are tedious and expensive to make, and are not readily portable, and hence I have been trying various other forms in the hope of getting a cheap and portable kite, equally powerful and stable. So far as my limited experience goes the following form seems to meet all requirements. The kite is of the cellular form, but the section of the cells is a rhombus (diamond-shaped) instead of a rectangle, the shorter diagonal being of the same length as each side (Fig. 1). Each kite has four longitudinal sticks of triangular section (Fig. 2), and 7 ft. 6 in. long. The two opposite sticks which lie at the ends of the shorter diagonal are connected by three cross pieces of the same material, and form the frame of the kite (Fig. 3), the ends of the cross pieces being carefully spliced to the sticks. This is accordingly the size to which the kite will fold up,

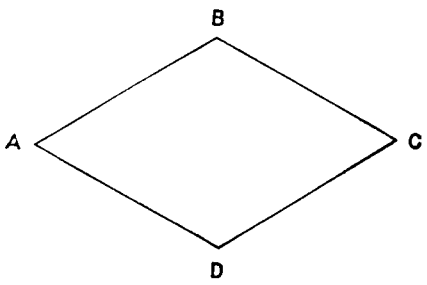


Fig. 1. SECTION OF KITE.
AB=BC=CD=DA=BD=3 ft. 6 in.

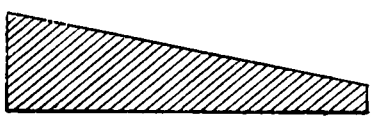


Fig. 2. SECTION OF STICK (actual size).

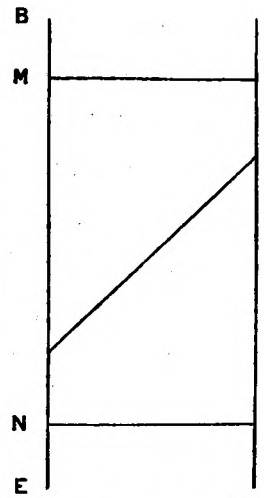


Fig. 3. FRAME OF THE KITE. BD=3ft. 6in. BM=NE=1ft. BE=7ft. 6in.

viz., 7 ft. 6 in. by 3 ft. 6 in. by 1 or 2 inches.

Two pieces of cloth are then prepared, both being 14 feet long, one 28 and the other 31 inches wide. (This difference of width is in accordance with Mr. Rotch's recommendation). The ends are sewn together, and a hem, inside which strong twine is placed, is run round each edge. The narrower of these pieces forms the upper, and the wider the lower cell of the kite. The pieces are now marked out by four lines drawn with a coloured pencil on the material, at equal distances of 3 ft. 6 in. apart, and the material is secured to the sticks along these lines. This is done by laying it over the sticks and placing on it a strip of thin wood, which is then nailed on with light brass tacks. To spread out the kite it is only necessary to separate to the greatest possible extent the two loose longitudinal sticks. This is done by means of two bamboos. The bamboos when in place are secured by string to the cross pieces of the frame, over which they lie at right angles.

The bridle can now be secured, and the kite (Fig. 4) is ready for use, having taken, apart from the sewing, only a few hours to make. It should be added that the part of the front stick where the bridle is fastened is stiffened by splicing to it a piece of wood about 18 in. long, and also the edges of the cloth cells are kept apart midway between the sticks by light pieces of wood of about $\frac{3}{8}$ in. square section, and of lengths equal to the width of the cloth. The ends of these pieces slip into small pockets sewn on for the purpose.

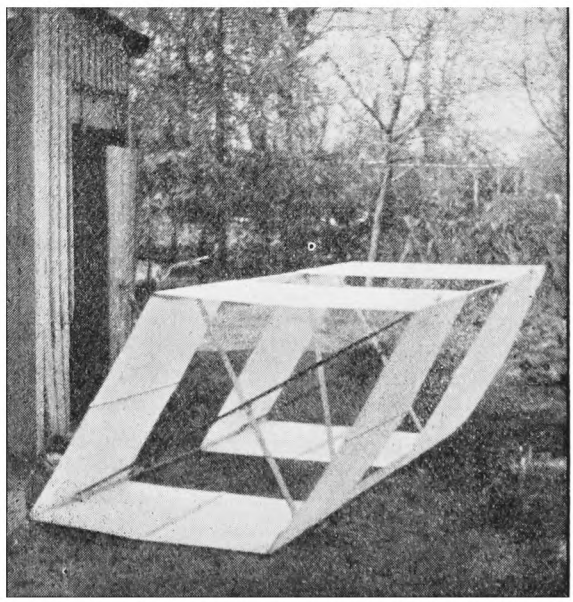


Fig. 4. RHOMBOIDAL KITE.

A kite of the dimensions given above will weigh about 6½ or 7-lbs. It will fly at an elevation of from 55° to 60°, and exert a pull of from 40 to 80-lbs. in a suitable breeze. It can be got up in a wind of from 8 to 10 miles per hour, but no opportunity of determining the greatest wind velocity at which it will fly has occurred as yet. Indeed the wind a few hundred feet high is, here at all events, very different to that prevailing at 50 feet, and without an anemometer attached to the kite it is impossible to estimate its velocity.

It may be mentioned incidentally that flying these kites at a height of 500 feet has shewn the existence of alternating upward and downward currents at that height, for a kite will fly at an elevation of 50° to 55°, and then without any change in the steadiness or pull on the wire fly at an angle of 70°, or even 75°, for some minutes, a change that can only be produced by the varying angle of the air motion.

The steadiness and angle of these kites is very dependent upon the arrangement of the bridle, and point of attachment of the line; 14½ inches downwards from the top and 5 inches outwards in front of the stick seems to be the most suitable place, but this may be modified by subsequent trials.

W. H. DINES.

Oxshott, April 24th, 1902.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on April 16th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. W. H. Dines, B.A., President, in the chair.

The following gentlemen were elected Fellows: Mr. S. B. Apostoloff, Mr. H. Bourhill, Surgeon-Major C. L. Cunningham, Mr. C. H. Jolliffe, F.R.M.S., and Mr. J. H. Tripe, M.R.C.S.

This being the "popular" meeting of the session, Capt. D. Wilson-Barker, F.R.S.E., at the request of the Council, gave a lecture on "Clouds," illustrated by lantern slides.

After some remarks on the composition, height and weight of the atmosphere, the lecturer said that the tradition of cloud-lore has come to us from ancient times. We mentally associate it with eastern shepherds of old, tending their flocks, and anxiously scanning the heavens for good or bad weather portents. Many old doggrels are extant, such as—

> "A red sky at night is the shepherd's delight,
> A red sky in the morning is the shepherd's warning."

In all that concerns the practical application of cloud observation to the science of weather forecasting, we are but little ahead of those ancient shepherds. Our backwardness must no doubt be in part attributed to the impossibility of making collections of cloud specimens, and the consequent difficulty in arriving at a simple practical classification of clouds, analogous to those available in

geology, zoology, or botany. Cloud photography has, however, done much of late years to minimize this difficulty. If we cannot have actual specimens, we can get accurate representations of every form and variety of cloud; and by studying them we learn that in spite of their constantly varying aspects, there still exists in clouds a uniformity of nature sufficiently marked to guide us to a serviceable classification. Several classifications exist. The French naturaliist, Lamarck, was probably the first to formulate one; but Luke Howard, a London merchant, about the year 1802 introduced the first practical classification, which is still in use by many observers.

Since the late Rev. W. Clement Ley drew attention to the value of cloud observations in weather forecasting, some progress has been made in different parts of the world in the art of measuring the height of clouds, and in noting their formation and character. The result of these studies has been most satisfactory, but we cannot be said, so far, to have more than skimmed the surface of a deep and complex subject.

Clouds are formed by two causes: (i.) the mixing of two masses of air of unequal temperature; and (ii.) through changes occurring in the atmosphere, where expansion and consequent loss of heat takes place, causing condensation of moisture.

Capt. Wilson-Barker said that a simple primary classification is best arrived at by a two-fold division of cloud types as follows:—

(1.) "Stratus," or sheet clouds.
(2.) "Cumulus," or heap clouds.

The former may be roughly considered the cloud of a settled, and the latter of an unsettled, state of the atmosphere.

The lecturer then showed by means of the lantern a large number of beautiful cloud pictures, taken by himself, illustrating certain varieties of both main types. Under "Stratus," or sheet clouds, he included fog, stratus, high stratus, cirro-cumulus, cirro-macula, cirrus, cirro-stratus, nimbus, and scud; and under "Cumulus," or heap clouds, he included the ordinary cumulus, the shower cumulus, the squall cumulus, pillar cumulus, and roll cumulus.

The lecturer concluded by referring to various optical phenomena associated with clouds, such as coronæ, halos, sun-pillars, rainbows, auroræ, and the colour of the sky.

On the motion of Dr. H. R. Mill, seconded by Mr. W. N. Shaw, F.R.S., a hearty vote of thanks was accorded to Capt. Wilson-Barker for his interesting and beautifully illustrated lecture.

METEOROLOGICAL NEWS AND NOTES.

THE TERRIBLE VOLCANIC ERUPTION which overwhelmed the town of St. Pierre, Martinique, in the West Indies on May 8th, may produce atmospheric effects similar to those which followed the explosion of Krakatoa in 1883. It would be well for rainfall

observers to be on the alert to notice any sediment resembling volcanic dust in their rain gauges. The transport of desert dust, in January last, from the latitude of Madeira to Wales, a distance exceeding 1,500 miles, over the sea, makes the transport of volcanic dust by the prevailing southwest winds for a distance of 4,000 miles appear by no means improbable.

THE PILOT CHARTS of the Meteorological Office have, from April onwards, introduced a new and important feature in the form of a small inset chart, showing the actual distribution of temperature in the surface water of the North Atlantic. Captain Campbell Hepworth published the temperatures for January in the Pilot Chart for April, and they continue to appear with the same promptitude. Remembering that the April chart is published on March 15th, and that the January returns cannot all reach the Meteorological Office before February 15th at the earliest, we see that no time is lost in placing the material before the public. The 2500 figures are combined so as to give the monthly mean for areas measuring 2° of lat. by 2° of long., and this value is printed on the map in bold type, while the difference from the average value for each square for the month in question is added in small type. A line on the chart separates the part of the sea surface which is above the average temperature from that which is below.

RAIN-MAKING SUPERSTITIONS are fairly numerous, but an Edinburgh evening paper of April 1st in an editorial on "Church Bells" creates a new one. "As for the ringing in the afternoon and evening," it says, "it is a mere disturbance of the air, and, as bad men have noticed, a kind of rain-maker, usefully intended, doubtless, to drive people within the shelter of the kirk."

REVIEWS.

Cape of Good Hope. Report of the Meteorological Commission for the year 1900. Cape Town: The Government Printers, 1901. Size 13 × 8. Pp. xvi. + 196.

THE meteorology of Cape Colony in 1900 was carried on under exceptional difficulties on account of "the almost universal proclamation of martial law and the general call-to-arms consequent on the irruption of hostile bands into the Cape Colony, rendering it in some cases impossible to communicate with the observers." Hence the appearance of the volume and the fulness of the records it contains are extremely creditable to all concerned. In addition to the official returns, brief extracts are given of papers communicated to the South African Philosophical Society by Professor J. T. Morrison on periodical rainfall variations at the Cape of Good Hope since 1841; by Mr. T. Stewart on the rainfall of the Cape Peninsula; by Mr. J. R. Sutton on some temperature and pressure results for the great plateau of South Africa; and by Dr. Gilchrist on the currents in the sea round the Cape Peninsula.

Conference on Water Supply and River Pollution. Journal of the Sanitary Institute. January, 1902, pp. 453—569.

AT this conference, which was held in October, 1901, fifteen papers were discussed at a representative gathering of the public authorities concerned in the regulation of water supply and the care of public health in all parts of the country. The papers are publirhed in full, with an abstract of the discussion. The subjects dealt with comprised rainfall, river-regulation, the protection and utilization of underground water supplies, river pollution, water purification, and the special problems of water supply in villages.

Versuch über die Hygrometrie. II. Heft. [Essay on Hygrometry, Part II.] *Von* HORACE BÉNÉDICTE DE SAUSSURE. *Neuchatel*, 1783. Leipzig, W. Engelmann, 1900. Size 8 × 5. Pp. 170. Price 2m. 40.

THE German translation of H. B. de Saussure's famous Hygrometrical studies is No. 119 of the invaluable series of Ostwald's "Classics of the Exact Sciences," which brings to the hand of German students and men of science literal reprints or translations of the epoch-making scientific works of all ages. It gives one cause for thought to find this series offering, for a shilling or two, some of the greatest works of Clerk Maxwell, Faraday, Dalton and Sir Isaac Newton, which the English student could not procure in their original language for ten times the money.

Meteorological Observations at Stations of the Second Order for the Year 1898. Published by direction of the Meteorological Council. Edinburgh, 1901. Printed for His Majesty's Stationery Office. Size 12 × 10. Pp. xiv. + 184. Price 22s. 6d.

THE complete daily observations are printed for 21 selected stations, and the monthly values for 60 other stations, the whole number of 81 being made up as follows:—Scotland 25, England 44, Wales 3, and Ireland 9. The introductory statement explains very clearly everything which it is necessary to know in order to make use of the observations recorded in the volume. We trust that an effort will be made to publish succeeding annual volumes a little nearer the date to which they refer.

Jahrbuch des k.k. hydrographischen Central-Bureaus [Yearbook of the Imperial Austrian Hydrographic Office]. VII. Jahrgang, 1899. Vienna, 1901. Size 14½ × 10½. Fifteen separately-paged parts.

THIS immense report deals comprehensively with the rainfall, variations of water-level, and water-temperature of each of the great river systems of Austria. Its magnitude may be guessed at from the fact that it contains the daily values of rainfall at 1375 stations, and the monthly values of 1444 more, together with observations of water-level at 1271 stations. The mass of figures is accompanied by

explanatory maps on a large scale, numerous diagrams and discussions of the principal meteorological occurrences of the year, with special reference to floods. Although the data are published long after they have ceased to be of immediate interest to the public, it is to be remembered that they are utilized from day to day as they are collected for the purpose of issuing warnings of floods, a vital matter in a country where the bulk of the population lives on valley floors, or flat plains, watered by torrential rivers descending from snow-clad mountains.

Current Papers, No. 5. By H. C. RUSSELL, B.A., C.M.G., F.R.S. (From "Journ. and Proc. Royal Society of N.S.W. Vol. **35**.) Size 9 × 6. Pp. 12. Charts.

MR. RUSSELL continues his important investigations of the oceanic currents of the Southern Hemisphere by the aid of floats, a research of importance to meteorology as well as to oceanography, if indeed the two sciences can be separated. This paper gives a very interesting chart showing the drift of the disabled steamer *Waikato*, in the "roaring forties," from June 5th, when she broke down off Cape Agulhas, to September 15th, 1899, when she was picked up in the longitude of Kerguelen. The rate of drift varied from 4 to 110 miles per day, and the total drift was 4450 miles, although the distance on a straight course was only 2000 miles.

Bathymetrical Survey of Grasmere Lake, by T. A. GREEN, Grasmere. Ambleside, George Middleton, 1902. Scale (apparently) 25 inches to 1 mile. Price 3s.

WE welcome this extremely careful map of soundings made in Grasmere (which, by the way, it is tautology to call "Grasmere Lake"), and if we were disposed to be hypercritical the only fault we could point out is that the soundings are closer and more numerous than is necessary. We doubt whether any other lake has been so minutely surveyed, and the exact knowledge of its depths may some day be of advantage to engineers, while it will always be of scientific importance to physical geographers. To meteorologists lakes are perhaps most interesting as natural rain-gauges; but until the variations of their level and of the volume of their outflow are accurately and continuously recorded, they are from this point of view merely receivers without a measuring glass.

The State of the Ice in the Arctic Seas, 1901. *Prepared by* V. GARDE. (From the Nautical Meteorological Annual of the Danish Meteorological Institute). Copenhagen, 1902. Size 12 × 9½. Pp. 24.

THIS important annual summary is printed in Danish and English, in parallel columns, and illustrated by six maps, representing the position and amount of ice in the Arctic seas for each month of the navigable season, April to September The information is collected

by the Danish Meteorological Institute from explorers, whalers and other navigators of the polar seas, and while of primary importance to them it is none the less interesting to meteorologists, who are recognising more and more how closely air and sea are interrelated in the production of weather.

BOOKS RECEIVED.

Nineteenth Report (Third Series) of the Committee on the Climate of Devon. [1900]. Edited by Alfred Chandler and W. Ingham, A.M.I.C.E. (Reprinted from *Trans. Devonshire Assoc.* 1901. Pp. 77-91). Size $1\frac{1}{2} \times 5\frac{1}{2}$. Pp. 16.

Annual Report upon the Meteorology of Cheltenham [for 1901]. By Richard Tyrer, B.A., F.R.Met.Soc., Borough Meteorologist, Cheltenham, 1902. Size 10×6. Pp. 8.

Meteorological Report for the year 1901. Borough of Torquay, by Fredk. March, F.R.Met.Soc., Borough Meteorologist, Torquay. 1902. Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. 20.

Meteorology. Oxford Road, Redhill, Surrey. For the year 1901. By William Henry Tyndall, F.R.Met.Soc. 1902. Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. 6.

Observatoire St. Louis, Jersey (Iles de la Manche). Bulletin des Observations Magnétiques et Météorologiques. VIIIme Année 1901. Par Marc Dechevrens, S.J. Jersey, St. Hélier, 1901 [should be 1902]. Size $11 \times 8\frac{1}{2}$. Pp. 32.

Results of Rain, River and Evaporation Observations made in New South Wales during 1899. With maps and diagrams. By H. C. Russell, B.A., C.M.G., F.R.S., Government Astronomer, Sydney, 1901. Size $9\frac{1}{2} \times 6$. Pp. lx. + 252.

Emilien Jean Renou.

VENDÔME, MARCH 8TH, 1815. PARIS, APRIL 6TH, 1902.

FOR the last thirty years M. Renou had been the Director of the Meteorological Observatory at Parc St. Maur, in Paris, the observations of which are officially accepted as representing the climate of the French capital. M. Renou had a scientific education both in France and Germany. At first he devoted his attention mainly to geology; afterwards the fascination of African travel laid hold of him and he made two important journeys in Marocco. But for the last fifty years meteorology absorbed almost his whole attention. He was one of the founders of the French Meteorological Society in 1853, and frequently served it as Secretary and President, contributing also many papers to its annual publication. Possessing "the glorious privilege of being independent" he was able to bestow not only time but money on his travels and researches.

Precision in observation was a passion with him: as he expressed it in his presidential address in 1888:—"naturally disinclined to accept anything which was not proved, simply because it had always been, and having a natural antipathy to 'about,' I devoted all my care to the improvement of observations, and I have demonstrated that meteorology is capable of the same precision as other sciences." M. Renou's work on the Climate of Paris will stand as a monument which he reared to himself by patient observation and scientific discussion.

THE FOUR MONTHS' RAINFALL OF 1902.

Aggregate Rainfall for January—April, 1902.

Stations.	Diff. from aver.	Per cent. of aver.	Stations.	Diff from aver.	Per cent. of aver.	Stations.	Diff. from aver.	Per cent. of aver.
	in.			in.			in.	
London	—1·91	69	Arncliffe	—7·61	61	Aberdeen	—1·63	82
Tenterden	—2·82	61	Hull	—1·87	72	Cawdor	—2·14	73
Hartley Wintney	—2·28	66	Newcastle	—2·46	64	Strathconan	+1·31	108
Hitchin	—2·41	61	Seathwaite	—12·36	72	Glencarron	+1·01	104
Winslow	—2·29	63	Cardiff	—2·01	82	Dunrobin	—1·75	81
Westley	—1·10	83	Haverfordwest	—2·11	84	Darrynane	—5·30	67
Brundall	—1·98	69	Aberystwyth	—3·89	70	Waterford	— ·37	97
Blandford	—2·26	78	Llandudno	— ·04	100	Broadford	+1·17	112
Polapit Tamar	—1·26	88	Dumfries	—2·98	78	Carlow	— ·20	98
Stroud	—2·37	69	Lilliesleaf	—2·00	77	Dublin	— ·71	91
Woolstaston	—1·41	83	Colmonell	—1·05	92	Mullingar	—1·02	90
Worcester	— ·19	97	Glasgow	—2·14	80	Ballinasloe	+ ·96	109
Boston	—1·04	80	Islay	—1·41	90	Clifden	—2·11	91
Hesley Hall	— ·19	97	Mull	— ·19	99	Crossmolina	— ·08	100
Derby	+ ·11	102	Loch Leven	—4·32	59	Seaforde	+ ·35	103
Manchester	...	...	Dundee	—3·23	60	Londonderry	—2·34	80
Wetherby	—1·61	75	Braemar	—1·36	86	Omagh	+1·19	111

The above table shows that Ireland alone is in the happy position of having no cause of complaint regarding the rainfall of the first four months of 1902. There the extreme south-west is somewhat deficient, but over more than three-quarters of the island the fall has varied only from 10 per cent. less to 12 per cent. more than the average, as satisfactory a state of matters as the farmer could wish for.

Crossing the Irish Sea, we find a belt of central England from the north coast of Wales to the Trent in which the rainfall has just reached the average; but over all the rest of England there has been a deficiency. Over the greater part of Wales, Cornwall, and Devon the deficiency is less than 20 per cent., in other words more than four-fifths of the average supply has fallen. The south-eastern section has been much drier. Within a radius of fifty miles from London the fall has only exceeded 66 per cent. or two-thirds of the average at London itself, while at Hitchin on the north and Tenterden on the south-east the rainfall has only amounted to 61 per cent of the average, in other words at these stations the seventeen weeks have only yielded the rain which ought, normally, to have fallen in ten weeks and a half. The whole of England north of the Humber and the Ribble has had less than three-quarters of its normal rainfall, and along the east coast the amount was probably less than two-thirds.

As far as the data enable us to judge, the east of Scotland is in even a worse case than the east of England, the lowest percentages being those of Loch Leven 59 and Dundee 60. On the other hand the western half of Scotland is, like Ireland, well provided for, and has enjoyed the ample fall to which its position entitles it.

APRIL, 1902.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1890-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	No. of Nights below 32°. On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	·49	— 1·03	·13	5	10	69·5	19	29·7	7	1	11
II.		Tenterden	·70	— 1·07	·25	22	10	66·0	24	29·0	7	2	14
,,		Hartley Wintney	1·05	— ·59	·25	22	12	67·0	26	27·0	14*d*	7	18
III.		Hitchin	·86	— ·66	·22	5	13	66·0	19	27·0	9	6	...
,,		Winslow (Addington)	·94	— ·62	·31	15	11	67·0	19	28·0	14	9	11
IV.		Bury St. Edmunds (Westley)	1·30	— ·23	·82	5	11	67·0	18	27·0	9	8	...
,,		Norwich (Brundall)	1·31	...	·80	5	13	65·2	19	29·2	9	2	16
V.		Winterborne Steepleton	2·43	...	·88	21	13	60·8	25	25·2	7	6	19
,,		Torquay	2·05	...	·84	22	13	59·1	30	34·4	13	0	8
,,		Polapit Tamar [Launceston]..	1·97	— ·19	·89	21	9	60·5	16	24·4	13	10	15
VI.		Stroud (Upfield)	1·85	+ ·01	·84	15	11	64·0	21	32·0	6	1	...
,,		Church Stretton (Woolstaston)	2·74	+ ·86	·70	23	12	63·5	25	28·0	11	10	16
,,		Worcester (Diglis Lock)	2·34	+ ·91	·89	15	10	...	...	...	...	...	...
VII.		Boston	1·32	— ·06	·70	5	11	68·0	25	28·0	8	6	...
,,		Hesley Hall [Tickhill].....	1·96	+ ·62	·75	15	11	66·0	25	27·0	9, 10	9	...
,,		Derby (Midland Railway).....	2·25	+ ·70	·99	15	10	65·0	25	26·0	13	6	...
VIII.		Manchester (Plymouth Grove)	...	...	...	...	...	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ...	1·70	— ·04	·86	15	8	...	...	...	...	...	...
,,		Skipton (Arncliffe)	2·41	— ·95	·60	15	12	...	...	...	...	...	...
,,		Hull (Pearson Park).	1·42	— ·17	·62	5	12	64·0	20	28·0	9	6	15
X.		Newcastle (Town Moor)	1·40	— ·26	·53	15	11	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	6·38	+ ·04	1·62	22	14	62·0	25	29·1	8	4	...
XI.	WALES.	Cardiff (Ely).....	2·26	+ ·08	·56	22	12	...	...	...	...	...	...
,,		Haverfordwest	2·36	— ·06	1·25	21	12	57·7	25	30·4	12	4	18
,,		Aberystwith (Gogerddan) ...	1·09	— 1·48	·45	4	8	69·0	25	22·0	9,	17	...
,,		Llandudno.....	2·02	+ ·24	·49	4	16	63·0	25	32·0		1	...
XII.	SCOTLAND.	Cargen [Dumfries]	2·40	+ ·07	·73	22	10	64·0	25	26·0	8	7	...
XIII.		Edinburgh (Royal Observatory)	1·05	...	·24	15	14	58·4	20	29·9	4	1	12
XIV.		Colmonell	1·94	— ·23	·68	22	11	65·0	3	25·0	6, 7	9	...
XV.		Tighnabruaich	1·95	...	·45	21	14	59·0	25	28·0	7	9	...
,,		Mull (Quinish).....	3·33	+ ·54	1·10	9	16	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·51	— ·48	·25	12*a*	12	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·65	+ ·11	·40	11	12	62·2	29	27·0	7	6	...
XVII.		Braemar	3·37	+ 1·28	·89	22	15	55·2	17	21·2	7	15	24
,,		Aberdeen (Cranford)	2·88	+ 1·04	·83	15	18	58·0	26	27·0	3, 6*e*	13	...
,,		Cawdor (Budgate)	1·03	— ·54	·24	11	9	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	2·05	— 1·00	·75	6	4	...	...	...	...	...	...
,,		Glencarron Lodge.....	3·30	— 1·36	·98	2	15	59·8	25	27·0	7	11	...
XIX.		Dunrobin	1·81	+ ·04	·45	12	11	58·0	2	28·0	7	10	...
,,		S. Ronaldshay (Roeberry) ...	1·61	— ·31	·42	12	14	57·0	25	30·0	10	3	...
XX.	IRELAND.	Darrynane Abbey.....	2·59	— ·91	·50	8	16	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	3·47	+ ·85	1·90	21	11	59·0	29*b*	29·0	6	5	...
,,		Broadford (Hurdlestown) ...	2·00	+ ·08	·35	21	18	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	2·73	+ ·44	·86	21	12	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·06	+ ·09	·60	4	16	61·7	24	33·0	10	0	7
XXII.		Ballinasloe	3·12	+ ·83	·51	20	19	70·0	25*c*	25·0	6	11	...
,,		Clifden (Kylemore)	3·85	— 1·42	1·55	21	14	...	...	...	...	...	...
XXIII		Seaforde.....	3·36	+ ·93	·99	21	16	58·0	29	29·0	5	9	15
,,		Londonderry (Creggan Res.).	2·07	— ·39	·37	3, 22	18	...	...	...	...	...	...
,,		Omagh (Edenfel)	3·48	+ 1·12	·56	21	17	62·0	25	25·0	11	7	17

+ Shows that the fall was above the average ; — that it was below it.
a—and 23. *b*—and 30. *c*—and 26. *d*—and 15. *e*—and 10.

SUPPLEMENTARY TABLE OF RAINFALL, APRIL, 1902.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	·90	XI.	Castle Malgwyn	2·60
II.	Dorking, Abinger Hall .	1·20	,,	Builth, Abergwesyn Vic.	2·75
,,	Sheppey, Leysdown	·39	,,	Rhayader, Nantgwillt ...	2·48
,,	Hailsham	·85	,,	Lake Vyrnwy	1·49
,,	Crowborough.....	1·28	,,	Ruthin, Plâs Dráw	1·88
,,	Ryde, Beldornie Tower..	1·49	,,	Criccieth, Talarvor	1·40
,,	Emsworth, Redlands ...	1·02	,,	I. of Anglesey, Lligwy..	·97
,,	Alton, Ashdell	1·54	,,	Douglas, Woodville.....	1·93
,,	Newbury, Welford Park	1·53	XII.	Stoneykirk, Ardwell Ho.	1·82
III.	Oxford, Magdalen Coll..	1·23	,,	Dalry, Old Garroch	3·28
,,	Banbury, Bloxham	1·47	,,	Moniaive, Maxwelton Ho.	2·91
,,	Pitsford, Sedgebrook ...	1·33	,,	Lilliesleaf, Riddell	1·86
,,	Huntingdon, Brampton.	·97	XIII.	N. Esk Res. [Penicuick]	1·90
,,	Wisbech, Bank House...	1·19	XIV.	Glasgow, Queen's Park..	·86
IV.	Southend	·27	XV.	Inveraray, Newtown ...	2·79
,,	Colchester, Lexden	·60	,,	Ballachulish, Ardsheal...	2·99
,,	Saffron Waldon, Newport	·62	,,	Islay, Eallabus.....	2·95
,,	Rendlesham Hall	·76	XVI.	Dollar.....	1·39
,,	Swaffham	1·06	,,	Balquhidder, Stronvar...	5·40
V.	Salisbury, Alderbury ...	1·83	,,	Coupar Angus Station...	1·52
,,	Bishop's Cannings	1·38	,,	Blair Atholl	2·44
,,	Blandford, Whatcombe .	2·23	,,	Montrose, Sunnyside ...	2·38
,,	Ashburton, Druid House	2·81	XVII.	Keith H.R.S.....	2·07
,,	Okehampton, Oaklands.	1·61	XVIII.	Fearn, Lower Pitkerrie..	·73
,,	Hartland Abbey	1·63	,,	S. Uist, Askernish	2·75
,,	Lynmouth, Rock House	1·46	,,	Invergarry.....	·80
,,	Probus, Lamellyn	2·31	,,	Aviemore, Alvie Manse.	1·30
,,	Wellington, The Avenue	1·59	,,	Loch Ness, Drumnadrochit	1·45
,,	North Cadbury Rectory	1·90	XIX.	Invershin	1·92
VI.	Clifton, Pembroke Road	1·60	,,	Bettyhill	·74
,,	Ross, The Graig	2·32	,,	Watten H.R.S.....	1·28
,,	Shifnal, Hatton Grange	2·02	XX.	Dunmanway, Coolkelure	5·15
,,	Wem, Clive Vicarage ...	1·92	,,	Cork, Wellesley Terrace	2·92
,,	Cheadle, The Heath Ho.	1·77	,,	Killarney, District Asyl.	2·19
,,	Coventry, Priory Row ..	2·41	,,	Caher, Duneske	...
VII.	Market Overton	1·36	,,	Ballingarry, Hazelfort...	2·07
,,	Grantham, Stainby	1·87	,,	Miltown Malbay	1·69
,,	Horncastle, Bucknall ...	...	XXI.	Gorey, Courtown House	2·84
,,	Worksop, Hodsck Priory	2·27	,,	Moynalty, Westland ...	2·75
VIII.	Neston, Hinderton	2·28	,,	Athlone, Twyford	2·91
,,	Southport, Hesketh Park	1·56	,,	Mullingar, Belvedere ...	2·10
,,	Chatburn, Middlewood.	1·50	XXII.	Woodlawn	2·58
,,	Duddon Val., Seathwaite Vic.	3·55	,,	Westport, Murrisk Abbey	2·72
IX.	Baldersby	1·59	,,	Crossmolina, Enniscoe ..	2·76
,,	Scalby, Silverdale	1·01	,,	Collooney, Markree Obs.	2·90
,,	Ingleby Greenhow Vic..	2·14	XXIII.	Enniskillen, Model Sch.	...
,,	Middleton, Mickleton ...	1·57	,,	Warrenpoint.....	2·77
X.	Beltingham	1·44	,,	Banbridge, Miltown.....	2·64
,,	Bamburgh	1·86	,,	Belfast, Springfield	2·94
,,	Keswick, The Bank	...	,,	Bushmills, Dundarave..	1·82
XI.	Llanfrechfa Grange	2·40	,,	Stewartstown	2·77
,,	Treherbert, Tyn-y-waun	4·18	,,	Killybegs	2·56
,,	Llandovery	2·61	,,	Horn Head	2·29

METEOROLOGICAL NOTES ON APRIL, 1902.

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.

ENGLAND.

LONDON, CAMDEN SQUARE.—Although one of the driest Aprils on record unsettled conditions prevailed generally, whilst northerly and easterly winds considerably retarded foliage. Mean temp. 47°·2 or 0°·1 above the average.

ABINGER HALL.—Rather dry but good for all garden and farm operations. Fruit prospects seemed favourable but the fierce gale of cold E. and N.E. winds on 26th did some damage. Cuckoo first heard on 13th and nightingale on 14th. First swallow seen on 26th.

TENTERDEN.—Dry, cold and windy till 11th, generally warmer from 12th to 25th, then cold E. winds again. Duration of sunshine 195 hours. Four months' R 4·33 in., the least in 39 years.

CROWBOROUGH.—The first 12 days were unprecedentedly cold. Afterwards the weather was pleasant with several warm days. The last days were again cold with very keen E. winds up to 29th.

HARTLEY WINTNEY.—Dry and cold with slight frosts on many mornings and bitter N.E. and E. winds from 6th to 13th and 26th to 29th. Four months' R the smallest on record. Ozone on 10 days with a mean of 4·2. Cuckoo heard on 12th.

PITSFORD, SEDGEBROOK.—The greater part of the month was very pleasant, but some days were very cold.

COLCHESTER, LEXDEN.—Cold winds from 5th to 14th and from 25th to 29th. Some warm days between. Sharp TS at 3 p.m. on 17th with large H.

BURY ST. EDMUNDS, WESTLEY.—Cold and dry. T on 5th and 17th.

BISHOPS CANNINGS.—R ·40 in. and rainy days 2 below the average. Since January 1st R 2·68 in. and rainy days 14 below the average.

TORQUAY, CARY GREEN.—R ·37 in. below the average. Mean temp. 0°·3 below the average. Duration of sunshine 152·9 hours with 3 sunless days. Mean amount of ozone 5·9; max. 8·5 on 18th with S.W. wind; min. 3·0 on 27th with N.E. wind.

POLAPIT TAMAR [LAUNCESTON].—Dry and unseasonably cold.

WELLINGTON, THE AVENUE.—A period more in keeping with the proverbial March as regards winds, which were very violent at times both from southerly and northerly points.

NORTH CADBURY RECTORY.—An ungenial April after a very mild March. The driest and coldest for 6 years. Vegetation backward and ponds and springs very low.

ROSS, THE GRAIG.—R slightly above the average falling on 4 or 5 days only. There was much sunshine but many very cold days. The first half was very cold and this was more noticeable after the warm weather in March. Nevertheless vegetation made great progress and was not much behind the average at the close. TS on the afternoon of 20th.

SEATHWAITE VICARAGE.—A cold and ungenial month with small R and one fairly heavy S.

HULL, PEARSON PARK.—The early part was noticeable for cold E. and N.E. winds. Fogs were generally slight except on 15th and 17th which were dense.

BELTINGHAM.—Fine in early part but frost on 10 days out of the first 12. Then fine and warm till about 23rd when it became colder and frost occurred on one or two nights.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE.—Vegetation backward till the latter part. T and L to S.E. at 8.30 p.m. on 20th.

HAVERFORDWEST.—The first 17 days were bright and sunny but with cold winds and grass frosts. From 19th to 24th broken weather set in with strong S. winds. Spring flowers abundant. Chestnut trees in full leaf but foliage generally backward. Oak much in advance of the ash. Duration of sunshine 165·4 hours.

DOUGLAS, WOODVILLE.—Fine with slight excess of bright sunshine and R below the average. Temp. usually below the mean and Spring, which promised at the end of March to be early, hardly made much progress till after 15th. E. and N.E. winds of considerable force prevailed on 15 days reaching the force of a gale on 6. Fruit blossom unusually abundant.

SCOTLAND.

CARGEN [DUMFRIES].—Cold and unsettled. Vegetation much retarded by cold E. winds.

LILLIESLEAF, RIDDELL.—R, though little, is rather above the average. On May 1st larches and plane trees were slightly green and all other trees as leafless as in mid-winter.

COUPAR ANGUS.—The nights were cold and the days dry till 10th when there was a wet cold period of several days followed by an improvement of night temp. which started vegetation though frost checked it again on 28th.

DRUMNADROCHIT.—R for the first four months only 7·87 in., being the lowest since the record commenced in 1886, and 3·19 in. below the average of 16 years.

BETTYHILL.—Dry and somewhat cold in the early part; fine bright spring weather during the remainder.

WATTEN.—Dry, with cold easterly winds and many frosty nights. Vegetation backward.

IRELAND.

CORK, WELLESLEY TERRACE.—The coldest April for 19 years and probably for a longer period. Mean temp. 3°·6 below the average.

MILTOWN MALBAY.—Cold, ungenial and damp with little sunshine and no vegetation, winding up a spring during which, in this district, the soil never dried or became properly fit for the plough or harrow. H on 9 days, cubes of ice larger than marbles falling on 19th.

DUBLIN, FITZWILLIAM SQUARE.—The mean temp. 47°·1 only fell short of the average by 0°·6 but this was due to comparatively high day temp. Winds from polar quarters predominated. Fog occurred on 5 days. High winds on 12 days reaching the force of a gale on 3rd and 22nd. H on 3 days, S and sleet on one. On the afternoon of 28th a splendid display of solar halos and parhelia was seen.

COLLOONEY, MARKREE OBSERVATORY.—A very fine month on the whole; 211·9 hours of bright sunshine. H on 5 days.

OMAGH, EDENFEL.—Vegetation was backward and pastures as bare as in March. Tillage has however proceeded under favourable conditions and the corn brairds did not seem to have suffered much from the 17 nights of frost.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOVEMBER, 1901.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	54·7	11	24·0	16	46·8	35·7	36·6	84	79·6	22·7	·59	7	6·4
Malta	76·6	17	46·5	25	68·2	53·7	53·9	79	125·2	40·9	5·16	11	4·4
Lagos, W. Africa	93·1	6	73·1	3	87·6	81·3	75·2	76	145·0	69·0	4·10	3	5·0
Cape Town	94·8	14	50·1	21	73·6	56·6	54·8	66	...	...	2·24	6	4·8
Mauritius	87·2	14	63·1	4	82·9	67·4	64·0	70	153·6	55·7	5·06	13	6·0
Calcutta	90·3	1	56·9	30	81·8	65·0	63·4	72	145·2	50·7	2·87	4	3·7
Bombay	93·9	2	70·1	27	89·4	75·1	68·5	66	141·4	56·5	·00	0	1·6
Colombo, Ceylon	90·2	5	68·8	28	86·2	74·1	72·7	84	159·8	63·8	19·84	25	6·3
Melbourne	97·0	24	39·3	7	76·1	53·8	51·0	63	154·1	31·8	1·91	8	5·5
Adelaide	104·9	24	48·8	21	83·0	59·5	49·4	47	159·4	40·1	·87	8	4·7
Sydney	98·0	26	52·7	7	76·3	59·8	57·3	65	155·0	45·2	1·22	12	4·5
Auckland	70·0	24	43·0	11	64·1	52·6	44·7	60	142·0	40·0	1·44	11	5·4
Jamaica, Halfway Tree	88·0	7	66·0	18	85·1	70·1	68·8	79	...	...	1·40	4	4·0
Trinidad	91·0	16	68·0	22*a*	87·2	71·6	73·8	83	159·0	63·0	7·93	13	...
Grenada	85·4	23	72·4	9	83·5	74·8	72·7	77	150·2	...	10·26	22	3·7
Toronto	60·8	1	14·5	27	41·0	28·5	28·7	77	75·0	12·8	1·65	16	7·4
Fredericton, N.B.	64·7	1	4·6	24	39·9	23·7	24·0	66	...	...	2·71	10	6·8
Winnipeg, Manitoba	47·0	28	−6·0	22	32·7	12·5	...	...	...	...	·06	2	4·7
Victoria, B.C.	63·1	28	40·0	9	51·9	45·1	..	...	...	...	6·44	21	8·9
Dawson, Yukon	31·6	7	−36·6	19	9·9	−4·3	...	...	...	...	1·10	6	4·4

a—and 23.

REMARKS.

MALTA.—Mean temp. of air 61°·0, or 1°·3 below the average. Mean hourly velocity of wind 9·5 miles, or 0·2 above the average. Mean temp. of sea 68°·7. TSS on 2nd and 3rd. H on 2nd and 3rd. L on 1st and 28th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·5 below, of dew point equal to and R 3·15 in. above, their respective averages. Mean hourly velocity of wind 9·8 miles, or 0·8 miles below the average; prevailing direction E. by N. to S.E. by E. Sun spots, none from 2nd to 13th, and from 26th to 30th. T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air 79°·2 or 3°·1 below, of dew point 0°·5 above and R 7·29 in. above, their respective averages. Mean hourly velocity of wind 5·2 miles; prevailing direction S.W. and N.W. TSS on the 3rd, and L only was seen on the 8th. W. C. S. INGLES.

Adelaide.—Mean temp. of air 71°·2 (which has only once been higher in previous Novembers), was 4°·2 above the average. R under the average. C. TODD, F.R.S.

Sydney.—Mean temp. of air 2°·3 above, R 1·98 in. below, and humidity 3·3 below, their respective averages. H. C. RUSSELL, F.R.S.

Auckland.—Cool and dry, the mean temp. of air being 2° below the average of the previous 33 years, and R much less than one-half the average. T. F. CHEESEMAN.

TRINIDAD.—R 1·07 in. above the 30 years' average. J. H. HART.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXXXVII.] JUNE, 1902. VOL. XXXVII.

THE PROBABLE WEATHER OF THE LAST WEEK OF JUNE.

No meteorologist would undertake a fortnight in advance to give a definite forecast of the weather of any particular day; but if a sufficiency of accurate records exist it is not difficult to estimate the probability of certain conditions of weather on a given day. In view of the intensity of the public interest in the weather of June 26th and 27th this year, when the great Coronation processions are to pass through the streets of London, and millions of people will spend the greater part of the day out of doors, we have brought together some information which, although equally applicable to any year, may on this occasion be worthy of special attention.

Mr. E. Mawley treats of one aspect of the question in *The Rosarian's Year Book* for 1902. He considers the probability of any day in June or July being so wet as to ruin the prospects of a rose show, basing his discussion on 23 years' observations of rainfall at Berkhampstead, during which the amount of rain that fell between 9 a.m. and 9 p.m. was distinguished from that which fell in the other half of the 24 hours. He points out that the chances of rain are perhaps a little greater in July than in June, and then sums up—

"If the minimum amount be reckoned as half-an-inch, the chances against rain falling during the day-time to that amount are about 80 to 1.

"If the minimum amount be reckoned as a quarter-of-an-inch the chances against rain falling during the day-time to that amount are about 25 to 1.

"If the minimum amount be reckoned as one-tenth of an inch the chances are increased to 8 to 1.

"If the minimum amount be reckoned as five-hundreths of an inch the chances are 5 to 1.

"If the minimum amount is reckoned as one-hundredth of an inch the chances rise to 2 to 1."

It is further noted that a rainfull exceeding half-an-inch may be classed as an exceptionally wet day in summer; a fall exceeding a

quarter-of-an-inch as a decidedly wet day; a fall of one-tenth of an inch as a few heavy showers, or light rain for several hours; five-hundredths of an inch as a few passing showers; and one-hundreth as insufficient to lay the dust.

We have applied Mr. Mawley's classification for the two days, June 26th and 27th, to the Camden Square record of 45 years (1857-1901)*, and as it must be apparent to everyone who thinks of the matter that there can be no reason but chance for the probability of rain being appreciably greater on one day than on the day immediately following, we have taken the mean of the two days, as applying to either, and the result comes out as follows:—

Rainfall from 9 *a.m. to* 9 *p.m. at Camden Square, on June* 26*th and* 27*th.*

	More than ·50 in.	More than ·25 in.	More than ·10 in.	More than 05 in.	More than ·01 in.
Number of cases in 45	½	1	5	8	10
Chances against	90 to 1	45 to 1	8 to 1	5 to 1	3½ to 1
Mr. Mawley's figure.....	80 to 1	25 to 1	8 to 1	5 to 1	2 to 1

The similarity of the two sets of figures shows that the result is trustworthy. The only notable exception being due to the short period considered. This element of uncertainty may be met by carrying the investigation further back into the past; but in order to do this it is necessary to consider the probability of rain falling at any time in the 24 hours, and not in the twelve hours only.

We applied for data to Mr. R. C. Mossman, of Edinburgh, whose elaborate discussions of the climate of London must be known to most of our readers, and he kindly supplied values for the rainfall and other conditions for a complete century. The observations used were not made at the same place throughout, but it is very unlikely that the change will seriously affect the accuracy of the conclusions. The observations from 1802 to 1839 were made at Sunbury, near Kew, and from 1840 to 1901 at Greenwich Observatory. For the sake of comparison we also give the Camden Square values (1857-1901) for the 12 hours 9 a.m. to 9 p.m., and for the 24 hours, and the Greenwich values for 1857-1901, all calculated as a percentage of the 45 years, so as to be strictly comparable with the actual number of cases in the century under consideration. The chances against each particular value of rainfall are those for the hundred years.

The following table shows that taking the longer period the chances of heavy rain seem distinctly greater, although the chance of any rain falling is appreciably the same as was found for the shorter period. These figures are applicable to either day by itself. We may now consider the chances of one or both days proving wet, and for this purpose it must suffice to take the fall of ·01 in. or more, as constituting a wet day, although as a matter of fact ·01 in. would only mean a trifling shower in some part of the 24 hours.

* The record of 1857 was kept by Mr. Symons in another part of London; but for the present purpose the difference is of no importance.

Rainfall in 24 hours, June 26th or 27th.

	More than ·50 in.	More than ·25 in.	More than ·10 in.	More than ·05 in.	More than ·01 in.
45 years.					
Camden Square, 9 a.m. to 9 p.m., %	1	2⅔	12	16⅔	22
Camden Square, 24 hours, %	2½	6	14	23	32
Greenwich ,, %	2	8	12	15½	32
100 years.					
Greenwich	3½	9	16½	22½	36
Chances against	28 to 1	10 to 1	5 to 1	3½ to 1	2 to 1

In the hundred years from 1802 to 1901, June 26th was quite rainless on 63 occasions, and June 27th on 65; the 26th had some rain on 37 occasions, the 27th on 35. Both days were entirely free from rain on 50 occasions, and at least one of the days was entirely free from rain on 78 occasions. Both days had some rain on 21 occasions. Finally, it may be noted, that the whole of the last week of June was absolutely rainless on 19 occasions, and that rain fell on every day of that week only once, in 1848.

The final conclusion as to the probability of rainless weather, drawn from the records for 100 years, is:—The chances against the whole of the last week of June being rainless are 5 to 1; the chances are equal for both days being dry, or for one at least being wet; the chances against rain falling on both days are 5 to 1; and finally, as already stated, the chances against any rain on either day, considered separately, are practically 2 to 1. Thus it is just as likely that the two days will be wet as that the whole week will be dry; both days are as likely to be dry as not, and either day, considered separately, is twice as likely to be absolutely dry as to have even a single shower. As a matter of mere curiosity on which no suggestion as to the future can be made, it may be pointed out that no rain has fallen at Camden Square between 9 a.m. and 9 p.m. on the 26th of June since the year 1890, a period of 11 years; the longest previous succession of dry days on the 26th, in the 45 years, was 10, from 1862 to 1871. During the 45 years only two consecutive years have ever experienced rain on the 26th, and this has only happened twice. For the 27th the longest succession of dry years has been nine, and once the day was wet on three consecutive years.

Mr. Mossman has also supplied us with details of temperature for 100 years, from the same stations as the rainfall, and with particulars of non-instrumental observations for the 140 years 1763-1901.

As to temperature, the mean of either day is approximately 61°, that is to say, there is as much chance of it proving one, five or ten degrees hotter, as of it proving one, five or ten degrees colder than that figure. The highest mean temperature for either day was 76° in 1820, the lowest was 50° in 1835. The extreme temperatures to be expected are in a sense more important than the mean of the day. The average maximum for either day is about 72°, the average minimum for either night about 52°; but

in 1820 the tremendous maximum of 94° was experienced. On 13 years out of the 100 the maximum exceeded 85°, so that the chances are 7 to 1 against the maximum reaching that figure; the chances against it reaching 88° are 50 to 1. The lowest maximum was 57° in 1835, and on 11 occasions the maximum temperature of the day failed to reached 62°, a temperature below which it is uncomfortably cool to sit long out of doors in light summer clothes. The chances against so low a maximum are 9 to 1. The highest minimum recorded was 62°, in 1811, a delightfully warm night; the lowest was 40°, in 1871, which must have felt very cold indeed. The chance of either extreme occurring is very small; it is 15 years since the night minimum of either day fell below 43°, and 24 years since the day temperature of the 26th or 27th rose above 85°.

Of non-instrumental observations the most important are those on fogs, gales and thunderstorms. Thunderstorms have occurred on June 26th, 14 times in 100 years, and on June 27th, 9 times; but as the hours at which the storms occurred are not obtainable it is better to take an average, say 12 for either day. This shows that the chances against a thunderstorm on either day, considered separately, are about 12 to 1. Gales and fogs are so rare that it is enough to say that observations for a hundred years indicate that the chances against a gale on June 26th or 27th are 50 to 1, and against a fog nearly as high as 100 to 1.

From these data anyone with an instinct for probabilities can frame a forecast of the weather of any particular day, that would be much more likely to be right than wrong, though he could not distinguish one day from the next; but we repeat that it has not yet been shown to be possible to say with any approach to certainty whether the next occasion is or is not to be one of the less probable cases—the exception which proves at least the rule of chance.

THE WEST INDIAN VOLCANIC ERUPTIONS AND ATMOSPHERIC PHENOMENA.

By R. H. Curtis.

The startling accounts which have been received of the recent volcanic outbursts in the West Indies have caused a somewhat widespread curiosity to know whether they will be followed in this country by atmospheric phenomena similar to those which appeared after the great eruption of Krakatoa, in August, 1883.

The most remarkable of those phenomena were the wonderful sky-glows, which, after they had quickly extended themselves round the globe in the tropical zone, made their appearance here towards the end of November, and continued with great persistency for many weeks, and, according to some observers, for many months.

But besides these glows, there were other phenomena, which were not less wonderful, although they were not so evident to "the man in the street," or even to the great majority of those who were careful

and habitual observers of atmospheric occurrences. These phenomena were the result of the enormous atmospheric undulations which were set up by the explosions, and particularly by the final cataclysm on August 27th, when the greater part of the island of Krakatoa appears to have been hurled into space, so that where a mountain peak nearly 2,500 feet high had stood, there was afterwards found to be ocean with a depth of more than 300 fathoms.

Some of these air waves produced sounds which were heard at a distance of 3,000 miles from their place of origin, whilst those of less rapid oscillation had sufficient force to burst in windows and doors, and to crack walls, at a distance of 100 miles, or more, from the volcano. These huge billows of air, spreading outwards in vast circles from Krakatoa, travelled several times round the globe, taking something like eighteen hours to perform the journey from Krakatoa to its antipodes in Colombia, and in transit they literally left their signatures behind them wherever there was a barograph.

It is perhaps too early to say definitely whether the sky-glows are likely to recur over the British Islands as a result of the volcanic outbursts at Martinique and St. Vincent. Some expectant observers have already detected them in sunset effects, seen only a day or two after the eruptions began; but in their eagerness to be first in making the discovery these correspondents have overlooked the fact that a considerable time must necessarily elapse before the ejected matter necessary to produce the glows could arrive here, even supposing it to be on its way. In the case of the Krakatoa eruption the sky phenomena spread east and west through the tropics far more rapidly than they did polewards, and the glows were seen in the locality of the present outbreak, where therefore the dust must have been present to produce them, at least two months before they were observed in the British Isles. As yet, however, no reliable information has been received of the occurrence of glows, or other optical phenomena due to the volcanic outburst, anywhere outside the more immediate neighbourhood of the eruptions.

There is, however, more difficulty in deciding whether there has been any barometric record in this country of air waves, resulting from the volcanic explosions. The accounts to hand of the outbursts at Martinique and at St. Vincent do not supply information of any outstanding explosions of exceptional violence, and sufficiently distinct from the rest for the time of their occurrence to be localized, in such a way as to afford a basis from which to calculate the time when the passage across the British Isles of resulting air waves might be looked for. There is very little doubt that such atmospheric undulations, of greater or less magnitude, have been set up; and certain of the photographic barograms from the observatories of the Meteorological Office do exhibit barometric changes which closely resemble those caused by the Krakatoa waves; but unfortunately it is less easy to connect cause and effect in the present instance than was the case in 1883.

In the absence of other data, such as existed in the case of the Krakatoa outburst, as to the probable time of the origin of the waves, the only means of connecting recorded barometric oscillations with the recent eruptions is to find out whether similar oscillations were recorded elsewhere, and whether the proper intervals of time for their transit required by the positions of the stations occurred between the records. If this connexion cannot be traced the volcanic origin of the oscillations may very well be doubted, and especially if, coincident with them, other meteorological phenomena were observed, such as would, under normal conditions, be regarded as affording in themselves a sufficient explanation of their occurrence.

So far, the attempts which have been made to corelate in this way recent barometric oscillations with the West Indian eruptions have not been very successful. The time required for an atmospheric wave to travel from St. Vincent, or Martinique, to the British Isles, may be taken, nearly enough, as six hours ; and the time at which the portion of the wave which started in the opposite direction might be expected to show itself here would be about 25 hours later. Supposing the wave to have had sufficient energy to make a second circuit, and to record its passage, the second appearance of each phase would probably occur about 37 hours after the first.

None of the unusually numerous barometric oscillations recorded in the British Isles during the latter half of May accord very closely with these hypothetical conditions. Some were recorded at more than one place, but the interval between their occurrence was certainly too long; whilst in one instance in which an oscillation is shown at two stations with a proper time interval between them, no sign of the wave is indicated elsewhere. Probably the nearest approach to the required conditions is shown on the 18th, when two decided oscillations were recorded at Valencia, one at 9 a.m., and the other at about noon; at Falmouth, which is practically the same distance as Valencia from the volcanoes, similar oscillations were shown, but at 3 p.m. and 6 p.m. ; and at Kew one oscillation was felt about 20 minutes later than the first one at Falmouth. At Valencia, and at Falmouth, oscillations which *may* have been the recurrence of these, were again recorded about 42 hours after the first, but at Kew there was nothing to correspond with this ; and no oscillations at all were recorded at either time at the Observatories at Aberdeen and Fort William.

At Kew, a sharp squall, with rain, accompanied the barometric change, and probably there were also accompanying squalls at Valencia and Falmouth, although the traces of the Robinson anemograms at those places does not enable one to say so definitely, and this fact suggests a strictly meteorological origin for the oscillation ; but it may be a point to consider whether the atmospheric conditions indicated by the oscillation, however produced, would not of themselves cause something in the nature of a squall.

Possibly further investigation, with more data, may reveal the volcanic connexion sought for, but at present the probability of its existence does not seem to be very great.

ROYAL METEOROLOGICAL SOCIETY.

THE first of the afternoon meetings of the present session was held at the Society's Rooms, 70, Victoria Street, Westminster, on May 21st, Mr. W. H. Dines, B.A., President, in the chair.

Mr. G. P. Carless, M.Inst.C.E., Mr. J. C. Custodis, and Bahadur K. Ronendra Narayan Roy were elected Fellows.

Capt. D. Wilson-Barker read a report prepared by Mr. Dines and himself on the Wind-Force Experiments which had been made on board H.M.S. *Worcester*, and at Stoneness Point Lighthouse, 817 yards from the ship on the left bank of the River Thames. These experiments were in continuation of those on the exposure of anemometers at different elevations, which were carried out on the *Worcester* a few years ago. All the observations were made with the Dines' pressure-tube anemometers. The general result is that the lighthouse experiences steadier and stronger winds than the *Worcester*, the velocity being about six per cent. greater notwithstanding the fact that the elevation is less than half; but that in both positions the extreme velocities reached in the gusts are about equal.

Dr. R. H. Scott read a summary of the proceedings of the Wind Force Committee from its first appointment in 1885 to the present time.

In the discussion which followed the speakers remarked upon the great advance which had been made in the study of anemometry since the first appointment of the Committee. This was considered to be largely due to Mr. Dines' invention of the pressure-tube anemometer.

Dr. H. R. Mill read a paper on "The Cornish Dust Fall of January, 1902," in which he stated that in consequence of the large number of communications he had received after the publication of a preliminary account of the dust fall in *Symons's Meteorological Magazine* for February, the extent of the area affected had been very clearly indicated. The most important of the additional observations were supplied by the courtesy of the Trinity House, which communicated abstracts of the logs of all the light-houses and light-ships round the coast from Portland Bill to Bardsey Island.

It was found that the areas affected by the dust falls in January were (1) Cornwall and a strip of Devonshire measuring altogether 1,400 square miles; (2) North Devon, a very limited district not exceeding 150 square miles; (3) Somerset and the south of Gloucester including, in addition to a considerable stretch of the Bristol Channel, 260 square miles; and (4) South Wales, in the south of Monmouth and Glamorgan, about 340 square miles—a total area of about 2,200 square miles. The hypothesis that the dust was derived from the explosion at Perranporth was shown to be quite inadequate to account for the large area over which the deposit was found.

The date of the appearance of the dust was discussed. At a few stations, chiefly in northern Cornwall, it was observed on the

afternoon of January 21st, at most of the stations where a definite date could be assigned it undoubtedly fell on the 22nd, while in the north of Somerset and the adjoining part of Gloucester the fall was clearly due to a shower on the morning of the 23rd. Dust falls were reported in Normandy on the 22nd, in Portugal on several days about the 20th, and about Madeira on the 17th, when the dust-haze was so thick that the mail steamer *Lagos* was wrecked on the Dezertas. The conclusion arrived at was that the dust came from the African deserts, a portion of it was carried up into the stratum of air above the great anticyclone which lay over western Europe, and when rain happened to be formed in the dust-cloud, or to fall throught it, the muddy drops made themselves apparent on reaching the ground.

Dr. Mill referred gratefully to the very large number of correspondents whose voluntary co-operation made it possible to carry the discussion to a satisfactory conclusion.

After the paper was read a number of Fellows took part in the discussion, Captain Campbell Hepworth pointing out that about the date of the dust-storm the distribution of pressure and winds over North Africa was unusual, and might account for the simultaneous occurrence of dust-storms on the Atlantic and the Red Sea.

Correspondence.

RAINFALL OF FIRST FOUR MONTHS OF 1902.

To the Editor of Symons's Meteorological Magazine.

I SUPPOSE from the grouping of your decades that you consider 1900 to be the first year of the twentieth century! You will see that my decades are in the form 1881–90, not 1880–89. I notice that you take ten year averages, which is as much as most observers can manage; but, as a rule, the last decade has been drier than the two preceding, thus the four months' average for 30 years has been 7·50 in., as compared with 7·00 for the last 10 years. My value for the first four months of 1902 is 58 per cent. of the 30 years' average, or 62 per cent. of the 10 years' average. which is lower than 45 out of your 50 places. On sixteen occasions I have measured more in a single month than in the first four months of this year; and on 34 occasions the fall of a single month has been not less than 4·00 in. As regards the first four months it is interesting to compare 1900, when 11·03 in. of rain fell, with 1902, when the fall was only 4·38 in.

Average Rainfall, January to April.

Periods	1871–80.	1881–90.	1891–1900.	1871–1900.	1902.
Inches	7·64	7·88	7·04	7·52	4·38

The above summary shows the averages of three decades separ ately, and of 30 years, as compared with the fall of 1902.

ROBERT ELMHIRST.

Farnham Lodge, near Knaresboro', 17th May, 1902.

RAIN GAUGE MEASURING GLASSES.

To the Editor of Symons's Meteorological Magazine.

I HAD a glass made at Negretti and Zambra's, a good many years ago, for measuring small quantities, partly for the sake of eyesight; but Mr. Zambra seemed to think it rather a fad. I have had others, by Casella, graduated on both sides, to ·07 for 8 in. and ·18 for 5 in. gauges, and find them very convenient. They are 9 inches long and $\frac{3}{4}$ in. diameter. Some glasses I have seen do not look as if the first ·01 was carefully measured before the glass was graduated, in fact, I once saw one where the ·01 was almost at zero. One would think that all good makers would test ·01 instead of merely dividing ·10 into ten parts by a scale. For a 5 inch gauge a half inch diameter would be better than mine for reading to thousandths.

J. E. MACE.

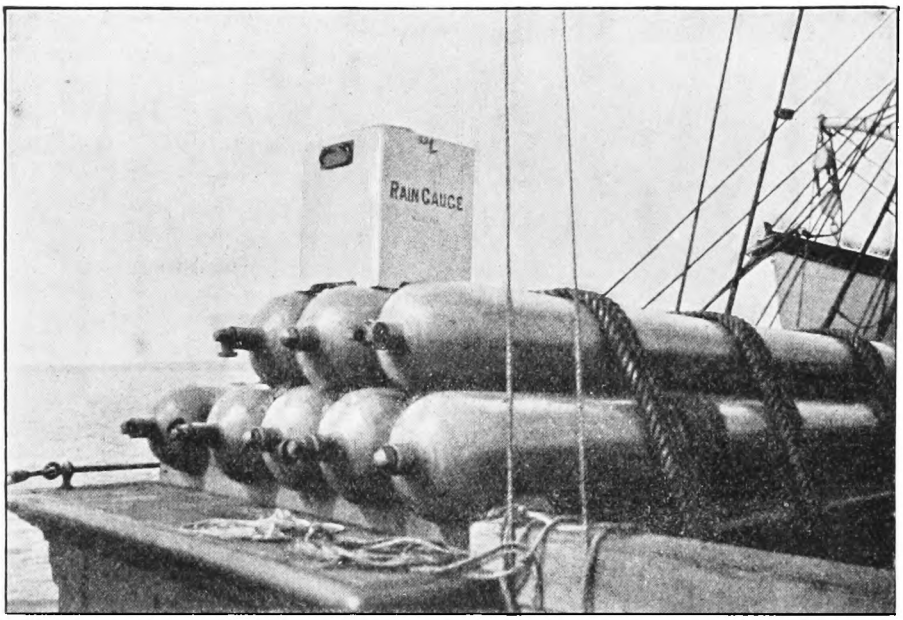
CLOUD CHARACTERS, APRIL–MAY, 1902.

To the Editor of Symons's Meteorological Magazine.

THE recent phenomenally cold weather which, in East Suffolk, gave way on May 23rd, was accompanied by abnormal skies. The type of cloud prevailing may be described as a sheet or pallium of semi-stratified, electrical cumulus. The peculiarity of this sky was as follows: Numerous masses of the cumulus-piles appeared at all points of the compass, often seen through a slight haze, yet showing distinctly the nodulous heads and processes usual in storms, and crossed and intersected by numerous strips and narrow bands of dark stratus. This stratus, called by Ley, Stratus Lenticularis ("Cloudland," plate V.) often assumed unusual forms, sometimes like dark cloudlets or small cumuli drawn out into semi-cylindrical bands, lying across or involved in the folds of the cumulus peaks. But the most striking feature of this "gloomy" time was the ominous and threatening expression of the pallium in its general character, accompanied by almost daily mutterings of distant thunder. The thunder, I believe, occurred amongst *the clouds themselves*, and at a higher than ordinary elevation. I gather this from the fact that people continually remarked that a storm was occurring in a certain direction, yet no account of any particular storm was reported in the local papers.

The Festoon Cloud, or rather, the Festoon-Sheet, was accompanied by a good deal of patchy nimbus and uncertain drizzling. So cold a May was, perhaps, never before known in East Anglia. Respecting this sheet of imperfectly formed festoons, I may here note that I verified the fact that its origin (doubtless the same as that of the perfect cloud) is as follows: The lower stratum of air near the earth becomes saturated with vapour and while it is in this condition the wind in the upper levels shifts *suddenly* to a colder quarter. A number of descending cold currents are then poured down into the lower atmosphere, condensing the vapour in front of them, and presenting a globular form through the spiral movement of the outer ascending envelope of warmer vapour. In the case referred to it went rapidly from about S.W. to N. The bags, or festoons, were quickly formed, and rolled along with the wind.

Elmsett, Ipswich, May, 1902. SAMUEL BARBER.



[*Photograph by* Dr. H. R. Mill.

The Rain Gauge on the "Discovery."

OCEAN RAINFALL ON THE "DISCOVERY."

Surgeon-Major W. G. Black, of Edinburgh, whose persevering efforts to establish measurements of rainfall at sea are so well known to meteorologists, supplied one of his special marine rain gauges to the British National Antarctic expedition on board the *Discovery*, and he now sends us for publication the readings of the gauge on the voyage to New Zealand, as taken by Lieut. C. Royds.

The form of the rain gauge may be seen from the accompanying photograph, which represents it mounted on the gas-cylinders on the weather quarter of the *Discovery*. This position was adopted as the result of much anxious consideration, and though it involved shifting the rain gauge every time the ship changed her tack, the advantages are obvious. One advantage is that the rain gauge was never sheltered by the sails; another that the wind always blew over it from the sea, thus, whatever deflecting influence upon the wind the side of the ship exerted was always the same. The eddy of air from the spanker, the only sail which could have any influence on the gauge, is the only variable condition, and that cannot easily be allowed for. The rim of the rain gauge remains horizontal as it is mounted so as to swing freely, and its height above sea-level (about

12 or 14 feet) remains as nearly the same as the motion of the ship allows. The *Discovery* proved to be a very dry ship, and apparently no correction for spray was found necessary.

The positions given in the table are for noon, and the amount of rainfall entered opposite each date is that which was measured at noon on the following day.

The only heavy rainfall recorded was on August 24th and 25th, about lat. 12° N., when the total fall of two days, for it happened to be in progress at noon, and so was divided in the record, was 3·94 in. On this occasion the fresh water tanks of the *Discovery* were replenished by 15 tons of rain-water collected on deck. During the 60 days in the Atlantic Ocean, from August 6th, when the ship left Cowes, to October 4th, when she reached Capetown, there were 16 days on which more than ·01 in. of rain fell, and on only five of these did the fall equal, or exceed, ·25 in. During the 46 days in the Southern Ocean, from October 14th, when she left Simon's Bay, to November 29th, when she reached Lyttelton, there were 30 days with rain, but on only four days was the fall as much as ·25 in., and only on nine as much as ·10 in. It will be noticed that from October 30th to November 12th there were 13 consecutive rainy days. The longest period without rain was 13 days, from August 11th to 23rd.

Rainfall recorded on S.S. "Discovery," England to New Zealand.

1901. Date.		Lat. ° ′	Long. ° ′	Rain in.	1901. Date.		Lat. ° ′	Long. ° ′	Rain in.
Aug.	10	43 45 N.	9 45 W.	·01	Oct.	30	47 38 S.	74 4 E.	·32
,,	24	12 28	20 51	1·79	Nov.	1	46 55	84 21	·07
,,	25	11 7	21 12	2·15	,,	2	46 51	89 28	·05
,,	28	5 35	21 46	·04	,,	3	46 38	93 27	·08
Sept.	4	5 35 S.	29 2	·05	,,	4	47 41	95 51	·27
,,	7	10 32	32 49	·22	,,	5	48 44	100 17	·12
,,	10	15 45	33 11	·41	,,	6	50 9	104 6	·04
,,	15	23 45	27 21	·02	,,	7	51 16	108 50	·072
,,	18	30 43	21 36	·06	,,	8	51 50	112 46	·052
,,	19	32 59	19 40	·54	,,	9	51 40	116 59	·301
,,	20	33 53	17 38	·04	,,	10	50 51	122 35	·025
,,	22	35 10	13 40	·11	,,	11	51 20	126 23	·022
,,	24	36 27	8 20	·48	,,	12	51 49	130 18	·010
,,	25	36 53	5 48	·05	,,	14	57 41	134 50	·023
,,	27	38 12	0 31 E.	·03	,,	15	59 18	138 2	·020
,,	30	37 12	9 30	·09	,,	18	61 9	142 59	·015
Oct.	16	37 16	22 28	·01	,,	21	56 31	156 19	·014
,,	17	38 59	25 54	·10	,,	22	55 12	158 30	·006
,,	21	45 7	36 53	·15	,,	24	52 13	163 53	·016
,,	22	45 0	40 57	·16	,,	25	50 30	166 1	·010
,,	23	45 8	44 47	·06	,,	26	48 54	169 49	·475
,,	24	44 37	48 25	·07	,,	27	47 12	170 32	·235
,,	25	45 35	51 18	·03	,,	28	44 37	172 10	·023

Dr. Black points out that most rain was recorded in the Atlantic equatorial belt, and in the Brave West Winds of the South Indian Ocean, and least in the North and South Atlantic tropical belts. Of the 103 days when the ship was at sea rain fell on 46, the total amount being 8·939 in.

REVIEWS.

Hints to Meteorological Observers. Instructions for taking Observations and Tables for their Reduction, together with a Glossary of Meteorological Terms. Prepared under the direction of the Council of the Royal Meteorological Society, by WILLIAM MARRIOTT, F.R.Met.Soc., Assistant Secretary. Fifth edition, revised and enlarged. London: Edward Stanford, 1902. Size $9\frac{1}{2} \times 6$, pp. 60. Price 1s. 6d.

WE welcome this enlarged edition of a thoroughly practical book, which has long since commended itself to the good opinion of all meteorological observers. In its new form an impression of the reverse of the Symons' medal appears on the cover, and by revision and large additions to the text the instructions are brought thoroughly up to date. A table for the correction of barometer readings for differences in the force of gravity has been added; a fresh chart of magnetic variation is supplied, and the newly-adopted value of the factor for reducing the Robinson anemometer readings to true wind velocity finds a place. New tables of comparison for barometer and rainfall in inches and millimetres will be appreciated by many readers. The most important addition, however, is the glossary of meteorological terms. It has been prepared as a step towards carrying out a resolution of the International Meteorological Congress held at Rome in 1879, to the effect that an International Dictionary of Meteorology should be published. The step certainly cannot be said to be precipitate, but it is in the right direction, and better late than never. The glossary contains 236 terms, with brief definitions, which may help to correct the constant tendency of the human mind to imperceptibly change the meaning of words. While most of the terms defined are English, a few foreign expressions—chiefly the names of instruments or of local winds—find a place.

Loss of Life in the United States by Lightning. By ALFRED J. HENRY, Professor of Meteorology. (Weather Bureau Bulletin No. 30). Washington, 1901. Size 9 × 6. Pp. 22. Maps.

AS the result of investigations extending over the eleven years 1890-1900, the author concludes that from 700 to 800 lives are lost each year by lightning stroke in the United States. The fact that many more cases occur in the country than in towns is accounted for partly by the very small area of the latter and partly by the power of steel-framed buildings, electric light and telegraph wires to dissipate an electric charge harmlessly. The damage done by lightning and the frequency of storms is much greater in the eastern than in the western states, and greatest of all in New England and the Ohio valley. The author lays great stress on the importance of persevering for at least an hour in the attempt to restore animation in persons apparently killed by lightning, the method being similar to that applicable to the apparently drowned; the maintenance of artificial respiration, continuous friction of the limbs and the application of hot bottles, &c.

On the Origin and Propagation of Cyclonic Storms. By A. WALKER, F.R.A.S. (From Trans. Met. Soc. Mauritius, 1902.) Size 9 × 6. Pp. 22.

A COMPARISON of various theories as to the origin and propagation of cyclones, showing that Ferrel's theory of the convectional origin of cyclones by local heating cannot apply to those of the tropical ocean, but that the initial rotatory movement may be accounted for by opposing currents of air.

The Recent Sunsets and Sky-glows. By T. F. CLAXTON, F.R.A.S. (From Proc. Met. Soc. Mauritius, 1901.)

GORGEOUS sunsets were visible in Mauritius during June, July and August, 1901, and the author traces them to the dust from the eruption of Keloet in Java. The fact is interesting in its relation to the Krakatoa sunsets of 1883, and to the probable effects of the recent eruptions in the West Indies.

BOOKS RECEIVED.

Journal of the Royal Agricultural Society of England. Vol 62. 1901. Size 9 × 5½. Pp. [vi.] + 404 + cciv. [Contains an article on the Weather during the Agricultural Year 1900–1901.]

Indian Meteorological Memoirs. Published under the direction of John Eliot, M.A., F.R.S., C.I.E. Vol. 12. Pt. 2. Discussion of the results of the hourly observations recorded at 29 stations in India. Calcutta, 1902. Size 14 × 10. Pp. 316.

Jahrbuch des Norwegischen Meteorologischen Instituts für 1901. Herausgegeben von Dr. H. Mohn. Christiania, 1902. Size 13 × 10. Pp. xii. + 122.

Meteorologisch Jaarboek voor 1899 uitgegeven door het Koninklijk Nederlandsch Meteorologisch Instituut. Een en vijftigste Jaargang. [Meteorological Year-book for 1899, published by the Royal Dutch Meteorological Institute; 51st year.] Utrecht, 1902. Size 12½ × 9½. Pp. 252.

Ergebnisse der Meteorologischen Beobachtungen in Potsdam in Jahre, 1899 [Results of the Meteorological Observations in Potsdam for 1899.] Durch . . . Wilhelm von Bezold. Berlin, 1901. Size 13 × 10. Pp. 120.

Results of Observations in Meteorology and Terrestrial Magnetism made at the Melbourne Observatory and other localities in the State of Victoria, Australia. From the 1st of January to the 30th of June, 1901. Under the direction of Pietro Baracchi. Melbourne, 1901. Size 10 × 6. Pp. 48.

Meteorological Observations taken in Hertfordshire in the year 1900, by John Hopkinson, F.L.S., F.G.S., F.R.Met.Soc. [From *Trans.* Hertfordshire Nat.Hist.Soc. Vol. 11. Pt. 3. March, 1902]. Size 8½ × 5½. Pp. 10.

The Farnley Observatory, Southport. Reports and Results of Observations for the year 1901, by Joseph Baxendell, F.R.Met.Soc. Meteorologist to the Southport Corporation. Southport, 1902. Size 9½ × 7½. Pp. 26.

Variation séculaire du magnetisme terrestre, par M. V. Raulin [On the secular variation of terrestrial magnetism]. Extract from Annales de Chimie et de Physique, Mars, 1902. Size 10 × 6½. Pp. 20.

Results of Rain, River and Evaporation Observations made in New South Wales, during 1899, with maps and diagrams. By H. C. Russell, F.R.S. Sydney, 1901. Size 10 × 6½. Pp. lx. + 252. Price 3/6.

METEOROLOGICAL NEWS AND NOTES.

A NEW FORM OF MEASURING GLASS for a 5-in. rain gauge has been submitted to us by Messrs. Casella and Co. It is on the pattern suggested by Mr. Aitken, and figured in our April number, p. 36. While we do not consider that such a refinement is necessary or to be recommended for the ordinary observer, there are some enthusiasts who are prepared to devote an exceptional amount of attention to their readings; and to such as are particular to obtain the precise number of technical "rainy days" in the year, the new glass will no doubt prove acceptable.

SULPHUR RAINS have been reported from several parts of England, and one sample of the yellow dust which gave rise to the belief that sulphur has fallen from the sky has been sent to us. It is not sulphur, however, but an organic substance, almost certainly the pollen of some conifer. "Sulphur rains" are even more frequently recorded than rains of "blood" or "ink," and the cause has been pointed out very frequently. It is extremely unlikely that any volcanic dust resulting from the West Indian eruptions would take the form of so easily oxidisable a substance as sulphur.

HAIL-PREVENTION EXPERIMENTS are now being carried out by the Italian Government in the province of Treviso; and Herr G. Suschnig, of Graz, informs us that the "grelifuge cannon" invented by him and made by his firm, Carl Greinitz Nephews, has been selected for the purpose of bombarding the sky to prevent hail from forming.

LONDON FOGS are to be investigated next winter by the well-known scientific aeronaut the Rev. J. M. Bacon, by means of pilot balloons launched from the summit of various high buildings, in order to test the direction and strength of the upper currents which he has found usually to exist above the stratum of still air in which the fog forms. The work will be carried out in conjunction with the *Daily Express*.

METEOROLOGICAL NONSENSE in the newspapers is only dangerous when it is seriously meant, and we are sorry to think that a correspondent of an evening paper seems to believe the following theory of the cause and consequences of a halo to be illuminating :—

"My opinion is that after a spell of fine or moderate weather the wind which has been northerly commences to travel south by east (dry quarter), and drives in a strong current of damp atmosphere from the south, the wind again going north at night, which counteracts the damp atmosphere, causing white frost. The moon being a round orb reflects a round shadow, or halo, through the damp atmosphere, appearing to the eye to be round the moon. On the second day the wind again traverses the same course, with like results; but on the third day the wind, attracted by the damp atmosphere, backs south by west (wet quarter), as damp attracts damp, hence the rain on third day after halo appeared."

THE FIVE MONTHS' RAINFALL OF 1902.

Aggregate Rainfall for January—May, 1902.

Stations.	Diff. from aver.	Per cent. of aver.	Stations.	Diff. from aver.	Per cent. of aver.	Stations.	Diff. from aver.	Per cent. of aver.
	in.			in.			in.	
London	— ·87	89	Arncliffe	—8·30	64	Aberdeen	+ ·71	106
Tenterden	—2·88	68	Hull	— ·93	89	Cawdor	—1·89	81
Hartley Wintney	—1·41	84	Newcastle	—1·78	79	Strathconan	+1·80	109
Hitchin	—2·02	74	Seathwaite	—13·91	73	Glencarron	+1·89	105
Winslow	—2·10	74	Cardiff	—1·90	86	Dunrobin	— ·77	93
Westley	— ·14	98	Haverfordwest	—2·66	83	Darrynane	—5·32	71
Brundall	+ ·60	107	Aberystwyth	—2·01	87	Waterford	—1·14	92
Blandford	—1·66	86	Llandudno	+1·11	111	Broadford	+1·30	111
Polapit Tamar	—1·30	90	Dumfries	—3·16	81	Carlow	— ·79	94
Stroud	—1·90	80	Lilliesleaf	— ·73	93	Dublin	+ ·19	102
Woolstaston	— ·34	97	Colmonell	— ·51	97	Mullingar	— ·76	94
Worcester	+ ·54	107	Glasgow	—2·38	82	Ballinasloe	+ ·74	106
Boston	+ ·50	107	Islay	— ·63	96	Clifden	—3·86	87
Hesley Hall	+ ·62	109	Mull	— ·76	96	Crossmolina	+ ·90	105
Derby	+ ·89	111	Loch Leven	—4·43	66	Seaforde	+2·09	116
Manchester	...	...	Dundee	—2·89	71	Londonderry	— ·50	96
Wetherby	— ·87	89	Braemar	— ·07	99	Omagh	+3·35	125

May proved a wet month over nearly the whole country, and the rainfall has gone a long way towards making up the serious deficiency referred to last month—indeed, fifteen of the stations quoted above now show an excess.

In Ireland the extreme south-west still shows a considerable deficiency, and two stations in the north show a considerable excess; but on the whole the condition is but little changed during last month.

Over Scotland much less deficiency is to be found, though Fife still appears to have received only two-thirds of the average fall, and it is only in a narrow belt from Aberdeen to opposite the Isle of Skye that the average has been exceeded.

In England the alarming deficiency so general at the end of April had disappeared by the end of May, except in two areas which have little else in common, and lie at opposite extremities of the kingdom —Kent and the Lake District. There the total rainfall so far was still under three-quarters of the average. The whole of central England, from the Ribble and Humber in the north to Worcester and Norwich in the south, has now had about nine per cent. more than its average fall. South of the wet belt, however, the deficiency was still very considerable, varying from 10 to about 30 per cent.

It may be said generally that so far as agriculture is concerned, more rain is not now urgently required; while as regards water-storage the exceptionally low temperature of May and early June has kept down evaporation, and so permitted a larger proportion of the rainfall to be utilized than is to be expected at this season.

MAY, 1902.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1890-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·60	+ 1·04	·53	17	22	72·3	31	31·4	14	1	11
II.		Tenterden	1·75	— ·06	·28	17*a*	19	73·0	31	29·5	14	3	14
,,		Hartley Wintney	2·73	+ ·87	·63	17	24	72·0	25	26·0	13*d*	7	11
III.		Hitchin	2·13	+ ·39	·38	23	22	67·0	27*b*	28·0	14	7	...
,,		Winslow (Addington)	1·90	+ ·19	·32	22	17	70·0	24	29·0	14	6	9
IV.		Bury St. Edmunds (Westley)	2·80	+ ·96	·34	16	21	70·8	27	29·8	14	6	...
,,		Norwich (Brundall)	4·39	...	·67	3	25	72·8	31	31·2	14	1	12
V.		Winterborne Steepleton	2·21	...	·51	31	17	70·4	24	27·3	14	3	15
,,		Torquay	1·39	...	·42	31	15	69·9	24	36·2	7	0	0
,,		Polapit Tamar [Launceston]..	2·20	— ·04	·40	17	19	63·0	26	27·2	11	4	8
VI.		Stroud (Upfield)	2·36	+ ·47	·41	22	20	72·0	24	34·0	13	0	...
,,		Church Stretton (Woolstaston)	3·37	+ 1·07	·63	17	22	67·5	24	31·5	7	1	7
,,		Worcester (Diglis Lock)	2·47	+ ·73	·69	30	15	...	...	...	...	...	...
VII.		Boston	3·04	+ 1·54	·53	31	20	70·0	24	30·0	7	6	...
,,		Hesley Hall [Tickhill].....	2·35	+ ·81	·44	31	21	69·0	23	31·0	10	2	...
,,		Derby (Midland Railway).....	2·63	+ ·78	·50	22	20	70·0	31	33·0	7	0	...
VIII.		Manchester (Plymouth Grove)	3·08	+ ·99	·50	22	21	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ...	2·41	+ ·74	·57	31	19	...	...	...	...	...	...
,,		Skipton (Arncliffe)	2·70	— ·69	·42	2, 16	24	...	...	...	...	...	...
,,		Hull (Pearson Park).....	2·75	+ ·94	·75	30	24	...	...	...	...	...	...
X.		Newcastle (Town Moor)	2·43	+ ·68	·60	30	21	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	5·79	— 1·55	1·46	27	25	61·8	23	30·3	11	2	...
XI.	WALES.	Cardiff (Ely).....	2·46	+ ·11	·40	16	20	...	...	...	...	...	...
,,		Haverfordwest	1·74	— ·55	·31	31	17	63·7	23	32·5	10	0	6
,,		Aberystwith (Gogerddan) ...	4·40	+ 1·88	1·27	22	17	78·0	31	26·0	6*g*	8	...
,,		Llandudno.....	2·98	+ 1·15	·80	22	24	62·8	24	38·0	11	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	2·46	— ·18	·40	16	13	66·0	23	28·0	10	13	...
XIII.		Edinburgh (Royal Observatory)	2·11	...	·36	31	21	63·1	24	32·9	14	0	8
XIV.		Colmonell	3·00	+ ·54	·44	30	18	64·0	24	28·0	9	6	...
XV.		Tighnabruaich	4·03	...	·54	27	22	61·0	23	30·0	9, 20	9	...
,,		Mull (Quinish).....	2·58	— ·57	·60	27	19	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·18	— ·11	·37	31	18	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	2·10	+ ·34	·35	16	23	74·8	23	32·0	10*d*	2	...
XVII.		Braemar	3·48	+ 1·29	·48	4	25	68·3	23	23·2	10	6	17
,,		Aberdeen (Cranford)	4·35	+ 2·34	·78	31	25	75·0	23	31·0	1, 4*e*	4	...
,,		Cawdor (Budgate)	2·35	+ ·25	·30	3	27	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	3·81	+ ·49	1·00	29	9	...	...	...	...	...	...
,,		Glencarron Lodge.....	6·13	+ ·88	1·23	27	26	55·0	23	28·6	10	5	...
XIX.		Dunrobin	2·91	+ ·98	·42	18	19	64·0	23	28·5	16	9	...
,,		S. Ronaldshay (Roeberry) ...	1·88	— ·18	·38	27	23	60·0	24	29·0	4, 12	7	...
XX.	IRELAND.	Darrynane Abbey.....	2·42	— ·02	·56	14	22	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	1·88	— ·77	·51	31	17	69·0	23	33·0	6	0	...
,,		Broadford (Hurdlestown) ...	2·36	+ ·13	·65	27	20	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	1·71	— ·59	·22	18	18	...	...	...	...	...	...
,,		Dublin (Fitz William Square)	2·80	+ ·90	·62	30	22	67·9	24	36·0	7	0	0
XXII.		Ballinasloe	2·23	— ·22	·20	14	19	71·0	23	32·0	6*f*	3	...
,,		Clifden (Kylemore)	2·87	— 1·75	·78	15	17	...	...	...	...	...	...
XXIII		Seaforde.....	4·05	+ 1·74	·70	30	19	60·0	21*c*	32·0	9	1	5
,,		Londonderry (Creggan Res.).	4·48	+ 1·84	·64	30	27	...	...	...	...	...	...
,,		Omagh (Edenfel)	4·70	+ 2·16	·85	15	26	62·0	24	32·0	9	1	6

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

a—and 22. *b*—and 31. *c*—and 22, 30. *d*—and 14. *e*—and 6. *f*—and 10, 21. *g*—and 10.

SUPPLEMENTARY TABLE OF RAINFALL, MAY, 1902.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	1·96	XI.	Castle Malgwyn	2·51
II.	Dorking, Abinger Hall .	2·46	,,	Builth, Abergwesyn Vic.	...
,,	Sheppey, Leysdown	2·31	,,	Rhayader, Nantgwillt...	3·89
,,	Hailsham	2·15	,,	Lake Vyrnwy	4·49
,,	Crowborough.....	3·09	,,	Ruthin, Plâs Dráw	4·17
,,	Ryde, Beldornie Tower..	1·84	,,	Criccieth, Talarvor	3·74
,,	Emsworth, Redlands ...	2·64	,,	I. of Anglesey, Lligwy..	3·24
,,	Alton, Ashdell	2·71	,,	Douglas, Woodville.....	3·40
,,	Newbury, Welford Park	3·04	XII.	Stoneykirk, Ardwell Ho.	2·91
III.	Oxford, Magdalen Coll..	1·66	,,	Dalry, Old Garroch	3·23
,,	Banbury, Bloxham	1·78	,,	Moniaive, Maxwelton Ho.	2·55
,,	Pitsford, Sedgebrook ...	2·02	,,	Lilliesleaf, Riddell	3·19
,,	Huntingdon, Brampton.	3·01	XIII.	N. Esk Res. [Penicuick]	3·10
,,	Wisbech, Bank House...	3·63	XIV.	Glasgow, Queen's Park..	2·15
IV.	Southend	2·72	XV.	Inveraray, Newtown ...	3·76
,,	Colchester, Lexden	2·52	,,	Ballachulish, Ardsheal...	4·13
,,	Saffron Waldon, Newport	3·34	,,	Islay, Eallabus.....	3·06
,,	Rendlesham Hall	2·52	XVI.	Dollar.....	1·61
,,	Swaffham	3·62	,,	Balquhidder, Stronvar...	3·43
V.	Salisbury, Alderbury ...	2·34	,,	Coupar Angus Station...	1·36
,,	Bishop's Cannings	2·59	,,	Blair Atholl	1·54
,,	Blandford, Whatcombe .	2·36	,,	Montrose, Sunnyside ...	2·20
,,	Ashburton, Druid House	2·03	XVII.	Keith H.R.S.....	4·12
,,	Okehampton, Oaklands.	2·52	XVIII.	Fearn, Lower Pitkerrie..	2·42
,,	Hartland Abbey	1·84	,,	S. Uist, Askernish	2·28
,,	Lynmouth, Rock House	2·49	,,	Invergarry.....	3·21
,,	Probus, Lamellyn	1·99	,,	Aviemore, Alvie Manse.	3·37
,,	Wellington, The Avenue	2·09	,,	Loch Ness, Drumnadrochit	3·68
,,	North Cadbury Rectory	2·38	XIX.	Invershin	2·79
VI.	Clifton, Pembroke Road	2·02	,,	Bettyhill	1·59
,,	Ross, The Graig	1·81	,,	Watten H.R.S.....	1·61
,,	Shifnal, Hatton Grange	...	XX.	Dunmanway, Coolkelure	2·45
,,	Wem, Clive Vicarage ...	2·83	,,	Cork, Wellesley Terrace	...
,,	Cheadle, The Heath Ho.	2·51	,,	Killarney, District Asyl.	3·41
,,	Coventry, Priory Row ..	2·38	,,	Caher, Duneske	...
VII.	Market Overton	3·06	,,	Ballingarry, Hazelfort...	2·69
,,	Grantham, Stainby	2·57	,,	Miltown Malbay	2·02
,,	Horncastle, Bucknall ...	2·13	XXI.	Gorey, Courtown House	2·23
,,	Worksop, Hodsck Priory	2·72	,,	Moynalty, Westland ...	2·94
VIII.	Neston, Hinderton	3·75	,,	Athlone, Twyford	2·42
,,	Southport, Hesketh Park	3·39	,,	Mullingar, Belvedere ...	2·83
,,	Chatburn, Middlewood.	2·83	XXII.	Woodlawn	2·27
,,	Duddon Val., Seathwaite Vic.	4·21	,,	Westport, Murrisk Abbey	2·17
IX.	Baldersby	2·32	,,	Crossmolina, Enniscoe ..	4·02
,,	Scalby, Silverdale	2·62	,,	Collooney, Markree Obs.	3·13
,,	Ingleby Greenhow Vic..	2·68	XXIII.	Enniskillen, Model Sch.	...
,,	Middleton, Mickleton ...	2·06	,,	Warrenpoint.....	2·85
X.	Beltingham	2·19	,,	Banbridge, Milltown ...	3·46
,,	Bamburgh	2·49	,,	Belfast, Springfield	3·71
,,	Keswick, The Bank.....	2·53	,,	Bushmills, Dundarave..	3·01
XI.	Llanfrechfa Grange	1·81	,,	Stewartstown	4·55
,,	Treherbert, Tyn-y-waun	3·99	,,	Killybegs	4·54
,,	Llandovery	3·65	,,	Horn Head	4·16

METEOROLOGICAL NOTES ON MAY, 1902.

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.

ENGLAND.

LONDON, CAMDEN SQUARE.—Cold and unsettled, the only fine days being between the 24th and 29th. T, L and H were fairly frequent during the first half, and from 17th to 23rd an almost perpetual drizzle continued. Mean temp. 50°·3, or 3°·7 below the average.

ABINGER HALL.—Showery. The first half was very cold; 10° of frost on the morning of the 13th did great damage to all fruit crops. TS of short duration on 18th. The L struck a fine oak but did not do much damage.

TENTERDEN.—Showery, without much R. The coldest May for many years; no night so cold as the 14th since May 3rd, 1877. Potatoes, black currants and cherries were badly injured, and the first leaf of oak trees was quite cut off in valleys and colder places. Duration of sunshine 163 hours.

CROWBOROUGH.—Up to the 20th very cold and unsettled, with R every day from 2nd to 19th. Pleasant and warm after 20th. During the first 20 days all growth of foliage was retarded, and in the valleys damage was done by the cold winds and frost, but the warmth of the latter part of the month made up in some measure, and growth of vegetation was rapid. H storms on six days, and TSS on 3rd and 30th. S fell at 1.45 p.m. on 6th, in very large flakes.

HARTLEY WINTNEY.—A peculiarly cold month, with a persistent northerly wind until 27th, and slight showers of H and R daily. TSS, with H, on 3rd, 7th, 16th and 17th. Temp. a little higher during the last few days, but still showery. Ozone on every day, with a mean of 4·1.

PITSFORD, SEDGEBROOK.—The greater part of the month was rough and cold. Mean temp. 48°·4. R ·03 in. below the average. T on 3rd and 17th.

COLCHESTER, LEXDEN.—Remarkably cold and unsettled till the 23rd, after which it was very mild. Few bright days. S in the neighbourhood on 6th and 8th. Large H on 18th. Slight TS on 3rd, and sharp on 31st.

BURY ST. EDMUNDS, WESTLEY.—Cold and winterly till 21st, with S on 5th, 6th, 7th and 14th. Mild and very growing from 21st. T on four days.

NORWICH, BRUNDALL.—The coldest May since 1887, and the wettest since 1878. R fell daily on the first 22 days, and S on 6th, 12th and 13th. Mean temp. of the first 22 days 44°·5, of the month 48°·2. TSS on five days.

TORQUAY, CARY GREEN.—R ·59 in. below the average, and for the first five months of the year 4·38 in. below the average. Mean temp. 51°·6, or 1°·5 below the average. Duration of sunshine 235·2 hours, or 4·8 hours above the average; one sunless day. Mean amount of ozone 5·4; max. 7·5 on 21st, with W.S.W. wind, and min. 3·0 on 24th, with N.W. wind.

LYNMOUTH, ROCK HOUSE.—Very cold up to 22nd. Although R fell on a greater number of days than in any of the preceding four Mays, the total was 1·75 in. lower than the average of that period, whilst that of the first five months was 4·41 in. below the average. T, L and H on 6th; heavy H on 17th.

NORTH CADBURY RECTORY.—Very cold, cloudy and showery, yet not wet. The weather was undisguisedly miserable till the 23rd, then four beautiful days, and four very damp and showery days till the end.

CLIFTON, PEMBROKE ROAD.—Cold and ungenial, with a prevalence of N. winds, but a great and sudden rise of temp. occurred on 23rd. Though R was ·30 in. below the average, the number of rainy days was five above it.

ROSS, THE GRAIG.—The coldest, except 1879. Max. temp. about 6° below the average, and the min. 4°·5 below, from 1st to 21st. No max. reached 60° till 23rd; on 24th, however, a max. of 74° caused a burst of vegetation.

HULL, PEARSON PARK.—Very cold and cheerless weather. N.N.E. and W. winds prevailed, with frequent showers. T on 17th. H on 9th and 18th.

WALES AND THE ISLANDS.

HAVERFORDWEST.—One of the most ungenial in a record of 53 years, but notably exceeded in severity by the Mays of 1876, 1877 and 1879. Remarkable for the persistency of cold N.E. winds, uniformly low temp., absence of R, and dry harsh air. Duration of sunshine 164·3 hours. Vegetation backward.

DOUGLAS, WOODVILLE.—Cold, wet and windy, and in every way abnormal. From April 24th to May 21st, N.W. winds, harsh, cold, always strong, and often reaching the force of a gale. Three mild and springlike days from 22nd to 24th alone redeemed it, but the spring was very backward. A S.W. gale on 27th wrought cruel havoc among foliage and blossom, followed by a furious N.E. gale on 30th, lasting 50 hours, which completed the destruction.

SCOTLAND.

LILLIESLEAF, RIDDELL.—Exceptionally cold, with much S and sleet, and a succession of half-gales. Ground frost occurred nightly, with few exceptions. R 1·19 in. above the average. The effect on the blossom, &c., was, however, trifling, probably owing to the exceptional dryness.

INVERARAY, NEWTOWN.—Very cold. The first three weeks were fine and dry, though cold, with N. wind. It was no warmer when the R came.

ISLAY, EALLABUS.—Very cold, and vegetation from 10 to 14 days late.

COUPAR ANGUS.—R like that of the four preceding months, about ·50 in. short of the average, but number of rainy days excessive. Mean temp. 46°·3, or about 2°·0 below the average. During the first three weeks frost occurred almost every morning, and the cold of the month was unequalled in 20 years.

DRUMNADROCHIT.—Uncommonly miserable and inclement. Not one summer-like day. A neighbouring hill was covered with S until about the 20th. Vegetation was from three weeks to a month behind. H on three days.

WATTEN, H.R.S.—Cloudy and cold. Blighting N. and E. winds, with frosts at night. Vegetation far behind the average.

S. RONALDSHAY, ROEBERRY.—Cold and changeable. Mean temp. 42°·3, being 5°·0 below the average, and the lowest in 12 years.

IRELAND.

DUNMANWAY, COOLKELURE.—Remarkable for very low temp. R light, and plant growth restricted. Wind principally between N.N.W. and N.N.E.

MILTOWN MALBAY.—The coldest May in memory. R scarcely appreciable, save on four or five days from 13th to 17th, and then mostly in H showers, but 26 days of drizzle and fog. A frosty air prevailed nearly all the time, doing damage to fruit and early potatoes.

DUBLIN, FITZWILLIAM SQUARE.—The converse of May, 1901, for it proved dull, showery and unseasonably cold. Duration of sunshine only 178·8 hours. N. and N.W. winds showed a remarkable predominance, and so cold a May has not been experienced since 1869. Mean temp. 49°·9, or 2°·1 below the average. High winds on 7 days. H fell on 6 days; T and L on 17th.

WESTPORT, MURRISK ABBEY.—Temp. very variable. Sunless days and heavy leaden clouds. Vegetation backward, with little promise of a fruit crop. H showers, night frosts and a constant N. wind caused much damage.

OMAGH, EDENFEL.—There is no record here (37 years) of such a May. The disastrous year of 1879 bears the closest resemblance, each having being about 3° under the average in temp.; but R for May, 1879, was 3·35 in. on 18 days, compared with 4·70 in. on 26 days for May, 1902, an amount not before approached and more than twice the average of 30 years. There has not been one fine or pleasant day. On every day the winds were strong, and on 25 from polar or easterly points, but all were inclement, ungenial and wet.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1901.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	55·7	7	23·3	20	44·3	33·9	35·9	87	64·1	24·1	3·07	17	6·4
Malta	67·7	16	40·3	1	62·9	51·2	49·4	77	119·8	36·9	1·94	9	4·0
Lagos, W. Africa	96·1	8	70·0	14	89·1	80·0	74·9	76	139·0	69·0	·00	0	7·3
Cape Town	88·5	19	50·4	30	77·6	58·3	55·4	65	...	...	·31	3	3·2
Mauritius	87·1	22*a*	67·2	7	84·3	71·6	69·1	76	150·2	62·0	6·10	20	6·3
Calcutta	81·7	1	51·2	24	77·5	55·9	54·5	66	133·0	44·0	·00	0	2·4
Bombay	90 3	1	68·1	15	86·5	71·9	65·6	65	137·3	56·2	·00	0	2·7
Colombo, Ceylon	90·6	12	69·3	14	88·4	73·4	70·1	76	154·8	65·5	3·40	8	3·3
Melbourne	103·8	28	43·8	25	76·4	54·3	50·3	61	158·0	34·9	·68	5	6·0
Adelaide	108·3	27	48·6	23	87·7	61·1	49·9	43	163·0	42·4	·98	4	3·6
Sydney	104·0	17	54·7	8	77·5	62·2	55·4	59	157·1	45·8	·52	7	5·1
Wellington	75·5	28	44·0	17	66·9	52·1	47·7	67	134·0	34·5	3·94	18	5·9
Auckland	75·5	7	51·0	18	67·7	55·7	49·8	65	139·0	48·0	3·57	14	5·0
Jamaica, Halfway Tree	...	...	...	...	...	...	...	...	...	...	2·07	6	...
Trinidad	90·0	19	69·0	5	85·9	71·7	72·5	83	166·0	61·0	4·33	16	...
Grenada	87·0	22	70·0	20	82·0	72·9	72·3	79	150·0	...	13·17	27	4·5
Toronto	56·2	14	6·3	21	33·2	20·6	24·3	82	58·0	—5·2	3·61	15	7·3
Fredericton, N.B.	54·7	14	—11·5	7	32·8	12·6	13·5	65	...	...	6·42	13	...
Winnipeg, Manitoba	37·5	22	—32·7	13	18·3	0·4	..	...	...	...	·43	6	6·3
Victoria, B.C.	53·2	22	29·5	12	46·1	39·9	...	...	...	...	3·46	20	7·5
Dawson, Yukon	20·6	16	—50·0	31	—1·7	—14·1	...	...	...	...	1·85	6	5·0

a—and 29.

REMARKS.

MALTA.—Mean temp. of air 56°·9, or 0°·6 above the average. Mean hourly velocity of wind 12·0 miles, or 0·9 above the average. Mean temp. of sea 65°·5. TSS on 15th. L on 6th and 22nd. H on 15th and 27th. J. F. DOBSON

LAGOS.—The Harmattan season commenced on the 4th, and the peculiar haziness of the atmosphere, due to the presence of Harmattan dust, continued more or less throughout the month. ARTHUR CLEMINSON.

Mauritius.—Mean temp. of air 0°·8 below, dew point 1°·1 below, and rainfall 1·35 in. above, their respective averages. Mean hourly velocity of wind 11·6 miles, or 0·7 miles above average; extremes 30·1 on 4th, and 2·0 on 21st; prevailing direction E. by N. to E.S.E. L on 11th. T and L on 12th and 31st. T. F. CLAXTON.

COLOMBO, CEYLON.—Mean temp. of air 79°·8 or 0°·7 above, dew point 0°·9 below, and R 2·95 in. below, their respective averages. Mean hourly velocity of wind 9·8 miles; prevailing direction N.W., N. and N.E. TSS occurred on the 18th and 19th. W. C. S. INGLES.

Adelaide.—A warm month. Mean temp. 74°·4, or 3°·0 above average, and mean max. 4°·0 in excess. Only coastal rains were registered, Adelaide having ·16 in. in excess of 44 years' average. C. TODD, F.R.S.

Sydney.—Mean temp. of air equal to average, R 1·98 in. below, humidity 9·5 below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Mean temp. 0°·8 above, and R ·55 in. below, their respective averages. A showery month, prevailing winds N.W., rather strong gales on 15th and 18th. T on 16th and 18th. Earthquakes on 1st, 2nd and 29th. Aurora on 28th, coinciding with a sudden dip in barograph curve. R. B. GORE.

Auckland.—An unusually cold and showery December. Mean temp. quite one degree under the average, and R 1·25 in. above the average. T. F. CHEESEMAN.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXXXVIII.] JULY, 1902. VOL. XXXVII.

THE MOON AND RAINFALL.

By W. ELLIS, F.R.S.

IN the number of this magazine for November, 1901, there is a communication from Mr. MacDowall, in which he draws attention to the circumstance that in the years 1889 to 1900 the rainfall at Greenwich was in each year "greater about new moon than about the middle of the time between full moon and last quarter." He takes the sum of rainfall on the day before, the day of, and the day following new moon, and the sum also for the third, fourth and fifth days, following full moon, in each month of every year. Forming annual means of these sums he finds as stated that the value at new moon is greater in every year, by amounts varying from 0·02 in. to 0·25 in., with a mean excess of 0·10 in.

Mr. MacDowall remarks that he hoped "at some future time to extend this branch of the inquiry further back." But why, it may be asked, should he publish a partial result at all, since the labour of carrying back the investigation to earlier years was not great, and the Greenwich records, on which the results are based, are easily available. I am led to offer this remark from having noticed in other of Mr. MacDowall's papers their fragmentary character. Considering his capacity for work, one hardly understands how he can be content to put forward results that can carry little or no weight, when the material is to hand on which to base something more worthy of attention, more especially considering that he attacks subjects that call for somewhat exhaustive treatment. No good purpose is served by publishing immature work, indeed harm, and too often such is done. Better to labour more in secret, than produce that which cannot reasonably carry some degree of conviction. Even a negative result, if arrived at after a laborious investigation, is well worth making known, as it may prevent others doing unprofitable work.

In the present case any person meeting with Mr. MacDowall's figures would be inclined at once to ask what happened before the year 1889. I have had the curiosity to inquire, having re-calculated what Mr. MacDowall has done, and carried back the investigation to include the forty years 1862 to 1901, sufficient for my present

purpose (see annexed table). My numbers for the years 1889 to 1900 confirm entirely those of Mr. McDowall, but it will be seen that whilst in each year from 1889 to 1900 the new moon value is the greater; in 1888, the year next preceding that first employed by him, it is less by 0·19 in. It is also less in seven out of the twelve years that precede the twelve used by him. There are also six years, 1872 to 1877, having consecutively a lesser new moon value.

It will be further seen by the table that there is a tendency to — values in the earlier years, and a yet more decided tendency to + values in the later years. Dividing the whole period into four groups of ten years each, we deduce from the table as follows :—

Mean three days' Rainfall.

Period.	At New Moon. in.	Following Full Moon. in.	Excess at New Moon. in.
1862—1871	0·204	0·213	— 0·009
1872—1881	0·208	0·237	— 0·029
1882—1891	0·197	0·177	+ 0·020
1892—1901	0·234	0·140	+ 0·094

Considering that the average three days' rainfall is about 0·20 in. the differences in the first three decades, regarding the variable character of rainfall, are perhaps not surprising: that in the fourth decade is considerable, but it happens here that the rainfall at new moon is much above the average, and that following full moon very much below. It forms no part of my object to suggest any direct cause of these variations, but it has yet to be shown that the moon has anything to do therewith.

Meteorological investigations of the kind cannot be, as it were, rushed or settled by a few figures hastily thrown together. Nature does not so readily yield up many of her secrets. In the apparent charm and fascination that impels people to endeavour to trace lunar influence in meteorology it seems not to be sufficiently understood that the sun is the real disturber of the atmosphere, variations otherwise produced appearing to be, in comparison, insignificant, and correspondingly difficult to determine. It is to be remembered that no sensible heat is received from the moon, and the endeavour to trace lunar influence on rainfall is not encouraged thereby. Besides which in any attempt to discover lunar influence in meteorology a first condition is that the inquiry should be thorough, based on a long series of observations, and also on the records of different places, in order that any proposition made may, as far as possible, be either distinctly affirmed or negatived thereby. For otherwise, one inquiry may reveal some apparent connection that another inquiry would apparently overturn, rendering it doubtful whether the resulting numbers could, in either case, be taken as anything more than accidental residuals, that is effects of which the precise cause is unknown.

Mean Three Days' Rainfall at the Royal Observatory, Greenwich.

Year.	At New Moon.	Following Full Moon.	Excess at New Moon.	Year.	At New Moon.	Following Full Moon.	Excess at New Moon.
	in.	in.	in.		in.	in.	in.
1862.....	·07	·40	—·33	1882.....	·10	·20	—·10
1863.....	·08	·20	—·12	1883.....	·14	·15	—·01
1864.....	·21	·11	+·10	1884.....	·08	·14	—·06
1865.....	·45	·17	+·28	1885.....	·36	·16	+·20
1866.....	·28	·32	—·04	1886.....	·30	·17	+·13
1867.....	·18	·23	—·05	1887.....	·19	·21	—·02
1868.....	·28	·14	+·14	1888.....	·12	·31	—·19
1869.....	·17	·30	—·13	1889.....	·19	·10	+·09
1870.....	·14	·13	+·01	1890.....	·30	·20	+·10
1871.....	·18	·13	+·05	1891.....	·19	·13	+·06
1872.....	·29	·32	—·03	1892.....	·27	·15	+·12
1873.....	·15	·24	—·09	1893.....	·28	·08	+·20
1874.....	·16	·20	—·04	1894.....	·17	·15	+·02
1875.....	·08	·19	—·11	1895.....	·31	·27	+·04
1876.....	·21	·23	—·02	1896.....	·36	·17	+·19
1877.....	·19	·24	—·05	1897.....	·22	·14	+·08
1878.....	·25	·19	+·06	1898.....	·13	·10	+·03
1879.....	·26	·24	+·02	1899.....	·30	·05	+·25
1880.....	·16	·21	—·05	1900.....	·14	·11	+·03
1881.....	·33	·31	+·02	1901.....	·16	·18	—·02

The three days included at New Moon are the day before, the day of, and the day following New Moon. Those following Full Moon are the 3rd, 4th and 5th days after that of Full Moon.

The excess in the last column is to be understood algebraically, the sign — indicating defect.

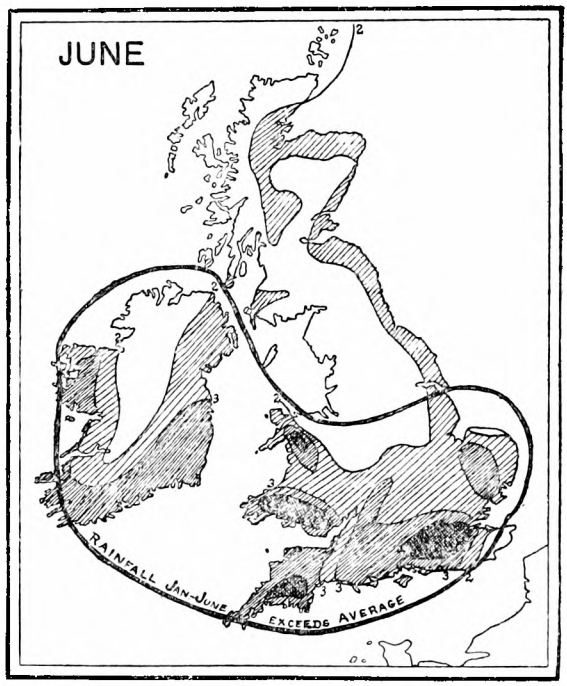
Each yearly value depends on 12 monthly values, excepting, for New Moon, in the years 1864, 1867, 1870, 1872, 1875, 1878, 1880, 1883, 1886, 1889, 1891, 1894, 1897, 1900; and for Full Moon in the years 1863, 1866, 1868, 1871, 1874, 1876, 1879, 1882, 1885, 1887, 1890, 1893, 1895, 1898, 1901, when they depend on 13 monthly values.

THE WEATHER OF JUNE AND THE RAINFALL OF THE FIRST HALF OF 1902.

WITH reference to our article in the previous number on the probable weather of the last week in June, in London, it is interesting to notice that the week, except its last day, was absolutely rainless, and for several days absolutely cloudless. As an illustration of the dryness of the air we may mention that at Camden Square, on the 28th, at 0·20 p.m., the dry bulb thermometer read 82°·3, and the wet bulb only 62°·3. Mr. J. McEwan sends us the following record of the week's sunshine at Enfield, which we think must be nearly unique.

Sunday,	22nd June, 1902	10 hrs.	45 min.
Monday,	23rd ,, ,,	5 ,,	50 ,,
Tuesday,	24th ,, ,,	15 ,,	0 ,,
Wednesday,	25th ,, ,,	15 ,,	20 ,,
Thursday,	26th ,, ,,	15 ,,	0 ,,
Friday,	27th ,, ,,	15 ,,	20 ,,
Saturday	28th ,, ,,	15 ,,	20 ,,
	Total for week	92 hrs.	35 min.

No finer weather for great functions in the open air could be imagined, and the dramatic stoppage of the ceremonies, in honour of which the whole British Empire was a-flutter with flags, suggested a curious thought—that fine weather is no palliation for anxiety and disappointment, although bad weather is an effective check to rejoicing.



With the exception of the brilliant week, which began on June 24th, the month proved inclement, following closely in the wake of one of the worst of Mays. The mean temperature over the whole country was low, especially in the second week. At Camden Square the mean temperature of each of the ten days, 7th to 16th, was below 55°, and averaged only 52°·3, about 8° below the average of 40 years; while for the eleven days, 6th to 16th, the maximum temperature never rose above 65°, and averaged a trifle under 59°, more than 12° below the average of 40 years, and this was typical of the whole country.

The distribution of rainfall in June was particularly interesting, and the accompanying map exhibits its general features. The unshaded part of the land indicates a rainfall under two inches, which prevailed over the centre and north of Ireland, the north-west and centre of England, and the greater part of Scotland. This is an inversion of the usual distribution, and, speaking generally, the shortage of rain has been accentuated at the stations where rainfall is usually high; and obliterated at those where it is usually low;

indeed, twice as much rain fell at the stations in Surrey as at those in the Lake District, or in the west of Scotland.

The map shows a darker shading for each additional inch of rain, and it will be observed that falls exceeding three inches were confined to the south of Ireland, North Wales, South Wales, the south, and some parts of the east, of England. To the south and west of London a large area had more than four inches of rain, and this was in fact the wettest part of the British Isles. In consequence, the average, estimated on the basis of the ten years 1890–99, was made up at most stations in the south, as the table of the six months' fall on p. 99 shows in detail. The heavy line on the map encircles all those parts of the country where the six months' rainfall of 1902 is known to have exceeded the average, with the single exception of the north-east of Scotland, where two stations showed an excess of 1 and 2 per cent. respectively. Since May the whole of Scotland, and the greater part of the north of England, beyond the Trent, has suffered an increase of deficiency by nearly five per cent., but the remainder of England and Wales has, speaking generally, improved its rainfall position by a similar amount. The heavy line on the map is merely diagrammatic; within it there is a fairly large area in South Wales, the lower Severn and upper Thames valleys, where several stations were still 10 per cent., and one as much as 20 per cent., short of the average fall for the half-year.

Correspondence.

THE IPSWICH STORM OF JULY 1ST.

To the Editor of Symons's Meteorological Magazine.

I have seen no reports in the London newspapers of the terrific storm which occurred here on Tuesday, July 1st, an account of which, from the *East Anglian Daily Times*, I enclose. The rainfall registered by my gauge between 0.45 and 2.45 p.m. was 2·62 in., and that from 9 a.m. on the 1st to 9 a.m. yesterday 2·85 in. Sir Cecil Domville, whose residence is about a mile from the centre of the town in a westerly direction, writes in this morning's paper that he registered 3·36 in. between 0.30 and 2.30 p.m., and 3·90 in. for the twenty-four hours ending at 9 a.m. on the 2nd.

E. R. TURNER.

Clare Lodge, Ipswich, 3rd July, 1902.

[The very full report of the storm is too long to quote even in abstract. It was a thunderstorm of unusual intensity accompanied by torrential rain, which in a few minutes converted the steeper streets into rushing cataracts. The ornamental ponds in the Park overflowed, and fish washed out of them were caught in gardens and houses a long distance away. Cellars were flooded in the lower-

lying streets; the flood swept through some houses carrying furniture into the street, where for a time the depth of water exceeded 3 feet. The tide happened to be low at the time of the storm, which consequently appears to have been less destructive than that of July 21st, 1897, when a high tide prevented the flood-water from flowing off rapidly. Although the roads were seriously damaged by the force of the rush of water, and several buildings were struck by lightning, no loss of life is reported.]

A JULY FROST.

To the Editor of Symons's Meteorological Magazine.

ON Wednesday morning, the 2nd instant, the following remarkably low minima of temperature were registered here:—

		°
In Stevenson Screen		39·9
On short grass	Spherical bulb thermometer	31·3
	Link bulb sensitive thermometer	30·2

The instruments were in perfect order, and the readings were carefully checked before the indices were disturbed.

I believe that July frosts prevailed extensively in 1863, but they must be extremely rare so near to the coast as at Southport. The minimum on the present occasion occurred under an easterly "calm."

JOSEPH BAXENDELL.

The Fernley Observatory, Southport,
3rd July, 1902.

DEW IN RAIN GAUGES.

To the Editor of Symons's Meteorological Magazine.

WITH reference to the recent correspondence on the effect upon the number of "days with rain" of the practice of including small amounts of dew and hoar frost, may I venture to point out that in properly-constructed Snowdon and Meteorological Office pattern rain gauges *extremely* little dew or hoar frost is ever deposited. The reason, of course, is that the rims and funnels of those instruments are in such sufficiently good thermal contact with the lower metal cylinder sunk for some distance into the ground, that conduction from the warmer earth generally prevents the upper part of the gauge from cooling sensibly below the dew-point. The contrast—after a calm, clear night—between the nearly clean and dry appearance of a Snowdon rim and funnel and the thickly rime-coated condition of the thermally-insulated funnel of a "Howard's bottle" rain gauge has frequently much impressed me. For this reason the latest (Float pattern) form of Halliwell's standard self-recording rain gauge, which is now rapidly coming into both English and Colonial use, has been designed to be a substantially dewless gauge.

JOSEPH BAXENDELL.

The Fernley Observatory, Southport,
3rd July, 1902.

REVIEWS.

The Climates and Baths of Great Britain, being the Report of a Committee of the Royal Medical and Chirurgical Society of London. C. THEODORE WILLIAMS, M.D., *Chairman*; P. HORTON SMITH, M.D., *Hon. Secretary.* Volume II. *The Climates of London and of the Central and Northern portions of England, together with those of Wales and of Ireland.* London: Macmillan and Co., 1902. Size 9 × 6. Pp. xvi. + 628. *Maps.*

THE first feeling aroused by this substantial volume is regret that it was found impossible to secure local co-operation to enable the climates of Scotland also to be treated. We trust that the valuable collection of information compiled regarding the other parts of the British Isles will yet lead to the production of a similar volume in the Northern kingdom.

The present volume contains nine principal articles, viz. The climate of—

London and Middlesex, by Dr. W. Ewart.
The East Coast, by Dr. W. Murrell.
The Midland Counties, by Dr. P. Horton-Smith.
Lancashire, by Dr. R. Maguire.
The Lake District, by Dr. H. L. Brooksbank.
Northumberland, Durham and Yorkshire, by Dr. W. S. Lazarus-Barlow.
North Wales, by Dr. D. J. Leech.
South Wales, by Dr. C. Theodore Williams.
Ireland, by Sir John W. Moore.

Each article might be profitably noticed in detail did space permit, for each is a storehouse of interesting facts which are brought together nowhere else. Being the work of medical men, the treatment of climate is mainly in its relation to health, and necessarily in conjunction with the other conditions which affect hygiene. The general impression left on our mind by the perusal of the volume is that the winds, humidity, sunshine and temperature of the British Isles are so uniform and free from extremes that variations due to difference of latitude are quite unimportant compared with those produced by local conditions of soil, elevation and exposure. The determining causes of local climate are in fact geographical rather than meteorological, and the book is really an essay in medical geography. This is recognised, though perhaps not fully, by the inclusion of orographical maps on a serviceable scale, their colouring indicating the height of the land in tints of brown and green, but the maps would be more expressive if the two shades of green employed had been transposed. It is recognised also by many of the authors in their appeal to the maps of Bartholomew's magnificent "Atlas of Meteorology," itself perhaps the greatest contribution to meteorological science ever published in this country. But an atlas can only be serviceable for general distributions; minor varieties of climate

must be discussed from observations in the localities themselves, and it is here that the chief drawback to the scientific completeness of the work occurs.

The question has sometimes been raised as to whether there is any use in meteorological societies collecting and publishing observations from numerous stations, and here it has a conclusive answer. Were it not for the "Meteorological Record" and Mr. Bayard's discussion of its contents for the ten years 1880-89, the volume now under notice would have been a thing of shreds and patches distressing to contemplate. As it is, many places rising into note as health resorts have either no meteorological records or observations for so short a time as to be practically valueless, a fact which is not always clearly pointed out by the authors. In the case of temperature the mean for a few years often comes within a few degrees of the true mean; but with rainfall this happens much more rarely. Thanks to the labours of the observers associated with the British Rainfall Organization, there is less lack of data with regard to the distribution of rain; but the uncritical handling of the recorded figures may lead to erroneous results. As a model of how rainfall should be treated for such a purpose, we have pleasure in referring to Dr. Theodore Williams' chapter on the Climate of South Wales, in which he introduces a short but masterly discussion of the rainfall by the late Mr. Symons. There the fall for each station is calculated to the true mean and given to the nearest inch. Some of the authors have omitted to call attention to the totally different values of rainfall in different periods of years, and an unwary reader might go far astray in accepting the average say of 1895-99 at a wet western station as comparable with an average of say 1870-99 at a dry eastern one. We feel it to be our duty to state this plainly in the hope that a second edition may rectify any confusion that may have arisen.

Several authors very properly dwell on the necessity of looking at the intensity as well as the total amount of rainfall. It is well known that some places with a very high annual fall have a smaller number of hours of rain than other places with perhaps only half the fall. The soil also is of supreme importance as regards the humidity of the air, which may be greater over clay in a comparatively dry district than over sand or gravel in a wet one. Much stress is justly laid by all writers on the primary importance of drainage and water supply. An interesting case in point is London, where the water-tight paving of the streets has led to a remarkable dessication of the soil immediately underlying it with excellent results to health. We are happy to see the firm and honest handling of the drainage and water supply of some rising health resorts, the authorities of which have not yet realized the duties they owe to the public.

An interesting remark is made in treating of the climate of the coast of North Wales as to the power of a cliff facing north to neutralize the effect of the cold north wind beating against it, which would be felt severely if the background were a valley or plain. We

published in our last volume, p. 43, a photograph taken in Sweden which illustrates this point well.

We cannot attempt to go critically into the numerical data which are cited, but we cannot pass the remarkable statement on p. 245 that the rainfall of "Northumberland, Durham and Yorkshire" is 30·975 in., as compared with 39·76 in. for the British Isles generally. Our first conjecture was that the figures had been transposed; but even so it would not put the matter right. There is evidently a blunder somewhere.

Sir John Moore's account of Ireland occupies nearly half the volume, and all readers must regret to see in the preface that this section had to be curtailed. The general ignorance of Ireland which prevails in England is ample justification for the author's enveloping the dry bones of his subject in the living tissues of literary and historical associations, and this he has done in an admirable way. We should much like to see his work in its entirety, provided with numerous maps and photographs, published as a separate book which would form a most attractive guide to Ireland for the serious visitor anxious to know something of the country.

Temperature Tables for the British Islands. Daily Means for the Thirty years 1871 *to* 1900, *with Diagrams and Additional Tables.* Published by the Authority of the METEOROLOGICAL COUNCIL. London, 1902. Size 12 × 10. Pp. xvi. + 120. Price 10*s.* 6*d.*

THIS is a report of exceptional value. It is, in the first place, a compendium of exact and authoritative detail. The mean daily temperature with maximum and minimum for the 30 years, the highest and lowest daily temperature, with maxima and minima and the year in which each occurred, are given for every day of each month for the four observatories of Valencia, Aberdeen, Falmouth and Kew. All the elements are deduced from the sheets of the photographic recording instruments, and the mean for the day is the mean of 24 hourly points taken from the curve. The enormous thermometers used for photographic recording respond more slowly to changes of temperature than do the ordinary thermometers placed in a Stevenson screen, and an elaborate comparison of the two made at Aberdeen is given in the introduction.

Curves representing each of the elements dealt with are given for Valencia and Aberdeen, and the ingenious device is adopted of printing two sets of the curves, one in red and one in green, on transparent paper so mounted that either may be superimposed for comparison on the other, or on the third set which is printed in black. A normal curve of the yearly temperature, deduced theoretically from a formula based on the harmonic analysis of the actual data, serves as a standard of reference for all the other curves of annual change.

Diagrams also give the mean daily curves in terms of differences

from the monthly average for each hour of the day for every month at the four observatories, and the same data are expressed in tables.

Finally, the Report gives a set of Tables embodying the means and extremes of temperature for each month and for the year at 117 other places distributed over the whole surface of the British Isles. Many of these do not cover the whole period of 30 years, but a supplement is promised to supply the means of adjustment for the difference in length of observations. The mean monthly temperature is given in these supplementary tables in two forms: first, the actual mean of the maximum and minimum readings; and, second, the corrected mean obtained from the former by Sir Richard Strachey's method, which differs from the actual mean by about half a degree in the most extreme cases.

These Temperature Tables are of great value in forming a basis for the study of daily and monthly variations of temperature; though it must be confessed that so far as a smooth curve is a proof of the length of time being sufficient to furnish true means it is shown clearly enough that 30 years is not enough to found averages upon. But this is where theoretical treatment shows its strength, and it is impossible to doubt that the smooth curve deduced by the formula suggested by the observations does really represent the true mean which observations for an infinite number of years would yield if there is no secular change in progress.

We congratulate Mr. Shaw and the staff of the Meteorological Office on producing a piece of work of lasting value and an excellent example of the scientific method of handling a mass of figures.

METEOROLOGICAL NEWS AND NOTES.

BEN NEVIS OBSERVATORY is to cease to exist in October. We reserve any comment on this statement except that there seems unfortunately to be little room to hope for the decision of the Directors being altered.

THE QUEENSLAND WEATHER BUREAU has, according to the *Brisbane Chronicle*, been "completely wiped out" by the refusal of the Federal Government of Australia to take it over along with the Post Office Department, to which it was attached. We sympathise with Mr. Wragge on this abrupt conclusion of his enthusiastic labours in Queensland; but as we have received no indication of the intentions of either the Federal or the State Government with regard to the meteorological service in the future, we cannot at present express any opinion on the matter. It is incredible that so progressive a community as the Australian, and one so dependent on an efficient system of weather warnings, can have allowed observations to lapse over a large part of the Commonwealth.

"THE GOVERNMENT OF INDIA have decided," says *The Times* of June 27th, "not to make public the forecasts which the [Meteorological] Department submit to them from time to time, on account

of the imperfect data on which such forecasts are necessarily based. The weekly reports which are sent home by the Government of India and published in this country give the most trustworthy indications that can be obtained, both of the actual facts and of the prospects for the future." The suggestion seems to be that the Government of India have sources of information which enable them to supplement the imperfect data of the Meteorological Department; but additional information on the subject would be welcome.

BRILLIANT SUNSETS probably due to volcanic dust in the atmosphere, have been reported from all parts of the country, and several of our correspondents have been kind enough to send in specimens of dust found in rain gauges, suggesting that they may be of volcanic origin. In a few cases the large quantity and coarse grain of the dust proves at once that it had its origin within the immediate neighbourhood of the gauge, in other cases the small quantity received makes it almost impossible to determine the nature of the material; but we have submitted all the samples to a geological authority for his opinion.

MR. W. H. DINES has been carrying on experiments with his rhomboidal kites at Crinan, in the west of Scotland, during the month of June, and has, we believe, succeeded in obtaining satisfactory meteorological records from heights up to 4,800 feet or more. Mr. John Anderson has been making similar experiments with a bamboo box-kite at Millport.

METEOROLOGICAL KITE-FLYING is absorbing increased attention in several countries, and Herr R. Assmann gives an account in the current number of *Das Wetter* of the desiderata for an ideal kite-station. He enumerates the risks that have to be guarded against and suggests methods, sometimes very elaborate, for overcoming the various difficulties. The ideal site is a flat-topped hill or plateau, bare of vegetation over a considerable area, but surrounded at a proper distance by woods, so that an escaped kite may be recovered by the wire entangling in the trees. There must be no towns, railways, electric tramways or telegraph wires, and, above all, no military camps or exercising grounds in the neighbourhood; and all points where danger might arise should be guarded by the erection of safety wires on posts from 15 to 30 feet high.

THE ANNUAL VISITATION OF GREENWICH OBSERVATORY took place on Saturday, June 7th, when the guests were welcomed during a thunderstorm, which gave point to the remark in the Astronomer-Royal's Report that the rainfall since the beginning of May was showing signs of redressing the drought of the seven previous years which had only had the rainfall of six average years.

MAGNETISM AND SEISMOLOGY form the subject of a new department of the Royal Meteorological Institute of the Netherlands which has been placed under the direction of Mr. Maurits Snellen, while Mr. C. H. Wind has been appointed Director-in-Chief of the Institute.

JUNE, 1902.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1890-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	3·13	+ 1·23	·80	13	19	84·5	28	39·2	10	0	0
II.		Tenterden	1·57	— ·62	·26	3	16	81·0	28	40·0	10	0	0
,,		Hartley Wintney	3·36	+ 1·41	·68	13	18	85·0	28	40·0	10*c*	0	0
III.		Hitchin	...	...	...	...	..	...	...	...	...	...	...
,,		Winslow (Addington)	2·03	+ ·18	·45	12	18	83·0	28*a*	35·0	10	0	1
IV.		Bury St. Edmunds (Westley)	3·56	+ 1·52	·88	16	15	84·5	29	35·0	10	0	...
,,		Norwich (Brundall)	2·34	+ ·32	·76	13	16	80·2	30	36·3	11	0	0
V.		Winterborne Steepleton	3·40	...	·71	13	15	77·5	28	38·3	18	0	0
,,		Torquay	3·22	...	·81	13	17	70·3	27	45·3	15*c*	0	0
,,		Polapit Tamar [Launceston]..	3·52	+ 1·13	·52	15	17	78·5	28	39·2	10	0	0
VI.		Stroud (Upfield)	3·70	+ 1·70	·69	7	17	82·0	28	45·0	6, 17	0	...
,,		Church Stretton (Woolstaston)	2.94	+ ·80	·83	16	17	76·5	28	39·0	9	0	0
,,		Worcester (Diglis Lock)	2·52	+ ·90	·47	15	18	...	...	...	...	...	...
VII.		Boston	2·53	+ ·85	·60	14	18	85·0	27*b*	34·0	10	0	...
,,		Hesley Hall [Tickhill].....	1·22	— ·45	·50	12	13	86·0	28	37·0	10	0	...
,,		Derby (Midland Railway).....	2·53	+ ·48	·68	29	16	87·0	28	37·0	10	0	...
VIII.		Manchester (Plymouth Grove)	1·04	— 1·70	·17	6	14	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ...	1·21	— ·88	·29	12	13	...	...	...	...	...	...
,,		Skipton (Arncliffe)	1·65	— 2·08	·29	12	13	...	...	...	...	...	...
,,		Hull (Pearson Park).	2·13	+ ·16	·37	12	15	80·0	28	36·0	10	0	1
X.		Newcastle (Town Moor)	2·03	+ ·15	·33	16	14	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	2·01	— 5·09	·50	22	13	83·5	28	37·1	9	0	...
XI.	WALES.	Cardiff (Ely).....	2·71	+ ·38	·39	13	18	...	...	...	...	...	...
,,		Haverfordwest	3·18	+ ·85	·82	12	17	80·9	28	44·6	10	0	0
,,		Aberystwith (Gogerddan) ...	3·14	+ ·50	·68	1, 6	14	...	...	40·0	8*d*	0	...
,,		Llandudno.....	1·75	— ·22	·33	29	19	82·0	25	44·5	10	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	1·82	— ·90	·27	20	12	84·5	28	37·0	10	0	...
XIII.		Edinburgh (Royal Observatory)	2·33	...	·60	6	16	78·3	25	37·5	10	0	1
XIV.		Colmonell	1·65	— 1·02	·32	15	13	87·0	28	40·0	6	0	...
XV.		Tighnabruaich	1·54	...	·34	22	10	74·0	25*b*	40·0	9	0	...
,,		Mull (Quinish).....	1·36	— 2·07	·35	6	12	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·79	— ·59	·49	7	13	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·60	— ·23	·25	14	15	75·8	30	38·0	18	0	...
XVII.		Braemar	1·69	— ·64	·37	6	13	77·7	27	32·4	18	0	5
,,		Aberdeen (Cranford)	1·73	— ·41	·39	4	18	73·0	30	37·0	8, 10	0	...
,,		Cawdor (Budgate)	3·55	+ 1·23	1·19	14	17	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	1·96	— 1·55	·50	14	8	...	...	...	...	...	...
,,		Glencarron Lodge.....	2·01	— 3·73	·30	22	16	80·1	26	36·0	10	0	...
XIX.		Dunrobin	2·15	+ ·11	·52	5	13	73·8	25	37·0	1	0	...
,,		S. Ronaldshay (Roeberry) ...	1·57	— ·39	·32	13	13	73·0	27	37·0	8, 10	0	...
XX.	IRELAND.	Darrynane Abbey.....	3·72	+ ·62	1·16	18	24	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	3·73	+ 1·12	1·14	1	17	78·0	28	41·0	10*e*	0	...
,,		Broadford (Hurdlestown) ...	1·40	— 1·01	·33	1	17	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	3·20	+ ·93	·54	1	19	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·37	+ ·45	·74	19	17	74·7	25	42·1	10	0	0
XXII.		Ballinasloe	1·75	— ·90	·75	1	14	80·0	28	37·0	9	0	...
,,		Clifden (Kylemore)	4·76	— ·67	·93	1	16	...	...	...	...	...	...
XXIII		Seaforde.....	3·34	+ ·78	1·18	19	17	80·0	25	39·0	10	0	0
,,		Londonderry (Creggan Res.).	1·42	— 1·72	·31	13	15	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·12	— ·89	·40	1	14	80·0	28	37·0	12	0	0

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

a—and 29. *b*—and 28. *c*—and 18. *d*—and 10, 16. *e*—and 13.

SUPPLEMENTARY TABLE OF RAINFALL, JUNE, 1902.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	3·93	XI.	Castle Malgwyn	4·84
II.	Dorking, Abinger Hall .	3·68	,,	Builth, Abergwesyn Vic.	...
,,	Sheppey, Leysdown	2·69	,,	Rhayader, Nantgwillt ...	2·95
,,	Hailsham	2·60	,,	Lake Vyrnwy	2·72
,,	Crowborough.....	4·13	,,	Ruthin, Plâs Draw	1·96
,,	Ryde, Beldornie Tower..	2·23	,,	Criccieth, Talarvor	3·46
,,	Emsworth, Redlands ...	3·51	,,	I. of Anglesey, Lligwy..	2·33
,,	Alton, Ashdell	4·26	,,	Douglas, Woodville.....	1·51
,,	Newbury, Welford Park	3·35	XII.	Stoneykirk, Ardwell Ho.	2·37
III.	Oxford, Magdalen Coll..	1·80	,,	Dalry, Old Garroch	1·84
,,	Banbury, Bloxham	2·36	,,	Monaive, Maxwelton Ho.	2·16
,,	Pitsford, Sedgebrook ...	2·53	,,	Lilliesleaf, Riddell	1·96
,,	Huntingdon, Brampton.	2·50	XIII.	N. Esk Res. [Penicuick]	2·15
,,	Wisbech, Bank House...	3·40	XIV.	Glasgow, Queen's Park..	1·99
IV.	Southend	2·66	XV.	Inveraray, Newtown ...	1·89
,,	Colchester, Lexden	3·25	,,	Ballachulish, Ardsheal...	1·87
,,	Saffron Waldon, Newport	2·36	,,	Islay, Eallabus..... ...	1·99
,,	Rendlesham Hall	2 50	XVI.	Dollar.....	1·90
,,	Swaffham	2·89	,,	Balquhidder, Stronvar...	2·43
V.	Salisbury, Alderbury ...	3·19	,,	Coupar Angus Station...	2·06
,,	Bishop's Cannings	3·07	,,	Blair Atholl	1·30
,,	Blandford, Whatcombe .	...	,,	Montrose, Sunnyside ...	2·25
,,	Ashburton, Druid House	3·00	XVII.	Keith H.R.S.....	2·66
,,	Okehampton, Oaklands.	4·36	XVIII.	Fearn, Lower Pitkerrie..	1·74
,,	Hartland Abbey	3·71	,,	S. Uist, Askernish	1·00
,,	Lynmouth, Rock House	3·70	,,	Invergarry.....	·98
,,	Probus, Lamellyn	3·66	,,	Aviemore, Alvie Manse.	1·95
,,	Wellington, The Avenue	2·32	,,	Loch Ness, Drumnadrochit	2·26
,,	North Cadbury Rectory	3·59	XIX.	Invershin	2·71
VI.	Clifton, Pembroke Road	3·17	,,	Bettyhill	...
,,	Ross, The Graig	2·55	,,	Watten H.R.S.....	1·41
,,	Shifnal, Hatton Grange	1·92	XX.	Dunmanway, Coolkelure	5·55
,,	Wem, Clive Vicarage ...	1·65	,,	Cork, Wellesley Terrace	3.27
,,	Cheadle, The Heath Ho.	1·69	,,	Killarney, District Asyl.	3·09
,,	Coventry, Priory Row ..	2·94	,,	Caher, Duneske	...
VII.	Market Overton	2·11	,,	Ballingarry, Hazelfort...	1·60
,,	Grantham, Stainby	1·87	,,	Miltown Malbay	2·28
,,	Horncastle, Bucknall ...	2·59	XXI.	Gorey, Courtown House	3·30
,,	Worksop, Hodsck Priory	1·13	,,	Moynalty, Westland ...	2·55
VIII.	Neston, Hinderton	1·81	,,	Athlone, Twyford	1·83
,,	Southport, Hesketh Park	1·56	,,	Mullingar, Belvedere ...	1·93
,,	Chatburn, Middlewood.	1·08	XXII.	Woodlawn	2·20
,,	Duddon Val., Seathwaite Vic.	1·46	,,	Westport, Murrisk Abbey	2·44
IX.	Baldersby	1·96	,,	Crossmolina, Enniscoe ..	3·12
,,	Scalby, Silverdale	2·75	,,	Collooney, Markree Obs.	1·85
,,	Ingleby Greenhow Vic..	1·88	XXIII.	Enniskillen, Model Sch.	...
,,	Middleton, Mickleton ...	·90	,,	Warrenpoint.....	·85
X.	Beltingham	1·75	,,	Banbridge, Milltown ...	2·25
,,	Bamburgh	2·63	,,	Belfast, Springfield	...
,,	Keswick, The Bank	1·23	,,	Bushmills, Dundarave..	1·05
XI.	Llanfrechfa Grange	3·70	,,	Stewartstown	2·26
,,	Treherbert, Tyn-y-waun	4·97	,,	Killybegs	2·61
,,	Llandovery	2·58	,,	Horn Head	1·05

METEOROLOGICAL NOTES ON JUNE, 1902.

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.

ENGLAND.

LONDON, CAMDEN SQUARE.—Although the first few days were fair, real summer weather did not occur until after the 21st. Constant R and low temp. for the first three weeks. A week of hot sunny weather ended the month. TSS on 4th and 30th. Mean temp. 59°·5 or 0°·9 below the average.

TENTERDEN.—The first half was showery and cold, but with no heavy R. Ten days with max temp. below 60°. The last week was hot with the first full day's sunshine for two months. Total duration of sunshine 218 hours. TSS on 3rd, 4th and 30th.

CROWBOROUGH.—The first three days were warm, but afterwards it became unusually cold with keen winds. The last week was very warm. The month was very wet, only in 1871, 1872 and 1888, has June had a heavier fall. The 6 months' total is still 1·65 in. below the average of 27 years. TSS on 4th, 7th, 17th and 30th, the last being very severe.

HARTLEY WINTNEY.—The wettest June since 1888. The last week was hot and dry. Distant T on 7th and 14th; L on 3rd. Ozone on 23 days, mean 2·7.

BURY ST. EDMUNDS, WESTLEY.—Wet and cold until 17th. From 20th to the end fine and hot with with much sunshine. T on four days.

TORQUAY, CARY GREEN.—R 1·04 in. above the average. Mean temp. 2·3 in. below the average. Duration of sunshine 173·5 hours, or 62·6 hours below the average. Mean amount of ozone 5·0.

POLAPIT TAMAR [LAUNCESTON].—Very rough and wet to 22nd. Then fine and dry to the end and very hot. Wind chiefly easterly.

WELLINGTON, THE AVENUE.—Probably one of the coldest Junes on record up to 23rd, when a warm period set in with brilliant sunshine. R frequent but only exceeded the average by about ·30 in. Strong winds at times.

CLIFTON, PEMBROKE ROAD.—Rainy and cold with very little sun till 22nd. Very hot with brilliant sunshine from 24th to 28th. Dull and sultry on 29th and 30th. R ·75 in. above the average and that for the six months 3·33 in. below the average. TS on 7th.

ROSS, THE GRAIG.—Except on 2nd and 3rd the daily max. temp. of the first three weeks was almost unprecedentedly low. The last eight days however brought a spell of brilliant and very hot and dry weather, which, to some extent, restored the balance. Vegetation is vigorous and flourishing.

HULL, PEARSON PARK.—Very unpleasant until about the 20th being generally cold and cloudy. Very little sunshine until 19th, when a warm period set in. T and L on 1st and 4th, and L on 29th.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE,—Ungenial with cold winds until 23rd. Crops backward and fruit falling off in many places. Violent TS on 1st.

DOUGLAS, WOODVILLE.—Cold and sunless until the 24th, when a sudden change occured to sunshine. The winds were harsh, while the comparative drought was a drawback to vegetation.

SCOTLAND.

LILLIESLEAF, RIDDELL.—The first half was a continuance of R and cold experienced throughout the winter and spring. No TSS. Foliage and crops never looked better.

INVERARAY, NEWTOWN.—The early part was cold though fine. Warm weather set in on 22nd and it was very hot till the end.

MULL, QUINISH.—Very cold from 1st to 23rd, with persistent N.E. and N.W. wind. Very hot and dry from 23rd to the end. R is now much needed and this must rank as the worst spring and early summer for the last 30 years.

COUPAR ANGUS.—The temp. was reduced owing to the cold winds and the absence of sunshine. The heat wave on 22nd just came in time to redeem the character of the month. But for the TS on 30th it would have been the sixth month in succession with a short R.

WATTEN, H.R.S.—First half cloudy and cold. Little sun and thick haze. The latter half was mild and fine with more sunshine. TS on 23rd.

IRELAND.

MILTOWN MALBAY.—The coldest and most ungenial June remembered, till 23rd, when the temp. changed. The 27th, 28th and 29th were excessively hot. The R of the first six months is 12·12 in., the lowest on record.

DUBLIN, FITZWILLIAM SQUARE.—The mean temp. of the first three weeks was 53°·2, and that of the fourth week was 63°·0. Winds from polar quarters prevailed, but their force was light in the fourth week with unclouded sunshine. Up to the 22nd the R was frequent. The duration of sunshine was 193 hours. Mean temp. 56°·7 or 1°·1 below the average. High winds on 5 days, never reaching the force of a gale. L on 19th and TS on 29th.

OMAGH, EDENFEL.—The weather of the first fortnight was a continuance of the low temp., sunless skies and excessive R of the spring months. A complete reversal of atmospheric conditions, unprecedented in the 36 year's record, commenced on 20th, and brought a brilliant spell of summer weather. Vegetation is now abundant and promising.

THE FIVE MONTHS' RAINFALL OF 1902.

Aggregate Rainfall for January—June, 1902.

Stations.	Diff. from aver.	Per cent. of aver.	Stations.	Diff from aver.	Per cent. of aver.	Stations.	Diff. from aver.	Per cent. of aver.
	in.			in.			in.	
London	+ ·36	104	Arncliffe	-10·38	61	Aberdeen	+ ·30	102
Tenterden	—3·50	69	Hull	— ·77	93	Cawdor	— ·66	95
Hartley Wintney	·00	100	Newcastle	—1·63	84	Strathconan	+ ·25	101
Hitchin	...	...	Seathwaite	-19·00	67	Glencarron	—1·84	95
Winslow	—1·92	80	Cardiff	—1·52	90	Dunrobin	— ·66	95
Westley	+1·38	113	Haverfordwest	—1·81	90	Darrynane	—4·70	78
Brundall	+ ·92	109	Gogerddan	—1·51	92	Waterford	— .02	100
Blandford	...	...	Llandudno	+ ·89	107	Broadford	+ ·29	102
Polapit Tamar	— ·17	99	Dumfries	—4·06	79	Carlow	+ ·14	101
Stroud	— ·20	98	Lilliesleaf	— ·96	92	Dublin	+ ·64	105
Woolstaston	+ ·46	104	Colmonell	—1·53	92	Mullingar	—1·73	89
Worcester	+1·44	115	Glasgow	—2·91	81	Ballinasloe	— ·16	99
Boston	+1·35	116	Islay	—1·48	92	Clifden	—4·53	87
Hesley Hall	+ ·17	102	Mull	—2·83	88	Crossmolina	+ ·95	104
Derby	+1·37	114	Loch Leven	—5·02	67	Seaforde	+2·87	118
Manchester	...	...	Dundee	—3·12	73	Londonderry	—2·22	87
Wetherby	—1·75	83	Braemar	— ·71	95	Omagh	+2·46	115

For comments on this table see p. 87.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1902.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	52·9	10	23·8	15	46·0	36·6	36·4	86	70·9	25·2	·76	11	6·6
Malta	64·3	31	45·3	30	60·2	48·8	46·6	79	119·5	38·9	·84	6	3·9
Lagos, W. Africa	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape Town	88·3	20	49·6	17	75·3	58·2	54·2	65	...	...	·58	6	4·1
Durban, Natal	92·1	16	56·4	5	82·7	66·5	...	...	150·5	...	6·35	23	6·5
Mauritius	87·8	3	65·1	20	85·9	72·2	68·4	72	154·9	58·5	2·20	21	5·6
Calcutta	86·2	31	49·5	2	79·7	56·1	53·8	63	133·5	43·1	·00	0	0·6
Bombay	89·6		65·3	5	84·9	69·8	65·9	69	136·3	54·9	·00	0	0·3
Madras	85·3	*a*	63·0	31	83·9	67·8	67·1	78	140·3	58·9	1·28	3	2·8
Kodaikanal	68·5	28	39·4	26	60·3	45·6	...	63	128·4	27·2	8·61	8	1·6
Colombo, Ceylon	91·8	25	65·2	24	87·9	70·6	68·4	75	157·7	61·3	1·95	5	3·7
Hongkong	78·0	13	48·5	1	68·4	59·2	52·2	67	125·4	...	·28	1	3·5
Melbourne	103·0	31	46·2	28	77·8	55·5	51·4	59	161·7	36·3	1·53	9	5·7
Adelaide	109·8	31	48·6	15	84·7	60·8	51·0	50	162·2	43·4	·28	9	5·4
Coolgardie	108·3	11	48·8	21	88·5	61·4	62·4	56	...	...	1·25	7	3·4
Sydney	92·2	17	58·1	29	78·1	64·2	58·2	65	151·2	49·8	1·77	15	4·7
Wellington	8·10	13	48·0	30	69·0	56·0	50·8	67	133·0	41·0	2·27	13	5·3
Auckland	78·0	14	52·0	8	70·6	58·5	53·2	67	144·0	54·0	1·58	11	5·4
Jamaica, Negril Point	88·0	19	66·0	23*b*	82·9	71·2	70·1	81	...	...	1·32	5	...
Trinidad	91·0	3	61·0	5	84·7	67·8	71·4	80	166·0	63·0	2·56	8	...
Grenada	84·4	14	69·6	31	81·5	72·7	69·2	72	150·0	...	4·22	17	2·0
Toronto	41·0	2	1·3	28	30·5	16·2	20·2	80	74·2	—3·2	2·60	12	7·3
Fredericton, N.B.	45·9	23	—12·7	15	27·5	6·9	6·0	60	...	...	3·44	10	5·4
Winnipeg	40·0	8	—36·1	27	19·3	—4·4	..	...	...	...	·12	4	4·7
Victoria, B.C.	52·4	3	12·3	25	43·9	35·2	...	...	...	...	3·13	15	7·1
Dawson, Yukon	16·0	22	—50·0	1	—7·4	—23·6	...	...	...	..	1·73	6	4·7

a—and 27. *b*—and other days.

REMARKS.

MALTA.—Mean temp. of air 54°·1, or 0°·8 above the average. Mean hourly velocity of wind 10·1 miles, or 1·3 below average. Mean temp. of sea 61°·0. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·7, dew point 1°·8, and rainfall 4·96 in. below their respective averages. Mean hourly velocity of wind 11·0 miles, or 0·2 miles below the average; prevailing direction E. by N. to E.S.E. T. F. CLAXTON.

MADRAS.—R ·39 in. above the average. 238 hours of bright sunshine. A. MOFFAT.

KODAIKANAL.—Mean temp. 51°·6. Sunshine 231 hours. Wet bulb minimum 30°·2 on 26th; lowest humidity 7 per cent. on 17th. C. MICHIE SMITH.

COLOMBO.—Mean temp. of air 78°·5 or 0°·6 below, of dew point 1°·4 below, and R 1·29 in. below, their respective averages. Mean hourly velocity of wind 8·5 miles; prevailing direction N.W. and N.E. TSS on 2nd. W. C. S. INGLES.

HONGKONG.—Mean temp. of air 63°·1, or 3°·4 above the average, bright sunshine 239 hours, or 33 per cent. above the average. R ·70 in. below the average of 39 years. Mean hourly velocity of wind 13·5 miles, or 0·9 miles below the average. F. G. FIGG.

Adelaide.—Mean temp. of air 1°·3 below the average C. TODD, F.R.S.

Sydney.—Mean temp. of air 0°·4, R 1·86 in., humidity 6·4, below their respective averages. H. C. RUSSELL, F.R.S.

Auckland.—Mean temp. of air 2°·0, and R 1 inch below average. T. F. CHEESEMAN.

TRINIDAD.—R ·38 in. below the 30 years average. J. H. HART.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXXXIX.] AUGUST, 1902. VOL. XXXVII.

THE BEN NEVIS OBSERVATORIES.

THE Meeting of the Scottish Meteorological Society, held in Edinburgh on July 23rd, was mainly devoted to the question of the closing of the Ben Nevis and Fort William Observatories. A memorandum was submitted by the Directors of the Observatories, who consist of the Council of the Scottish Meteorological Society together with one representative of the Royal Society, one of the Philosophical Society of Glasgow, and two of the Royal Society of Edinburgh. It commences with the statement:—

It has become necessary that the Observatories at the top of Ben Nevis and in Fort William be discontinued at the beginning of October next. The directors are not in possession of the funds needed for carrying them on beyond that date, and they cannot with any hope of success make further appeals to the public. During the last four years the great liberality of one gentleman, Mr. Mackay Bernard of Dunsinnan, made the continuation of the work at the Observatories possible, but there is no hope, in the opinion of the Directors, that the observatories can be continued as permanent institutions except by assistance from the State, and as yet no encouragement has been given to the efforts made to obtain this. In these circumstances the Directors feel obliged to close the Observatories, though they do so with much regret, believing that high-level observations are of the utmost importance in the study of meteorology, and are destined to play an important part in weather forecasting. In other countries the use of High-level Stations is greatly extending.

The observatory on Ben Nevis occupies the highest point in the British Isles—4,400 feet above the sea; it was opened in 1883, and the observatory at Fort William, practically at sea level, was opened in 1890. The total expenditure on the two observatories has been fully £24,000, of which £17,000 has been subscribed by scientific bodies and the public, almost exclusively in Scotland. The Meteorological Council has granted £100 a year to Ben Nevis Observatory in return for a copy of the observations, and has given £250 a year to the Fort William Observatory, which is one of the Council's First Order stations. The Directors state that the grant by the Meteorological Council is to be withdrawn, whether the observatories are continued or not.

After reading the memorandum to the meeting, Sir Arthur Mitchell, Secretary to the Directors, made a further statement pointing out the admitted value of high-level observations. He said that application for assistance from the Government was made in 1898 and 1899, but the Directors were informed that in the view of the Treasury, "State aid to the study of meteorology is given solely through the medium of the Meteorological Council." He also made the following statements :—

Having high-level observations to compare with suitably associated observations at sea-level has a direct bearing on the study of meteorology broadly ; but it is also and everywhere held that the possession of such observations may be reasonably expected to assist directly in weather forecasting. It might perhaps be more correctly said—will certainly assist.

Weather forecasting in this country is still done by rule of thumb.

No effort, so far as known, has been made to turn the observations on Ben Nevis to account in forecasting weather . . . .

In the work of the two Ben Nevis Observatories the Directors did all that was possible to render the observations useful in forecasting. They could not themselves issue forecasts. This, indeed, can only be done from a Central Office receiving information by wire, at short intervals, from a great many stations near and remote.

Sir John Murray said that he had taken part in the heavy work of starting the observatory, which was founded for the purpose of making a great experiment, not of founding a permanent institution ; and in his opinion the experiment must now come to an end unless either the Government took it over, with all its responsibilities, or some private individual endowed it, and requested the Directors to continue their work.

None can regret more than we do the threatened termination of a splendid scientific enterprise, initiated with difficulty and continued through difficulties for nearly twenty years. It says much for the scientific enthusiasm of those who have actually carried on the work that there has been no lack of volunteers to undergo the hardships of residence on the top of Ben Nevis, which combines many of the worst features of life in a lighthouse and polar exploration. We cannot believe that the Meteorological Council could have come to the conclusion to withdraw their grant unless they had satisfied themselves that they were unable to utilize the observations for forecasting, or unless the other claims on their not too generous subsidy were held to be more pressing in the interests of an efficient weather service.

But it may possibly be that, on looking fully into the circumstances of the case, reason will be found for increasing the grant to the Meteorological Council, improving the status of the Ben Nevis Observatories, and advancing towards greater certainty in weather prediction. All meteorologists are desirous of advancing the science by every means in their power, and few will be found to deny that the maintenance of a properly-endowed and efficiently-manned observatory on Ben Nevis will yield valuable results. In any case it

would be a calamity if the observatories were closed until the fullest inquiry as to their value, and the possibility of obtaining State support, has been made.

Since writing the above, we have seen the report of a question and answer in Parliament on August 4th, which we reproduce from *The Times*. We hope that the promised action will result in arrangements satisfactory to all parties, and beneficial to the cause of scientific research.

Mr. J. DEWAR (Inverness) asked the First Lord of the Treasury whether he had been made aware of the dissatisfaction in scientific circles at the impending closure of the observatories at Ben Nevis and Fort William owing to the lack of support of Government of these institutions, and whether he would order an inquiry to be made into the distribution by the Meteorological Council of the annual grant of £15,300, so as to secure that an adequate allowance be made to these stations of scientific observation, and whether, in the meantime, arrangements could be made for an interim maintenance grant pending the results of such an inquiry, so as to avert the interruption of the continuity of the meteorological records of the country.

MR. BALFOUR (Manchester, E.) said he was aware of the interest which this question excited and he had looked into the history of it. He confessed that he started with considerable prejudice against having an inquiry into the action of those scientific gentlemen who had been good enough to assist the Government in the expenditure of this money; but he found there was such an inquiry held about 20 years ago, in which an honourable friend of his who now took great interest in the subject took a leading part. The committee recommended in their report that the inquiry should be repeated from time to time, a recommendation that had not been followed. In the circumstances it would be right to have an investigation and to repeat it from time to time. This would involve no slur or slight on the scientific committee who allocate the funds. He observed that this was assuming an almost international question, but he did not think that the risk of Ben Nevis being deprived of the observatory implied any insult to Ben Nevis or through Ben Nevis to Scotland; it was a purely scientific matter and ought so to be treated.

METEOROLOGICAL WORK AT MARKREE OBSERVATORY.

By F. W. HENKEL, B.A., F.R.A.S.

MARKREE Observatory, Collooney, in the county of Sligo, Ireland, was founded in the year 1824 by the late E. J. Cooper, Esq., and from that date until the present meteorological registers were kept, though the earlier years were somewhat imperfect owing to his frequent absence from Markree. However, from 1833 to 1863, when Mr. Cooper died and the Observatory was for a time neglected, the records were as good and complete as possible.

The *Quarterly Journal of the Royal Meteorological Society* for April, 1884, contains a summary of rainfall and temperature for this period, contributed by Dr. Doberck, who was in charge of the Observatory

from 1874 to 1883, and is now Director of the Hong Kong Observatory.

There are unfortunately breaks in the record during the period 1863-1874, until the appointment of Dr. Doberck, inexperienced assistants having been employed to take the meteorological readings. The Observatory became a station of the second order about 1875, and since then weekly and monthly returns have been continuously made to the Meteorological Office, as well as rainfall returns to the late Mr. Symons and his successors, also weekly reports of temperature, rainfall, &c., to the Registrar General at Dublin. In May, 1883, Dr. Doberck was succeeded by the late A. Marth, the well-known astronomical computer *par excellence*, who remained in charge till his death in 1897, whilst I was appointed to succeed him in 1898.

Although this Observatory was at one time described as the "richest private observatory in the world," and from 1842 to 1860 was in charge of Mr. Graham (who is now at Cambridge), during which time observations of over 60,000 stars situated near the Ecliptic were made by him and published in four volumes at Dublin at the expense of the Government, of late years little but meteorological observations have been made.

Apart from the astronomical equipment, with which we are not concerned in this article, there is a unifilar magnetometer by Elliot, and also a dip-circle by Dover, which were added about 1882, but no magnet house having been built to shelter them, only preliminary work has been done with these instruments.

The meteorological instruments consist of the usual ones for a second order station, *i.e.*, a barometer, a dry and a wet bulb thermometer, a maximum and a minimum thermometer, a black bulb thermometer, a grass mininum thermometer, a Campbell Stokes sunshine recorder, and two rain gauges—one on the grass at a short distance from the Observatory, and the other on the wall sheltering the telescope, at a height of about 16½ feet from the ground.

The rainfall observations for the period 1833-1863 give a total annual rainfall of 44·87 in. The original rain gauge was square (area one square yard), placed on the top of the library at a height of 16 feet above the ground, and gave a total mean rainfall in this position of 37·254 in. From comparison of this gauge with one of the ordinary pattern (5 in. diameter), placed at 6 in. above ground, during the period 1875-1881, it was found that this amount must be multiplied by 1·2045 to reduce it to the level of the lower rain gauge, thus giving the reduced total annual rainfall of 44·87 in.

The year of most rain was 1861, and that of least rainfall 1856, and the greatest mean rainfall is in the month of October, the least occurring in May, for this period (1833-1863). The table published by the Meteorological Office giving mean rainfall for each month and the results of observations made during the 25 years (1871-1895) gives the mean annual rainfall at Markree as 41·26 in.; October,

with a mean of 4·45 in., being the wettest, and April, with 2·16 in., the driest month.

The records of temperature from 1833 to 1863 give as the mean annual temperature 48°·5 F., the highest monthly mean being for July (59°·2) and the lowest for January (39°·4). The highest temperature recorded was in June, 1851 (92°·0), and the lowest during this period was in February, 1855 (7°·2 F.) The thermometer during the frost in February this year (1902) even on the grass never fell below 8° F.

The table published by the Meteorological Office giving maxima, minima and mean temperatures for the period 1875-1895 (21 years), gives as the mean temperature of Markree 47°·4 F., the highest mean being for July and August (57°·2) and the lowest for December (38°·9).

During the earlier period the thermometers were read at 8 a.m. up to the 30th June, 1846, and at 10 a.m. subsequently up to 1863, so that the results obtained are not directly comparable with the later 9 a.m. and 9 p.m. observations. The maximum monthly rainfall (October) corresponds nearly with the epoch of the minimum range of temperature, and the minimum rainfall with that of the maximum range of temperature (May).

The record of sunshine for the period of 15 years (1881-1895) gives a mean annual duration of 1253·9 hours, or 28 per cent. of the possible duration ; but this is perhaps slightly below the truth, since the growth of trees in the neighbourhood of recent years has cut off a small amount of the evening sunshine in the summer. The most sunny month is May (183·2 hours, or 37 per cent. of the possible amount), and the most sunless month December (34·3 hours, or 15 per cent.) The mean annual sunshine of 1253·9 hours is made up as follows :—

	hours.		hours.
January	42·4	July	128·3
February	64·6	August	122·5
March	105·3	September	103·1
April	150·0	October	90·3
May	183·2	November	57·7
June	172·2	December	34·3

The barometer has been regularly read each morning and evening at 9 a.m. and 9 p.m., and the results, corrected for temperature and altitude above sea-level (130 feet) are sent each month to the Meteorological Office. During the last twelve months some very high and some very low readings have been observed, the highest corrected reading having been 31·0 inches, on January 31st, 1902, in the morning, and the barometer having fallen below 28·5 inches on several occasions during the autumn of 1901.

Observations are also made of the wind force and direction, and it has been found that of late years the prevailing wind is S.E. Owing to its comparatively sheltered position the wind at Markree is generally of less intensity than in the neighbouring districts.

The mean amount of cloudiness is rather high, and in the winter months, in addition to heavy rainfall, there is much gloomy overcast weather, when nothing can be seen of the sky except during occasional intervals of frost.

On the whole it is clear that the climate at Markree is more equable than in the neighbourhood of London. Though the mean annual temperature is slightly lower, the extremes are not so great; the highest temperature in summer does not rise so high, nor the lowest temperature in winter fall so low. The rainfall, though greater, is not excessively so, and the amount of bright sunshine (1253·9 hours) is actually greater than that of London, whilst there are never any fogs to be compared with those with which Londoners are only too familiar.

The following table gives the mean monthly rainfall during the period 1833—1863, as well as that for 1871—1895; and the mean monthly temperature. The earlier observations are multiplied by the factor 1·2045 to render the results of the two gauges comparable, as explained above; but even so, there is considerable difference between them, the rainfall having apparently been less of late years than in the earlier period. The mean monthly temperatures are given for the period 1842—1863, and also for 1875—1895, but the values are not directly comparable, since the thermometers were read at 8 a.m. up to 30th June, 1846, and at 10 a.m. thence up to 1863, whilst the late results are from the mean of the 9 a.m. and 9 p.m. observations.

Months	Mean Rainfall.		Mean Temperature.	
	1833-1863	1871-1895	1842-1863	1875-1895
	in.	in.	°	°
January	4·16	3·87	39·4	39·1
February	3·34	2·76	40·1	40·4
March	2·99	2·72	42·3	42·0
April	2·96	2·16	46·7	46·0
May	2·44	2·46	51·7	49·8
June	3·67	2·94	57·3	55·1
July	3·96	3·76	59·2	57·2
August	4·34	4·10	58·5	57·2
September	3·91	3·83	54·5	53·5
October	4·67	4·45	48·1	47·3
November	4·25	4·05	42·4	42·7
December	4·18	4·16	40·9	38·9
Mean Annual...	44·87	41·26	48·4	47·4

[We are glad to learn that the meteorological observations at Markree are being continued, though the work of the observatory is stopped, and we hope that they will be made permanent. The value of a long series of careful observations in the West of Ireland is very great.—Ed. *S.M.M.*]

Correspondence.

THE MOON AND RAINFALL.

To the Editor of Symons's Meteorological Magazine.

I DID not expect to be again the poor text of a lecture in these columns.

I am sincerely glad that Mr. Ellis has carried out a piece of work from which I was debarred, being much away from London (for health reasons). If he felt called by duty not only to ascertain truth (a truth of course strictly limited in scope), but also to convict an offender, be it so. I hope he may be wrong.

With much that he says I agree, while questioning its application. It might be well (the thing is arguable) that nothing should be published on those topics which is not in a sense "exhaustive," so that our sole pabulum would be elaborate memoirs coming out at long intervals. On the other hand, there seems to be a general consensus (good or bad) that truth may at least be also advanced in another way, —viz., by free suggestion and discussion, both conceived in a generous and philosophic spirit. A man may say, and may be usefully allowed to say, "Here is a point that seems worth investigating; here is a vein that looks promising; here is a striking regularity of weather through a series of years; can it be traced further back? let us see if it persists in the future." The thought of one mind is brought before a great many other minds, and by some of these it is turned over and over, carefully examined and tested, proving to be valuable or otherwise. The "fragmentary" work of A furnishes hints to B, C, and D, perhaps men with better opportunities, perhaps in other countries, and is by them extended and developed. Ideas are exchanged; the deadly stagnation to which we are always liable is broken up, and meteorology "does get forrid" a little. The method may involve some little waste of time in hunting up and reading; but where statement is clear, the disciplined mind quickly gets to the core of a thing, and "spots" that which is valuable. When the great constructive genius comes along (which is but rarely), he finds much of his material in the "fragmentary" products of humbler workers before him.

It seems to me that most of the papers brought before learned societies, or otherwise published in Europe, must be pronounced "fragmentary," more or less. Does the *Met. Mag.* contain much that is exhaustive in its long and useful series, or the "Quarterly Journal," which Mr. Ellis partly controls?

I am afraid the dock in which Mr. Ellis would place me must be pretty capacious to hold all that should join me in it. I could cite not a few recent papers which deal with the lunar question on a still more slender basis than that of about 150 synodical revolutions (12 years). The eminent meteorologist who lately wrote

you (M. Dechevrens) thought fit to bring before a French society a single year's rainfall at his station in China, in its relation to lunar phases. A still more heinous offence, surely, on Mr. Ellis's showing! I dissent entirely.

It will be seen that, with all respect for Mr. Ellis, and accepting what truth he establishes, I am still unable to think myself an egregious culprit for sending that quite unpretentious letter, or you foolish for printing it; but I may get further light on these things.

As to the general question of a contrast in wetness due to the moon, I have some reason to believe the last word has not been said.

ALEX. B. MACDOWALL.

THE MOON AND THUNDERSTORMS.

To the Editor of Symons's Meteorological Magazine.

IN the Journal of the British Astronomical Association for June (p. 342) it is mentioned that Greenwich observations show thunderstorms to be slightly more frequent about the time of new moon than at full; and that Senor Ventosa finds similar results from Madrid observations.

On examining my own registers I find that of the 97 thunderstorms I have recorded in the 30 years, 1872-1901 inclusive, 43 were within seven days before or after new moon, 54 within seven days before or after full moon, so that if any inference is to be drawn on the subject, the question requires to be examined afresh.

The old idea of the effect of the moon on the weather keeps cropping up from the days of Theophrastus, who says "the new moon is generally an epoch of bad weather," to the present time.

S. J. JOHNSON, F.R.A.S.

Melplash Vicarage, Bridport, July 9th.

DOUBLE SOLAR HALO.

To the Editor of Symons's Meteorological Magazine.

ON Friday, May 30th, 1902, when in Norway near Sand, lat. 59½ N. long. 0° 24′ East, I was fortunate enough to witness a perfect double solar halo, viz., the ordinary halo of 22° and an elliptical halo (called by Bravais the *Halo circonscrit*), which is really formed by the junction of the upper and lower tangent arcs. The greatest distance between the outer and inner halo, at the points to right and left of the sun, I estimated as about 3°; at the points immediately above and below the sun two halos were apparently superposed, the maximum brilliancy being above, where the colours orange-red, yellow and blue, showed up very brightly, and in that order from the sun. At the point immediately below, the same colors, though

easily distinguished, were not so bright as above. The lateral arcs were more clearly defined in the outer than in the inner halo, but both halos were perfect for at least an hour; the time was about 11 a.m., L.M.T., and the sun's altitude 50° approximately. Light clouds of the cirrus type prevailed, but there was no trace of parhelia or other forms of halo.

CHARLES L. BROOK.

Harewood Lodge, Meltham, July 3rd, 1902.

ROYAL METEOROLOGICAL SOCIETY.

THE concluding meeting of the present Session was held on Wednesday afternoon, June 18th, at the Society's Rooms, 70, Victoria Street, Westminster, Mr. R. Inwards, F.R.A.S., Vice-President, in the chair.

Mr. L. H. Proud and Dr. H. Vallance were elected Fellows of the Society.

Mr. F. Campbell Bayard read a paper entitled "English Climatology, 1891–1900," which was a discussion of the climatological data printed in the *Meteorological Record*. In 1874 the Royal Meteorological Society commenced the organization of a series of "second-order" stations at which the observations are made twice a day on a uniform plan, so that the results are strictly comparable with each other. In addition to these, the Society in 1880 organized another class of stations, termed "climatological," at which the observations are made once a day, viz., at 9 a.m. Mr. Bayard on a former occasion worked up the results from the climatological stations for the 10 years 1881–1890, and in the present paper he gives the averages from 69 stations for the 10 years 1891–1900. The elements dealt with are:—(1) temperature at 9 a.m.; (2) mean minimum temperature; (3) mean maximum temperature; (4) mean temperature; (5) relative humidity; (6) amount of cloud; (7) rainfall; and (8) number of rainy days. The results form a valuable contribution to the climatology of the British Isles.

The Chairman, in expressing thanks to Mr. Bayard for his paper, said that few people could realize the amount of labour represented by these detailed investigations.

Mr. W. Marriott was glad that Mr. Bayard had discussed the observations published in the *Meteorological Record*, and was pleased to see that the results agreed so well together. After referring to the difficulties connected with the proper working of the wet bulb thermometer during frost, Mr. Marriott exhibited maps of relative humidity for January and July, which he had prepared from the figures given by Mr. Bayard. In January the greatest relative humidity prevailed over the eastern part of England from the Humber to the Severn, except along the south coast, while the driest part was the west coast of Wales. In July the greatest

dryness was over London and practically the whole of the home counties, and the greatest humidity was in the northern and in the south-western parts of the country. He also exhibited maps of England, showing the amount of cloud in the same manner. From these it appeared that in January the greatest amount of cloud was over the Thames valley and the manufacturing districts of Lancashire (London being the most cloudy of all), while the least cloud was along the south coast. In July the greatest amount of cloud was over the north-western part of the country, excepting along the coast, while the districts with the least amount of cloud were the south coast and on the coasts of North Wales and Lancashire.

Dr. Theodore Williams said that Mr. Bayard's paper would help to place British meteorology on a broader basis. Medical men should feel particularly obliged, since health was largely dependent upon climate, and this paper supplied valuable facts.

Dr. H. R. Mill hoped that Mr. Bayard would combine the results of his two papers, so as to furnish 20 years' averages. He pointed out that the January map, exhibited by Mr. Marriott, showed a striking agreement of relative humidity with geological formation, the whole of the area with the highest humidity being over those parts of the country where nearly level plains of clay covered much of the surface, and tended to retain moisture on the land. The regions of low relative humidity, on the other hand, though subject to heavy rainfall, were made up of steep slopes, allowing a rapid run off.

Mr. C. Harding having referred to the distribution of temperature and rainfall, and Mr. J. Hopkinson having pointed out that the paper was a complete justification of the continuance of the *Meteorological Record*, Mr. Bayard briefly replied to the remarks.

A paper was submitted by Mr. W. L. Dallas on "Earth Temperature Observations recorded in Upper India," in which he discussed the observations made on the temperature of the soil at three stations, viz., Lahore, the capital of the Punjab; Dehra Dun, in the north-west of the North Western Provinces; and Jaipur, the capital of the native state of that name. The observations, which were made at depths varying from 4 inches to 45½ feet below the surface, extended from 1884 to 1899.

METEOROLOGICAL NEWS AND NOTES.

METEOROLOGICAL KITE FLYING has been taken up in several parts of Europe. M. Teisserenc de Bort, together with Dr. Paulsen, Director of the Danish Weather Service, and Professor Hildebrandsson, of Stockholm, were engaged during July in experiments in the middle of Jutland, where some records from great heights were obtained, and we understand that it was their intention to proceed later to the Island of Oeland, off the east coast of Sweden, in order to continue the work.

THE KITE EXPERIMENTS AT CRINAN, being carried out by Mr. Dines for the joint Committee of the British Association and the Royal Meteorological Society, are being continued during the month of August. During the week from July 28th to August 2nd, ascents were made daily or twice daily, and records obtained from heights up to 8950 feet, or nearly $1\frac{3}{4}$ miles.

THE INTERNATIONAL COUNCIL FOR THE STUDY OF THE SEA held its first meeting in Copenhagen from July 22nd to 26th, when Great Britain, Germany, Holland, Denmark, Norway, Sweden, Finland and Russia were represented. The British delegates were Sir Colin Scott Moncrieff and Professor D'Arcy Thompson, who were accompanied by Dr. H. R. Mill and Mr. W. Garstang as advisers on oceanography and fisheries respectively. The Council decided that on account of the conditions attached by many of the participating governments to their promises of support, the primary work of the Council must be the investigation of problems directly bearing on the capture of fish. It is to be feared accordingly that the advantages of the international research to Meteorology may be less than the proposals of the Christiania Conference had led us to hope. The indirect results will, however, be of value.

THE DROUGHT IN AUSTRALIA has assumed the most serious dimensions, and we have received a large number of newspaper cuttings from correspondents describing the state of things in various parts of the commonwealth. It is difficult in the absence of precise data to compare the condition with that of previous dry periods; but many old residents assert that the present dearth of rain is unprecedented. The almost complete failure of rain in the interior during the first half of 1902, coming after a series of exceptionally dry years, has proved most destructive to sheep, and at the end of May the mail coaches ceased running over 2000 miles of roads on account of the impossibility of obtaining fodder for the horses.

WINTRY WEATHER IN SUMMER is no new experience, though its occurrence is rarely so pithily recorded as in the following extract from Richard Allyn's "Narrative of the Battle of La Hogue in 1692," to which attention was called by Professor J. K. Laughton in *The Times* of June 12th this year :—

"June 24th [o.s.].—This morning the wind sprung up fresh, northerly, with filthy rainy weather. The Almanacs call this Midsummer Day. It may have been so formerly, but I am sure it is not so now, for we have had no summer yet. Good God ! how it blows and rains. I dare challenge any day in winter to compare with this Midsummer Day for cold, rainy, and stormy weather.

"June 25th.—Why certainly the whole course of nature is inverted. Lord! here's winter all the year round, and the weather as bad or worse than it was on Midsummer Day. We were in hopes to have dated an end of winter from Midsummer Day, but, alas, I find it will be winter still."

JULY, 1902.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1890-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·40	— ·85	·45	1	11	85·1	15	44·9	12	0	0
II.		Tenterden	1·39	— 1·21	·61	1	13	84·0	15	43·5	12	0	0
,,		Hartley Wintney	1·29	— 1·07	·30	1	10	83·0	8	41·0	22*a*	0	0
III.		Hitchin	1·88	— ·53	·92	1	10	82·0	13	41·0	11	0	...
,,		Winslow (Addington)	1·27	— 1·20	·25	9	9	85·0	14	37·0	12	0	0
IV.		Bury St. Edmunds (Westley)	1·22	— ·69	·30	9	8	86·0	15	40·0	12	0	...
,,		Norwich (Brundall)	2·11	— ·76	·33	9	14	83·4	15	40·6	3	0	0
V.		Winterborne Steepleton	1·83	...	·81	19	10	78·4	15	38·2	12	0	1
,,		Torquay	2·25	...	1·05	19	11	77·5	15	47·5	22	0	0
,,		Polapit Tamar [Launceston]..	2·36	— ·66	1·02	19	10	79·9	14	36·0	12	0	0
VI.		Stroud (Upfield)	1·28	— 1·33	·38	25	11	80·0	14	47·0	11	0	...
,,		Church Stretton (Woolstaston)	1·54	— ·79	·37	25	15	80·0	14	41·0	22	0	0
,,		Worcester (Diglis Lock)	1·51	— ·25	·40	1, 24	11	...	...	...	...	...	...
VII.		Boston	1·35	— ·77	·20	1, 9	12	84·0	15	43·0	3	0	...
,,		Hesley Hall [Tickhill].....	1·62	— ·35	·48	25	13	81·0	14	39·0	25	0	...
,,		Derby (Midland Railway).....	1·40	— ·91	·38	25	12	84·0	14	40·0	12	0	...
VIII.		Manchester (Plymouth Grove)	2·14	— ·98	·45	26	16	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ...	2·39	+ ·10	·56	25	14	...	...	...	...	...	...
,,		Skipton (Arncliffe)	4·68	— ·35	·98	25	19	...	...	...	...	...	...
,,		Hull (Pearson Park).	2·43	+ ·11	·55	25	18	84·0	15	40·0	25	0	0
X.		Newcastle (Town Moor)	3·18	+ ·49	1·53	26	19	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	7·05	— 2·36	1·33	9	17	74·8	4	42·4	2	0	...
XI.	WALES.	Cardiff (Ely).....	1·98	— 1·26	·73	19	11	...	...	...	...	...	...
,,		Haverfordwest	2·89	— ·45	1·13	25	7	74·3	14	41·2	12	0	0
,,		Aberystwith (Gogerddan) ...	1·90	— 1·72	·54	4	11	79·0	6	34·0	14	0	...
,,		Llandudno.....	1·54	— 1·04	·47	26	15	73·5	6	44·5	25	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	2·48	— ·86	·77	25	13	71·0	5, 6	35·0	25	0	...
XIII.		Edinburgh (Royal Observatory)	2·43	...	·90	26	16	67·9	6	43·6	2	0	0
XIV.		Colmonell	3·06	— ·14	·63	12	16	76·0	4, 6	37·0	20	0	...
XV.		Tighnabruaich	4·75	...	1·40	12	16	68·0	1	39·0	24	0	...
,,		Mull (Quinish).....	3·51	— ·60	·52	3	25	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·89	— ·18	·81	27	14	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	2·75	+ ·39	·80	23	13	75·9	15	39·9	2	0	...
XVII.		Braemar	1·84	— ·93	·42	26	17	70·0	5	34·6	26	0	2
,,		Aberdeen (Cranford)	4·18	+ 1·55	1·06	26	20	80·0	15	38·0	24	0	...
,,		Cawdor (Budgate)	3·51	+ ·09	1·06	9	21	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	2·33	— 2·33	·56	8	11	...	...	...	...	...	...
,,		Glencarron Lodge.....	4·57	— 2·33	·80	9	24	64·7	5	39·7	24	0	...
XIX.		Dunrobin	3·54	+ ·84	1·31	17	17	70·0	6	38·0	24	0	...
,,		S. Ronaldshay (Roeberry) ...	2·32	— ·57	·41	28	24	67·0	3	40·0	23	0	...
XX.	IRELAND.	Darrynane Abbey.....	3·40	— ·32	1·82	3	17	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	3·41	+ ·03	1·99	25	7	75·5	1	43·5	21	0	...
,,		Broadford (Hurdlestown) ...	...	...	...	...	...	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	2·68	— ·27	1·14	25	12	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	3·16	+ ·58	1·34	25	17	74·8	13	45·1	21	0	0
XXII.		Ballinasloe	1·62	— 1·65	·84	25	21	73·0	16	41·0	28	0	...
,,		Clifden (Kylemore)	3·40	— 3·19	·56	2	16	...	...	...	...	...	...
XXIII		Seaforde.....	3·43	+ ·24	1·29	25	18	76·0	8	39·0	24	0	0
,,		Londonderry (Creggan Res.).	3·90	+ ·20	·65	19	21	...	...	...	...	...	...
,,		Omagh (Edenfel)	3·95	+ ·40	·90	25	22	72·0	...	36·0	...	0	1

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

a—and 23.

SUPPLEMENTARY TABLE OF RAINFALL, JULY, 1902.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	1·64	XI.	Castle Malgwyn	2·35
II.	Dorking, Abinger Hall .	1·27	,,	Builth, Abergwesyn Vic.	...
,,	Sheppey, Leysdown	1·62	,,	Rhayader, Nantgwillt ...	...
,,	Hailsham	1·54	,,	Lake Vyrnwy	2·05
,,	Crowborough.....	1·68	,,	Ruthin, Plâs Dráw	1·49
,,	Ryde, Beldornie Tower..	·96	,,	Criccieth, Talarvor	1·97
,,	Emsworth, Redlands ...	1·57	,,	I. of Anglesey, Lligwy..	1·87
,,	Alton, Ashdell	1·08	,,	Douglas, Woodville.....	3·60
,,	Newbury, Welford Park	·82	XII.	Stoneykirk, Ardwell Ho.	3·06
III.	Oxford, Magdalen Coll..	·65	,,	Dalry, Old Garroch	3·18
,,	Banbury, Bloxham	1·17	,,	Moniaive, Maxwelton Ho.	2·40
,,	Pitsford, Sedgebrook ...	1·39	,,	Lilliesleaf, Riddell	2·85
,,	Huntingdon, Brampton.	1·30	XIII.	N. Esk Res. [Penicuick]	2·80
,,	Wisbech, Bank House...	1·69	XIV.	Glasgow, Queen's Park..	2·63
IV.	Southend	1·12	XV.	Inveraray, Newtown ...	4·87
,,	Colchester, Lexden	1·07	,,	Ballachulish, Ardsheal...	3·98
,,	Saffron Waldon, Newport	1·55	,,	Islay, Eallabus..... ...	4·37
,,	Rendlesham Hall	4·21	XVI.	Dollar.....	3·65
,,	Swaffham	2·70	,,	Balquhidder, Stronvar...	2·94
V.	Salisbury, Alderbury ...	1·22	,,	Coupar Angus Station...	2·33
,,	Bishop's Cannings	1·11	,,	Blair Atholl	1·75
,,	Blandford, Whatcombe .	...	,,	Montrose, Sunnyside ...	2·79
,,	Ashburton, Druid House	3·44	XVII.	Keith H.R.S.....	5·36
,,	Okehampton, Oaklands.	3·14	XVIII.	Fearn, Lower Pitkerrie..	2·90
,,	Hartland Abbey	3·12	,,	S. Uist, Askernish	...
,,	Lynmouth, Rock House	2·41	,,	Invergarry.....	2·52
,,	Probus, Lamellyn	2·35	,,	Aviemore, Alvie Manse.	2·27
,,	Wellington, The Avenue	2·12	,,	Loch Ness, Drumnadrochit	1·82
,,	North Cadbury Rectory	1·65	XIX.	Invershin	2·30
VI.	Clifton, Pembroke Road	1·27	,,	Bettyhill	3·16
,,	Ross, The Graig	...	,,	Watten H.R.S.....	2·39
,,	Shifnal, Hatton Grange	1·58	XX.	Dunmanway, Coolkelure	2·41
,,	Wem, Clive Vicarage ...	1·02	,,	Cork, Wellesley Terrace	2.40
,,	Cheadle, The Heath Ho.	1·82	,,	Killarney, District Asyl.	1·66
,,	Coventry, Priory Row ..	1·36	,,	Caher, Duneske	...
VII.	Market Overton	1·22	,,	Ballingarry, Hazelfort...	2·33
,,	Grantham, Stainby	1·43	,,	Miltown Malbay	1·80
,,	Horncastle, Bucknall ...	1·24	XXI.	Gorey, Courtown House	2·86
,,	Worksop, Hodsck Priory	1·62	,,	Moynalty, Westland ...	3·43
VIII.	Neston, Hinderton	2·24	,,	Athlone, Twyford	2·52
,,	Southport, Hesketh Park	2·37	,,	Mullingar, Belvedere ...	3·60
,,	Chatburn, Middlewood.	3·49	XXII.	Woodlawn	2·29
,,	Duddon Val., Seathwaite Vic.	5·05	,,	Westport, Murrisk Abbey	2·93
IX.	Baldersby	1·88	,,	Crossmolina, Enniscoe ..	2·08
,,	Scalby, Silverdale	2·17	,,	Collooney, Markree Obs.	2·71
,,	Ingleby Greenhow Vic..	3·54	XXIII.	Enniskillen, Model Sch.	...
,,	Middleton, Mickleton ...	3·55	,,	Warrenpoint.....	4·72
X.	Beltingham	2·66	,,	Banbridge, Milltown ...	3·59
,,	Bamburgh	...	,,	Belfast, Springfield	...
,,	Keswick, The Bank	2·72	,,	Bushmills, Dundarave..	3·38
XI.	Llanfrechfa Grange	1·54	,,	Stewartstown	3·53
,,	Treherbert, Tyn-y-waun	3·73	,,	Killybegs	3·52
,,	Llandovery	1·58	,,	Horn Head	3·45

METEOROLOGICAL NOTES ON JULY, 1902.

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.

ENGLAND.

LONDON, CAMDEN SQUARE.—After a sharp TS on 1st the weather was generally fine and warm until the 18th, broken only by R on 9th and a TS on 10th. The last fortnight was cold and inclement with slight R nearly every day. Mean temp. 62°·6 or 0°·7 below the average.

UXBRIDGE, HAREFIELD PARK.—On 1st ·63 in. of R fell in 38 mins.

ABINGER HALL.—Very variable both as regards temp. and R.

TENTERDEN.—Slight TS with heavy R on evening of 1st, but only showers later in month. Drought becoming as serious as in other dry years, and wells and ponds lower than in 1901. Duration of sunshine, 222 hours.

CROWBOROUGH.—With absolutely dry periods from 2nd to 8th and from 11th to 16th, the R, though much below the average of 31 years, was fairly distributed over the remaining days, and there was no urgent need of moisture.

HARTLEY WINTNEY.—Dry and cold with remarkably low temp. The 14th, 15th and 16th were cloudless. Ozone on 4 days with a mean of 2·3. TS on 1st.

HITCHIN.—The coldest and most sunless July ever remembered.

COLCHESTER, LEXDEN.—Several hot days during the first half. From 18th to close it was remarkably cool with much cloud. TS on 9th.

BURY ST. EDMUNDS, WESTLEY.—Dry with great variation in temp. Very high wind on 26th. T on 3 days.

BISHOP'S CANNINGS.—R 1·28 in., and rainy days 3, below the average. Harvest will be late. T and H on 10th.

WINTERBOURNE STEEPLETON.—Only between the 6th and 17th was the weather really warm. Mean temp. 57°·2 or 2°·9 below the average of 9 years.

TORQUAY, CARY GREEN.—R ·11 in., and mean temp. 3°·7, below the average. Duration of sunshine 245·7 hours, being 27·8 hours above the average. Mean amount of ozone 4·3.

OKEHAMPTON OAKLANDS.—Fine and dry until 19th, when there was a heavy downpour. The rest of the month was wet and ungenial.

WELLINGTON, THE AVENUE.—The first half was fairly fine with some brilliant days, but in the last fortnight no day had a max temp. of 70°, and many were sunless.

NORTH CADBURY RECTORY.—The coolest July in 6 years. The first 18 days had nice sunny weather, splendid for hay. The remaining 13 were cool, gloomy and rather windy and showery.

CLIFTON, PEMBROKE ROAD.—Fine warm weather till 18th except 9th and 10th. The rest of the month was cold and ungenial with little sunshine and R on most days. Total R less than half the average.

HULL, PEARSON PARK.—Very variable weather. Frequently cold and unpleasant with a meagre amount of sunshine.

WALES AND THE ISLANDS.

HAVERFORDWEST.—Fine generally but broken, considerable falls of R occurring on 19th and 25th. Temp. generally low, the shade max. exceeding 70° on 7 days only. Strong winds very prevalent. Crops everywhere looking well,

ROSSETT, TREVELYAN HALL.—The min. temp. on 25th was 35°·5, the lowest in July during 31 years. There is a persistent run of low temp., consequent on cloudy skies and unsettled weather.

DOUGLAS, WOODVILLE.—Another abnormally cold month, probably coldest July on record, the temp. being persistently below the average throughout. The wind remained obdurately in the N. and during the last fortnight was very strong. All crops very backward.

SCOTLAND.

LILLIESLEAF, RIDDELL.—Wind very cold and mostly northerly. An abundance of "silent" TSS and R showers, but hay was got well in. Fruit and vegetables at least a month late.

MULL, QUINISH.—Cold and showery from first to last.

COUPAR ANGUS.—R ·62 in. above the average, falling sparingly on 14 days and excessively on 2. Except the first two weeks the weather was more like May than July. Normal temp. for the first half and cold later.

WATTEN, H.R.S.—The first part was dull and showery growing weather. The latter and greater part was cloudy, cold and wet.

S. RONALDSHAY ROEBURY.—Cold and changeable. Mean temp. 50°·5, or 4°·6 below the average.

IRELAND.

DARRYNANE ABBEY.—On the whole fine and fairly warm.

CORK, WELLESLEY TERRACE.—The mean temp. was the lowest in July for 20 years. There were only 5 days worthy of the name of summer.

MILTOWN MALBAY.—Moderately warm and very dry. All craggy and stony lands burned up and pastures burned and wilted. Hay crops scanty but crops looking well.

DUBLIN, FITZWILLIAM SQUARE.—The month opened well with spells of summer-like weather in the first fortnight, but after the 17th the temp. was low and cold N.W. winds prevailed with sunless skies. Mean temp. 59°·6, or 0°·7 below the average.

OMAGH, EDENFEL.—The brilliant summer weather of the latter part of June was not repeated in July. On the contrary, the R was above and temp. below the average, and much difficulty was experienced in saving the hay crop, which was still uncompleted at the end. Cereals and green crops will be late, but of nearly average quantity.

THE TEMPERATURE OF JULY, 1902, IN LONDON.

A COMPARISON of the average temperature of July with the means of 40 years' observations at Camden Square shows that, considering the month as a whole, the conditions differed very slightly from the normal. This is chiefly due to the fact that two bursts of warm weather, from 4th to 8th and from 13th to 17th, neutralised the cold and unseasonable character of the remainder of the month. Except during these two periods the mean temperature rose above the average on only one day, the 26th, whilst the maximum failed to reach 75° except on the 1st, and the minimum only exceeded 55° on three occasions. The lowest temperatures were, however, not remarkable, since lower July maxima have been recorded in 8 years and lower minima in 19 during 45 years.

Dividing the month into two halves, we get the following results :—

	Mean max.	Diff. from average.	Mean temp.	Diff. from average.	Mean min.	Diff. from average.
	°	°	°	°	°	°
1st to 16th	77·1	+3·0	65·1	+1·8	54·1	+0·1
17th to 31st	69·4	—4·7	60·1	—3·2	52·0	—2·0

showing that the cold weather was chiefly confined to the latter part. The lowest minima took place on the 3rd and 12th, whilst the second half of the month was characterised rather by persistent low temperature than by any remarkably low readings. The averages for this period show that, although cold, it was by no means unique, since the mean maximum for the whole month of July has been lower in three years than that of the colder half of July, 1902, the mean temp. in three, and the mean minimum in five years. In other parts of the country there is reason to believe that the month was relatively much colder than in London.

That the bad character given to the weather of July in the columns of the press is not due to any particular cloudiness is shown by the fact that the average amount at Camden Square was only 5·6, or 0·1 below the average, and that for the two halves 4·6 and 6·7, whilst in July, 1879, the average for the whole month reached 7·9, and in 1888 7·7, and 6·7 has been exceeded on four occasions. The total duration of sunshine at Westminster was 179 hours against an average of 186 hours.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1902.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	52·7	28	15·8	16	40·5	31·0	32·5	87	76·0	14·3	1·13	11	7·1
Malta	67·4	15	40·4	17	62·8	50·2	50·7	84	121·7	34·1	2·21	8	4·8
Lagos, W. Africa	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape Town	94·2	10	53·3	25	79·6	61·4	58·7	68	...	...	·52	3	3·6
Durban, Natal	95·2	20	60·5	10	87·1	68·6	...	...	151·3	...	2·09	12	4·4
Mauritius	88·4	3	68·0	3	84·1	73·1	71·0	78	155·2	62·5	17·52	21	7·1
Calcutta	...	...	...	...	...	...	...	...	140·0	41·1	·02	1	1·7
Bombay	90·3	8	64·1	7	85·1	70·0	66·3	70	139·6	55·7	·00	0	2·2
Madras	90·2	26	62·2	6	86·4	67·3	67·4	75	141·2	58·2	·05	1	2·4
Kodaikanal	71·1	2	43·5	10	65·0	46·9	...	56	134·6	29·3	1·66	3	0·3
Colombo, Ceylon	92·6	23	69·8	7	80·4	74·3	70·1	75	158·0	64·4	2·90	4	2·8
Hongkong	75·3	25	40·5	4	65·0	54·3	46·6	60	128·5	...	·02	2	4·0
Melbourne	95·3	9	47·3	5	74·7	54·9	49·5	62	159·6	36·9	·95	8	5·9
Adelaide	111·4	11	51·6	16	83·0	59·0	50·8	50	167·9	45·4	·35	5	3·8
Coolgardie	104·5	7	49·8	24	89·3	59·6	58·4	49	...	...	1·35	4	2·2
Sydney	96·3	6	58·6	14	79·1	65·0	57·9	66	144·7	46·8	·34	12	4·9
Wellington	76·5	9	47·0	13*a*	69·1	56·1	51·9	67	124·0	38·0	1·38	12	5·0
Auckland	79·0	4	54·0	15	72·2	59·6	53·9	66	144·0	52·0	·44	7	4·0
Jamaica, Negril Point	86·0	3	62·0	19	83·3	70·7	71·0	82	...	...	·10	2	...
Trinidad	89·0	18*b*	65·0	4, 5*c*	87·3	67·4	66·6	68	162·0	58·0	·51	2	...
Grenada	85·0	3	69·0	4	82·3	72·9	68·7	73	150·0	...	1·08	8	2·4
Toronto	45·0	28	1·0	5	28·1	14·4	18·6	80	61·5	—2·2	1·50	9	5·7
Fredericton, N.B.	50·3	27	—22·0	12	31·5	9·9	13·8	67	...	...	3·38	11	6·5
Winnipeg	44·0	22	—28·7	3	21·1	—0·2	...	...	...	...	·54	6	6·2
Victoria, B.C.	55·4	20	29·2	1	48·5	40·7	...	...	...	...	2·47	19	8·1
Dawson, Yukon	24·8	21	—49·0	2	0·9	—15·2	...	...	...	...	·20	1	...

a—and 17. *b*—and 25. *c*—and 17 & 24.

REMARKS.

MALTA.—Mean temp. of air 56°·2, or 2°·1 above the average. Mean hourly velocity of wind 10·9 miles, or 1·0 below the average. Mean temp. of sea 59°·9. J. F. DOBSON.

Mauritius.—Mean temp. 0°·5 below, and rainfall 10·47 in. above, the average. Mean hourly velocity of wind 15·7 miles, or 4·5 miles above the average. From February 2nd to 18th four cyclones occurred in the South Indian Ocean. T. F. CLAXTON.

MADRAS.—Mean temp. below average during the latter half of the month, on account of low night temp. Bright sunshine 242·1 hours. Evaporation 4·55 in. A. MOFFAT.

COLOMBO.—Mean temp. 80°·4, or 0°·2 above, dew point 0°·3 below, and R 2·63 in. above, their respective averages. Mean hourly velocity of wind 6·5 miles; prevailing direction N.E. to N.W. H. O. BARNARD.

HONGKONG.—Mean temp. 59°·5, or 1°·8 above, R 1·30 in. below, bright sunshine 200·5, or 122·8 above, their respective averages. Mean hourly velocity of wind 12·7 miles. F. G. FIGG.

Adelaide.—Mean temp. 71°·0 being 3°·2 below 45 years' average. Moderate rains fell over coastal district, but interior very dry, and monsoon rain of N. territory much under the average. C. TODD, F.R.S.

Sydney.—Mean temp. 1°·1 above, R 4·64 in. below, humidity 6·9 below, their respective averages. H. C. RUSSELL, F.R.S.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXL.] SEPTEMBER, 1902. VOL. XXXVII.

THE RAINFALL OF AUGUST.

A WET August is a misfortune of very wide incidence. It interferes seriously with harvest operations, and it washes the happiness out of the holidays of multitudes to whom the month brings the one opportunity of the year for healthy open-air enjoyment. From the fact that August is the outdoor month *par excellence*, more attention is perhaps paid to the weather than at other seasons, and unless it proves abnormally dry there is a tendency, which the newspapers are ready to encourage, to consider it abnormally wet. This year the complaints in the Press have been loud and frequent. The facts when collected and compared show that the month as a whole was by no means a bad one taken as a whole, so far as a low rainfall makes good weather.

In the south and east of England, August, 1902, was undoubtedly wet, but not excessively so. In other parts of the country it was dry, and over the greater part of the British Isles it still leaves a considerable deficiency of rainfall compared with the average (itself deficient) of the ten years 1890-99. Looking first at the absolute fall it is natural to expect that in a month the heavy rains of which are due mainly to thunderstorms, dry and wet areas should be frequently found very near each other.

Four small and isolated districts were remarkably dry, having less than two inches of rain for the month, and the holiday-makers who chose those localities had no cause to complain. These were—(1) Cornwall and a strip of North Devon, (2) the central part of the Southern Uplands of Scotland extending from the Firth of Forth to the Tweed, (3) Caithness and the east of Sutherland, and (4) a narrow strip in the middle of the valley of the Shannon.

Rainfall exceeding four inches for the month occurred in the centre of the Lake District, in the centre of North Wales, in the Killarney district, and in the Western Highlands, all places which have a naturally high rainfall, to which the tourist goes taking the risk well knowing that the exquisite beauty of one fine day is worth paying for with several wet ones. But rainfall also exceeded four inches along a broad belt of the south of England from Dorset to Kent, and along another broad strip running from London to

Yarmouth, where such heavy rain is distinctly more than was to be expected; even here the rainfall was very rarely one-third more than the average for the month. At several points in the south the fall exceeded five inches; but taking these also into account, we do not consider that more than the average quantity of rain fell on the British Islands as a whole last month. The deficiency in Ireland and the east of Scotland was more remarkable than the excess in Shropshire, parts of Hereford, and the south-east of England.

This opinion is confirmed by the study of the cumulative table of rainfall for the eight months ending with August 31st, which shows that the country as a whole is still suffering from a deficiency of rainfall. So far as the returns received up to the time of writing this summary enable us to judge, the rainfall this year has only exceeded the average for the period 1890-99 in central England south of the Humber and Mersey, in eastern England from the Humber to the North Downs (where the excess averages about 10 per cent.), in the extreme north-east of Scotland, and in the north-east of Ireland. The deficiency is most marked in the Lake District and the west of Yorkshire, in some parts of which less than two-thirds of the usual amount of rain have fallen. The midland valley of Scotland, between the Forth and Clyde, shows a deficiency of about 20 per cent., while some points in the west of Ireland and the west of Wales have been nearly as dry.

In referring to the table of cumulative rainfall, we take the opportunity of urging on those of our correspondents who are good enough to send observations for it, to do their best to send the returns in on the first day of the following month or as soon afterwards as possible. Although the table may be completed by the insertion of figures received the very day before it is printed, it is impossible to refer in the discussion to any returns but those which have been received early.

Correspondence.

RAINFALL OF AUGUST 16TH AND 18TH.

To the Editor of Symons's Meteorological Magazine.

A severe thunderstorm occurred at 11.15 p.m. on the 16th, up to which hour the day had been dry. The heavy rain measured 1·15 in. at 9 a.m. next day. On the morning of the 18th the measured fall was 0·10 in.; and on the morning of the 19th 1·49 in. was measured.

J. J. S. DRIBERG.

Uckfield Lodge, Crowborough, 19th August, 1902.

At 4.30 p.m. on the afternoon of the 17th thunder was heard in the S.W., and rain began to fall at 5.5, and after a heavy clap of thunder at 5.15 suddenly ceased at 5.20. On emptying the rain

gauge immediately afterwards I found that ·45 in. had fallen in fifteen minutes. No other rain fell during the day, and the evening was bright and fine. WILLIAM HALL.

Swerford, Oxford.

THE RAIN OF AUGUST 29TH AND 30TH.

To the Editor of Symons's Meteorological Magazine.

The rainfall of August 29th and 30th was so exceptional here, as well as local, that I am interested in knowing whether any other place has had a like experience. Friday was a very fine day, and on returning from a country drive at 6 p.m. I noticed that the west and south-west were getting very overcast and thick, at the same time the weather was calm and the barometer only slightly falling. The fall from 9 a.m. 29th to 9 a.m. 30th was 0·065 in., or corrected (sea and 32°) 29·681 in. to 29·616 in. The weather continued fine till 8.15 p.m., when rain began, at first quietly, but soon settled down to a steady pour till 9 a.m. next morning, or for a little over 12 hours. The next day was very gloomy, and also the night following, with occasional rain, but the air was completely saturated, humidity being 99. The amounts of rain registered were—

August 29th	1·25 in.
,, 30th	0·26 ,,
	1·51 ,,

The wind, which had been N.W., veered to N. and then to N.E., later becoming S.E. There was no appearance or sign that there was anything electric about the storm.

I have not seen many records except those published by the Meteorological Office, and these contain no station with special fall. The fall was extremely local. It varied here from 1·56 in. to 1·40 in., but at a station two miles to the south on the other side of a hill, 675 ft. above sea-level, less than half the quantity fell. At Worcester I hear they had a great downpour, but at Bath and Bristol and in South and North Wales it does not appear to have been experienced. It is not uncommon for us to have a heavy fall not generally extending to Swindon from an E.N.E. to N.E. wind, but generally it arises from a well-marked storm coming from S.W., and this time there is no such reason. H. SOUTHALL.

The Graig, Ross, September 2nd, 1902.

[So far as we can ascertain the rainfall in the east of Wales and west of England on the two days in question very rarely reached half-an-inch. The aggregate fall for August 29th and 30th at Clifton was ·47 in., at Cardiff ·39 in., at Llanvihangel Court 1·31 in., at Llanfrechfa Grange ·82 in., at Rochford ·39 in., and at Stroud ·33 in. Further north the fall was much less.—ED. *S.M.M.*]

THE RAINSTORM OF SEPTEMBER 2ND—3RD, 1902.

SIR JOHN MOORE, M.D., F.R.Met.Soc., of Dublin, reports, under date September 3rd :—

"Last night's deluge of rain in Dublin was of exceptional violence. It was caused by the rapid transit across Ireland, in a north-north-easterly direction, of the deepest atmospheric depression observed since the 22nd of last April. The centre passed along the east coast throughout. At 7.15 a.m. to-day the barometer in Dublin read as low as 29·14 inches. The rain began with a light S.S.E. wind, and fell persistently through the night. In the early morning the wind veered to W., and freshened to a moderate or fresh gale.

"The following rainfall returns have reached me—the measurements are for the 24 hours ended 9 a.m., Wednesday, Sept. 3rd :—

"Knockdolian, Greystones, co. Wicklow, 2·93 in ; Kingstown, co. Dublin, 2·83 in. ; Fassaroe, Bray, co. Wicklow, 2·64 in. ; Lynton, Dundrum, co. Dublin, 2·40 in. ; Ordnance Survey Office, Phœnix Park, 1·64 in. ; Leeson Park, Dublin, 2·10 in. ; Fitzwilliam Square, Dublin, 2·07 in. ; Royal Botanic Gardens, Glasnevin, 1·95 in.

"This is only the eighth occasion since 1865—that is, in 37 years—upon which two inches of rain have been measured in Dublin at 9 a.m. as the product of the preceding 24 hours' precipitation. It is noteworthy that of the eight excessive falls in question, four have occurred within the past four years—on August 4th, 1899, 2·227 in. ; August 2nd, 1900, 2·135 in. ; November 11th, 1901, 2·037 in., and September 2nd–3rd, 1902, 2·075 in."

Mr. J. Ernest Grubb, of Carrick-on-Suir, informs us that a fall of 3·55 in. was measured by him on the same occasion. The storm caused a somewhat serious flood at Belfast; and both in North Wales and in Scotland much damage was done by wind as well as by rain, telegraphic communication being interrupted over a considerable part of the country.

A SHORT PERIOD OF SOLAR AND METEOROLOGICAL CHANGES.*

By SIR NORMAN LOCKYER, K.C.B., F.R.S., and WILLIAM J. S. LOCKYER, M.A., PH.D., F.R.A.S.

IT is well known that in India during the summer months (April to September) and during the winter months (October to March) low and high pressures respectively prevail. In the case of the latter, the pressure is found to exhibit very remarkable and definite variations, and is in excess, every 3½ years, on the average, while at these times of excess of high pressure the low pressure during the other 6 months of the year is deficient; so that every 3½ years or so the high pressure becomes higher and the low pressure is not so low as usual.

---

*Abstract of a paper read at the Royal Society on June 19th, 1902.

Further, this short-period variation, which appears in the mean variation of pressure over the whole of India, is as well defined in the mean values for individual stations, such as Bombay, Calcutta, Madras, Nagpur, &c.

The view that the variation of pressure in question over India and its neighbourhood is not due to local causes, but is produced by some external or extra-terrestrial action, is considerably strengthened by an examination of the pressure-curve of a very distant station, such as Cordoba. Dealing with the pressure of Cordoba during the high-pressure months, April to September, the curve representing the variation from the mean from year to year, is exactly the *inverse* of the curve representing the Bombay and other Indian pressures for the same months over the same period of time. The cause, therefore, which raises the mean value for the low-pressure months over the Indian area would appear to lower the mean value of high-pressure months at Cordoba simultaneously. In fact, we have a see-saw.

Further investigation shows that not only do the pressures of practically the whole Indian area exhibit variations from year to year, which present very similar features, but that this is the case with other large areas. Thus, for instance, it is found that the yearly mean pressures for Brussels, Bremen, Oxford, Valencia, and Aberdeen (the only pressures that have been at present examined) are all remarkably similar in their variations from year to year, and it might almost be said that one curve, representing the variations from the normal, would approximately define the pressures at all these places. The probable extra-terrestrial origin of these short-period variations led to a detailed examination of the records of the phenomena connected with solar spots and prominences, with a view of seeing whether similar variations, indicating changes in the solar activity, could be detected.

A preliminary reduction of the Italian observations of prominences observed on the sun's limb since 1871 was first undertaken. The result of this inquiry indicates that, in addition to the main epochs of maximum and minimum of prominences, which coincide in time with those of maximum and minimum of the total spotted area, there are prominent subsidiary maxima and minima having a similar short period and also coinciding in time.

A comparison of these solar data with those already referred to relating to terrestrial pressures suggests that these simultaneous outbursts of prominences and changes of the latitudes in which the spots occur about every $3\frac{1}{2}$ years are the true cause of the pressure changes; and that the varying intensity of solar activity during the sunspot period of 11 years produces an effect on the pressure and circulation of our atmosphere, thus affecting the whole globe meteorologically.

The close correspondence between the epochs of these subsidiary pressure variations and those representing prominence frequency, suggests not only their very close relationship, but that the terrestrial

pressure quickly answers to the solar changes, while so far as the work has gone it would appear that rainfall and snowfall are subsequent effects.

It may be remarked that we have already obtained evidence showing that this short-period variation is not the only one acting, but that the 11-year and 35-year periods apparently influence the short-period variations; but even this does not explain some anomalies already met with, and should the solar origin of these short-period pressure changes be subsequently confirmed, some of them not constant in all localities will have to be explained; and it is possible we may obtain in this way some new knowledge on the atmospheric circulation.

The period of time included in this survey begins generally with the establishment of the full records of the Indian Meteorological Department in 1875, and extends to 1895, when the regularity of the widened-line phenomena was broken, as stated in a previous communication.

AN AFRICAN RAINMAKER.

By STANLEY P. HYATT.

AMONGST the natives of Rhodesia the rainmaker is a person of great importance, and once a man acquires a reputation as such his future prosperity is assured.

The mightiest rainmaker of modern times was Fupa D'Jena, a petty chieftain living in Eastern Mashonaland; his fame spread from the Limpopo to the Zambesi, from the east coast to the Kalahari desert. Born in the early part of last century, his memory stretched back to the time prior to the Zulu invasion, when the Mashonas were a prosperous nation, and the only indications of the coming storm were vague rumours of the northward march of M'Zilukatzi and his savage horde.

How Fupa D'Jena first acquired his reputation is one of those mysteries which a white man can never hope to penetrate, but the accession of Lobengula found his position firmly established. This savage ruler, though he persecuted the Mashona race with unrelenting hatred, entertained a great respect for the rainmaker, to whom he frequently sent presents of cattle, with the object of inducing him to procure favourable rains for the Matabele nation.

The manipulation of the weather is a jealously guarded secret; but the outward signs of the process are unholy orgies, involving the sacrifice of many cattle and the consumption of much native beer, accompanied by the beating of drums, braying of horns, and shaking of rattles; the result being a hideous uproar, which frequently continues for several days without intermission. The throwing of bones also plays an important part in the ceremony, as by that means the rainmaker can discover the auspicious moment for the planting of certain crops.

Fupa D'Jena maintained his reputation untarnished up to the time of his death, which occurred in September, 1900; but the closing years of his life were clouded through the downfall of his patron Lobengula, and the disfavour with which the new Government regarded his supernatural powers. In old age his personal appearance was not prepossessing, a shrivelled, toothless old savage, clad in a dirty blanket; the only outward sign of his wealth lay in the number of his wives and huts, the latter, however, were in no way superior to those of his neighbours, being wattle-and-dab hovels, which the human inhabitants shared with numerous goats, fowls, and dogs. Although he breathed his last in September, the fact was not officially announced till the following April, when a deputation waited on the Native Commissioner, and presenting him with a fat sheep, requested that he would nominate a successor to the temporal power of the late magician. The reason for the delay was that the wake of so important a personage could not, with propriety, be held until the next harvest was over. By the end of May the crops were all gathered, and after much throwing of bones and earnest consultation with the local ghosts, an auspicious day was discovered, and messengers despatched to summon the natives of the surrounding country to attend the funeral rites. From every direction the warriors of the tribe poured into the squalid little village hidden amongst the kopjes, which for many years had been the residence of the dead man. The scene on the footpaths leading thither was truly extraordinary, a continuous file of naked savages passed along, decked with ostrich feathers and armed with antiquated guns, assegais, and bows; on the backs of many were strapped drums, which those following behind beat incessantly with their hands, and all carried horns or rattles.

At the village itself an immense quantity of native beer was prepared, and when the tale of visitors was complete, six bulls were slaughtered as a sacrifice to the spirit of Fupa D'Jena; but as the Mashona is of a practical turn of mind these sacrifices are always eaten by the mourners instead of being burnt.

The funeral rites consisted chiefly of a wild dance, accompanied by the beating of innumerable drums; beer was served out freely, and the ceremony rapidly became a hideous saturnalia, which lasted till exhaustion and hunger forced the mourners to return to their kraals. Since the first wake more cattle have been sacrificed to pacify the uneasy spirit of Fupa D'Jena, which probably will refuse to depart permanently till all the available bulls have been eaten, and no more grain can be spared for the manufacture of beer.

Hervé Faye.

3rd October, 1814—July, 1902.

M. Hervé Faye, who has recently died at the great age of 88, entered the Paris Observatory as a pupil of Arago, in 1836, and continued for more than 60 years to take a leading part in astronomical and meteorological work. On the death of Le Verrier, who had for many years been the Director of the combined astronomical and meteorological work of the Observatory, M. Faye was generally considered as his most probable successor, but the French government resolved to separate the two establishments, and offered M. Faye the directorship of the astronomical branch; this incomplete appointment he declined to accept.

M. Faye brought a philosophical spirit to bear on his scientific work; but, perhaps misled by fancied resemblances between the dynamical conditions of nebulæ and of the Earth's atmosphere, he enunciated his famous theory of the origin of cyclones by descending currents, a theory which has failed to commend itself to other meteorologists, and is indeed disproved by observed facts. M. Faye was great as a teacher, both as a professor in the *Ecole Polytechnique* and through his writings.

REVIEWS.

Die Schwankungen der Niederschlagsmengen in grösseren Zeiträumen. [The variations of the amount of precipitation in long periods.] Von J. Hann. (From Sitzungsberichten der k. Akad. der Wissenschaften in Wien. Mathem.-naturw. Classe. Bd. cxi. Abth. IIa. Februar, 1902.) Size $9\frac{1}{2} \times 6\frac{1}{2}$. Pp. 120.

Professor Hann discusses three of the longest continuous records of rainfall in existence, those at Padua for the 176 years 1725–1900, at Milan for the 137 years 1764–1900, and at Klagenfurt for the 88 years 1813–1900. These records are familiar to English readers from the use made of portions of them by Sir A. R. Binnie in his well-known paper on "Mean or average Rainfall." In addition to publishing the yearly values (in millimetres) for each of the three stations the author gives in detail the monthly values for each of the 176 years at Padua, the difference of each month from the mean in percentages, the seasonal totals and the totals for the meteorological year, *i.e.*, December to November. The tables embodying all these data occupy about 85 pp.

The homogeneity of the Padua record is considered carefully and pronounced on the whole satisfactory. Since 1838 the receiving surface of the rain gauge has been the hollow metal roof of the meridian pillar, which has a total catchment area of 295 square feet, nearly seven times as large as the great Rothamsted gauge, the surface of which measures one-thousandth of an acre.

We have only space for a few of the general conclusions. The

following table shows the extremes of annual rainfall expressed as a percentage of the mean at the three stations :—

	Period. Years.	Driest year. Per cent.	Wettest year. Per cent.	Ratio of wettest to driest.
Padua	176	56	181	3·25 to 1
Padua	100	58	152	2·6 ,,
Klagenfurt ...	88	42	151	3·6 ,,
Milan.....	137	62	152	2·5 ,,

The second period given for Padua is the century 1801–1900, and the extremes for Milan occur within the same century. As to the frequency of dry and wet years the average of the three stations shows that in 100 years there may be expected 8 very dry (with 51 to 70 per cent. of the normal fall), 26 dry (71 to 90 per cent.), 37 nearly normal (91 to 110 per cent.), 22 wet (111 to 130 per cent.), 6 very wet (131 to 150 per cent.), and 1 excessively, wet with over 150 per cent.

The average departure of the mean rainfall of short periods from the mean for 100 years, which can be taken as the true mean, was found to be as follows :—

	5 years. Per cent.	10 years. Per cent.	20 years. Per cent.	30 years. Per cent.	40 years. Per cent.
Padua	9·6	8·4	6·6	2·5	2·39
Klagenfurt	9·5	8·1	5·2	2·6	2·55
Milan	7·0	5·9	3·9	2·7	1·96

The most interesting fact brought out here is that a 30 years' mean is practically as good as a 40 years' mean, while it is enormously better than a 20 years' mean. In fact, the table shows that a 30 or a 40 years' mean is not likely to differ from a true mean by more than $2\frac{1}{2}$ per cent., while a 20 years' mean may be expected to differ from the true mean by as much as $5\frac{1}{4}$ per cent.

Professor Hann investigated the amount of rainfall with reference to sunspot frequency during nine sunspot cycles, and came to the conclusion that no distinct relationship could be made out. He recognised, however, a very clear periodicity corresponding to Brückner's 35-year cycle.

A similar discussion of monthly falls completes this most valuable contribution to the literature of rainfall.

Clouds and Weather Signs by COMMANDER D. WILSON-BARKER, R.N.R. Reprinted from *Knowledge*. London: 1902. Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. 32. *Plates*. Price 1s.

CAPTAIN WILSON-BARKER presents his readers with a series of the most beautiful photographs of clouds that we have ever seen, a series rendered as valuable as they are beautiful by the care with which the types of cloud have been selected from the author's large collection of negatives. We heartily endorse his appeal for greater attention to be bestowed on the signs of weather change presented by the clouds.

Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus. Herausgegeben von PROFESSOR DR. G. HELLMANN. No. 14 *Meteorologische Optik*, 1000–1836. Theodoricus Teutonicus, R. Descartes, I. Newton, G. B. Airy, A. de Ulloa, P. Bouguer, J. Hevel, T. Lowitz, J. Fraunhofer, G. Monge, W. Scoresby, Alhazen, J. de Mairan. Berlin, A. Asher & Co., 1902. Size $10 \times 7\frac{1}{2}$. Pp. (12)+108. Price 11 marks.

PROFESSOR HELLMANN in this new volume of his invaluable series of reprints of meteorological classics, reproduces thirteen of the earliest or most important contributions to meteorological optics. Each memoir is reprinted from the original, now often very difficult of access, and is a verbatim copy in the original words of the author. Professor Hellmann explains in a brief preface the special circumstances which led him to choose the contents of the fascicle. The first four articles are on the rainbow, the oldest by the German monk Theodoricus Teutonicus, in Latin, and dated 1311, the others by Descartes in French (1637), by Sir Isaac Newton (1704) and Sir George Airy (1836) in English. Then follows the first account of the phenomenon known as the Brocken spectre, by Ulloa, who observed it in the Andes in 1748, in Spanish. Three chapters follow on halos, by Hevel, in Latin (1662), Lowitz, 1794, and Fraunhofer in 1826. Finally come three papers on exceptional refraction phenomena. One of these is an account of mirages on the coast of Greenland in 1820 by William Scoresby, the Whitby whaling captain, who qualified himself for studying Arctic phenomena by a university course, and subsequently became a Fellow of the Royal Society and a clergyman. The gem of the collection is undoubtedly the Latin translation of Alhazen's work on twilight, which was written in Arabic in the year 1000. On account of the rarity of this work Professor Hellmann has had it reproduced in facsimile from the first printed edition of 1542.

By making the labours of the pioneer meteorologists available in this way, Professor Hellmann lays his brethren in atmospheric studies under an obligation which it would not be easy to exaggerate.

METEOROLOGICAL NEWS AND NOTES.

MR. W. H. DINES has completed his series of kite-experiments at Crinan, N.B., and obtained a large number of records. His report was presented to the British Association meeting at Belfast on September 15th.

"WRAGGE" is the title of a new meteorological publication edited by Mr. Clement L. Wragge, whose post as Government Meteorologist of Queensland was abolished by the Federal Government of Australia. In the first number Mr. Wragge announces that he is to undertake himself, with government subsidies amounting

to £1000 per annum, the functions of a Central Weather Bureau for Australia. No one can help admiring the enthusiasm of a man who takes so prodigious a task on his shoulders; but we feel that it is wrong for Australia and a discredit to the British Empire that so important a department of the public service should be left to an individual, even if the heads of the weather services of the different States were co-operating with him, and as to this nothing is said. Next to India, we doubt if any country is so dependent as Australia on a scientific knowledge of its climate, and the neglect of the opportunity afforded by confederation to institute a central weather service, is much to be deplored. The example of Canada, and the efforts in Cape Colony, to keep its meteorological system at work during the war, ought in these days of imperial fraternity to have impressed the Australian Government with a sense of their duty to the community.

RAIN HAS FALLEN IN INDIA during the last week of August and the first part of September in sufficient quantity to dispel the fear of famine, and thanks to the excellent records of past seasons of deferred rains there is ground to hope that as in 1884 the monsoon though late may be a good one.

CO-OPERATION BETWEEN SCIENTIFIC BODIES to enable the results of their researches to be applied to practical matters is often difficult to bring about, and Lord Curzon, the Viceroy of India, is to be congratulated on employing his large executive powers to secure an efficient advisory committee to assist his government on economic questions. He has created a Board of Economic Enquiry, composed of the heads of the Meteorological, Geological, Land Survey, Botanical, Forest, Agricultural and Veterinary Departments of India, which will meet twice annually. It is encouraging to men of science to meet with an administrator like Lord Curzon who realizes the value of their services, and is determined to utilize them for the public good.

A WATERSPOUT of a somewhat interesting kind was seen in the south of Cornwall, on August 27th. It seems to have been first observed in a cornfield, near Trevilly, a mile from Land's End, about 2 p.m., when it took the shape of a small whirlwind, raising up and whirling about the sheaves, and then passing in a north-easterly direction over the sea, where the water was whirled and raised in the same way, forming, as far as we can judge from the descriptions sent to us, a typical waterspout. Waterspouts were reported on the same afternoon from the Lizard, and in the Scilly Isles; but the particulars are not precise enough to show whether it was the same whirl, or a succession of whirls due to similar atmospheric conditions.

AUGUST, 1902.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1890-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I	ENGLAND.	London (Camden Square) ...	3·69	+ 1·59	·96	18	18	79·9	29	44·0	11	0	0
II.		Tenterden	4·03	+ 1·59	·93	16	17	79·0	16	42·5	11	0	0
,,		Hartley Wintney	3·40	+ 1·05	·59	18	23	80·0	30	42·0	2	0	0
III.		Hitchin	4·02	+ 1·39	·83	6	19	75·0	29	44·0	10*c*	0	0
,,		Winslow (Addington)	2·63	+ ·50	·65	7	21	77·0	16	40·0	11	0	0
IV.		Bury St. Edmunds (Westley)	3·83	+ 1·43	·71	23	18	78·5	29	41·5	2	0	...
,,		Norwich (Brundall)	3·37	+ 1·00	·68	7	18	77·8	29	39·8	2	0	0
V.		Winterborne Steepleton	4·39	...	·89	16	20	76·9	29	39·5	27	0	0
,,		Torquay	2·44	...	·75	16	15	71·8	8	48·3	2	0	0
,,		Polapit Tamar [Launceston]..	1·66	— 1·68	·31	17	22	74·9	29	38·9	26	0	0
VI.		Stroud (Upfield)	3·17	+ ·63	·31	18	23	78·0	14	44·0	10	0	...
,,		Church Stretton (Woolstaston)	6·13	+ 3·29	1·66	7	24	70·0	16	43·0	11	0	0
,,		Worcester (Diglis Lock)	3·62	+ 1·47	·84	29	25	...	...	...	...	...	...
VII.		Boston	4·38	+ 2·43	1·84	6	16	77·0	27	43·0	11	0	...
,,		Hesley Hall [Tickhill].....	3·58	+ 1·37	·80	17	17	73·0	26*a*	40·0	11	0	...
,,		Derby (Midland Railway).....	3·22	+ 1·10	·90	7	18	74·0	26	42·0	11*d*	0	..
VIII.		Manchester (Plymouth Grove)	2·78	— ·63	·65	18	20	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ...	2·92	+ ·65	·82	17	17	...	...	...	...	...	...
,,		Skipton (Arncliffe)	2·96	— 2·53	·61	17	19	...	...	...	...	...	...
,,		Hull (Pearson Park).	2·18	— ·44	·57	17	19	75·0	16	39·0	11*e*	0	0
X.		Newcastle (Town Moor)	2·58	— ·33	·50	4	16	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	7·23	— 4·17	2·96	22	16	71·5	16	41·2	30	0	...
XI.	WALES.	Cardiff (Ely).....	3·95	— ·22	·82	18	23	...	...	...	...	...	..
,,		Haverfordwest	3·02	— ·64	·90	5	15	74·3	16	40·4	27	0	0
,,		Aberystwith (Gogerddan) ...	2·97	— ·98	·85	7	13	77·0	16	31·0	4	1	...
,,		Llandudno.....	1·96	— ·84	·48	5	18	70·0	18	43·5	5	0	..
XII.		Cargen [Dumfries]	2·88	— 1·26	·68	17	15	71·0	16	35·0	11	0	..
XIII.		Edinburgh (Royal Observatory)	1·30	...	·40	18	11	69·8	15	40·3	11	0	0
XIV.		Colmonell	2·91	— 1·08	·64	17	15	76·0	16	37·0	29	0	...
XV.		Tighnabruaich	3·88	...	·70	21	14	65·0	15	41·0	20	0	...
,,		Mull (Quinish).....	4·54	— ·58	·85	1	22	...	...	...	...	...	...
XVI.		Loch Leven Sluices	3·73	+ ·07	1·42	4	14	...	...	...	...	...	.
,,		Dundee (Eastern Necropolis)	3·00	+ ·19	·85	18	19	74·5	15	38·0	21	0	...
XVII.		Braemar	2·73	— ·94	·45	17	22	66·1	15	33·8	30	0	4
,,		Aberdeen (Cranford)	2·61	— ·69	·47	3	24	68·0	9*b*	43·0	20*c*	0	...
,,		Cawdor (Budgate)	3·31	+ ·16	·60	17	16	..	..	...	...	...	
XVIII		Strathconan [Beauly]	2·58	— 1·82	·48	11	11	...	...	...	...	...	...
,,		Glencarron Lodge.....	5·62	— 2·92	·77	22	22	65·7	22	40·0	1	0	...
XIX.		Dunrobin	...	...	...	...	...	...	...	...	...	...	...
,,		S. Ronaldshay (Roeberry) ...	2·43	— ·59	·44	28	15	64·0	24	41·0	13	0	
XX.	IRELAND.	Darrynane Abbey.....	3·97	— ·52	·85	5	20	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	2·45	— 1·48	·60	5	14	72·0	14	41·0	30	0	..
,,		Broadford (Hurdlestown) ...	1·61	— 1·97	·37	22	21	70·0	4	44·0	29	0	...
XXI.		Carlow (Browne's Hill)	2·76	— ·67	·86	6	15	...	...	..	...	...	...
,,		Dublin (FitzWilliam Square)	2·95	— ·01	·92	6	18	71·2	18	44·8	4, 11	0	0
XXII.		Ballinasloe	2·01	— 1·92	·49	5	16	70·5	14*e*	38·0	4	0	...
,,		Clifden (Kylemore)	3·40	— 4·50	·92	21	13	...	...	...	...	...	...
XXIII		Seaforde.....	2·75	— ·55	·52	6	18	...	...	...	...	...	...
,,		Londonderry (Creggan Res.).	3·62	— ·80	·55	28	23	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·65	— 1·59	·76	17	18	70·0	16	37·0	29	0	...

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

a—and 27. *b*—and 15, 24, 26. *c*—and 25. *d*—and 26. *e*—and 15.

SUPPLEMENTARY TABLE OF RAINFALL, AUGUST, 1902.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	5·22	XI.	Castle Malgwyn	2·42
II.	Dorking, Abinger Hall .	2·90	,,	Builth, Abergwesyn Vic.	...
,,	Sheppey, Leysdown	4·20	,,	Rhayader, Nantgwillt ...	5·27
,,	Hailsham	4·48	,,	Lake Vyrnwy	5·16
,,	Crowborough.....	5·38	,,	Ruthin, Plâs Dràw	2·47
,,	Ryde, Beldornie Tower..	4·38	,,	Criccieth, Talarvor	2·97
,,	Emsworth, Redlands ...	4·53	,,	I. of Anglesey, Lligwy..	2·16
,,	Alton, Ashdell	3·33	,,	Douglas, Woodville.....	3·28
,,	Newbury, Welford Park	3·39	XII.	Stoneykirk, Ardwell Ho.	4·15
III.	Oxford, Magdalen Coll..	2·50	,,	Dalry, Old Garroch	3·02
,,	Banbury, Bloxham	2·60	,,	Moniaive, Maxwelton Ho.	2·88
,,	Pitsford, Sedgebrook ...	3·21	,,	Lilliesleaf, Riddell	2·69
,,	Huntingdon, Brampton.	1·93	XIII.	N. Esk Res. [Penicuick]	1·50
,,	Wisbech, Bank House...	3·14	XIV.	Glasgow, Queen's Park..	2·71
IV.	Southend	2·58	XV.	Inveraray, Newtown ...	4·69
,,	Colchester, Lexden	2·79	,,	Ballachulish, Ardsheal...	5·57
,,	Saffron Waldon, Newport	3·26	,,	Islay, Eallabus.....	2·34
,,	Rendlesham Hall	3·51	XVI.	Dollar.....	3·03
,,	Swaffham	2·17	,,	Balquhidder, Stronvar...	3·47
V.	Salisbury, Alderbury ...	3·10	,,	Coupar Angus Station...	3·43
,,	Bishop's Cannings	3·43	,,	Blair Atholl	2·24
,,	Blandford, Whatcombe .	...	,,	Montrose, Sunnyside ...	3·01
,,	Ashburton, Druid House	3·40	XVII.	Keith H.R.S.....	3·03
,,	Okehampton, Oaklands.	1·69	XVIII.	Fearn, Lower Pitkerrie..	1·15
,,	Hartland Abbey	2·62	,,	S. Uist, Askernish	2·36
,,	Lynmouth, Rock House	1·88	,,	Invergarry.....	3·16
,,	Probus, Lamellyn	1·65	,,	Aviemore, Alvie Manse.	3·26
,,	Wellington, The Avenue	3·69	,,	Loch Ness, Drumnadrochit	2·47
,,	North Cadbury Rectory	4·17	XIX.	Invershin	1·75
VI.	Clifton, Pembroke Road	4·16	,,	Bettyhill	1·60
,,	Ross, The Graig	3·73	,,	Watten H.R.S.....	1·85
,,	Shifnal, Hatton Grange	6·06	XX.	Dunmanway, Coolkelure	4·89
,,	Wem, Clive Vicarage ...	3·16	,,	Cork, Wellesley Terrace	2·89
,,	Cheadle, The Heath Ho.	3·29	,,	Killarney, District Asyl.	4·95
,,	Coventry, Priory Row ..	3·86	,,	Caher, Duneske	...
VII.	Market Overton	3·24	,,	Ballingarry, Hazelfort...	3·10
,,	Grantham, Stainby	3·28	,,	Miltown Malbay	3·27
,,	Horncastle, Bucknall ...	3·06	XXI.	Gorey, Courtown House	2·75
,,	Worksop, Hodsck Priory	3·94	,,	Moynalty, Westland ...	3·64
VIII.	Neston, Hinderton	3·44	,,	Athlone, Twyford	2·21
,,	Southport, Hesketh Park	2·07	,,	Mullingar, Belvedere ...	1·78
,,	Chatburn, Middlewood.	2·89	XXII.	Woodlawn	2·63
,,	Duddon Val., Seathwaite Vic.	5·76	,,	Westport, Murrisk Abbey	1·88
IX.	Baldersby	2·43	,,	Crossmolina, Enniscoe ..	2·33
,,	Scalby, Silverdale	3·42	,,	Collooney, Markree Obs.	2·55
,,	Ingleby Greenhow Vic..	2·61	XXIII.	Enniskillen, Model Sch.	...
,,	Middleton, Mickleton ...	2·39	,,	Warrenpoint.....	3·42
X.	Beltingham	...	,,	Banbridge, Milltown ...	2·43
,,	Bamburgh	...	,,	Belfast, Springfield	...
,,	Keswick, The Bank.....	1·65	,,	Bushmills, Dundarave..	2·48
XI.	Llanfrechfa Grange	4·18	,,	Stewartstown	3·72
,,	Treherbert, Tyn-y-waun	...	,,	Killybegs	2·23
,,	Llandovery	2·56	,,	Horn Head	2·24

METEOROLOGICAL NOTES ON AUGUST, 1902.

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.

ENGLAND.

LONDON, CAMDEN SQUARE.—Wet and gloomy, with absence of sunshine, but many fine evenings. The greatest rainfall since 1881. Mean temp. 61°·3, or 0°·8 below the average.

TENTERDEN.—The long dry period came to an end on 16th, and instead of dull weather with occasional showers, there were heavy rains, bad for the harvest, but giving grass a good start. In 60 days ending August 15th, 1·92 in. of R fell; in 16 days ending 31st, 3·61 in. Duration of sunshine 154 hours.

CROWBOROUGH.—Most unseasonable, with very heavy R. TSS on 8th and 16th.

PITSFORD, SEDGEBROOK.—Cold, cloudy, and ungenial. R 1·34 in. above the average.

BURY ST. EDMUNDS, WESTLEY.—R over the average; most disastrous for agriculture. Very little wind or sun, making it impossible to dry the corn.

WINTERBOURNE STEEPLETON.—Colder and wetter than any August for ten years. Mean temp. 57·8, or 1°·7 below the average.

TORQUAY, CARY GREEN.—R ·21 in. below the average. Mean temp. 0°·4 below the average. Duration of sunshine 177·1 hours, or 31·3 hours below the average. Mean amount of ozone 3·7.

POLAPIT, TAMAR.—Rather cold, and certainly unseasonable. Although the R was below the average it was generally damp, owing to the number of days on which small quantities fell.

OKEHAMPTON, OAKLANDS.—Wet on the whole, and colder than usual. Late harvest.

WELLINGTON, THE AVENUE.—One of the wettest and coolest Augusts for several years. The temp. only rose to 70° on eight days, and the sky was often cloudy when there was not R. Total about an inch above the normal.

NORTH CADBURY RECTORY.—By far the coolest, cloudiest, and most humid August in six years. The ground remained moist all the time. The last week was by far the best and warmest. Disastrous for hay, corn, and potatoes.

CLIFTON, PEMBROKE ROAD.—R nearly every day till 23rd, with low temp. and little sunshine. On 17th ·25 in. of R fell in 15 minutes at 3 p.m.

ROSS, THE GRAIG.—Till the 29th, although unsettled and showery, there was less R than usual. A sudden change, however, brought on a great downpour, extending over quite a limited area.

COVENTRY, PRIORY ROW.—Cool, rainy and sunless, and very bad for harvest operations. The latter part was especially depressing.

WALES AND THE ISLANDS.

HAVERFORDWEST.—One of the coolest Augusts on record. Much bright sunshine and moderate R. The appearance of the country was magnificent, and it was a most productive month. No TSS. Duration of sunshine 138·3 hours.

DOUGLAS, WOODVILLE.—The first three weeks showed no improvement on the previous three months. Temp. again low. The harsh N. winds, which prevailed without a break since the middle of July, continued to the 11th, and R was frequent till 22nd. From 12th to 15th was fine and warmer, and from 18th to 21st fine but cold. The last nine days were brilliantly fine and dry, with very cold nights.

SCOTLAND.

LILLIESLEAF, RIDDELL.—Remarkable for uniformity of pressure and temp. An excessive number of very heavy "silent" TSS, and one very noisy one on 27th, when ·90 in. of R fell, nearly all between 3 and 4.30 p.m. Vegetation was most luxuriant, there was not a brown spot in the whole landscape. Crops heavy and good.

MULL, QUINISH.—The first half was generally very fine, the second wet and unsettled. A curious absence of strong winds.

COUPAR ANGUS.—R about normal, but excess of rainy days. Low temp. and cloudy days, and a harvest just beginning which should have been finished. Mean temp. 54°·4.

DRUMNADROCHIT.—The wind, particularly in the early part, was cold and mostly N. and E. Green crops a full month behind, and badly laid. R ·46 in. below the average of 16 years.

BETTYHILL.—Generally fine and dry, with an occasional shower.

WATTEN, H.R.S.—Cloudy and overcast, with some fine days, but often cold. Occasional slight frost.

S. RONALDSHAY, ROEBERRY.—Cold and changeable. Mean temp. 50°·5, being 4°·1 below the average, and the lowest in 12 years.

IRELAND.

CORK, WELLESLEY TERRACE.—R ·68 in. less than the average. The coldest August for 20 years, the mean temp. being 3°·3 below the average. No T or L.

DARRYNANE ABBEY.—Cold, with a few very fine days.

BROADFORD, HURDLESTOWN.—The driest August on record. Water was much wanted in many places, and many mountain streams were quite dry.

MILTOWN MALBAY.—Very fine, temp. not too high. The R, except on four days, was scarcely appreciable, none of it reaching the springs, which nearly all ran dry. The potato and oat crops were splendid.

DUBLIN, FITZWILLIAM SQUARE.—Changeable and cool, with a continued prevalence of polar winds. Mean temp. 58°·4, or 1°·3 in. below the average. High winds on four days, never reaching the force of a gale. Duration of sunshine 162·7 hours, or exactly the average.

OMAGH, EDENFEL.—With a bar. that fluctuated only ·5 in. during the month, a R considerably below the average, temp. almost exactly the average, and wind largely from N. and E., one might suppose we could look back on a brilliant and summer-like month; but it was not so. Except on a few bright days, so persistent was the cloud, and so moist the atmosphere, that it was essentially dull and damp. Crops depending on sunshine were a failure, and much fear was expressed for cereals generally.

THE EIGHT MONTHS' RAINFALL OF 1902.

Aggregate Rainfall for January—August, 1902.

Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver	Station.	Diff. from Aver.	Per cent. of Aver.
	in.			in.			in.	
London	+1·10	108	Arncliffe	-13·26	64	Aberdeen	+1·16	106
Tenterden	—3·12	81	Hull	—1·10	93	Cawdor	— ·41	98
Hartley Wintney	— ·02	100	Newcastle	—1·47	91	Strathconan	—3·90	88
Hitchin	+1·10	108	Seathwaite	-25·53	68	Glencarron	—7·09	87
Winslow	—2·62	82	Cardiff	—3·00	87	Dunrobin	...	...
Westley	+1·12	107	Haverfordwest	—2·90	88	Darrynane	—5·54	81
Brundall	+1·16	108	Gogerddan	—4·21	84	Waterford	—1·47	94
Blandford	...	...	Llandudno	— ·99	94	Broadford	—2·97	86
Polapit Tamar	—2·51	88	Dumfries	—6·18	77	Carlow	— ·80	96
Stroud	— ·90	95	Lilliesleaf	—1·39	93	Dublin	+1·21	107
Woolstaston	+2·96	117	Colmonell	—2·75	89	Mullingar	—3·82	84
Worcester	+2·66	120	Glasgow	—4·24	81	Ballinasloe	—3·73	84
Boston	+3·01	124	Islay	—2·04	92	Clifden	-12·22	75
Hesley Hall	+1·19	109	Mull	—4·01	88	Crossmolina	—3·14	90
Derby	+1·56	111	Loch Leven	—5·13	77	Seaforde	+2·56	111
Manchester	...	...	Dundee	—2·54	85	Londonderry	—2·82	89
Wetherby	—1·00	93	Braemar	—2·58	88	Omagh	+1·27	105

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1902.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	62·2	31	29·5	7	52·9	38·2	39·8	82	108·4	26·1	1·87	11	6·6
Malta	72·5	2	45·0	17	62·9	51·7	48·8	78	123·4	38·4	·76	8	4·1
Lagos, W. Africa	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape Town	98·9	20	51·7	1	80·2	62·1	58·7	66	...	...	·90	4	3·3
Durban, Natal	93·8	2	59·2	23	84·1	66·7	...	...	151·3	...	10·23	20	5·8
Mauritius	85·5	14	67·7	14	83·0	71·2	69·1	78	159·2	61·7	5·20	20	6·4
Calcutta	99·7	28	65·8	15	92·8	71·5	66·4	63	150·8	61·7	1·49	2	2·2
Bombay	92·2	25	71·3	1	88·2	75·7	72·6	74	133·5	63·5	·00	0	0·4
Madras	94·3	18	65·9	3	90·3	72·7	71·8	76	147·9	62·2	·00	0	1·6
Kodaikanal	75·2	23	45·3	6	68·3	50·9	42·3	55	143·8	32·1	3·43	13	3·0
Colombo, Ceylon	93·4	5	72·2	6	90·7	75·0	73·0	77	153·3	69·0	6·85	12	3·8
Hongkong	79·5	17	53·7	5	72·9	64·5	62·4	81	134·9	...	·48	6	7·8
Melbourne	95·1	7	40·3	21	70·9	53·5	50·3	68	150·1	29·0	5·44	9	5·5
Adelaide	97·8	1	46·7	30	78·2	55·7	48·5	53	156·0	38·2	·99	5	2·7
Coolgardie	102·9	5	47·5	26	89·6	61·5	56·4	45	166·1	42·6	·00	0	2·6
Sydney	97·0	26	54·4	23	74·8	61·8	56·0	69	141·2	45·1	2·38	17	5·2
Wellington	77·0	4	43·0	19	67·9	54·7	51·7	72	117·0	34·0	3·10	10	5·0
Auckland	79·5	1	53·0	15	70·3	58·8	53·3	67	143·0	50·0	3·34	10	4·5
Jamaica, Negril Point	86·9	9	64·9	20	84·0	70·8	70·2	78	...	...	4·48	11	...
Trinidad	92·0	24*a*	64·0	10*b*	88·1	67·1	69·8	77	160·0	58·0	1·18	8	...
Grenada	88·4	28	71·4	3*c*	83·5	72·7	68·0	72	156·0	...	1·33	11	2·3
Toronto	57·0	23	13·0	19	44·6	30·2	30·7	75	81·2	5·5	2·53	14	6·3
Fredericton, N.B.	56·8	22	— 5·6	9	44·7	25·5	25·5	64	...	...	7·58	19	7·4
Winnipeg	53·5	12	—22·5	17	35·6	16·9	...	...	...	...	2·88	9	7·3
Victoria, B.C.	59·0	31	30·2	15	48·1	38·8	...	...	...	...	2·27	19	7·1
Dawson, Yukon	...	...	...	...	...	...	...	...	...	...	...	...	...

a—and 25, 27. *b*—and 27. *c*—and 16, 17.

REMARKS.

MALTA.—Mean temp. of air 56°·3, or 0°·4 above the average. Mean hourly velocity of wind 13·4 miles, or 2·4 above the average. Mean temp. of sea 61°·0. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·9, dew point 1°·3, and rainfall 3·03 in. below their respective averages. Mean hourly velocity of wind 8·9 miles, or 0·9 miles below average; prevailing direction E. to E.S.E. T. F. CLAXTON.

MADRAS.—Mean temp. below normal for first week and above for rest of the month. Sunshine 234·2 hours, or 62·9 per cent. of possible. Evaporation 5·92 in. A. MOFFAT.

COLOMBO, CEYLON.—Mean temp. of air 82°·4, or 0°·5 above, and R 2·09 in. above, their respective averages. Mean hourly velocity of wind 4·9 miles; prevailing direction S.W. H. O. BARNARD.

HONGKONG.—Mean temp. 68°·1, or 5°·9 above average. Sunshine 79·3 hours. R 2·76 in., below average of 39 years. Mean hourly velocity of wind 12·5 miles; prevailing direction E. F. G. FIGG.

Adelaide.—Mean temp. 67°·0, or 3°·3 below average; coldest March (except 1885, 66°·0) in 45 years. Good rain over Central and South parts of State. C. TODD, F.R.S.

Sydney.—Mean temp. of air 0°·9 below, R 2·74 in. below, humidity 6·3 below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Mean temp. 0°·8, and R ·44 in., below the average. R. B. GORE.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXLI.] OCTOBER, 1902. VOL. XXXVII.

METEOROLOGY AT THE BRITISH ASSOCIATION.

BELFAST MEETING, 1902.

THE British Association for the Advancement of Science met this year at Belfast from September 10th to 17th, and although the number attending was smaller than last year—smaller even than at the previous Belfast meeting in 1874—various circumstances conspired to make the gathering unusually pleasant and successful. The weather certainly did not enter into the conspiracy to please, but it did not succeed in doing more harm than spoiling a garden party and reducing the comfort of several excursions. The citizens of Belfast received the visiting members with a friendly heartiness which gives an intenser meaning to the phrase "Irish hospitality" in the minds of those who experienced it. The meeting-rooms were conveniently arranged and fully satisfied the wants of the Sections. The Sectional meetings themselves disposed of an unusual number of papers descriptive of sound scientific work.

As regards Meteorology the meeting was both richer and poorer than those which preceded it. Richer, because a new sub-section of Section A, Physics, was constituted to deal with papers on "Astronomy and Cosmical Physics," including in this comprehensive title Seismology, Mathematical Geography, Terrestrial Magnetism and Meteorology: poorer, because only one purely meteorological paper and one purely meteorological report were submitted to the Section. An interesting address was given by Professor Schuster, chairman of the sub-section, which dealt with some of the essential features of meteorological observations in a fresh and even surprising manner. The address, which we hope to publish in abstract, opened a door to controversy, and although we welcome it as a wholesome criticism, we cannot agree with all its conclusions.

It was at the Belfast meeting in 1874 that Mr. Symons established the Meteorologists' Breakfast on a co-operative basis, as a regular institution, and although the short notice consequent on delay in the publication of the lists of members made the number attending a small one, the breakfast this year afforded a pleasant opportunity for friendly intercourse between meteorological workers. It took

place on Tuesday, 16th September, at Princes Restaurant, when the following were present:—

Fabyan Amery, Ashburton, Devon.
W. G. Aspland, Newton Abbot, Devon.
C. Vernon Boys, F.R.S., London.
W. S. Bruce, Leader of Scottish Antarctic Expedition.
T. G. Firth, Belfast.
Professor R. A. Gregory, London.
C. Hawksley, Pres. Inst. C.E., London.
Dr. A. J. Herbertson, Oxford.
Professor W. Libbey, Princeton, New Jersey.
Dr. H. R. Mill, London.
J. Milne, F.R.S., Newport, Isle of Wight.
Dr. W. N. Shaw, F.R.S., London.
J. Smyth, Banbridge, Co. Down.
J. Wilton, of the Scottish Antarctic Expedition.

Before the party separated reference was made to the previous Belfast breakfast in 1874, in which one of those present, Mr. J. Smyth, of Banbridge, who has been a meteorological observer for forty years, had taken part.

Amongst the subjects brought forward for the consideration of local scientific societies at the Conference of Delegates, held on the afternoon of the 17th, was that of starting records of rainfall in conditions which would admit of continuous observations not depending on the life of any one individual; but unfortunately new records are most needed in localities where there are no scientific societies.

The Committee of Recommendations gave a grant of £75 to the committee for making observations in the upper atmosphere by means of kites, and a grant of £50 to the funds of the Scottish Antarctic Expedition, the work of which will be more largely meteorological than that of any of the other south polar expeditions now in the field.

In Section A., Dr. W. N. Shaw, F.R.S., read the following report:—

Investigation of the Upper Atmosphere by Means of Kites in co-operation with a Committee of the Royal Meteorological Society.—Report of the Committee, consisting of Dr. W. N. Shaw (*Chairman*), Mr. D. Archibald, Mr. C. Vernon Boys, Dr. A. Buchan, Mr. W. H. Dines (*Secretary*), *and* Dr. H. R Mill. *Drawn up by the Secretary.*

On the invitation of the Committee appointed by the Royal Meteorological Society, it was decided to hold joint committee meetings, and such meetings were held on October 25th, 1901, January 14th, April 8th, and May 7th, 1902.

The sum of money at the disposal of the joint committee, viz., £75 granted by the British Association and £25 by the Royal Meteorological Society, not being sufficient to meet the necessary expenses, it was decided to apply to the Meteorological Council and to the Government Grant Committee of the Royal Society for further assistance. The Meteorological Council kindly undertook to supply the necessary instruments for a base station, and the Government Grant Committee have made a grant of £75.

Inasmuch as there is considerable risk of damage and also of injury to life should a long wire carrying one or more kites break loose in a thickly populated district, it was decided to make observations in some thinly inhabited part, and, if possible, over the sea, so as to reduce this risk to a minimum. Since, further, we have no information whatever as to the vertical temperature gradient over the great oceans, and this knowledge is of supreme importance for theoretical meteorology, it seemed desirable to work on the west coast, since the prevailing westerly winds must make observations taken there equivalent, as a rule, to those taken over the open sea. It was also thought that if a fair number of observations could be obtained at the height of Ben Nevis, but somewhere on the coast in the neighbourhood of Ben Nevis, some light would be thrown upon the question as to how far the temperatures taken on a mountain summit differ from the temperatures of the free air in the surrounding districts at the same level. With these objects in view I was commissioned to obtain the necessary apparatus and erect it at some convenient spot on the west coast of Scotland.

The apparatus has been obtained and is now (June 17) erected on a small island at Crinan, a small village lying at the north end of the Crinan Canal, about thirty miles south of Oban. The apparatus consists of—

I. The winding-in apparatus, which carries two reels of 16 inches diameter and 4 inches broad, to hold the wire, and two strain-pulleys to reduce the tension of the wire before it is wound. The reels run loose on the same shaft that carries the strain-pulleys, but there is an arrangement by which they are pressed automatically against the strain-pulleys to increase their turning moment by friction against the outer rim of the pulley, or against the fixed frame of the apparatus to reduce the moment. By this means an adjustment of the tension is obtained, and the risk of the reel being crushed by the tension of the many turns of the wire is avoided.

II. *Steam-engine.*—This was obtained from the Reading (U.S.) Road Car Company. It has four single acting cylinders of 2½ inch bore and 4 inch stroke. It weighs about 60 lb. and is nominally of 6 H.P. The cost was £25. The choice lay between a steam-engine and a petrol motor. The steam-engine was chosen for the following reason. It is not desirable to draw in a kite wire when the wire is near the breaking point at a uniform speed, because the speed of winding in is equivalent to an increase of the wind velocity, and greatly adds to the strain. Advantage should be taken of the intervals between the gusts to get in the wire, and this a steam-engine without a dead point does automatically. Winding in a kite during a gale on June 14 the engine acted perfectly, running fast whenever the tension of the wire slackened, and slowing down or even stopping entirely when the tension was increased by a gust. Of course the precise tension at which the engine stops is adjustable within wide limits by adjusting the steam pressure in the boiler. The boiler was obtained from the Britannia Company, Colchester, at a cost of £25. It is fired by ordinary lamp oil (paraffin), of which it uses about a gallon an hour.

III. *The kites.*—These are described in *Symons's Meteorological Magazine* for April, where also the reasons for not using the Blue Hill kite are stated. There are five kites ready for use and the materials for making six or eight more. There are also two kites designed by, and purchased of, Mr. F. S. Cody. Both kinds, so far as my present experience goes, seem entirely satisfactory. Mr. Cody's kite flies at a rather better angle, but does not seem to be quite as

steady as the other. Indeed, the angle of the Cody kite when made of silk and light bamboos is remarkably good.

IV. *The wire.*—This is of the usual kind, but I have been supplied with eight miles in one piece by Messrs. Brunton and Son, Musselburgh, N.B.

V. *Instruments.*—In addition to the well-known Richard instruments, which have been ordered, it seemed desirable to obtain, if possible, something cheaper, since the risk of losing the instruments is not small. I am experimenting with a cheaper form. I also hope to obtain correct determinations of the maximum height and the temperature at that height in the following manner. If a glass tube of uniform bore, sealed at the top, but with the other end under water or quicksilver, were sent up with a kite, it would, assuming constant temperature, give the maximum height, for the air in the tube would expand and bubble out under the decreased pressure, and on the descent water would rise in the tube, and the height of the water or quicksilver would give the minimum pressure, and hence the maximum height. This is assuming constant temperature. But if an exactly similar tube were also used containing saturated vapour of alcohol, two equations would be obtained, from which the two unknown quantities, temperature and height, can be determined. I hope to perfect this method, since there are many occasions on which a kite and a couple of glass tubes might be risked when one would hesitate to send up instruments costing £20.

The apparatus above described is now in use every day when the wind is suitable, but there seem to be very many days during the summer when a sufficiently strong wind does not occur. A velocity of about fifteen miles per hour is necessary, force 4 on the Beaufort scale; but the upper limit at which the kites will fly has not yet been determined.

Addendum by the Chairman, August 22.

Up to August 20 sixty-eight flights have been obtained, as shown in the following table :—

Date.	Time.	Greatest Height.	Temperature Gradient per 1,000 feet.	Wind Direction.		Length of Wire used.	No. of Kites.
				Above.	Below.		
		feet.	° F.			feet.	
June 19	11.50 a.m.	2,840	3·8	S.	E.	5,000	1
,, 20	11.0 ,,	3,300	—	S.E.	S.E.	5,000	1
,, 21	11.0 ,,	3,300	—	S.E.	S.E.	4,515	2
,, 24	11.0 ,,	2,100	5·7	S.S.E.	S.S.E.	—	1
,, 24	7.0 p.m.	2,300	—	S.S.E.	S.S.E.	5,000	1
,, 26	11.0 a.m.	4,600	—	S.S.E.	S.E.	7,500	1
July 1	11.0 ,,	1,850	—	N. by E.	N.N.W.	3,000	1
,, 3	12.45 p.m.	2,500	4·5	N. by E.	S.S.W.	4,000	1
,, 4	7.0 ,,	2,250	3·0	N.N.W.	N.N.W.	3,560	1*
,, 7	11.0 a.m.	4,600	2·2	W.	W.	7,330	1*
,, 8	11.0 ,,	2,000	1·8	—	S.S.E.	—	1*
,, 9	12.0 n.	4,950	3·3	S.W.	S.W.	9,000	2*
,, 9	6.10 p.m.	2,300	3·9	—	W.	4,000	1
,, 10	4.0 ,,	4,040	2·3	N.N.W.	N.W.	7,000	1
,, 11	12.30 ,,	1,800	—	—	—	—	1
,, 11	6.50 ,,	1,350	0·8	—	W.	2,300	1
,, 12	5.0 ,,	1,300	1·5	—	S.W.	—	1*
,, 14	6.0 ,,	1,950	—	S.W. by W.	S.S.W.	—	1

Date.	Time.	Greatest Height.	Temperature Gradient per 1,000 feet.	Wind Direction.		Length of Wire used.	No. of Kites.
				Above.	Below.		
		feet.	° F.			feet.	
July 15	11.0 a.m.	6,400	3·1	S.W. by W.	S.W.	10,300	2*
,, 15	5.0 p.m.	4,300	2·8	S.W.	S.W.	—	1*
,, 16	12.5 ,,	6,000	2·0	W.S.W.	S.W.	10,300	2*
,, 17	11.45 a.m.	3,160	2·9	—	W.	—	1*
,, 17	5.30 p.m.	3,600	3·3	N.N.W.	N.W.	—	1*
,, 18	1.0 ,,	5,000	3·6	N.N.W.	N.W.	—	2*
,, 19	6.55 ,,	3,400	2·6	N.N.W.	N.W.	6,000	1
,, 21	11.0 a.m.	1,170	4·3	N.N.W.	N.N.W.	—	1
,, 21	7.55 p.m.	3,000	2·7	N.W.	W.	6,200	2*
,, 22	4.45 ,,	1,330	—	N.N.W.	W.	—	1
,, 23	10.40 a.m.	1,750	3·4	N.N.W.	N.W.	—	1
,, 23	6.45 p.m.	2,230	—	N.W.	N.W.	3,225	1
,, 24	11.45 a.m.	4,000	4·2	N.	N.N.W.	7,000	2
,, 24	5.20 p.m.	4,760	3·6	N.W.	W.N.W.	10,600	2*
,, 25	11.0 a.m.	2,450	—	—	W.	4,200	1
,, 25	7.30 p.m.	1,320	—	—	N.W.	2,020	—
,, 26	11.0 a.m.	4,330	3·5	E.	E.N.E.	5,450	1*
,, 26	7.0 p.m.	5,500	2·3	E.N.E.	N.E.	10,200	2*
,, 28	12.0 n.	7,350	3·3	S.W. by W.	W.S.W.	12,000	2
,, 28	7.30 p.m.	5,000	2·5	S.S.W.	S.S.W.	8,100	1*
,, 29	12.30 ,,	4,325	2·7	W.	W. by S.	8,200	1*
,, 29	7.40 ,,	5,330	3·1	W.	W.S.W.	8,412	1*
,, 30	12.10 ,,	8,950	2·7	N.N.W.	N.W.	17,300	2*
,, 31	11.0 a.m.	1,560	3·6	—	N.N.W.	—	1*
,, 31	6.20 p.m.	1,550	—	—	W.	—	1
Aug. 1	11.0 a.m.	2,400	4·1	W.S.W.	S. by W.	—	1
,, 1	7.30 p.m.	8,550	1·7	W.S.W.	S.S.W.	16,000	2*
,, 2	11.30 a.m.	8,370	2·1	S.W. by W.	S.W.	13,500	2*
,, 2	5.10 p.m.	4,900	2·5	—	S.W. by W.	7,530	1*
,, 4	4.0 ,,	1,520	—	—	W.	—	1
,, 5	11.30 a.m.	1,840	—	—	E.	—	1
,, 6	1.30 p.m.	3,800	3·5	E.S.E.	E.	6,900	1*
,, 7	11.0 a.m.	2,725	5·0	E.N.E.	N.E.	4,300	1
,, 8	11.40 ,,	1,300	4·0	—	N.N.W.	—	1
,, 8	5.20 p.m.	6,900	3·5	N.W.	W.N.W.	12,000	2*
,, 9	11.0 a.m.	2,360	3·7	—	W.N.W.	—	1
,, 9	4.40 p.m.	7,175	3·1	N.W.	W.N.W.	13,000	2*
,, 11	1.20 ,,	7,425	2·4	N.W.	N.W. by W.	18,000	3*
,, 12	10.10 a.m.	4,080	3·5	N. by W.	N.W.	7,375	1
,, 12	4.15 p.m.	1,550	1·5	—	W.S.W.	2,900	1*
,, 13	3.0 ,,	1,350	3·0	S.E.	S.	—	1
,, 14	4.30 ,,	1,950	1·8	W.	W.	—	1
,, 15	11.30 a.m.	2,300	3·9	S.W.	W.	3,900	1
,, 15	6.30 p.m.	1,415	—	S.W.	W.	2,500	1
,, 16	11.30 a.m.	1,400	1·8	N.N.W.	N.W.	2,190	1
,, 18	2.30 p.m.	2,750	4·3	N.N.W.	N.	4,980	2
,, 19	11.10 a.m.	4,250	3·9	N.N.W.	N.W.	7,100	2
,, 19	3.30 p.m.	4,400	3·8	W.N.W.	N.W.	9,537	2*
,, 20	12.10 ,,	11,450	2·4	N.W.	N.W.	21,350	3*
,, 20	7.20 ,,	4,000	4·5	W.N.W.	W.	7,100	1

In the cases marked * records from Richard instruments were obtained, in the others the temperature at the highest point only.

For the period extending from July 8 to August 22 a steam-tug was obtained, and the apparatus mounted on the deck. This arrangement was found to give much more effective control over the experiments, and rendered possible observations in light winds that would not have lifted the kites on land.

The observations will be discussed, and the results prepared for publication in the course of the ensuing year. The Committee consider that the work that has been completed is amply sufficient to show that the apparatus and methods are effective for securing valuable information as to the upper air in various conditions of weather. There are some points in which it seems desirable to attempt to improve the recording apparatus in order that the readings may be more definitely checked, and the Committee think it desirable for the experiments to be continued for another year, during which it may be possible to arrange the flights to obtain precise information regarding the distribution of temperature and humidity in specific conditions of weather in order to examine the physical processes taking place in the upper air corresponding to weather changes noted at the surface.

Dr. H. R. Mill read the following extracts from a letter just received from Mr. Dines, giving particulars of the observations made during the last few days of the experiments at Crinan.

"The kite ascents, of which particulars were not sent for the report, were 12,000 feet with 3 kites on Saturday, August 23rd, and 8,600 feet with 3 kites on Monday, August 25th, in both cases there are good records. On August 26th, a height of about 14,500 feet was reached; on this occasion the instruments were lost, and as the furthest kite of the four used could not be located by the sextant, being hardly visible, the height is uncertain; but it was certainly somewhere between 14,000 and 15,000 feet.

"The total result of the experiments is 71 ascents, with an average height of 4,040 feet. For 38 of these there are automatic records, and the remainder were mostly low ascents on days when the wind was too light to raise the instruments; but the temperature at the highest point was obtained."

Mr. C. Vernon Boys expressed the gratitude of the meeting to Mr. Dines for the manner in which he had carried out the experiments, and congratulated him on his good fortune in not losing the instruments before what was in any case to be the final ascent of the series.

On the motion of the Chairman, Professor Schuster, a vote of thanks was passed to Mr. Dines and to the Committee.

The Rainfall of Ireland. *By* HUGH ROBERT MILL, D.Sc., LL.D. (*Read in Section* G.)

In order to determine the true mean annual rainfall of any region it is necessary to have uniform, continuous, and prolonged observations at a large number of well-distributed stations.

It is now possible for the first time to give a fairly satisfactory account of Irish rainfall, though the observing stations at work are only one for every 170 square miles, as compared with one for every 20 square miles in England. The number of stations in Ireland has increased from 83 in 1874, to 190 in 1901, an increase of 140 per cent.; while the number of stations in England and Wales increased only by 120 per cent., and in Scotland only by 32 per cent. in the same period. In 1874 there was not a single record of rainfall from

the counties of Clare, Kildare, Leitrim, Limerick, Longford, or Monaghan; now there is at least one rain record from every county. The number of stations whose readings are quoted in "British Rainfall" is still far too small, especially in Connaught, and after the stimulus of the British Association in Belfast produced its effect in 1875, the number in Ulster has ceased to grow.

	Rain stations.		
Province.	No. in 1874.	No. in 1875.	No. in 1901.
Ulster	30	55	56
Connaught	10	15	22
Leinster	26	31	62
Munster	17	28	50
Ireland	83	129	190

While 1,400 additional stations would be necessary to place Ireland on the same footing as England per unit of area, only 185 additional observers are required to give the same number of rain gauges per thousand of population, but even this means practically doubling the number of observing stations.

Perfect records for the ten years 1890-99 exist for 108 stations in Ireland, and by computation 31 additional records can be made available. Of these, 20 records are perfect for the thirty years 1870-99, and 57 records of somewhat shorter duration can be computed with reasonable accuracy. The distribution is not satisfactory, the western half of the country and all the mountainous districts being very poorly represented. Maps have been constructed, however, which give a more complete representation of Irish rainfall than anything previously compiled.

The map for the thirty years 1870-99 may be taken as showing the true mean fall as far as the limited number of stations makes it possible to do so. There are only three small areas with a fall exceeding 50 inches per annum—in the west of Kerry, of Mayo, and Donegal respectively. Possibly some parts of the eastern mountains may also have a fall exceeding 50 inches. More than 40 inches fall over the whole of Ireland west of the Foyle and the Shannon, and to the west and south of a line drawn from Limerick through Mallow to Clonmel, whence a narrow belt equally wet runs north-eastward through the counties of Waterford, Wexford and Wicklow. Two small areas with more than 40 inches occur in the mountains of the south-east of co. Down and the east of co. Antrim. All the rest of Ireland has between 30 and 40 inches of rain, except parts of co. Dublin and co. Meath, where the fall averages a little less than 30 inches. The following table gives a rough approximation to the areas of the different zones of rainfall:—

Under 30 inches	(average 29 in.)	600	sq. miles.
From 30 to 40 inches ...	(,, 35·5 ,,)	13,200	,,
,, 40 ,, 50 ,, ...	(,, 44 ,,)	13,600	,,
Above 50 inches	(,, 60 ,,)	4,400	,,
		31,800	,,

This gives an average of 42 inches for the whole country, but the figure is by no means certain.

The variations of rainfall in Ireland are less than those in England. Thus, for the ten years 1890-99 the rainfall over Ireland was only 2 per cent. below

the 30 years' average; that over England and Wales showed a deficiency of 7 per cent. The average rainfall of the 10 years was practically the same as that of the thirty years in central Ireland; a trifle above the average in the north-west, and a little below the average round the north, east and south coasts.

It is to be hoped that existing rainfall stations will be kept up and new ones established in all parts of the country, so that there may be a basis for the accurate measurement of the average quantity of water available for inland navigation, town supply and for power.

This paper was discussed in conjunction with a paper by Mr. F. T. Dick on the Available Water-power of the Principal Rivers of Ireland, especially the Shannon, Erne and Bann. Mr. Dick was of opinion that an exaggerated idea as to the amount of power to be obtained from the rivers had got abroad. This was confirmed by several speakers, but energetically combatted by others.

Mr. J. Smyth, of Banbridge, referred to the numerous water-power installations on the Upper Bann where many turbines were now in use. As an old rainfall observer, he hoped that more rain gauges would be started, especially at high stations.

Professor Unwin considered that more local knowledge as to the water-power of Ireland was required, and hoped that Government might be induced to facilitate a complete investigation of the available power.

Sir William Preece, F.R.S., congratulated Dr. Mill on his paper, which supplied data of the greatest value, and said that given the rainfall on a river-basin and the fall of the land, it was the easiest thing in the world to calculate the resulting water-power. As to the utilization of the power, it was simply a matter of relative expense, and even although the Irish rivers might not be able to supply distant towns with all the power required for lighting and tramways, he agreed with Professor M. FitzGerald that they might well be capable of supplying electric energy to small factories in the vicinity of the stream, and so be extremely useful.

Mr. Charles Hawksley, President of the Institution of Civil Engineers, drew attention to the importance of comparing the rainfall of longer and shorter periods as was done on the maps exhibited; and pointed out that the rivers were approached by the public from many different motives—they were required for water-supply, for navigation, for drainage, for the production of power, and finally for fisheries, an object to which it was too much the habit to sacrifice the other and more important uses.

(*To be continued.*)

THE MAIDSTONE HAILSTORM OF SEPTEMBER 10TH.

A VIOLENT thunderstorm, accompanied by heavy rain and exceptionally severe hail, caused much damage in the district between Maidstone and Tonbridge, on the afternoon of Wednesday, 10th September. Similar storms occurred, though less intensely, in other parts of the country, on the same afternoon, the areas affected being small in every case, so that falls of between 1·50 in. and 2·00 in. are reported at Maidstone, Wallington, and Pyrford, while no rain at all, or less than ·10 in., was observed at intervening stations.

The main feature of the storm at Maidstone was the size and amount of the hail, which, coming at the time when hop-picking was at its height, did great damage, entirely destroying the hop-crop in some gardens, and causing much discomfort to the hop-pickers. The following extracts from correspondence and from the press show that the visitation was of no ordinary kind.

To the Editor of Symons's Meteorological Magazine.

In the course of three-quarters of an hour, judging from reports, during a violent storm of rain, hail, thunder and lightning, this afternoon, 1·65 in. of rain fell. I was on Bidborough Hill, near Southborough, at the time, and there there was very little rain. Going down to Tonbridge we began to see signs of a heavier fall, and about 5.30 p.m. we saw from Paddock Wood a very thick white mist rising from the fields, which were white with hail, and water was lying on the land. The storm was very severe at East Farleigh, where 2·00 in. is said to have been measured by the gauge at the waterworks. Here a whole field of hops was prostrate, including the large outside poles, while the soil was washed out into the road, and into the school and church. No one remembers such a storm before.

T. W. CARR.

Long Rede, Barming, Maidstone,
10th September, 1902.

I forward a newspaper containing particulars of the storm in the Maidstone district on 10th. To me the great interest of this storm lies in the size of the hailstones, and in the quantity that fell.

The storm was at its worst between 3 and 4 p.m. At 8 p.m. I had to drive through a part of the district which had been very severely visited, and I am not exaggerating when I say that at certain parts of the road the hail lay in masses to the depth of a foot and more, and impeded our progress, and this despite the fact that the temperature did not seem to have perceptibly fallen, though there was a dense fog. Yesterday, three days after the storm, I saw hailstones from the garden of a friend at Wateringbury still measuring half-an-inch in diameter.

JAMES W. NORTH.

Maidstone, 14*th September*, 1902.

From the "Kent Messenger," 13*th September*, 1902.

"Our Wateringbury correspondent writes: At about 2.45 p.m. a thunderstorm came up from the westward and broke over the village. The thunder and lightning were very severe, and at the commencement of the storm the rain was fairly heavy, but it was not until about three o'clock that the worst began, and then it commenced to hail, at first moderately and with stones

about the size of peas. Then it suddenly changed to enormous hailstones, many of which were at least two inches through, some even larger, and any amount of the size of large walnuts. During the worst of the storm it was absolutely dangerous to life to be out of shelter. Windows were broken in hundreds, in some cases almost every pane of glass being smashed in one window. Glass houses suffered severely. The hop gardens and orchards also have suffered an enormous amount of damage. Incredible as it may seem, hop gardens in some instances are literally stripped bare, scarcely a hop or a leaf being left. Apples were washed down the roads in the torrents of water; even piles of stones for repairing roads were washed completely away from their depôts."

The following casualties from lightning are reported in the same paper:—

Two men were struck in a hop-garden at Hunton, and one, named Charles Reed, age 21, was killed.

Two houses were struck in Maidstone, in one a gas-pipe was melted, and the gas set on fire.

At Mereworth a horse was killed, and a stack of wheat set on fire by lightning. The stack is said to have been insured only a few hours before.

At Hadlow Grange a man was struck, but not seriously injured, and at Hildenborough a bullock was killed.

Correspondence.

THE MOON AND RAINFALL.

To the Editor of Symons's Meteorological Magazine.

I am afraid that Mr. Mac Dowall, in his letter in your August number, to some extent misunderstands me. I do not say that we should publish only what is exhaustive, but rather that a good deal that appears hardly tends to edification. The measure of the value of a paper is the quality of the work put into it, be it lengthy or brief.

Mr. Mac Dowall considers that a man may be usefully allowed to say, "Here is a point that seems worth investigating; here is a vein that looks promising; here is a striking regularity of weather through a series of years; can it be traced further back?" Undoubtedly he may. But the results given in Mr. Mac Dowall's papers are too often far from striking, or likely to encourage others to pursue his lead. Moreover, in his paper on "The Moon and Rainfall," they were, to those conversant with questions of the kind, distinctly suggestive of what was misleading, and it was to remove the impression created that I undertook to extend Mr. Mac Dowall's inquiry to include a period of forty years, with result as stated, that it has yet to be shown that the moon has anything to do with the

variations of rainfall therein found to exist. A further point is that Mr. Mac Dowall frequently fails to give sufficient indication of the source from which the material he employs is obtained, and so makes difficult any direct confirmation of his work by others. I am not denying lunar influence, but only ask that it shall be satisfactorily proved to exist. As regards M. Dechevrens having brought before a French society the relation of a single year's rainfall to lunar phases, any such comparison can have no real value, as regards proof of connection between the two classes of phenomena.

I would further refer to two other of Mr. Mac Dowall's papers: to one on "Sunspots and Air Temperature," given at page 118 of Vol. **28** of your Magazine, and to my remarks thereon at pages 22 and 88 respectively of your following Vol. **29**. The other is to be found in the "Quarterly Journal of the Royal Meteorological Society," page 243 of Vol. **23**, under the title "Suggestions of Sunspot Influence on the Weather of Western Europe," my remarks in this case appearing in the discussion that followed the reading of the paper, with the appearance of which in the Quarterly Journal I had nothing to do.

We can all admire the efforts of one who has shown so considerable an industry, and hope to see him yet produce some valuable work. I cannot, however, help expressing regret at the tone of parts of Mr. Mac Dowall's last letter, which seems, I think, somewhat out of place. I may add that, as respects the present discussion, this is my last word.

WILLIAM ELLIS.

Blackheath, September 15th, 1902.

THE METEOR OF JULY 13TH.

To the Editor of Symons's Meteorological Magazine.

Standing in my garden facing S.W., I saw on my left a sudden flash of intensely bright white light casting a strong shadow. Immediately turning round, I saw the meteor as a ball of light disappearing behind a tree and leaving a trail which simultaneously became sinuous, changed from nearly white through red to violet, and resolved itself into a chain of separate points of light or "stars," and on their fading away the impression was left on the retina (perhaps an illusion) of a dark line in the sky.

The time was between 10.30 and 10.31 p.m., the direction S.E., the trail passed through an angle of from 50° or 55° to 40° with the horizon and inclined to the right or S. about 10° or 12° with the vertical, and it was visible for from 5 to 10 seconds as nearly as I can estimate.

JOHN HOPKINSON.

Weetwood, Watford.

THE CLIMATE OF PEMBA IN 1901.

MR. THEODORE BURTT has favoured us with his meteorological observations for 1901 at Banani, in the island of Pemba, on the East Coast of Africa, one of the least known of British possessions. We published his records for 1899 and 1900 in our number for April, 1901.

With regard to 1901, Mr. Burtt says:—"There has been more cloud than usual, and the rainfall has been better distributed over the year than in 1899 or 1900. This has somewhat reduced the mean and the maximum temperatures, but has not affected the minimum."

It is impossible to praise too highly the perseverance of an observer who keeps a regular record in so trying a climate as that of Pemba, and we would like to see the good example largely followed in other parts of Africa.

Meteorological Observations taken at Banani, Island of Pemba, East Africa.

1901.	Mean Max.	Mean Min.	Absolute Max.	Absolute Min.	Rainfall.	Rainy Days.
	°	°	°	°	in.	
January	84·6	73·8	90·0	70·0	4·00	13
February	82·5	71·9	85·0	68·0	12·09	13
March	85·8	74·2	90·5	72·5	6·54	12
April	81·9	70·6	87·0	70·0	20·79	23
May	80·2	70·0	84·0	68·0	27·40	25
June	78·9	68·1	83·0	66·0	3·23	16
July	78·5	67·1	80·0	66·0	3·06	14
August	79·2	67·3	82·0	66·0	·93	11
September	80·5	67·4	83·0	65·0	·90	5
October	83·2	69·5	86·0	67·0	2·73	8
November	82·9	71·5	87·0	70·0	7·50	13
December	83·5	73·0	87·0	71·0	3·61	13
Year	81·8	70·4	90·5	65·0	92·78	166

Highest temperature in sun ... ... 175°.

Years.	Mean Max.	Mean Min.	Absolute Max.	Absolute Min.	Rainfall.	Rainy Days.
	°	°	°	°	in.	
1899	83·3	70·2	92·0	65·0	105·24	149
1900	83·5	71·3	95·0	66·0	90·35	160
1901	81·8	70·4	90·5	65·0	92·78	166

ERRATUM.

In the September number, p. 118, line 8 from bottom, *in place of* 1·15 in. *read* 1·51 in.

REVIEWS.

Report of the Kodaikanal and Madras Observatories for the period 1st April to 31st December, 1901. [By C. MICHIE SMITH.] Size 13 × 8½. Pp. 22.

THESE observatories are under the Observatories Committee of the Royal Society; that at Kodaikanal a hill-station in the Madras presidency has recently been completed, and is largely devoted to solar physics and meteorology. The current report refers to nine months only, as a change is being made from the official to the more convenient calendar year. We are now publishing monthly returns from both observatories in the table of Climatology of the British Empire.

Der Ozean. Eine Einführung in die allgemeine Meereskunde. Von DR. OTTO KRÜMMEL. Zweite Auflage. Leipzig, G. Freytag, 1902. Size 7½ × 5½. Pp. viii.+286.

IT is curious that although British men of science have done more for the study of the ocean than those of any other nationality, there is no book in the English language dealing with the science of oceanography as a whole. We have been so frequently asked to recommend a good and simple book on the science of the sea that it gives us great pleasure to see the new edition of Professor Krümmel's excellent little work. It contains all that the general reader need wish to know on the subject of the oceans, the mode in which they are investigated, the conditions and movements of their waters; and to those who find the German language no bar to their enjoyment of a piece of real scientific literature, we most cordially commend it. The facts are up to date, the illustrations are well selected, and the index is of great value.

The Circulation of the Atmosphere in the Tropical and Equatorial Regions. By A. LAWRENCE ROTCH. Reprinted from the *Monthly Weather Review* for April, 1902. Size 9 × 6. Pp. 4. Plates.

THIS paper gives the views of Mr. Rotch and Professor Hildebrandsson on various theories of atmospheric circulation, a summary of the ascertained facts, and a scheme for new and direct observations on the upper atmosphere in the tropics by means of kites or balloons.

Informe que . . . Ing. Manuel E. Pastrana rinde . . . sobre las observaciones ejecutadas durante el eclipse total de Sol de 28 de Mayo de 1900. [Report presented by M. E. PASTRANA on the observations made during the total solar eclipse of May 28, 1900.] Mexico, 1901. Size 9½ × 7. Text, 192 pp., and Atlas of 42 plates.

THE Director of the Mexican Meteorological Office treats in great detail of the observations of atmospheric conditions at different

stations in the republic of Mexico during the eclipse of the sun in 1900, but it is a great pity that so much good work should be set forth without a table of contents, an index, or any help to obtain a general idea of the nature of the work. To most men of science the reading of Spanish is a toil that demands every mitigation if it is to be attempted.

BOOKS RECEIVED.

The Cyclone of 1901, January 9-16. By T. F. Claxton, F.R.A.S. *Proc. Met. Soc. Mauritius.* 1901. Size 8½ × 6. Pp. 22.

Climatologie du Littoral roumain de la Mer Noire par le Dr. Stefan C. Hepites. Liége, 1901. Size 10 × 6. Pp. 28.

Climatologia Bucaresciana. Anul, 1898 and 1899. de Stefan C. Hepites. Bucaresci, 1901. Size 11 × 8. Pp. 38 and 32.

Totland Bay, Isle of Wight. Report of Meteorological Observations for the Year 1901. Second year of issue. By John Dover, M.A., F.R.Met.Soc. Newport, 1902. Size 9½ × 6. Pp. 16. Price 1s.

Borough of Hastings. Annual Report of Meteorological Observations for the Year 1901. Published by the authority of the Corporation. H. Colborne, M.R.C.S., Borough Meteorologist. St. Leonards, 1902. Size 9½ × 6. Pp. 16.

Nedböriagttagelser i Norge [Rainfall in Norway]. Aargang VII. 1901. One map and two plates. Christiania, 1902. Size 16 × 11. Pp. 125. [We believe this to be the only national record of rainfall in the world which is published at an earlier date than *British Rainfall.* We congratulate Professor Mohn on his prompitude and on the accurate nature of his report].

Ergebnisse der Beobachtungen an den Stationen II. und III. Ordnung im Jahre 1897, zugleich Deutsches Meteorologisches Jahrbuch für 1897. One map. Heft III., 1897. Von V. Kremser. Berlin, 1902. Size 13 × 10. Pp. 372.

Bericht über die Thätigkeit im Königlich sächsischen meteorologischen Institutes für das Jahr 1898. Four plates. XVI. Jahrgang, 1898. Von Prof. Dr. Paul Schreiber. Chemnitz, 1902. 12 × 10. Pp. 80 and Index.

METEOROLOGICAL NEWS AND NOTES.

THE POSITION OF METEOROLOGY IN AMERICA is the theme of Professor Cleveland Abbe in the June number of the *North American Review*, and he claims that the United States has led the way in scientific meteorology, and maintained its lead through the wide scope of the Weather Bureau and the enlightened administration of its Director, Professor Willis L. Moore. With regard to research, Professor Abbe says:—

"The gift for research is a style of intellectual energy that refuses to be bound by regulations. An energetic investigator, immured in the walls of a great organization, may be as much out of place as a wild bird in a cage. He must have intellectual freedom. He can utilize, but must not be dominated by, his surroundings.

"It is the object of the Weather Bureau to profit by the services of men of this character, and give them opportunities for research."

WOLFE'S SUNSPOT NUMBERS for each month from January, 1749, to December, 1901, revised in March, 1902, and published in the *Monthly Weather Review* for April, will be found very useful by all those whose attention is turned to the possibility of establishing a relationship between solar periodicity and terrestrial atmospheric recurrences. The observed values of sunspot frequency are given in figures and in a curve through which a smoothed curve is drawn and this in turn reduced to figures.

THE INTERNATIONAL METEOROLOGICAL COMMITTEE will hold its next meeting at Southport during the meeting of the British Association in that town in September, 1903. We understand that an effort will be made to allow the distinguished continental meteorologists who will be present to see that the science of meteorology is being actively advanced in this country.

A RAINFALL MAP OF BULGARIA, compiled by Dr. C. Kassner from the observations of 102 stations, most of them for the nine years 1893—1901 appears in Petermanns Mitteilungen for July. The period is certainly a short one from which to deduce the mean distribution of rainfall over a country; but the author shows that at the not very distant station of Bukharest, in Rumania, the ten years 1891—1900 had the same mean fall as the thirty years 1871—1900, hence it is reasonable to assume that the period available for Bulgaria was probably a normal one. The isohyets on the map are, however, drawn partly from theoretical considerations, especially in the mountainous regions.

DEW BOWS form the subject of an article in *Science* for September 19th. Mr. Lyman J. Briggs describes a bow resembling a small rainbow but formed by the drops of dew which tipped the blades of a field of very short young grass of uniform height.

THE INTERNATIONAL AERONAUTICAL CONGRESS at Berlin in May is described by Mr. A. Lawrence Rotch in a recent number of *Science*. A large part of the time of the Congress was devoted to meteorological kite-flying and the use of unmanned balloons; one of the latter liberated during the Congress brought back a record from the unprecedented height of 65,500 feet, or nearly $12\frac{1}{2}$ miles. Mr. Rotch announced that he had applied to the Carnegie Institution (recently founded in the United States) for £2000 towards the expense of a special expedition to explore the upper atmosphere in the trade-wind regions by means of kites. The British Government was represented at the Congress, which augurs well for the future of these important researches in this country.

MR. MAXWELL HALL, who has for many years carried out the heavy task of collecting records of the rainfall and other meteorological elements of Jamaica, has retired from the work, which has been transferred to the Board of Agriculture of the Colony and is being continued by Mr. H. H. Cousins.

SEPTEMBER, 1902.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1890-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	No. of Nights below 32°. On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·00	— 1·07	·41	10	9	76·0	22	38·3	19	0	0
II.		Tenterden ...	1·64	— ·75	1·18	2	13	71·5	7	37·0	19	0	1
,,		Hartley Wintney ...	·50	— 1·70	·14	11	10	72·0	1	31·0	19*a*	2	7
III.		Hitchin ...	1·87	— ·26	1·33	11	9	70·0	22	35·0	29	0	...
,,		Winslow (Addington) ...	1·81	— ·45	1·32	10	9	75·0	22	32·0	19	1	2
IV.		Bury St. Edmunds (Westley)	·69	— 1·80	·32	11	7	73·0	7	36·5	13	0	...
,,		Norwich (Brundall) ...	1·38	— 1·07	·66	2	8	73·0	3	38·0	19	0	0
V.		Winterborne Steepleton ...	1·86	...	·56	2	14	69·7	8	33·4	19	0	5
,,		Torquay ...	2·46	...	·80	22	11	68·4	1	43·9	19	0	0
,,		Polapit Tamar [Launceston]..	2·95	— ·35	·91	22	18	71·2	21	30·6	19	1	3
VI.		Stroud (Upfield) ...	2·73	+ ·29	1·21	10	14	71·0	2, 4	40·0	29	0	...
,,		Church Stretton (Woolstaston)	1·93	— ·48	·46	10	17	68·5	1	37·5	13	0	...
,,		Worcester (Diglis Lock) ...	1·12	— ·70	·54	10	11	...	...	...	...	...	...
VII.		Boston ...	1·46	— ·52	·48	11	11	74·0	1	40·0	19	0	...
,,		Hesley Hall [Tickhill]...	·62	— 1·27	·38	10	11	75·0	8	32·0	24	1	...
,,		Derby (Midland Railway)...	1·66	— ·35	·59	10	15	75·0	1, 8	37·0	13	0	...
VIII.		Manchester (Plymouth Grove)	·99	— 2·18	·23	17	17	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ...	·88	— 1·34	·23	22	13	...	...	...	...	...	...
,,		Skipton (Arncliffe) ...	2·59	— 2·59	·70	15	16	...	...	...	...	...	...
,,		Hull (Pearson Park).	·69	— 1·54	·26	10	12	72·0	6	35·0	13	0	1
X.		Newcastle (Town Moor) ...	·61	— 1·57	·11	12	12	...	...	...	...	...	...
,,		Borrowdale (Seathwaite)...	5·84	— 7·04	1·93	15	16	73·2	8	34·6	29	0	...
XI.	WALES.	Cardiff (Ely) ...	2·67	— 1·08	·77	23	14	...	...	...	...	...	...
,,		Haverfordwest ...	3·85	+ ·05	·93	2	16	70·9	8	34·1	19	0	8
,,		Aberystwith (Gogerddan) ...	1·68	— 2·39	·52	23	12	75·0	8	27·0	18	4	...
,,		Llandudno...	1·40	— 1·47	·33	23	15	74·0	2	39·5	29	0	...
XII.	SCOTLAND.	Cargen [Dumfries] ...	2·61	— 1·14	·80	2	12	71·0	8	30·0	13	1	...
XIII.		Edinburgh (Royal Observatory)	1·40	...	·34	3	12	67·2	8	35·7	13	0	2
XIV.		Colmonell ...	4·50	+ ·51	1·11	2	14	72·0	7, 8	31·0	12	1	...
XV.		Tighnabruaich ...	6·81	...	1·32	20	18	63·0	9	34·0	12	0	...
,,		Mull (Quinish)...	6·72	+ 1·60	1·16	2	19	...	...	...	...	...	...
XVI.		Loch Leven Sluices ...	1·94	— ·97	·41	3	11	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·45	— ·78	·40	2	16	70·9	8	36·6	13	0	...
XVII.		Braemar	2·06	— 1·06	·61	2	17	67·2	8	32·6	19	0	2
,,		Aberdeen (Cranford)	1·52	— 1·21	·57	22	21	71·0	6	35·0	24	0	...
,,		Cawdor (Budgate) ...	1·69	— 1·40	·31	2	21	...	...	...	...	...	...
XVIII		Strathconan [Beauly] ...	3·13	— 1·35	1·00	3	9	...	...	...	...	...	...
,,		Glencarron Lodge...	...	...	...	...	...	...	...	...	...	...	...
XIX.		Dunrobin ...	1·85	— ·74	·68	2	13	62·0	6	36·0	19	0	...
,,		S. Ronaldshay (Roeberry) ...	2·13	— 1·34	·43	3	17	62·0	6	39·0	12	0	...
XX.	IRELAND.	Darrynane Abbey...	2·31	— 1·86	·55	21	18	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	5·02	+ 1·89	2·25	2	11	68·5	7	34·0	18	0	...
,,		Broadford (Hurdlestown) ...	2·19	— ·68	·62	2	17	68·0	3	38·0	12	0	...
XXI.		Carlow (Browne's Hill) ...	3·97	+ 1·24	2·32	2	14	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·97	+ ·85	2·08	2	16	69·0	22	41·6	18	0	0
XXII.		Ballinasloe	1·75	— 1·39	·72	2	17	68·5	6	32·0	13	1	...
,,		Clifden (Kylemore)	4·25	— 2·59	1·29	22	13	...	...	...	...	...	...
XXIII		Seaforde...	5·46	+ 2·31	2·64	2	15	70·0	6, 8	37·0	17	0	...
,,		Londonderry (Creggan Res.).	3·74	— ·13	·74	1	20	...	...	...	...	...	...
,,		Omagh (Edenfel) ...	3·20	— ·51	·90	2	19	69·0	8	34·0	17	0	1

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

a—and 26.

SUPPLEMENTARY TABLE OF RAINFALL, SEPTEMBER, 1902.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	1·00	XI.	Castle Malgwyn	2·73
II.	Dorking, Abinger Hall .	·83	,,	Builth, Abergwesyn Vic.	...
,,	Sheppey, Leysdown	·90	,,	Rhayader, Nantgwillt...	3·37
,,	Hailsham	·84	,,	Lake Vyrnwy	1·99
,,	Crowborough.....	·49	,,	Ruthin, Plâs Drâw	1·14
,,	Ryde, Beldornie Tower..	...	,,	Criccieth, Talarvor	1·46
,,	Emsworth, Redlands ...	·99	,,	I. of Anglesey, Lligwy..	1·78
,,	Alton, Ashdell	1·03	,,	Douglas, Woodville.....	3·44
,,	Newbury, Welford Park	2·07	XII.	Stoneykirk, Ardwell Ho.	4·22
III.	Oxford, Magdalen Coll..	1·07	,,	Dalry, Old Garroch	4·85
,,	Banbury, Bloxham	1·80	,,	Monaive, Maxwelton Ho.	3·35
,,	Pitsford, Sedgebrook ...	1·22	,,	Lilliesleaf, Riddell	2·00
,,	Huntingdon, Brampton.	1·28	XIII.	N. Esk Res. [Penicuick]	2·25
,,	Wisbech, Bank House...	1·30	XIV.	Glasgow, Queen's Park..	3·56
IV.	Southend	1·30	XV.	Inveraray, Newtown ...	5·13
,,	Colchester, Lexden	1·47	,,	Ballachulish, Ardsheal...	5·93
,,	Saffron Waldon, Newport	·75	,,	Islay, Eallabus.....	7·18
,,	Rendlesham Hall	1·31	XVI.	Dollar.....	2·08
,,	Swaffham	1·04	,,	Balquhidder, Stronvar...	5·33
V.	Salisbury, Alderbury ...	1·17	,,	Coupar Angus Station...	1·83
,,	Bishop's Cannings	1·57	,,	Blair Atholl	2·60
,,	Blandford, Whatcombe .	...	,,	Montrose, Sunnyside ...	1·83
,,	Ashburton, Druid House	3·38	XVII.	Keith H.R.S.....	2·29
,,	Okehampton, Oaklands.	2·40	XVIII.	Fearn, Lower Pitkerrie..	1·81
,,	Hartland Abbey	3·04	,,	S. Uist, Askernish	...
,,	Lynmouth, Rock House	2·64	,,	Invergarry.....	2·76
,,	Probus, Lamellyn	3·15	,,	Aviemore, Alvie Manse.	1·65
,,	Wellington, The Avenue	2·41	,,	Loch Ness, Drumnadrochit	1·65
,,	North Cadbury Rectory	1·24	XIX.	Invershin	2·37
VI.	Clifton, Pembroke Road	2·12	,,	Bettyhill	2·31
,,	Ross, The Graig	1·83	,,	Watten H.R.S.....	2·07
,,	Shifnal, Hatton Grange	1·27	XX.	Dunmanway, Coolkelure	...
,,	Wem, Clive Vicarage ...	1·24	,,	Cork, Wellesley Terrace	2·02
,,	Cheadle, The Heath Ho.	1·89	,,	Killarney, District Asyl.	1·84
,,	Coventry, Priory Row ..	1·25	,,	Caher, Duneske	...
VII.	Market Overton	1·71	,,	Ballingarry, Hazelfort...	2·19
,,	Grantham, Stainby	1·24	,,	Miltown Malbay	...
,,	Horncastle, Bucknall ...	·73	XXI.	Gorey, Courtown House	3·16
,,	Worksop, Hodsck Priory	1·05	,,	Moynalty, Westland ...	2·31
VIII.	Neston, Hinderton	·83	,,	Athlone, Twyford	2·20
,,	Southport, Hesketh Park	·97	,,	Mullingar, Belvedere ...	2·39
,,	Chatburn, Middlewood.	1·01	XXII.	Woodlawn	1·80
,,	Duddon Val., Seathwaite Vic.	3·16	,,	Westport, Murrisk Abbey	2·88
IX.	Baldersby	·88	,,	Crossmolina, Enniscoe ..	2·47
,,	Scalby, Silverdale	·96	,,	Collooney, Markree Obs.	2·93
,,	Ingleby Greenhow Vic..	1·05	XXIII.	Enniskillen, Model Sch.	...
,,	Middleton, Mickleton ...	1·24	,,	Warrenpoint.....	2·78
X.	Beltingham	...	,,	Banbridge, Milltown ...	3·71
,,	Bamburgh	...	,,	Belfast, Springfield	5·52
,,	Keswick, The Bank.....	3·70	,,	Bushmills, Dundarave..	4·71
XI.	Llanfrechfa Grange	2·82	,,	Stewartstown	2·83
,,	Treherbert, Tyn-y-waun	2·78	,,	Killybegs	3·85
,,	Llandovery	1·98	,,	Horn Head	3·69

METEOROLOGICAL NOTES ON SEPTEMBER, 1902.

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.

ENGLAND.

LONDON, CAMDEN SQUARE.—After two wet and unpleasant days at the commencement, there was a week of almost the finest weather of the whole summer, terminating on 10th with a TS and heavy R. The remainder of the month was remarkably dry, with northerly winds and cloudy skies. Thick fog on the morning of the 19th. Mean temp. 56°·9, or 0°·8 below the average.

ABINGER HALL.—Generally cold and dry with frosts almost nightly after the 17th. Harvest operations closed about the 20th. R is much needed.

TENTERDEN.—Unsettled at first but dry generally, many sunny days with cold nights. Duration of sunshine 180·5 hours.

CROWBOROUGH.—Remarkably dry, the nearest approach since record commenced in 1871 was ·63 in. in 1898. A good deal of sunshine, and the month was the most agreeable of the summer.

WINSLOW, ADDINGTON.—Frequent dense morning fogs, and min temp. often very low.

PITSFORD, SEDGEBROOK. Very fine and pleasant. R 1·38 in. below the average of 10 years. Mean temp. 55°·0.

COLCHESTER, LEXDEN.—First half mild and dull, then some bright weather and heavy dews. Last week cold.

BURY ST. EDMUNDS, WESTLEY.—Dry with no R after 16th.

WINTERBOURNE STEEPLETON.—Again cold, the mean temp. being 1°·1 below the average of 10 years. Rainy days slightly in excess, and the heavy R in the earlier part interfered much with harvest work.

TORQUAY, CARY GREEN.—R ·07 in. above the average. Duration of sunshine 9.3 hours above the average, with three sunless days. Mean amount of ozone 5·2; max. 8·5 on 3rd with W. wind; min. 2·0 on 7th with E. wind.

WELLINGTON, THE AVENUE.—The first half was generally stormy and unsettled, but from 17th to the end R fell on only three days. R about ·25 above the average.

NORTH CADBURY RECTORY.—Damp, cool and equable, with small R, but, up to 23rd inclusive, showery. Temp. very little below the average.

CLIFTON, PEMBROKE ROAD.—Changeable with three short spells of fine weather. R 1·18 in. below the average.

ROSS, THE GRAIG.—Rather cool, but fine and dry. Harvest was nearly completed, and seemed fairly good. R more than an inch below the average, almost all of it falling between 9th and 11th, and 22nd and 23rd. Mean temp. 55°·5.

HULL, PEARSON PARK.—Some cold nights with variable weather.

WALES AND THE ISLANDS.

HAVERFORDWEST.—Wet with light winds. R fell mostly at night. The last seven days were beautifully fine, but with low night temp. Duration of sunshine 154·2 hours. Crops of all kinds were good, but considerable damage was done by the wet.

ABERYSTWITH, GOGERDDAN.—Very cold with little sun; nearly always overcast, but not nearly enough rain.

DOUGLAS, WOODVILLE.—Fine, though the R was considerable. Temp. generally low, especially from 9th to 15th. The last six days very fine, with a marked absence of gales. Violent gale on 3rd, uprooting forest trees.

SCOTLAND.

LILLIESLEAF, RIDDELL.—Dull and showery throughout. The last week was calm and very warm. R ·01 in. above the average. Crops good but green in patches, and plums and apricots hard and shrivelling, reminding one of the old saying, "No fruit ripens in Scotland but roasted apples."

TIGHNABRUAICH.—Marked by three heavy falls, which took place during the night. The dry days were generally cloudy without wind, and not at all ideal harvest weather.

ISLAY, EALLABUS.—On 3rd, 2·93 in. of R fell between 1 a.m. and 4 p.m. Many bridges were broken down, and there was much flooding.

COUPAR ANGUS.—Cloudy skies and sunless days generally. R short of the average, but weather very moist throughout. Mean temp. 52°·8.

DRUMNADROCHIT.—Although the R was 1·19 in. under the average of 16 years, it was so distributed that the month earned the character "wet." Very cold with S and H showers.

WATTEN, H.R.S.—Overcast, cold and wet with very little sun, and generally drizzly.

S. RONALDSHAY, ROEBERRY.—Dull and changeable. Mean temp, 50°·2 or 1°·6 below the average of 12 years.

IRELAND.

BROADFORD, HURDLESTOWN.—Water was very low and many springs were dry that were not remembered to have been so before.

DUBLIN, FITZWILLIAM SQUARE.—Nothwithstanding a violent storm of R on 2nd and 3rd the month proved favourable. Mean temp. 56°·1, or 0°·2 above the average; duration of sunshine 139·5 hours, or 3·9 hours below the average. High winds were noted on six days, attaining the force of a gale on 3rd and 21st.; prevailing wind N.E. and W. Foggy on eight days.

COLLOONEY, MARKREE OBSERVATORY.—Fine on the whole, but many days without R were dull or gloomy, with some cool nights.

OMAGH, EDENFEL.—Some of the heaviest R of the summer fell in the first week, after which there was a favourable spell for some days, with a return to much R from 20th to 26th, when the weather improved, but so stagnant is the atmosphere and heavy the night dews that harvesting is only possible for a few hours daily.

THE NINE MONTHS' RAINFALL OF 1902.

Aggregate Rainfall for January—September, 1902.

Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver	Station.	Diff. from Aver.	Per cent. of Aver.
	in.			in.			in.	
London	+ .03	100	Arncliffe	-15·85	63	Aberdeen	— ·05	100
Tenterden	—3·87	79	Hull	—2·64	85	Cawdor	—1·81	92
Hartley Wintney	—1·72	90	Newcastle	—3·04	83	Strathconan	—5·25	86
Hitchin	+ ·84	105	Seathwaite	-32·57	65	Glencarron	...	...
Winslow	—3·07	82	Cardiff	—4·08	85	Dunrobin	—1·80	91
Westley	— ·68	96	Haverfordwest	—2·85	90	Darrynane	—7·40	78
Brundall	+ ·09	101	Gogerddan	—6·60	78	Waterford	+ ·42	102
Blandford	...	...	Llandudno	—2·46	88	Broadford	—3·65	85
Polapit Tamar	—2·86	88	Dumfries	—7·32	76	Carlow	+ ·44	102
Stroud	— ·61	97	Lilliesleaf	—1·97	91	Dublin	+2·06	111
Woolstaston	+2·48	112	Colmonell	—2·24	93	Mullingar	—4·53	83
Worcester	+1·96	113	Glasgow	—3·97	84	Ballinasloe	—5·12	80
Boston	+2·49	117	Islay	+ .53	102	Clifden	-14·81	73
Hesley Hall	— ·08	99	Mull	—2·41	94	Crossmolina	—4·96	86
Derby	+1·21	107	Loch Leven	—6·10	76	Seaforde	+4·87	119
Manchester	...	...	Dundee	—3·32	83	Londonderry	—2·95	90
Wetherby	—2·34	86	Braemar	—3·64	85	Omagh	+ ·76	103

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1902.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	69·5	19	29·7	7	57·6	39·6	39·5	71	111·3	23·6	·49	10	6·1
Malta	78·4	4	49·2	2	68·5	56·3	54·9	82	138·0	43·4	1·33	6	3·9
Cape Town	90·4	1	44·3	22	70·8	53·5	53·0	72	...	...	2·51	8	4·6
Durban, Natal	86·2	5	56·9	15	80·2	63·3	...	...	139·8	...	2·52	9	3·5
Mauritius	85·9	1	62·4	27	82·9	69·5	68·3	79	148·7	53·4	1·66	12	5·7
Calcutta	97·3	7	67·4	22	92·0	74·5	74·2	72	150·0	65·8	6·11	8	4·9
Bombay	91·9	19	77·3	3	90·2	78·9	75·3	75	140·4	69·6	·00	0	1·3
Madras	98·0	22	73·9	4	93·4	78·3	74·3	74	148·8	70·6	·02	1	3·4
Kodaikanal	74·1	28	49·0	2	70·0	52·9	50·4	70	145·2	37·4	4·33	17	5·2
Colombo, Ceylon	93·2	10	72·8	7	91·0	75·8	75·4	80	149·2	70·0	10·01	18	3·0
Hongkong	86·8	25	56·8	13	77·7	69·6	68·0	83	142·0	...	1·85	8	7·9
Melbourne	88·2	19	43·9	12	67·8	50·2	49·5	73	143·0	34·0	·57	5	5·2
Adelaide	92·3	19	45·4	3	77·5	54·3	46·9	52	141·3	38·5	·37	2	3·6
Coolgardie	97·9	19	45·6	27	85·3	56·1	46·2	41	153·1	39·0	·04	1	2·1
Sydney	80·1	14	51·8	29	69·9	56·9	52·7	77	127·0	41·9	2·67	14	4·5
Wellington	73·0	2	39·0	28	62·6	49·3	46·3	70	109·0	28·0	4·70	20	5·3
Auckland	73·0	4, 5	46·0	13	65·6	55·4	50·8	76	134·0	43·0	6·27	19	5·6
Jamaica, Negril Point	...	...	...	...	86·0	71·5	68·0	70	...	...	2·74	5	...
Trinidad	92·0	21	65·0	2	85·7	69·6	70·3	73	165·0	63·0	1·78	9	...
Grenada	86·4	27	71·8	6	83·9	74·1	69·1	72	153·2	...	2·08	11	2·9
Toronto	75·5	22	26·4	5	52·7	35·2	35·0	72	89·8	...	2·17	15	6·7
Fredericton, N.B.	74·8	29	22·9	7	51·2	30·0	26·5	52	...	...	2·90	14	5·6
Winnipeg	67·0	26	11·0	6	48·5	26·1	...	...	...	...	1·33	4	4·3
Victoria, B.C.	60·6	1	34·0	8	53·8	41·2	...	...	...	...	·95	13	7·7

REMARKS.

MALTA.—Mean temp. of air 61°·0, or 0°·5, above, and mean hourly velocity of wind 9·5 or 2·1 below, average. Mean temp. of sea 63°·4. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·1, dew point 0°·4, and rainfall 3·50 in. below, their respective averages. Mean hourly velocity of wind 6·4 miles, or 4·0 below the average; prevailing direction S.E. to E.N.E. T. F. CLAXTON.

MADRAS.—Mean temp. below normal during first week; afterwards the temp. rose, and on the 26th averaged 4° in excess in the Deccan. Sunshine 246·6 hours, or 66·4 per cent. of possible amount. A. MOFFAT.

KODAIKANAL.—Mean temp. of air 59°·6; sunshine 201 hours; mean daily velocity of wind 240 miles; max. velocity of wind 472 on 1st. C. MICHIE SMITH.

COLOMBO, CEYLON.—Mean temp. of air 83°·4 or 0°·9 above, of dew point 75°·4 or 1°·0 above, and R 1·33 in. below, their respective averages. Mean hourly velocity of wind 5·9 miles, prevailing direction S.W. H. O. BARNARD.

HONGKONG.—Mean temp. of air 73°·1, or 3°·2 above the average. Sunshine 142 hours, or 31 hours above the average. R 3·43 in. below the average of 39 years. Mean hourly velocity of wind 13·4 miles, prevailing direction E. 5° S. F. G. FIGG.

Adelaide.—Mean temp. of air 1°·9 above average of 45 years. C. TODD, F.R.S.

Coolgardie.—Mean max. 8°·9 above average for previous years. W. ERNEST COOKE.

Sydney.—Mean temp. of air 1°·1 below, R 2·89 in. below, and humidity 1°·5 below, their respective averages. H. C. RUSSELL, F.R.S.

Auckland.—R quite double the average of 33 years. T. F. CHEESEMAN.

TRINIDAD.—R ·25 in. below the 30 years' average. J. H. HART.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXLII.] NOVEMBER, 1902. VOL. XXXVII.

CONTINUITY IN OBSERVATIONS.

IN the concluding part of our notice of the Belfast Meeting of the British Association we print this month long extracts from Professor Schuster's striking and original address to the sub-section of Astronomy and Cosmical Physics. These comprise the views of this eminent physicist as to the position of meteorology and his plan for its improvement. That meteorology is in an unsatisfactory state and that it requires improvement, we fully agree, and we are sure that the criticism and counsel of men of Professor Schuster's power will do much to help it. But we by no means agree that "drudgery is often its highest ambition," that "it would not be a great exaggeration to say that meteorology has advanced in spite of the observations and not because of them," or that disorganization can ever be better than organization.

Much advantage would inevitably accrue to meteorology by the exhaustive study of limited series of carefully planned observations, and we share the belief expressed by Dr. W. N. Shaw, in speaking on Professor Schuster's paper, that the establishment of Chairs of Meteorology in our Universities would promote this result, but we do not think it necessary to stop or even to discourage observations meanwhile. One might as well suggest that because it is possible by the diligent study of the baking of bread to improve the quality of the product, therefore the harvesting of wheat should be stopped for five years so that all the energy of all the farmers and their labourers could be concentrated on the problem of the improved loaf of the future.

We, no more than Professor Schuster, wish to become slaves to continuity. He allows that continuity is important, and we declare that it is essential; but we all agree that when observations are recognised as useless they should be stopped. Undoubtedly the routine of meteorological observations can be improved, undoubtedly much of the work done is of no direct utility; but in such a question as this the indirect utility of habits of methodical and conscientious work on the part of observers must also be taken into account. It must be remembered that if routine observations were

stopped tomorrow, the energy of thousands of observers would not be concentrated on high problems of meteorology but dissipated on imperceptible trifles. It is not every observer who has the education or the habit of mind necessary for discussing his results. Many absurd ideas and immature speculations would have been spared to the world if observers had been sure of their work being considered and discussed by specialists adequately equipped for the task, and so had no excuse for themselves attempting with untrained minds to generalize from incomplete data. But those very observers can bring together accurate and comparable observations such as the highest genius would never have the patience to collect for himself.

It seems to us that the steady routine services of many people are not thrown away because only the work of a few is made use of to forward great discoveries; it is the way of Nature to seem lavish of unproductive labour. An oak grows from one acorn; but no forester would dream of restricting the number of acorns he allowed to sow themselves to the number of oaks he wished to spring up.

The question of meteorological work is complicated, and it must be treated as a whole and not in compartments. The highly trained specialist must discuss the best data he can get; it is the duty of the humbler servant of science to collect the material although its value may vary. In opposition to Professor Schuster's suggestion that observations should be stopped until we can decide what use is to be made of them, we assert the supreme importance of maintaining the continuity of records for ever. A gap in a long series of observations is an irreparable loss, for although it may possibly be patched up for some purposes, the weak place in the chain will always remain.

It is granted that carrying on special researches for a short period is sufficient to obtain many theoretical results which are much needed and of high value. This should be done without leaving the other undone; for it must be remembered that we have to deal with climatology as well as with meteorology, with the facts as well as with their causes. The climate even of the United Kingdom has not yet been satisfactorily described. If we allow that a fifty years' average is necessary to determine its normal condition, we can only guess at the normal condition of the greater part of the country, and when we endeavour to ascertain whether any long periodicity exists, or any secular change of climate is in progress, we are unable to come to any conclusion at all, except for a very few stations which cannot be accepted as representative. Discontinuity of observations is the chief stumbling block in the way; insufficient number of observing stations is another and a serious one. It may be that wet-bulb observations are of little use, but the observation of extremes of temperature is undoubtedly of high importance, and the measurement of rainfall is absolutely vital to the well-being of every country. From the purely scientific point of view continuity of observation is necessary, because the conditions of climate are too multitudinous ever to be reduced to dependence on a few simple

factors; from the practical point of view it is even more necessary —because we must be able to compare our present condition with the past in order to gain some light on the future.

We sincerely hope that the attention of mathematicians and physicists will be directed to meteorology in this country more than has been the case in recent years; and we feel sure that when they do take up the subject seriously they will feel grateful for the long-continued records which it has been so difficult to maintain, and sorry for any gaps that may have been caused by their authoritative discouragement.

METEOROLOGY AT THE BRITISH ASSOCIATION.

BELFAST MEETING, 1902.

Address to Sub-section of Astronomy and Cosmical Physics. By PROFESSOR ARTHUR SCHUSTER, F.R.S.

A great advantage of the scientific treatment of periodical occurrences lies in the fact that we may determine *a priori* how many events it is necessary to take into account in order to prove an effect of given magnitude. Let us agree, for instance, that we are satisfied with a probability of a million to one as giving us reasonable security against a chance coincidence. Let there be a periodic effect of such a nature that the ratio of the occurrence at the time of maximum to that at the time of minimum shall on the average be as $1 + \lambda$ to $1 - \lambda$, then the number of observations necessary to establish such an effect is given by the equation $n = 200/\lambda^2$. If there are 2 per cent. more occurrences at the time of maximum than at the time of minimum $\lambda = \cdot 01$, and n is equal to two million. If the effect is 5 per cent., the number of events required to establish it is 80,000.

To illustrate these results further, I take as a second example a suggested connection between the occurrence of thunderstorms and the relative position of sun and moon. Among the various statistical investigations which have been made on this point, that of Mr. MacDowall lends itself most easily to treatment by the theory of probability. One hundred and eighty-two thunderstorms observed at Greenwich during a period of fourteen years have been plotted by Mr. MacDowall as distributed through the different phases of the moon, and seem to show a striking connection. I have calculated the principal Fourier coefficient from the data supplied, and find that it indicates a lunar periodicity giving for the ratio of the number of thunderstorms near new moon to that near full moon the fraction 8·17 to 4·83.

This apparently indicates a very strong effect, but the inequality is only twice as great as that we should expect if thunderstorms were distributed quite at random over the month, and the probability of a true connection is only about 20 to 1. No decisive conclusions can be founded on this, the number of thunderstorms taken into account being far too small. We might dismiss as equally inconclusive most of the other researches published on the subject were it not for a remarkable agreement among them, that a larger number of storms occur near new moon than near full moon.

I have put together in the following table the results of all investigations

that are known to me; following the example of Koeppen, I have placed in parallel columns the number of thunderstorms which have occurred during the fortnight including new moon and the first quarter, and the fortnight including the other two phases.

Place of Observations and Author.	Time of Observations.	Percentage of Thunderstorms during the fortnight including	
		New moon and first quarter.	Full moon and last quarter.
Karlsruhe (Eisenlohr)	1801-31	50·8	49·2
Gotha (Luedicke)	1867-75	72·5	27·5
Vigevano (Schiaparelli)	1827-64	46	54
Germany (Köppen)	1879-83	56	44
Glatz, Silesia (Richter)	1877-84	62	38
United States (Hazen)	1884	56·5	43·5
Prag (Grüss)	1840-59	51	49
,, ,,	1860-79	52·5	47·5
Göttingen (Meyer)	1857-80	54	46
Kremsmunster (Wagner)	1862-87	53·8	46·2
Aix la Chapelle (Polis)	1833-92	54·4	45·6
Sweden (Ekholm)	1880-95	53·8	46·2
Batavia (v.d. Stock)	1887-95	51·9	48·1
Greenwich (MacDowall)	1888-91	54	46
Average	—	54·9	45·1

It will be seen that out of fourteen comparisons, thirteen show higher numbers in the first column, there being also, except in two cases, a general agreement as regards the magnitude of the effect. Two of the stations given in the table, Göttingen and Gotha, are perhaps geographically too near together to be treated as independent stations, and we may, therefore, say that there are thirteen cases of agreement, against which there is only one published investigation (Schiaparelli) in which the maximum effect is near the full moon.

The probability that out of thirteen cases in which there are two alternatives, selected at random, twelve should agree and one disagree is one in twelve hundred. If the details of the investigations summarised in the above table are examined, considerable differences are found, the maximum taking place sometimes before new moon and sometimes a week later. There is, however, evidently sufficient *prima facie* evidence to render an exhaustive investigation desirable. The most remarkable of all coincidences between thunderstorms and the position of the moon remains to be quoted. A. Richter has arranged the thunderstorms observed at Glatz, in Silesia, according to lunar hours, and finds that in each of seven successive years the maximum takes place within the four hours beginning with upper culmination. If this coincidence is a freak of chance, the probability of its recurrence is only one in three hundred thousand. The seven years which were subjected to calculation ended in 1884. What has happened since? Eighteen years have now elapsed, and a further discussion with increased material would have definitely settled the

question, but nothing has been done, or, at any rate, published. To me it seems quite unintelligible how a matter of this kind can be left in this unsatisfactory state. Meteorological observations have been allowed to accumulate for years, one might be tempted to say for centuries, yet when a question of extraordinary interest arises we are obliged to remain satisfied with partial discussion of insufficient data.

The cases I have so far discussed were confined to periodical recurrences of single detached and independent events, the condition, under which the mathematical results hold true, being that every event is entirely independent of every other one. But many phenomena, which it is desirable to examine for periodic regularities, are not of this nature. The barometric pressure, for instance, varies from day to day in such a manner that the deviations from the mean on successive days are not independent. If the barometer on any particular day stands half an inch above its average it is much more likely that on the following day it should deviate from the mean by the same amount in the same direction than that it should stand half an inch below its mean value. This renders it necessary to modify the method of reduction, but the theory of probability is still capable of supplying a safe and certain test of the reality of any supposed periodic influence. I can only briefly indicate the mathematical theorem on which the test is founded. The calculation of Fourier's coefficients depends on the calculation of a certain time integral. This time integral will for truly homogeneous periodicities oscillate about a mean value, which increases proportionately to the interval, while for variations showing no preference for any given period, the increase is only proportional to the square root of the time.

Investigations of periodicities are much facilitated by a certain preliminary treatment of the observations suggested by an optical analogy. The curve, which marks the changes of such variables as the barometric pressure, presents characteristics similar to those marking the curve of disturbance along a ray of white light. . . . . .

I believe meteorologists would find it useful to draw similar curves connecting intensity and period for all variations which vary round a mean value such as barometric, thermometric or magnetic variations. These curves will, I believe, in all cases add much to our knowledge ; but they are absolutely essential if systematic searches are to be made for homogeneous periods. The absence of any knowledge of the intensity of periodic variation renders it, *e.g.*, impossible to judge of the reality of the lunar effect which Ekholm and Arrhenius believe to have traced in the variations of electric potential on the surface of the Earth. The problem of separating any homogeneous variation, such as might be due to lunar or sunspot effects, is identical with the problem of separating the bright lines of the chromosphere from the continuous overlapping spectrum of the sun. This separation is accomplished by applying spectroscopes of great resolving powers. In the Fourier analysis, resolving power corresponds to the interval of time which is taken into account, hence to discover periodicities of small amplitude we must extend the time interval of the observations.

I believe that the curve which connects the intensity with the period will play an important *rôle* in meteorology. It is a curve which ought to have a name, and for want of a better one I have suggested that of periodograph. To take once more barometric variations as an example, it is easy to see that,

just as in the case of white light, the periodograph would be zero for very short, and probably also for very long, periods. There must be some period for which intensity of variation is a maximum. Where is that maximum? And does it vary according to locality? The answer to these questions might give us valuable information on the difference of climate. Once the periodograph has been obtained, the question of testing the reality of any special periodicity is an extremely simple one. If h be the height of the periodograph, the probability that, during the time interval chosen, the square of the Fourier coefficient should exceed kh is e^{-k}. If we wish this quantity to be less than a million, k must be about 11; so that in order to be reasonably certain that any periodicity indicates the existence of a truly homogeneous variation, the square of the Fourier coefficient found should not be less than 11 times the corresponding ordinate of a periodograph. . . . . .

If such a danger exists in Astronomy, what shall we say about Meteorology? That science is bred on routine, and drudgery is often its highest ambition. The heavens may fall in, but the wet bulb must be read. Observations are essential, but though you may never be able to observe enough, I think you can observe too much. I do not forget the advances which Meteorology has made in recent years, but if you look at these advances, I think you will find that most of them do not depend on the accumulation of a vast quantity of material. The progress in some cases has come through theory, as in the applications of Thermodynamics, or through special experiments as by kite and balloon observations, and when it has come through the ordinary channels of observation only a comparatively short period of time has been utilised. It would not be a great exaggeration to say that Meteorology has advanced in spite of the observations and not because of them.

What can we do to mend matters? If we wish to prepare the way for the gradual substitution of a better system, we should have some one responsible for the continuation of the present one. For this purpose it should be recognised that the head of the Meteorological Office is something more than a Secretary to a Board of Directors; also that he is appointed to conduct Meteorological research and not to sign weather forecasts. The endowment of Meteorology should mean a good deal more than the endowment of the Telegraph Office which transmits the observations. Terrestrial Magnetism and Atmospheric Electricity are looked after at present by institutions already over-worked in other directions and should be handed over to an enlarged Department of Meteorology. Seismology in this country now depends on the private enterprise and enthusiasm of a single man, and as long as Prof. Milne is willing to continue his work, we cannot do better than leave it with him, but some permanent provision will ultimately have to be made.

An improved organisation such as I have sketched out would do good, but could only very slowly overcome the accumulated inertia of ages. I should prefer a more radical treatment. Organisation is good, but sometimes disorganisation is better.

Most earnestly do I believe that the subjects of meteorology and terrestrial magnetism, and possibly also of atmospheric electricity, could be most quickly advanced at the present moment if all observations were stopped for five years, and all the energy of all observers and computors concentrated on the discussion of the results obtained and the preparation of an improved scheme of observation for the future. When we have made up our minds what to do with the

observations, when we have actually done it, when we know where our present instruments require refining or supplementing, and especially when we have found out whether we have not spent much time and trouble on unnecessary detail, then the time will have arrived for us to draw up an economical, sufficient and efficient scheme of observations. At present we are disinclined to discontinue observations, though recognised as useless, for fear of causing a break. We make ourselves slaves to so-called "continuity," which is important, but may be, and I believe is being, too dearly purchased.

There are no doubt some, though probably not very many, observations which it is necessary to carry on continuously over long periods of time. But at present we are groping in the dark, and go on observing everything, and always in the hope that some time the observations may prove useful. Our whole point of view in this respect wants altering. We should fix on our problem first and then provide the observations which are necessary for the solution of the problem. Let us restrict, in the first instance, the secular observations to the smallest number, and concentrate our attention, for short periods of time, on some special question. Let us have, for instance, two or three years of thunderstorm observations, all countries joining in concentrating their energies to the elucidation of all the various features of their phenomena. When that is accomplished, it will probably be found that thunderstorms may be left to shift for themselves for a while, and attention might be directed to some other matter. The whole question of lunar influence on meteorological phenomena might be settled in a comparatively short space of time if the civilised countries of the world could agree to record all observations during a few years according to lunar instead of solar co-ordinates. Other problems will readily suggest themselves to you, and several might possibly be dealt with simultaneously.

The great reform I have in view is this:—Before you observe, make sure that your observations will be useful and will help to answer a definite question. . . . . .

Radiation in Meteorology. *By* W. N. SHAW, Sc.D., F.R.S.

It may be said, without any serious misrepresentation, that experimental measurements of radiation are at present devoted to astronomical purposes, in respect of which the atmosphere is an undesirable disturbing element to be eliminated if possible. The intruments have been directed towards the unclouded sun or the moon with the object of determining a "constant" of solar or lunar radiation, and, to avoid the disturbing effect of the atmosphere, observations have been taken at very considerable heights. The solar constant depends upon the temperature of the sun, and radiation experiments are our only means of estimating that temperature. We may, indeed, regard a "radiometer," using that name to indicate any instrument used for measuring radiation (although "actinometer" may be the more correct appellation from the literary point of view) as a thermometer which, under certain assumptions, has the invaluable characteristic that its readings depend on action at a distance. In a sense a radiometer will determine the temperature of anything that it can see, and on that account it is very desirable that radiometric methods should be applied to the atmosphere for meteorological purposes. It is of course a little unfortunate that a radiometer can usually see the whole thickness of the more or less transparent atmosphere, and that meteorology offers no object so well

defined from the point of view of radiation as the sun or the moon; but very valuable information of at least a qualitative kind might be obtained by differential measurements of the effect upon a radiometer when the sky is not clear, or intermittently clear, and much light may thus be thrown upon such subjects as the temperature of clouds and the physical processes associated with various states of the weather.

An effective radiometer might be regarded as a sixth sense for the meteorologist, giving the same kind of information with regard to the temperature of clouds and other masses of air, as the eye gives for luminosity. There are, of course, many difficulties to be overcome before the readings of such an instrument can be fully interpreted, but even the eye itself is not free from objections as an instrument for observing meteorological changes, it nevertheless gives us information which is altogether indispensable, and a good radiometer might be no worse, and perhaps no better, than the eye.

The instrumental observations of the meteorologist, on the other hand, have developed into a certain routine, and it is in the hope that those observers who have the opportunity and inclination to prosecute the study in a more experimental manner may be encouraged to take up the subject of the measurement of radiation, that I have ventured to make this communication.

In this paper I do not purpose dealing with special apparatus of comparatively recent design, such as that of Violle, Crova, Ångstrom or Chevolson, for the accurate measurement of radiation.

Some of the meteorological instruments already in general use depend upon radiation for their readings, viz., the grass minimum and the black bulb thermometers, and the sunshine recorder. I shall leave out of account the grass minimum, because it is purposely placed in a situation in which convection, or the absence of it, affects the readings very seriously. It records the cumulative effect of direct radiation, together with the cooling produced by previous exposure.

The black bulb thermometer is used only as a maximum instrument, and although its indications may be useful for statistical purposes, they are of very little importance to students of atmospheric physics. On the other hand, a comparison of the simultaneous readings of a thermometer sensitive to and exposed to radiation and of a thermometer in the screen might give very valuable results for different conditions of weather. Such observations taken at night might distinguish between warm and cold clouds. The thick haze which sometimes precedes a thunderstorm is relatively opaque and might probably be recognised as producing considerable rise of temperature in objects in consequence of its own radiation.

It is doubtful whether the black bulb in vacuo would be a serviceable instrument for these purposes on account of the opacity as regards heat of the glass envelope. Mr. Omond found it unserviceable for this purpose at the Ben Nevis Observatory, but an unenclosed black bulb might be arranged to show some indication. Many years ago Mr. Glaisher compared a thermometer in a screen with one exposed at the focus of a parabolic mirror directed to the sky and obtained differences of 1°·5 C. for a cloudy sky and 4°·6 C. for a clear sky. It is also, I believe, well known that in the mountain districts of India radiation may cause very serious disturbance of the temperature readings. So that it is still possible that a thermometer might be found sufficiently sensitive for the purpose I have indicated, and a reading each night under various

specified conditions of weather might enable us to explain on the basis of meteorological fact the difference, for example, between sultry and brisk warm weather.

The sunshine recorder shows, of course, a record whenever the sun's radiation exceeds a certain limit, but there are still some unexplained phenomena associated with solar records which accentuate the desirability of exploring the atmosphere with a radiometer. In this matter I wish to refer to some records shown to me recently by Mr. A. Cresswell, of the Midland Institute Observatory, Birmingham. Mr. Cresswell has the solar records of the Campbell-Stokes and the Jordan sunshine recorders placed side by side. Some of these records show traces of actinic effect when no charring effect is produced—that does not seem surprising—but there were also cases in which there was a scar on the Campbell-Stokes card without any record on the photographic paper. I hope Mr. Cresswell will give the details. They appear to show that there is no immediate proportionality between the transparency of the atmosphere for thermal and actinic rays, and this selective absorption certainly requires investigation. The Birmingham atmosphere may, perhaps, not be regarded as normal, but at least one other observer has informed me that he has noticed corresponding effects. I mention these matters because they show that we have not yet reached the meteorological explanation, or even a complete classification, of the facts which our instruments record. The meteorologist who is satisfied with his mean values and desires to go beyond the limits of routine, if he is willing to venture into the region of experiment, need not go far to find subjects of interest and importance.

Correspondence.

THE MOON AND THUNDERSTORMS.

To the Editor of Symons's Meteorological Magazine.

I HAVE just seen in your August number (p. 108) a letter by the Rev. S. J. Johnson, in which he gives the results of his observations of the relation of thunderstorms to the phases of the moon during thirty years, from which he concludes, in opposition to other observers, that there was a slight excess of thunderstorms about full moon and a slight defect about new moon.

I agree with him that the question is far from being settled, and that it deserves fuller consideration, but it seems to me that his conclusion is based on too small a number of cases, for the 97 thunderstorms with which he deals only amount to an average of a trifle over three each year. On the other hand the results I found, which are in accordance with those of Mr. MacDowall, and the other observers cited by him, according to Professor Hann, are deduced from observations of 455 thunderstorms at Madrid, during the twenty years 1882–1901, an average of nearly 23 per year.

It is to be regretted that Mr. Johnson has been able to make use only of data which are, in my opinion, insufficient; for in all such statistical problems the laws governing phenomena can only be deduced by the systematic study of a considerable assemblage of observed facts.

V. VENTOSA.

Observatorio Astronomico, Madrid, 23rd Oct., 1902.

THE TEN MONTHS' RAINFALL OF 1902.

Aggregate Rainfall for January—October, 1902.

Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver	Station.	Diff. from Aver.	Per cent. of Aver.
	in.			in.			in.	
London	—1·10	94	Arncliffe	-16·99	65	Aberdeen	—1·82	93
Tenterden	—4·96	77	Hull	—2·49	88	Cawdor	—2·81	89
Hartley Wintney	—2·89	86	Newcastle.....	—3·25	85	Strathconan ...	—7·18	83
Hitchin	·00	100	Seathwaite ..	-35·38	66	Glencarron ...	—6·94	91
Winslow	—4·16	79	Cardiff	—4·94	84	Dunrobin	—3·44	86
Westley.....	—1·73	92	Haverfordwest	—3·80	89	Darrynane ...	—9·64	75
Brundall.....	—1·19	94	Gogerddan ...	—6·87	80	Waterford ...	— ·95	97
Blandford	...	...	Llandudno ...	—3·55	85	Broadford.. ...	—4·88	82
Polapit Tamar ...	—4·08	86	Dumfries	—7·95	77	Carlow	— ·37	99
Stroud	—1·67	92	Lilliesleaf.....	—2·99	88	Dublin	+2·09	109
Woolstaston	+2·25	110	Colmonell.....	—4·37	87	Mullingar.....	—5·06	83
Worcester	+2·13	112	Glasgow	—4·74	83	Ballinasloe ...	—6·93	76
Boston	+2·37	114	Islay	—2·41	93	Clifden	-19·10	70
Hesley Hall	— ·15	99	Mull	—3·19	93	Crossmolina ...	—6·19	85
Derby.....	+1·09	106	Loch Leven ...	—7·77	73	Seaforde	+3·28	111
Manchester	...	...	Dundee	—4·68	79	Londonderry..	—3·22	87
Wetherby	—1·85	91	Braemar	—4·34	84	Omagh	— ·49	98

The past month has proved exceptionally dry. Normally no part of the British Islands receives less than 2·50 in. of rain during October, but for October, 1902, the whole of the centre of Ireland, the east of Scotland, and a great triangular area of England spreading from Bath to the Wash on the north-east and to Dungeness on the south-east, have received less than two inches. The result has been to intensify the dearth of rain, diminishing the area of the district within which a normal amount has been received to the Midland counties and the Welsh border. The deficiency is most marked in some of the districts which have normally the heaviest fall—thus, for the ten months less than eight-tenths of the normal rainfall appear to have fallen in the south west of Ireland, the English Lake District and the neighbouring parts of Yorkshire and Northumberland, the centre of the Southern Uplands of Scotland, Midlothian, Fife and Forfar. Certain isolated parts of the south of England, illustrated in the above table by Tenterden and Winslow, shared in this excessive dryness.

BOOKS RECEIVED.

Annales de l'Observatoire National d'Athènes. Tome III. Publiées par Démétrius Eginitis. Athènes, 1901. Size 12 × 9. Pp. 376.

Borough of Eastbourne. Annual Report of the Meteorological Observations for the year 1901. Published by authority. Alderman N. Strange, R. Sheward, and C. H. Taylor. Size 9 × 6. Pp. 19.

Cornwall County Council. Sanitary Committee. Annual report, vital statistics and meteorological summary for 1901. Truro, 1902. Size 11 × 8½. Pp. 20.

METEOROLOGICAL NEWS AND NOTES.

THE SCOTTISH ANTARCTIC EXPEDITION sailed from the Clyde on November 2nd, on board the *Scotia*, which is practically a new ship, specially built and equipped for scientific work. The *Scotia* is a singularly graceful vessel, and while as strong as any Arctic whaler she can steam faster, and proceed faster under sail, than any of the four ships now employed on scientific work in Antarctic waters. She is under the command of an able and experienced whaler, Captain Thomas Robertson, acting under the instructions of Mr. W. S. Bruce, who is alone responsible for the promotion and execution of the expedition. The funds were provided by private subscription, one or two wealthy donors giving the greater part. No society or committee can claim any credit in the matter. Special attention will be devoted to meteorology, including kite-work. Mr. Bruce is himself a trained meteorological observer, and so is his assistant, Mr. Wilton; but this department has been placed in the eminently capable hands of Mr. R. C. Mossman, whose original work in many departments of meteorology is familiar to our readers. The equipment of recording instruments is very complete.

KITE EXPERIMENTS AT SEA were made from the German Antarctic ship *Gauss*, on her voyage to Cape Town, last year, but from the recently published report they do not seem to have been successful. Great difficulty was found in raising the kite when the ship was under sail on account of the eddy of air from the sails, and the experiments were ultimately postponed so as to leave sufficient material for observations in the Antarctic. The greatest height reached was on October 18th, 1901, in about 18° 7′ S., when the kite was raised to about 1,200 feet, the temperature at that height being found to be 7° F. lower than at sea-level.

SUNSETS OF REMARKABLE BEAUTY have been reported from many parts of the country, and there seems no reason to doubt that they are the result of the presence of very fine particles of dust, resulting from the volcanic eruptions in the West Indies.

THE CYCLONE is a poem by Mr. Townsend Allen, quoted from a newspaper by the *Monthly Weather Review*, and since the Editor of that official publication justifies the quotation because "the poetry is good; the meteorology seems to be correct," we need make no apology in offering the two first stanzas to our readers—

"With my heart on fire
With the sun's desire,
I arise from my tropic home,
And curl and swirl
With a passionate whirl
To the breast of the temperate zone;
Then my arms I fling
Round the winds and sing,
As I fast and faster turn
In my sullen shroud
Of darkening cloud
Through which the lightnings burn.

"Around and around
With terrible sound
A living wheel of air
I circling glide
O'er the ocean's tide
And scatter the ships that are there,
Then close to the shore
I press on and roar
While towns and cities fall,
As my garments swing
In the fatal ring
I destroy them one and all.

OCTOBER, 1902.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1890-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·46	— 1·13	·28	9	17	66·2	10	32·7	19	0	2
II.		Tenterden	1·90	— 1·09	·35	15	18	64·0	10	33·0	30	0	4
,,		Hartley Wintney	1·72	— 1·17	·33	10	14	68·0	10	31·0	31	2	5
III.		Hitchin	1·73	— ·84	·38	17	19	63·0	10	30·0	18	1	...
,,		Winslow (Addington)	1·60	— 1·09	·56	9	16	63·0	10	28·0	19	2	6
IV.		Bury St. Edmunds (Westley)	1·61	— 1·05	·31	17	18	64·5	10	33·0	19	0	...
,,		Norwich (Brundall)	1·34	— 1·28	·21	5	23	65·3	10	35·6	31	0	2
V.		Winterborne Steepleton	2·92	...	·50	10	17	63·3	10	33·0	8	0	8
,,		Torquay	3·51	...	1·38	9	17	62·8	26	41·6	31	0	0
,,		Polapit Tamar [Launceston]..	3·32	— 1·22	·60	9	22	61·2	23	29·0	8	1	2
VI.		Stroud (Upfield)	1·72	— 1·06	·66	9	12	61·0	10	37·0	17	0	...
,,		Church Stretton (Woolstaston)	3·27	— ·23	1·25	9	20	59·0	13	37·0	3,4,5	0	1
,,		Worcester (Diglis Lock)	2·82	+ ·17	1·02	8	18	...	...	...	...	...	...
VII.		Boston	2·15	— ·12	·55	13	16	60·0	12	30·0	31	...	...
,,		Hesley Hall [Tickhill].....	2·50	— ·07	·55	13	20	57·0	25	31·0	4	1	...
,,		Derby (Midland Railway).....	2·42	— ·12	·40	13	23	65·0	4	35·0	12	0	...
VIII.		Manchester (Plymouth Grove)	...	...	...	...	...	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ...	3·29	+ ·49	1·01	9	22	...	...	...	...	...	...
,,		Skipton (Arncliffe)	5·50	— 1·14	·78	15	25	...	...	...	...	...	...
,,		Hull (Pearson Park).	3·19	+ ·15	·84	13	22	60·0	13	31·0	19	1	10
X.		Newcastle (Town Moor)	2·51	— ·21	·95	10	21	...	...	..	...	...	...
,,		Borrowdale (Seathwaite).....	10·61	— 2·81	1·50	15	19	58·5	13	30·3	8	1	...
XI.	WALES.	Cardiff (Ely).....	3·57	— ·86	·67	9	20	...	...	...	...	...	...
,,		Haverfordwest	4·13	— ·95	·90	13	16	61·2	1	35·5	19	0	6
,,		Aberystwith (Gogerddan) ...	5·29	-- ·17	2·00	13	18	63·0	10	27·0	11	5	...
,,		Llandudno.....	2·91	— 1·09	·90	9	18	61·2	13	40·0	19	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·80	— ·63	·61	14	14	59·0	14*a*	29·0	19	2	...
XIII.		Edinburgh (Royal Observatory)	1·06	...	·30	14	13	60·7	29	36·9	19	0	5
XIV.		Colmonell	2·21	-- 2·13	·62	25	17	66·0	3	29·0	3	3	...
XV.		Tighnabruaich	4·24	...	·71	25	16	54·0	1	32·0	10	1	...
,,		Mull (Quinish).....	4·79	— ·78	·86	14	18	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·90	— 1·67	·37	16	17	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·40	— 1·36	·25	14	20	58·9	31	29·9	19	3	...
XVII.		Braemar	3·18	— ·70	·93	16	19	56·0	28	21·8	11	9	15
,,		Aberdeen (Cranford)	1·59	— 1·77	·30	14	22	60·0	14	25·0	18	7	...
,,		Cawdor (Budgate)	1·94	— 1·00	·48	24	13	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	3·72	— 1·93	·74	17	11	...	...	...	...	...	...
,,		Glencarron Lodge.....	10·34	+ 1·05	2·66	15	21	58·0	2	31·8	4	1	...
XIX.		Dunrobin	1·64	— 1·64	·75	19	13	59·0	29	32·0	19	1	...
,,		S. Ronaldshay (Roeberry) ...	2·33	— 1·85	·28	23	22	59·0	2	36·0	30	0	...
XX.	IRELAND.	Darrynane Abbey.....	2·97	— 2·24	·58	25	17	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	2·53	+ 1·37	·45	9	16	60·0	1	37·0	21	0	...
,,		Broadford (Hurdlestown) ...	1·87	— 1·23	·40	25	21	62·0	31	34·0	10	0	...
XXI.		Carlow (Browne's Hill)	2·59	— ·81	·40	10	20	...	...	...	...	...	...
,,		Dublin (Fitz William Square)	3·06	+ ·03	·81	4	23	61·5	12	40·3	17	0	0
XXII.		Ballinasloe	1·59	— 1·81	·35	19	17	60·0	11*b*	34·0	11	0	...
,,		Clifden (Kylemore)	3·65	— 4·29	·54	20	15	...	...	...	...	...	...
XXIII		Seaforde.....	2·00	— 1·59	·50	17	18	59·0	29	32·0	3	1	3
,,		Londonderry (Creggan Res.).	2·81	— 1·27	·76	15	17	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·66	— 1·25	·52	15	18	58·0	24	31·0	10	1	4

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

a—and 23. *b*—and 24.

SUPPLEMENTARY TABLE OF RAINFALL, OCTOBER, 1902.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	1·73	XI.	Castle Malgwyn	4·02
II.	Dorking, Abinger Hall .	2·44	,,	Builth, Abergwesyn Vic.	...
,,	Sheppey, Leysdown	1·71	,,	Rhayader, Nantgwillt ...	4·87
,,	Hailsham	2·62	,,	Lake Vyrnwy	5·20
,,	Crowborough.....	3·12	,,	Ruthin, Plâs Dráw	3·84
,,	Ryde, Beldornie Tower..	2·13	,,	Criccieth, Talarvor	4·36
,,	Emsworth, Redlands ...	2·25	,,	I. of Anglesey, Lligwy..	3·50
,,	Alton, Ashdell	2·26	,,	Douglas, Woodville.....	4·20
,,	Newbury, Welford Park	2·20	XII.	Stoneykirk, Ardwell Ho.	1·93
III.	Oxford, Magdalen Coll..	1·66	,,	Dalry, Old Garroch	3·82
,,	Banbury, Bloxham	2·26	,,	Monlaive, Maxwelton Ho.	2·96
,,	Pitsford, Sedgebrook ...	2·18	,,	Lilliesleaf, Riddell	2·12
,,	Huntingdon, Brampton.	1·81	XIII.	N. Esk Res. [Penicuick]	2·50
,,	Wisbech, Bank House...	1·80	XIV.	Glasgow, Queen's Park..	2·36
IV.	Southend	1·72	XV.	Inveraray, Newtown ...	5·69
,,	Colchester, Lexden	1·49	,,	Ballachulish, Ardsheal...	7·69
,,	Saffron Waldon, Newport	1·29	,,	Islay, Eallabus.....	2·18
,,	Rendlesham Hall	1·81	XVI.	Dollar.....	2·63
,,	Swaffham	1·86	,,	Balquhidder, Stronvar...	5·41
V.	Salisbury, Alderbury ...	1·85	,,	Coupar Angus Station...	1·18
,,	Bishop's Cannings	1·78	,,	Blair Atholl	1·48
,,	Blandford, Whatcombe .	...	,,	Montrose, Sunnyside ...	1·61
,,	Ashburton, Druid House	4·00	XVII.	Keith H.R.S.....	3·12
,,	Okehampton, Oaklands.	3·61	XVIII.	Fearn, Lower Pitkerrie..	1·28
,,	Hartland Abbey	3·63	,,	S. Uist, Askernish	3·98
,,	Lynmouth, Rock House	4·17	,,	Invergarry.....	6·82
,,	Probus, Lamellyn	2·91	,,	Aviemore, Alvie Manse.	2·98
,,	Wellington, The Avenue	1·98	,,	Loch Ness, Drumnadrochit	2·49
,,	North Cadbury Rectory	2·28	XIX.	Invershin	1·12
VI.	Clifton, Pembroke Road	2·56	,,	Bettyhill	3·91
,,	Ross, The Graig	3·36	,,	Watten H.R.S.....	1·85
,,	Shifnal, Hatton Grange	2·78	XX.	Dunmanway, Coolkelure	...
,,	Wem, Clive Vicarage ...	2·89	,,	Cork, Wellesley Terrace	1·30
,,	Cheadle, The Heath Ho.	3·09	,,	Killarney, District Asyl.	2·46
,,	Coventry, Priory Row ..	2·55	,,	Caher, Duneske	...
VII.	Market Overton	2·49	,,	Ballingarry, Hazelfort...	1·76
,,	Grantham, Stainby	2·14	,,	Miltown Malbay	2·37
,,	Horncastle, Bucknall ...	1·99	XXI.	Gorey, Courtown House	2·64
,,	Worksop, Hodsck Priory	2·16	,,	Moynalty, Westland ...	2·43
VIII.	Neston, Hinderton	3·28	,,	Athlone, Twyford	1·82
,,	Southport, Hesketh Park	3·01	,,	Mullingar, Belvedere ...	2·52
,,	Chatburn, Middlewood.	5·30	XXII.	Woodlawn	1·67
,,	Duddon Val., Seathwaite Vic.	6·48	,,	Westport, Murrisk Abbey	3·25
IX.	Baldersby	2·39	,,	Crossmolina, Enniscoe ..	4·02
,,	Scalby, Silverdale	2·88	,,	Collooney, Markree Obs.	3·12
,,	Ingleby Greenhow Vic..	3·08	XXIII.	Enniskillen, Model Sch.	...
,,	Middleton, Mickleton ...	2·57	,,	Warrenpoint.....	2·21
X.	Beltingham	3·37	,,	Banbridge, Milltown ...	1·32
,,	Bamburgh	1·26	,,	Belfast, Springfield	...
,,	Keswick, The Bank.....	5·30	,,	Bushmills, Dundarave..	1·93
XI.	Llanfrechfa Grange	4·29	,,	Stewartstown	1·65
,,	Treherbert, Tyn-y-waun	7·85	,,	Killybegs	4·65
,,	Llandovery	4·08	,,	Horn Head	3·47

METEOROLOGICAL NOTES ON OCTOBER, 1902.

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.

ENGLAND.

LONDON, CAMDEN SQUARE.—Variable weather with frequent drizzle, but little heavy R. Mild on the whole, though often damp, with frequent fog during the last week. Mean temp. 50°·4, or 0°·6 above the average.

ABINGER HALL.—Very mild and genial throughout. Flowers, including roses, still adorn our gardens. The foliage is beautiful on account of calm weather and absence of frost.

TENTERDEN.—R and sunshine both deficient. Ground dry at the close, but grass was abundant. Duration of sunshine 73 hours. T and H on 14th.

CROWBOROUGH.—October maintained its reputation as a rainy month. Sun on 19 days. Mean max. temp. 54°·6, mean min. 43°·2.

WINSLOW, ADDINGTON.—Very unsettled weather. Generally dull, but favourable for outdoor work. T on 14th.

PITSFORD, SEDGEBROOK.—Mild, cloudy and open. R ·90 in. below the average of 10 years. Mean temp. 48°·6.

BURY ST. EDMUNDS, WESTLEY.—Mild, with tender flowers in full bloom at the end. TS on 14th.

NORWICH, BRUNDALL.—Although R was recorded on 23 days, on 17 of these the fall was under ·10 in. There was practically no frost, and garden flowers kept in full bloom. T and L on 14th.

TORQUAY, CARY GREEN.—R ·44 in. below the average. Mean temp. 53°·8, or 2°·0 above the average. Duration of sunshine 93·5 hours, or 22·8 hours below the average. Mean amount of ozone 5·0, max. 9·0 on 9th, with E. wind, 10th with S.S.E. wind, and 11th with N.W. wind, and min. 1·0 on 6th, with N.E. wind.

LYNMOUTH, ROCK HOUSE.—Mild, but with no long period of bright sunshine. On 14th H fell between 8 and 9 a.m.

WELLINGTON, THE AVENUE.—R more than an inch deficient. The month opened with strong, dry and cold N.E. winds, but after the 8th the temp. was fairly high.

NORTH CADBURY RECTORY.—Very equable temp.; the early part cool and the latter warm. Frosts were unusually few. R was small and frequent, hardly up to the average. Excessively damp, and cloud considerably in excess.

CLIFTON, PEMBROKE ROAD.—Weather changeable, but a dry mild type predominated. R 1·16 in. below the average.

ROSS, THE GRAIG.—The R, which almost all fell in the first 19 days, was ·40 in. above the average. Mean temp. 50°·0, or 1°·4 above the average of 30 years. The first twenty days were usually cold and wet, the remainder very fine and warm. There was no frost in the screen, and tender plants, such as dahlias, were uninjured at the close. Autumn tints very beautiful.

COVENTRY, PRIORY ROW.—Very fine, though a fairly heavy R, and perhaps less sun, than usual. Foliage little changed at the end. No severe frosts.

CHATBURN, MIDDLEWOOD.—R ·75 in. above the average of 13 years.

HULL, PEARSON PARK.—Very cloudy and dismal on several occasions. R fell principally during daytime. Fog on 15 days, generally slight. N.E. winds in the earlier part, afterwards S. or S.W. Duration of sunshine 31 hours.

WALES AND THE ISLANDS.

HAVERFORDWEST, HIGH STREET.—There were 11 days without R, and 14 more when the R fell at night, so October may be said to have had its proverbial 20 fine days. Uniform mildness characterized the month. Prevailing winds N.E., W., and N.W. Hours of bright sunshine 80.

DOUGLAS, WOODVILLE.—Northerly winds, more or less strong and cold, prevailed for the first week, and were followed by strong S.W. winds, with milder weather, frequent gales, and almost daily R. The last week, though the temp. was nearly 3° above the mean, was almost sunless. No frost.

SCOTLAND.

LILLIESLEAF, RIDDELL.—Continual light and short showers, with little wind, kept the corn very wet, and it was impossible to get it properly in. A severe storm, with some R, on 15th, lasted from about 10 a.m. to 5 p.m., the wind velocity varying from 30 to 49 miles an hour. A good deal of damage was done, principally to ash trees.

TIGHNABRUAICH.—The prevailing winds were N.E., and so long as they blew steadily there was no R. However they gave way during the latter part, favouring us with an average fall.

COUPAR ANGUS.—Mean temp. 45°·7, or about 1°·0 above the average, and R 1·48 in. below the average. As in the preceding months the atmosphere was continuously moisture laden. Harvest not yet finished.

BETTYHILL.—R fell pretty frequently, but was generally very slight. There were two or three very stormy days, notably the 24th.

WATTEN, H.R.S.—The first half was cloudy and comparatively dry, with frosts at night; the second half wet and dull, with storms of wind and moderate R.

S. RONALDSHAY, ROEBERRY.—A very fair month, with no severe gales. Mean temp. 46°·7, or 0°·5 above the average of 12 years.

IRELAND.

CORK, WELLESLEY TERRACE.—Mean temp. 1°·7 below the average. A cyclonic storm from S.W. on the morning of 15th did great damage to shipping and old houses.

DARRYNANE ABBEY.—The first ten days were very fine, but with cold E. and N.E. wind. The remainder was mild, with days usually dry and R at night. The last few days were foggy and close.

MILTOWN MALBAY.—Very fine and mild with no high wind except a heavy N.W. gale on 15th. The first fortnight was very dry, and dried up all pastures and springs, so that a dearth of feed for cattle and of water ensued. The latter half was dripping, with two heavy falls, but no water reached the springs, though herbage became green again.

DUBLIN, FITZWILLIAM SQUARE.—Cloudy skies, deficient sunshine, frequent R and high mean temp. Mean temp. 51°·7 or 2°·3 above the average. High winds on 14 days, reaching the force of a gale only on 15th. Foggy on 8th and 11th. Duration of sunshine 84 hours.

COLLOONEY, MARKREE OBSERVATORY.—The first part was fine but at times gloomy, and with cold nights. From 11th it was showery with high wind, H on 16th. Duration of sunshine 66 hours.

OMAGH, EDENFEL.—Fine with practically no R until 12th, and less humidity than in September, so that a good though late harvest was fairly well saved. There was little or no frost, and the R fell mostly at night. The mean temp. 48°·6, is nearly 3°·0 above the average, and as a result the fall of the leaf was delayed beyond precedent.

REMARKABLE SQUALL AT MAURITIUS.

Mr. Claxton sends us the following note as to a squall felt at Mauritius on May 21st, 1902. The wind suddenly chopped from N.W. to S.W. at 9.50 p.m., and increased in velocity from 14 to 25 miles per hour, the temperature fell from 77°·2 to 68°·9, in eight minutes, while the barometer rose from 29·727 in. to 29·751 in. in 25 minutes. The preceding weather indicated that a storm was passing from S.W. to S.E. of Mauritius. Similar squalls often occur near the centres of extra-tropical gales, and from subsequent weather it would seem that the whole weather-system of the Southern Ocean has this year advanced farther north than usual.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1902.

STATIONS. *(Those in italics are South of the Equator.)*	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	72·3	31	31·4	14	59·6	41·7	40·9	68	121·9	26·4	2·60	22	6·3
Malta	76·9	4	48·9	11	70·4	56·9	52·9	74	139·0	43·6	·52	2	3·9
Cape Town	91·7	14	40·4	29	71·9	53·3	54·0	72	...	...	4·28	11	4·2
Durban, Natal	83·5	2	52·0	17	77·4	59·3	...	...	132·3	...	1·21	10	2·4
Mauritius	83·4	4	59·9	31	80·2	66·4	64·4	76	146·2	51·8	1·88	12	5·7
Calcutta	97·2	7	68·4	3	92·2	76·6	75·8	77	152·8	67·2	9·19	9	4·5
Bombay	94·0	13	79·6	1	92·5	82·3	76·6	72	140·7	75·0	·00	0	2·7
Madras	108·0	8	77·7	3	100·5	82·2	74·0	66	150·2	75·7	·17	1	3·2
Kodaikanal	75·2	7	52·7	17	70·4	55·5	53·0	74	144·5	45·9	3·95	14	5·7
Colombo, Ceylon	90·5	12	72·8	21	88·3	78·6	76·0	83	148·8	70·0	11·89	24	7·3
Hongkong	89·1	7	70·6	11	83·9	76·0	74·3	84	141·7	...	26·73	24	8·1
Melbourne	71·7	5	37·1	20	62·2	47·9	47·7	78	128·0	29·1	1·05	7	6·1
Adelaide	83·9	5	43·9	16	70·5	51·9	46·6	62	136·9	35·0	1·07	11	5·3
Coolgardie	80·9	19	42·0	27	69·7	49·0	48·6	60	148·0	34·6	2·20	6	5·2
Sydney	75·3	7	45·2	21	64·8	51·5	47·5	77	118·8	36·0	1·21	14	3·8
Wellington	64·0	31	33·0	24	57·2	45·9	39·9	64	110·0	28·0	5·19	21	6·5
Auckland	67·0	10	45·0	27	60·2	49·7	45·4	70	127·0	43·0	6·30	25	6·0
Jamaica, Negril Point	...	...	...	...	86·5	72·7	72·3	74	...	...	4·57	10	...
Trinidad	94·0	8*a*	65·0	1	91·7	66·7	71·9	69	167·0	58·0	2·14	7	...
Grenada	90·8	18	73·0	2*c*	84·3	75·4	71·0	75	154·0	...	3·00	16	4·0
Toronto	80·0	19	29·0	11	63·3	43·5	44·3	69	97·5	19·7	1·89	13	5·8
Fredericton, N.B.	81·7	23	25·9	19	60·3	37·7	32·9	48	...	...	4·84	13	5·9
Winnipeg	86·0	19	24·5	9	65·9	44·2	...	...	...	...	3·87	13	7·2
Victoria, B.C.	77·0	26	42·4	19	60·6	48·0	...	...	...	...	·97	10	6·8

a—and 12, 14. *b*—and 22. *c*—and 25.

REMARKS.

MALTA.—Mean temp. of air 62°·3, or 1°·8, below, and mean hourly velocity of wind 10·1 or 0·1 above, average. Mean temp. of sea 66°·8. TS on 25th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·5 above, dew point 0°·4, and rainfall 2·19 in. below, their respective averages. Mean hourly velocity of wind 8·8 miles, or 1·4 below average; prevailing direction S.S.E. to E. (See also p. 167). T. F. CLAXTON.

MADRAS.—Mean temp. of air below normal during first week, and then rose rapidly. Sunshine 202·5 hours, or 51·5 per cent. of possible amount. A. MOFFAT.

KODAIKANAL.—Mean temp. of air 61°·1; sunshine 185·7 hours; mean daily velocity of wind 218 miles. Many afternoon TSS. C. MICHIE SMITH.

COLOMBO, CEYLON.—Mean temp. of air 82°·7 or 0°·2 above, of dew point 76°·0 or 0°·6 above, and R 0·3 in. above, their respective averages. Mean hourly velocity of wind 9·5 miles, prevailing direction S.W. H. O. BARNARD.

HONGKONG.—Mean temp. of air 79°·4, or 2°·8 above average. Sunshine 121·0, or 31 hours below average. R 14·19 in. above 39 years average. Mean hourly velocity of wind 12·0 miles, prevailing direction S.E. F. G. FIGG.

Adelaide.—Mean temp. 61°·2, the highest on record for May in 46 years. R 1·73 in. below the average. Extreme drought over all inland parts of State. C. TODD, F.R.S.

Coolgardie.—R excessive. W. ERNEST COOKE.

Auckland.—Excessively stormy. Mean temp. of air 3° below average. R 2·07 in. above average of 30 years. T. F. CHEESEMAN.

TRINIDAD.—R 1·25 in. below average of 40 years. J. H. HART.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXLIII.] DECEMBER, 1902. VOL. XXXVII.

AN OLD SCOTTISH WEATHER RECORD.

THE Scottish History Society has recently printed for the first time a diary kept by a country gentleman of the seventeenth century. It is merely a fragment, one surviving note-book out of a series which has been lost sight of, and it covers only the period from 1st May, 1659, to 31st January, 1660. The author, Mr. Andrew Hay, of Craignethan, led an active life, much of his time being spent on horseback in visits to Edinburgh and to Humbie, in Berwickshire, each about thirty miles distant from his home in Lanarkshire, close to Biggar. After recording each day's proceedings, with very lengthy notes of the Sunday's sermons, Mr. Hay wound up with a critical estimate of his own spiritual condition, and a terse characterization of the weather of the day. The editor of the diary may possibly have felt some difficulty in distinguishing between the expressions applied to the inward and outward strife of the elements; and it might suggest itself as an interesting task to trace any possible relation between the two. However, we wish to do no more than to bring before the students of climate one of the most graphic descriptions of the variations of weather from day to day that we ever met with, rendered the more effective by the quaint and forcible language in which it is conveyed. These notes have been extracted from the volume, which is not accessible to the public, by Mrs. Mill, of Edinburgh, and they are published with the permission of the Secretary of the Scottish History Society. On account of the author constantly travelling over a circumscribed area, these notes may be taken as applying to the counties of Peebles, East Lothian and Midlothian as a whole. It is believed that other volumes of this interesting diary may be in existence, perhaps hidden away with old family papers, and it would certainly be interesting to have a set of these weather notes complete for the circle of the year.

CALENDAR OF WEATHER FROM DIARY OF ANDREW HAY, OF CRAIGNETHAN, LANARK.§

MAY, 1659.

1 May, Lord's Day, 7 hors.—A very filthie raine all day.
2 May, Munday, 7 acloak.—Snow & raine till 4 hors, then fair.
3, Twysday, 7 acloak.—A gray dawkie* day.
4 May, Wednesday, 6—7 acloak.—A fair gray day.
5, Thursday, 7 acloak.—A gray mistie day.
6 May, Fryday, 7 acloak.—A foule day till neer night.
7, Saturnday, 6—7 acloak.—A gray louring cloudie day, some raine.
8 May, Lord's day, 7 acloak.—A gray cloudie day.
9, Munday, 7 acloak.—Warme with clouds of raine.
10 May, Twysday, 6 acloak.—A gray morning & faire afternoone.
11, Wednesday, 7 acloak.—A warme day wt 2 great showers.
12 May, Thursday, 7 acloak.—A very fair warme day.
13, Fryday, 7 acloak.—A dustling gray day.
14 May, Saturnday, 6 acloak.—A prettie fair seasonable day.
15 May, the Lord's day, 7 acloak.—A prettie fair sharp day.
16 May, Munday, 7 acloak.—A raine and mist all day.
17 May, Twysday, 6—7 acloak.—Raine till noone, thereafter fair.
18, Wednesday, 7 acloak.—A very hot seasonable day.
19 May, Thursday, 6—7 acloak.—A fair seasonable day.
20, Fryday, 7 acloak.—A very fair caller† day.
21, Saturnday, 5 acloak.—A very great raine.
22, Lord's day, 4—5 acloak.—A fair caller day.
23 May, Munday, 5 acloak.—Fair befor noone, & raine after.
24, Twysday, 8 acloak.—A sharp louring day wt raine.
25 May, Wednesday, 7 acloak.—A fair, windie day.
26, Thursday, 7 acloak.—A prettie fair day.
27 May, Fryday, 5 acloak.—A gurle‡ day of blinks & shouers.
28, Saturnday, 4 acloak.—Foule in the morning and windie yrafter.
29 May, the Lord's day, 3—4 acloak.—A fair windie day.
30, Munday, 5 acloak.—Some shouers of raine but warme.
31 May, Twysday, 6—7 acloak.—A fair day and drying wind.

JUNE.

1 June, Wednesday, 7 acloak.—A fair, drying day.
2 June, Thursday, 4—5 acloak.—A very fair warme day.
3, Fryday, 5—6 acloak.—A gray louring fair day.
4 June, Saturnday, 7 acloak.—A fair warme day, but windie.
5 June, the Lord's day, 7 acloak.—A wind and grey day.
6 June, Munday, 7 acloak.—A very high wind & a cold day.
7, Tuysday, 7 acloak.—This was a very windie day; some raine.
8 June, Wednesday, 8 acloak.—A very vehement wind, and dry.
9, Thursday, 5—6 acloak.—A rough fair day.
10 June, Fryday, 5 acloak.—Fair befor, & very foule after noone.

§ The Diary of Andrew Hay, of Craignethan, 1659-1660. Edited, with Introduction and Notes, by Alexander George Reid, F.S.A. Scot. Edinburgh. Printed at the University Press, by T. and A. Constable, for the Scottish History Society. 1901. Publications of the Scottish History Society. Vol. XXXIX.

* Dawkie, moist. † Caller, fresh. ‡ Gurle, or gurlie, squally.

11, Saturnday, 4 acloak.—A gray day with some raine.
12 June, the Lord's day, 5 acloak.—A very warme day.
13, Munday, 5 acloak.—A prettie fair day.
14 June, Twysday, 4 acloak.—A drying day with some wind.
15, Wednesday, 8 acloak.—A fair drying day.
16 June, Thursday, 6 acloak.—A windie day, with some raine.
17, Fryday, 7 acloak.—A drying day after morning raine.
18 June, Saturnday, 7 acloak.—A mixed day, wind and some raine.
19, The Lord's day, 7 acloak.—A cold windie day & some raine.
20 June, Munday, 6 acloak.—A very warme, faire day.
21, Twysday, 4 acloak.—A prettie faire day.
22 June, Wednesday, 6 acloak.—A windie, ranie day.
23, Thursday, 7 acloak.—A prettie faire day and warme.
24 June, Fryday, 7 acloak.—A tollerable faire day.
25, Saturnday, 6—7 acloak.—A fair day but not very warme.
26 June, the Lord's day, 7 acloak.—A very seasonable raine all day.
27, Munday, 7 acloak.—Much raine fell this day.
28 June, Twysday, 4 acloak.—Warme & fair till night, then raine.
29, Wednesday, 7 acloak.—Fair before, & very foule after noone.
30 June, Thursday, 6—7 acloak.—A very seasonable faire day.

JULY.

1 July, Fryday, 7—8 acloak.—A faire warme day.
2 July, Saturnday, 7 acloak.—A very warme seasonable day.
3, The Lord's day, 7 acloak.—A prettie warme day.
4 July, Munday, 5—6 acloak.—A very hote day.
5, Twysday, 7 a'cloak.—A hote day with some clouds of raine.
6 July, Wednesday, 6 acloak.—Foule in the morning, and faire afternoone.
7, Thursday, 7 acloak. A prettie faire day with some wind.
8 July, Fryday, 6 acloak.—A faire seasonable day.
9, Saturnday, 7 acloak.—A faire louring day.
10 July, The Lord's day, 7—8 acloak.—A faire day and seasonable.
11 July, Munday, 5 acloak.—A prettie fair warme day.
12 July, Twysday.—A louring day, w^{t} some raine.
13, Wednesday, 6 acloak.—Rainie and cold before noone, faire but sharp after.
14 July, Thursday, 6 acloak.—A faire day but cold.
15, Fryday, 5—6 acloak.—Faire in the morning, and raine afternoone.
16 July, Saturnday, 5—6 acloak.—Faire in the morning, and foul after.
17, The Lord's day, 5 acloak.—Some showers of raine and cold.
18 July, Munday, 5 a'cloak.—Fair and warme all day.
19, Twysday, 6 acloak.—This was a very warme day.
20, Wednesday, 7 acloak.—A closse warme day.
21, Thursday, 6 acloak.—A warme day and some clouds of raine.
22 July, Fryday, 5—6 acloak.—Most pairt raine all day.
23, Saturnday, 6—7 acloak.—Great clouds of raine and many this day.
24 July, The Lord's day, — acloak.—Sumq^{t} cold and a blustering wind.
25, Munday, 7 a'cloak.—Some clouds and raine this day.
26 July, Twysday, 7 acloak.—Foule in the morning & fair y^{r} after.
27, Wednesday, 7 acloak.—Warme clouds of rane all day.
28 July, Thursday, 7 acloak.—Raine most p^{t} of this day.
29, Fryday, 7 hour.—Very rainie till noone, therafter faire.

30, Saturnday, 7 acloak.—A very seasonable & pleasant day.

31, The Lord's day, 6—7 acloak.—A blasting foule day of east winde and raine.

AUGUST.

1 August, Munday, 7—8 acloak.—A most tempestuous night & day of east winde and raine.

2, Twysday, 7 acloak.—A tollerable calm day.

3, August, Wednesday, 7 acloak.—Wind in the morning & raine afternoone.

4, Thursday, 6 acloak.—A fair, windie, dry day.

5 August, Fryday, 7 acloak.—A foule day, most part rainie all day.

6, Saturnday, 8 acloak.—A very windie goulin day.

7 August, The Lord's day, 7 a'cloak.—A warme day w^{t} some shouers.

8, Munday, 5—6 acloak.—A very warme fair day.

9 August, Twysday, 7 acloak.—Warme with some heavie shouers of rayne.

10, Wednesday, 8 acloak.—A prettie good day till neer night.

11 August, Thursday, 6—7 hours.—A very great raine all day since midnyt.

12, Fryday, 7 a'cloak.—A terrible raine all day.

13 August, Saturnday, 6—7 hors.—Prettie fair all day.

14, The Lord's day, 4 a'cloak.—A warm day w^{t} some shouers.

15 August, Munday, 5—6 a'cloak.—A good seasonable day.

16, Twysday, 7 a'cloak.—Much raine fell this day. "We had great difficulties to pass the waters" [fords].

17 August, Wednesday, 5 a'cloak.—A very rainie day.

18, Thursday, 6 a'cloak.—A most vehement raine.

19 August, Fryday, 7 a'cloak.—Fair, except some small shouers.

20, Saturnday, 7 a'cloak.—A very seasonable fair day.

21 August, the Lord's day, 7 a'cloak.—A very seasonable day.

22, Munday, 6 a'cloak.—A louring day and some raine.

23 August, Twysday, 7 a'cloak.—A very seasonable good day.

24, Wednesday, 7 a'cloak.—A prettie good, warme day.

25 August, Thursday, 6—7 a'cloak.—A very good fair day.

26, Fryday, 7 hors.—Fair before and raineing afternoone.

27 August, Saturday, 6 a'cloak.—A prettie fair day.

28, The Lord's day, 5 a'cloak.—A seasonable fair day.

29 August, Monday, 5 a'cloak.—A pretty fair, louring day.

30, Twysday, 8 a'cloak.—A rainie warm day.

31 August, Wednesday, 7 a'cloak.—A rainie warme day.

(To be continued.)

ROYAL METEOROLOGICAL SOCIETY.

THE first meeting of this Society for the present session was held on Wednesday evening, November 19th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. W. H. Dines, B.A., President, in the chair.

The following gentlemen were elected Fellows of the Society :—Mr. W. H. Archer, Mr. E. J. Bentley, Mr. J. H. W. Biggs, Mr. A. Chandler, Mr. S. F. Cody, Prof. A. C. Datta, B.A., Mr. W. Digby, C.I.E., Mr. H. S. Haworth, Mr. J. Pulteney-Tolland, Mr. W. S. Torbitt, B.A., Mr. V. M. Watermeyer, and Mr. H. B. Witty.

The President stated that the kite experiments for investigating the meteorological conditions of the upper atmosphere had been carried out during the summer months off the west coast of Scotland, the expenses having been met by grants from the Royal Society, the Royal Meteorological Society, and the British Association, and by a contribution from one of the Fellows. He also announced some donations to the Society's Research Fund.

Mr. F. Campbell Bayard read a paper entitled "English Climatology, 1881—1900," which was a discussion of the climatological data printed in the Society's *Meteorological Record.* Readers of this Magazine will, no doubt, remember that Mr. Bayard has already worked up the results for 1881—1890, and for 1891—1900, but in the present paper he gives monthly and yearly averages from 40 stations where the records have been continued during the 20 years 1881—1900. The elements dealt with are:—(1) Temperature at 9 a.m.; (2) Mean minimum temperature; (3) Mean maximum temperature; (4) Mean temperature; (5) Relative humidity; (6) Amount of cloud; (7) Rainfall; and (8) Number of rainy days.

Mr. W. Marriott exhibited a series of maps showing the range of temperature, relative humidity, amount of cloud, and number of rainy days at the various stations given in the tables of Mr. Bayard's paper. These maps showed clearly that there was a much greater range of temperature at inland stations than on the coast. The influence of the warm water of the Atlantic was distinctly manifest in the small range of temperature at the south-western coast stations, and also in the very small range in the values of relative humidity. One of the most striking features brought out in these maps was the small range in the monthly amounts of cloud and in the number of rainy days over the central northern parts of England, while along the south and west coasts there was a considerable variation in these elements.

Mr. R. H. Curtis criticised several points in the paper. He thought that the large amount of cloud at Wakefield was mainly due to the quantity of smoke in that neighbourhood.

Mr. J. Hunter referred to his own long-continued series of observations at Belper and thought that 20 years was hardly long enough to give a reliable mean for rainfall.

Dr. H. R. Mill said that while 30 years have been shown to give a satisfactory average for annual rainfall, he was of opinion that perhaps 50 years are necessary to give a good monthly curve.

The President, Dr. C. Theodore Williams, Mr. J. Hopkinson, Mr. R. Inwards, Mr. F. J. Brodie, and Surgeon-Major W. G. Black also took part in the discussion, and Mr. F. C. Bayard replied.

A paper by Mr. C. V. Bellamy, M.Inst.C.E., on "The Rainfall of Dominica," was read by the Secretary. This was in continuation of a former paper on the same subject, and dealt with all the available rainfall data for the island of Dominica. In the neighbouring island of Montserrat a remarkably heavy rainfall occurred during the night of November 28-29, 1896, when 20·13 in. fell in 6 or 8 hours.

THE CLIMATE OF THE BRITISH EMPIRE IN 1901.

THE Annual Climatological Table for 1901 is drawn up on precisely the same lines as in other years and presents very similar features. Of the fresh stations recently introduced into the monthly tables, only Lagos had completed the record for the year.

None of the extremes noted in the summary can claim distinction as "records," but a higher rainfall than that at Lagos has only twice appeared in these tables. At individual stations the sun temperatures both at London and Malta are the highest yet recorded, and at London the number of rainy days is the lowest since the tables were commenced. Mauritius, for the first time since our climatological table appeared, has a maximum temperature exceeding 90° in the shade, and Bombay and Calcutta also reached higher shade maxima than we have had occasion to note before. Curiously enough at the latter station the lowest absolute sun maximum for the period under consideration also took place. The records of relative humidity show that at Colombo and Trinidad it was the dampest year, and at Auckland the driest yet shown in these tables. If the records at the new station at Dawson on the Yukon are carried on, Winnipeg will be relieved from its hitherto unchallenged supremacy for low winter temperatures in the table, since a reading of —50°·0 was recorded at Dawson on December 31st.

Again we must beg our readers to remember that while the stations with the records of which we deal are on the whole representative stations, they are not necessarily the hottest, coldest, wettest or driest points of the British Empire. From the extraordinary richness of the varieties of climate included within the British dominions beyond the seas, those instances which are quoted cannot furnish more than a few useful samples.

SUMMARY.

Highest Temp. in Shade	110°·0 at Adelaide on February 6th.
Lowest ,, ,, ...	—36°·8 at Winnipeg on January 2nd.
Greatest Range in year	129°·6 at Winnipeg.
Least ,, ,, ...	21°·8 at Grenada.
Greatest Mean Daily Range ...	23°·7 at Winnipeg.
Least ,, ,, ...	9°·4 at Grenada.
Highest Mean Temp.	82° 1 at Colombo.
Lowest ,, ,, ...	36°·4 at Winnipeg.
Driest Station	Adelaide, mean humidity 59.
Dampest ,, ...	Colombo, ,, ,, 82.
Highest Temp. in Sun.....	168°·0 at Trinidad.
*Lowest Temp. on Grass**	—12°·5 at Toronto.
Greatest Rainfall.....	114·01 in. at Lagos, W. Africa.
Least ,, ...	18·01 in. at Adelaide.
Most Cloud	6·3 at Melbourne and Victoria, B.C.
Least ,, ...	3·0 at Malta and Grenada.

* The min. on grass is not recorded at the other Canadian stations.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1901.

Stations. *Those in Italics are South of the Equator.*	Absolute. Maximum. Temp.	Maximum. Date.	Minimum. Temp.	Minimum. Date.	Average. Max.	Min.	Mean.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Average. Cloud.
	°F		°F		°F	°F	°F	°F		°F	°F	in.		0—10
London	89·9	July 19	17·9	February 14	58·4	42·2	50·3	42·4	77	139·8	16·3	22·18	128	5·8
Malta	103·0	July 3	39·5	January 6	72·6	58·4	65·5	56·5	76	162·9	35·4	24·85	81	3·0
Lagos, W. Africa	96·1	December 8	...	.....	86·9	...	...	74·7	80	158·0	53·0	114·01	...	...
Cape Town	99·1	February 23	37·1	June 18	71·0	54·1	62·5	52·7	70	...	...	25·68	100	4·2
Mauritius	90·7	January 1	55·3	September 28	81·0	67·7	74·4	65·3	75	153·6	47·5	56·47	180	5·7
Calcutta	108·4	June 11	50·1	January 25	87·8	70·9	79·3	68·4	72	157·0	44·0	70·11	79	4·6
Bombay	96·4	March 12	58·4	February 22	86·3	75·4	80·8	71·6	75	151·5	48·9	75·32	98	4·0
Colombo, Ceylon	94·0	February 19	68·8	November 28	88·6	75·6	82·1	73·7	82	159·8	63·8	77·56	185	4·8
Melbourne	109·5	February 7	30·0	July 6	67·1	49·5	58·3	47·5	71	158·3	22·9	27·45	113	6·3
Adelaide	110·0	February 6	35·2	August 1	73·5	53·7	63·5	47·4	59	163·0	25·9	18·01	124	5·1
Sydney	104·0	December 17	38·4	June 16	69·7	55·8	62·8	51·9	72	157·1	30·0	40·12	151	4·6
Wellington	79·0	January 19	30·0	July 5	61·4	48·7	55·1	44·6	69	140·0	22·0	41·57	166	4·6
Auckland	79·0	January 6	37·0	June 23 & 25	63·7	52·9	58·3	47·7	68	152·0	33·0	38·49	176	5·6
Jamaica, Halfway Tree	...	.....	...	.....	...	...	...	...	...	...	...	49·19	93	...
Trinidad	96·0	May 11	60·0	January 31	87·8	69·9	78·8	72·8	81	168·0	51·0	59·32	138	...
Grenada	90·0	October 6	68·2	January 13	83·5	74·1	78·8	71·1	76	160·0	...	92·15	233	3·0
Toronto	97·1	June 27	—10·9	January 19	54·5	37·6	46·0	39·4	77	113·4	—12·5	32·20	...	6·1
New Brunswick, Fredericton	...	.....	...	.....	...	...	...	...	...	...	...	...	...	..
St. John, N.B.	...	.....	...	.....	...	...	...	...	...	...	...	...	...	...
Winnipeg, Manitoba	92·8	July 14	— 36·8	January 2	48·3	24·6	36·4	...	...	...	...	23·90	101	...
Victoria, B.C.	79·2	August 15	24·0	January 4	55·4	44·2	49·8	...	...	...	...	26·13	148	6·3
Dawson, Yukon	...	.....	...	.....	...	...	...	...	...	...	...	...	...	...

METEOROLOGICAL NEWS AND NOTES.

THE BEN NEVIS OBSERVATORIES have been made the subject of the following Memorandum, the contents of which will be welcome to all meteorologists:—

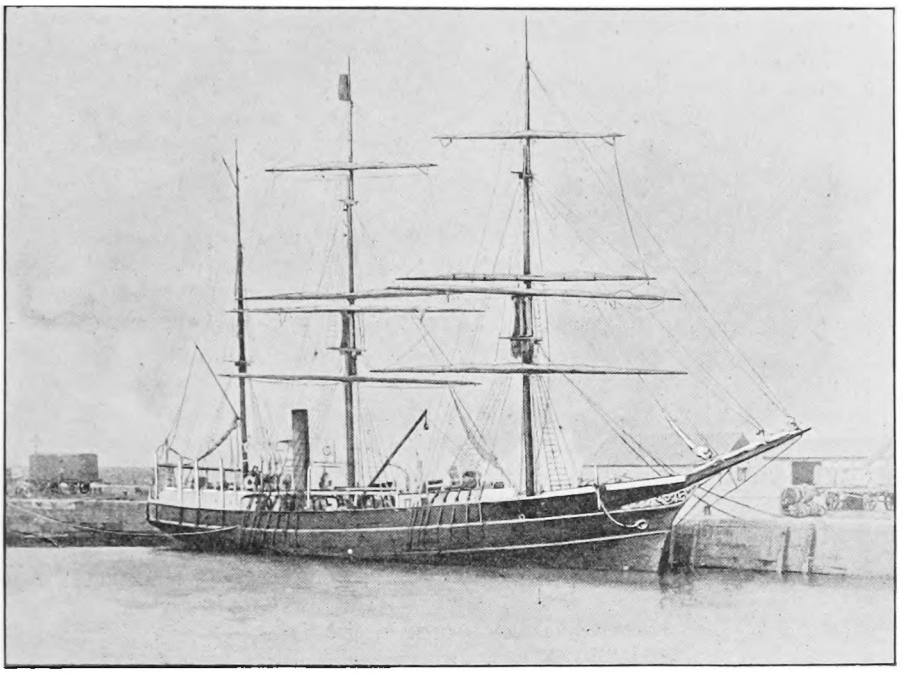
In a Memorandum, dated June, 1902, the Directors intimated that the Observatories at the top of Ben Nevis and in Fort William were to be discontinued at the beginning of October, 1902. In consequence of a proposal by the Treasury to make an inquiry into the administration of the grant to the Meteorological Council, the Directors were urged by Members of Parliament and others interested in the Observatories, to make an effort to keep the Observatories at work till the inquiry had been completed. They have now to intimate that they have succeeded in obtaining the necessary funds, and that there will be no stoppage of the work at the Observatories till October, 1904; that is, the work will go on as hitherto for other two years. One generous donor is to provide the whole funds necessary for the second year. This prolongation will give ample time to make such arrangements as may be consequent on the Report of the Committee of Inquiry.

THE BIDSTON OBSERVATORY, opposite Liverpool, where much excellent meteorological work has been carried on for many years, is threatened with extinction. The Mersey Docks and Harbour Board, to which the observatory belongs, is, we understand, applying to Parliament for a Bill containing a clause "to relieve the Board from all obligations to maintain the Observatory on Bidston Hill, and to authorise the Board to sell or dispose of the same and the site thereof and the instruments and the appurtenances therein and connected therewith." Much surprise and regret is expressed in the Liverpool newspapers, and suggestions have been made that the proposed University of Liverpool or the Municipal authorities should assume the duties which the Dock Board is anxious to cease to perform.

MR. H. E. HAMBERG, who has been a member of the staff of the Central Meteorological Institute in Stockholm for twenty-four years, has been appointed Director of the Institute, in succession to the late Mr. Robert Rubenson.

DR. W. N. SHAW, F.R.S., read a paper at the meeting of the Aëronautical Society on December 4th, on the contributions which balloon and kite investigations have made to Meteorology. He called special attention to the fact that cyclonic storms had been shown to be characteristic of the lower strata of the atmosphere.

THE BELGIAN MAGAZINE "CIEL ET TERRE" states that at a recent meeting of the Belgian Geological Society, Professor E. Lagrange and M. E. Vanden Broeck proposed to undertake a scientific study of all the phenomena of geophysics during the year 1902, on the exceptional character of which they laid stress. They propose to take into account the seismic, volcanic, meteorological, magnetic and solar phenomena of the year as observed in all parts of the world, and they request the collaboration of foreign workers, who may, pending the appointment of an executive committee, communicate with Professor Lagrange, 60, Rue des Champs Elysées, Brussels.



THE ANTARCTIC RESEARCH SHIP "SCOTIA."

THE METEOROLOGICAL EQUIPMENT OF THE SCOTTISH ANTARCTIC EXPEDITION.*

BY R. C. MOSSMAN, F.R.S.E.

IN order to prevent this short article from assuming the form of a catalogue of meteorological instruments, I shall restrict my remarks to a few generalisations on the apparatus provided. The Scottish Antarctic Expedition, under the leadership of Mr. W. S. Bruce, while primarily an expedition on the Challenger and Valdivia lines, viz., for oceanographical research, is in all points of its equipment prepared to winter amidst the ice. The meteorological apparatus taken therefore provides for such a contingency. To give a list of the instruments provided is unnecessary, but a few notes on the broad aspects of the work now begun and contemplated, may be of interest. At present, on the voyage to Madeira, observations are taken every four hours, but south of latitude 30° S. readings will be

* This article was written on the voyage of the *Scotia*, and posted at Madeira. We understand that the expedition will remain continuously at work for one year, and that a second year's work will be undertaken if funds are forthcoming.—ED. *S.M.M.*

taken every two hours, and after passing the Falkland Islands, every hour, day and night.

For temperature observations two screens of the ordinary pattern for use on ship board are provided, each containing a dry and wet bulb thermometer. They have been placed aft, on cross beams raised well above the surface of the poop deck, and clear of it, one on the port the other on the starboard side. On the weather side are also suspended a Richard thermograph and hygrograph, the latter in such a position as to be uninfluenced by artificial changes in the humidity, such as may be occasioned by the deck being washed, or by rain. A special form of screen has been devised for these instruments, made of wood and calico, which answers well if one may judge from the comparative readings obtained from the thermometers in the adjoining screens. A marine rain gauge, provided by Dr. W. G. Black, is placed on the weather side, also on one of the cross beams referred to. A suitable place for his evaporator has not yet been found. A Stevenson screen of the ordinary land pattern, containing a maximum and minimum thermometer, is located on the roof of the forward laboratory, amidships. Inside this laboratory is a Kew marine barometer, and the Richard statoscope (an extremely delicate barograph), for measuring the height of ocean waves. This instrument was tried in the Bay of Biscay and found to answer well, the mean height recorded being 11·4 feet from trough to crest. In the writer's cabin is a large Richard barograph and another marine barometer. Small barographs are also suspended in Mr. Bruce's cabin, and in the chart room.

A Whipple temperature indicator is also in Mr. Bruce's cabin, the platinum resistance thermometer for surface sea temperature work being placed well forward on the starboard side, and the cable led along the gunwale under the rail. Eye observations of sea surface temperature, from water drawn up in a bucket, will be taken several times daily, as a check on the readings of the platinum thermometer. The thickness of the rainband in the spectrum of sunlight is taken four times daily, also observations on the number of dust particles by means of Aitken's pocket dust-counter.

A prominent feature of the meteorological work will be the investigation of the upper atmosphere by means of kites carrying meteorographs. A special engine for reeling in the four miles of kite wire has been constructed, and this can be worked either directly from a 10 h.p. quick-working steam winch, or by a petrol motor. Five aluminium meteorographs have been taken, also two large box kites, standing over seven feet high. A large stock of bamboo rods, calico, and wire, are provided for the construction of more kites should they be required, but this is unlikely as the kites are very strong and durable, one of the two taken, though in use for nearly three years, being to all appearance as good as new. The services rendered to the expedition by Mr. John Anderson, who

has directed the preliminary kite work, both on land and on sea, have been of the utmost value.

With reference to the equipment for a land station in the far south, I have been largely guided by the information kindly furnished by the Meteorological Office relative to the instruments supplied to the "Discovery." Our stock of apparatus is practically similar, and need not be given in detail. In connection with our preparations I have received much valuable advice and help, from among others, Dr. Buchan, Mr. R. T. Omond, Prof. Copeland, Mr. J. Y. Buchanan, and Mr. John Aitken.

In this short notice I have merely indicated in a general manner the meteorological work with which I am more immediately associated, in conjunction with Mr. W. S. Bruce and Mr. D. W. Wilton (the assistant zoologist), who are both meteorologists of wide experience. I have said nothing about the physical apparatus provided for extending our knowledge of the science of the sea, such as the reversing thermometers, the Pettersson-Nansen insulating water bottles and the chemical and bacteriological equipment generally.

If I may be permitted to do so, I should like to draw attention to the utterly inadequate methods at present in vogue for the prosecution of meteorological work at sea. The subject is undoubtedly a difficult one, but a committee of experts might take the matter up and devise, for example, a thermometer screen which, in addition to the dry and wet bulbs, might also contain a specially constructed maximum and minimum thermometer (not a Six's), which would be uninfluenced by the rolling or pitching of the ship. Special screens to be suspended from spring hooks are also much needed for the Richard hygrograph and thermograph, and a sunshine recorder, mounted like the rain gauge on gymbals, might be practicable. As regards sea temperature work, some form of self-registering platinum-resistance thermometer might surely be devised, which could be lowered into the sea and record graphically the variations of temperature as it descended into the depths.

REVIEWS.

Wind Charts for the Coastal Regions of South America. Prepared in the Meteorological Office under the superintendence of COMMANDER CAMPBELL HEPWORTH, R.N.R. Published by the Hydrographic Department of the Admiralty, 1902. Size 26½ × 20. Price 7s.

THERE are twelve maps of South America, from the equator southward, one for each month of the year, with the sea within about 300 miles of the coast divided into a number of rectangular areas in each of which there is a wind-rose showing the average frequency and force of winds from sixteen directions. This atlas gives the results for the coast region of a very extensive work now in progress

at the Meteorological Office on the winds of the Atlantic and eastern margin of the Pacific from the Equator to 70° S. The portion now published generalizes the results of 264,639 observations of wind and simultaneous readings of the barometer. Isobars for each tenth of an inch are given as well as the wind roses.

A general result of great interest is that on the west coast of South America from about 40° S. northward to the Equator the prevailing wind for every month blows from southerly points and parallel with the coast, thus explaining the aridity of the coast plain, and contradicting the common notion that the trade wind blows across the Andes. South of 40° S. the direction varies somewhat with the season, but westerly points always predominate, blowing on the whole at right angles to the shore and accounting for the heavy rainfall of that part. On the east coast, except in the trade-wind belt, there is no very great predominance of one direction over another, and even in the trades the range in direction is far greater than in the constant southerly winds of the west coast.

Temperatures in Kingston, Jamaica, and the connection between sun-spot frequency, the mean max. temperature and the rainfall in Jamaica. By MAXWELL HALL. Kingston, 1902. Size, $13\frac{1}{2} \times 8\frac{1}{2}$. Pp. 12.

THE relation between the sun-spot and maximum temperature curves is very striking; but the rainfall curve is much less congruent with that of sun-spots.

The Dominion of the Air, the story of Aërial Navigation, by the REV. J. M. BACON. London, Cassell and Company. *Not dated.* Size, $8 \times 5\frac{1}{2}$. Pp. viii. + 348.

AN interesting popular sketch of the incidents in the history of ballooning, with frequent reference to the use of balloons for scientific purposes. The disadvantages of a balloon floating in the air and drifting with the wind for delicate thermometric observations, as compared with a kite past which the wind is always blowing strongly, are pointed out; but more might, in our opinion, have been said of the admirable work now being carried on by the International Aëronautical Association. We fear indeed that the popular idea of the balloon as a showman's or adventure-seeker's toy will not be altogether dispelled by the numerous extracts from newspapers, and the reproductions of posters that enliven this very readable book. We would gladly have seen more of Mr. Bacon's own experiences—the references to his observations on the extraordinary complexity of the air-currents in the atmosphere striking us as perhaps the most interesting part of this work.

The general reader will not at once see where the advantage of inflating a balloon with hydrogen comes in when he reads on p. 104, "whereas 1000 cubic feet of hydrogen is capable of lifting 7 lbs., the same quantity of coal gas of ordinary quality will raise but

35 lbs." But the author has reason to complain of his printer in several places; the pages yielding an unusual crop of typographical slips, sometimes misleading and always irritating. The illustrations, on the other hand, are excellent, if not invariably required for the elucidation of the text.

GAMBLING BY RAIN GAUGE.

DR. HELLMANN sends us a cutting from a German newspaper, which is worth translating, as showing to what base uses a rain gauge may be turned, to nothing less in fact than a substitute for a roulette wheel. We cannot vouch for the truth of the paragraph, but we give the statement as it stands.

"*An Indian Sport.*—Educated Europeans must soon learn to grow accustomed to a name which at first has a somewhat barbarous sound—*Barsat ka satta.* It is a very simple game, which had its origin in India. It consists in betting on the amount of rain which will fall on a certain day, and it thus converts meteorology into a sport. In order to measure the intensity of the rainfall, vessels with divisions marked on the side are placed on the terraces or balconies of the houses. However simple this way of finding amusement on a rainy day may appear, it has attained so much popularity in India that great and small take up *Barsat ka satta.* The betting grew more general, and the sums risked higher, until finally many families came to financial ruin, and numerous suicides resulted. The state of matters became so serious that the British Government was at last obliged to interfere and forbid the game. As a result of this regulation the British public became acquainted with the Indian sport, and during the expected rainy summer in England *Barsat ka satta* will be played with enthusiasm."

If the game does eventually oust ping-pong we trust that the players will see that the best type of rain gauge is established, and the records regularly kept. Hitherto British rainfall observers have been remarkably long lived, and we do not even now anticipate an epidemic of suicide and ruin following on the abuse of the harmless necessary rain gauge.

Correspondence.

THE MOON AND THUNDERSTORMS.

To the Editor of Symons's Meteorological Magazine.

BEFORE entering upon a discussion as to whether more thunderstorms occur at the time of full or new moon, it would be well to make sure that the greater light at the time of full moon has not introduced a systematic error into the observations. It is certain that a flash of lightning would be more likely to be noted on a dark than on a bright night, and that therefore, *cæteris paribus*, more observations of lightning will be recorded at the time of new than at the time of full moon. W. H. DINES.

December 6th, 1902.

COLONIAL METEOROLOGY.

To the Editor of Symons's Meteorological Magazine.

To my mind, the comparison you draw in the September number, p. 127, between the governments of Australia and Cape Colony, tells altogether the other way. What efforts the latter made "to keep its meteorological system at work during the war," I really do not know, seeing that it has never hitherto made any effort in time of peace. The Cape vote for meteorology is £600 per annum. Out of that all salaries, rent of offices, travelling expenses, cost of instruments,—in fact everything, has to be paid. It has no observatory of any shape or form, for any science whatever. On the other hand, each of four of the Australian colonies has an observatory and weather service; and in addition they subscribe another £1,000 between them. Of course it is to be hoped that this amount may be doubled or trebled in the near future; but meanwhile it would appear that Australia spends as much upon science in one year as Cape Colony does in ten. A few volunteer observers here did, it is true, in the infested districts, try to keep their end up, and in some cases succeeded, but what credit that can be to the government is hard to see. Even in volunteer effort we are far behind the Australians.

Kenilworth, Kimberley, 11th Oct., 1902. J. R. SUTTON.

[Mr. Sutton scarcely appreciates our careful selection of words in speaking of "the efforts *in* Cape Colony;" we did not say "*of* Cape Colony," for we had in view the work of the devoted individual observers like himself, not the funds given by the government. Now in a time of peace and re-organization it may not be too much to hope that the Cape government will realise that it is true economy to spend annually a few thousand pounds of public money on an efficient meteorological service, and that a central meteorological office will ultimately be established, not for Cape Colony only, but for British South Africa as a whole. That the fine observatory at Cape Town is supported by Imperial funds may possibly account for the absence of any observatory supported by the Colony. We appreciate very highly the admirable Weather Services of the Australian States, yet there too the work ought to be supplemented and completed by a properly constituted federal department.—Ed. *S.M.M.*]

BOOKS RECEIVED.

Rousdon Observatory, Devon. Meteorological observations for the year 1901, continued under the superintendence of the Hon. Lady Peek, F.R. Met.Soc. Volume XVIII. London, 1902. Size 11 × 8½. Pp. 12.

Annals of the Astronomical Observatory of Harvard College. Vol XLIII. Part II. Observations and Investigations made at the Blue Hill Meteorological Observatory, Mass., U.S.A., in the years 1899 and 1900, under the direction of A. Lawrence Rotch. Cambridge (Mass.), 1902. Size 12×10. Pp. 39–110.

THE ELEVEN MONTHS' RAINFALL OF 1902.

Aggregate Rainfall for January—November, 1902.

Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver	Station.	Diff. from Aver.	Per cent. Aver.
	in.			in.			in.	
London	—1·52	93	Arncliffe	-19·09	65	Aberdeen	—2·40	92
Tenterden	—5·27	78	Hull	—3·44	85	Cawdor	—4·80	83
Hartley Wintney	—2·73	88	Newcastle	—4·50	81	Strathconan	-10·88	77
Hitchin	— ·95	96	Seathwaite	-40·10	66	Glencarron	-13·46	84
Winslow	—5·00	77	Cardiff	—4·28	88	Dunrobin	—5·63	80
Westley	—2·81	88	Haverfordwest	—1·53	96	Darrynane	—8·00	82
Brundall	—2·23	90	Gogerddan	—8·64	78	Waterford	+2·84	108
Blandford	...	...	Llandudno	—5·24	81	Broadford	—3·23	89
Polapit Tamar	—2·72	92	Dumfries	—8·28	79	Carlow	+1·31	104
Stroud	—1·96	92	Lilliesleaf	—4·33	84	Dublin	+2·86	111
Woolstaston	+1·96	107	Colmonell	...	...	Mullingar	—4·75	86
Worcester	+2·28	111	Glasgow	—6·53	80	Ballinasloe	—5·70	83
Boston	+1·76	109	Islay	—2·23	95	Clifden	-16·00	78
Hesley Hall	— ·50	97	Mull	—3·46	93	Crossmolina	—5·60	88
Derby	+ ·85	104	Loch Leven	—9·11	72	Seaforde	+5·65	117
Manchester	...	...	Dundee	—4·59	81	Londonderry	—5·17	86
Wetherby	—2·13	90	Braemar	—4·96	84	Omagh	+ ·18	101

November showed a very unequal distribution of rainfall. The north of Scotland was the driest part of the British Islands, with less than an inch of rain in Caithness and round the Moray Firth. Less than an inch also fell on the south side of the Firth of Forth. The whole of the east and centre of England had less than two inches of rain, and all stations in this area had less than the November average. In South Wales and the south-west of England, on the other hand, the rainfall was more than five inches over a considerable area, and the average was considerably exceeded. Ireland had a very heavy rainfall everywhere, much exceeding the average in the west and south.

The result has been to intensify the deficiency of rain in England, reducing the small area in the Midlands, within which the average for the ten years 1890-99 (itself deficient) has been exceeded but slightly improving the state of matters in the west. The east of Ireland has received more than its normal rainfall; but in spite of the heavy falls in the west of that island there is still a deficiency of from 10 to 20 per cent. Generalizing, we may say that England and Wales as a whole has received 90 per cent. of the amount of rain which might be expected in the first eleven months of 1902, Scotland as a whole has received little more than 80 per cent., while Ireland has received 95 per cent. As October and November are two of the wettest months of the year, the outlook for water-storage in some parts of the country is very far from satisfactory.

NOVEMBER, 1902.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1890-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	No. of Nights below 32°. On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·80	— ·42	·36	29*a*	11	59·3	6	26·7	21	4	10
II.		Tenterden	2·26	— ·31	·49	8	17	58·5	6	28·0	20	6	12
,,		Hartley Wintney	2·64	+ ·16	·40	29	16	58·0	28	24·0	21	8	11
III.		Hitchin	1·47	— ·95	·27	28	13	59·0	6	26·0	17*b*	7	...
,,		Winslow (Addington)	1·63	— ·84	·36	29	14	58·0	3	27·0	21	5	9
IV.		Bury St. Edmunds (Westley)	1·42	— 1·08	·36	24*a*	11	62·0	1	26·0	22	...	...
,,		Norwich (Brundall)	1·42	— 1·04	·51	30	10	60·8	1	29·0	22	5	16
V.		Winterborne Steepleton	5·40	...	·83	24	16	56·8	6	28·1	22	7	9
,,		Torquay	4·93	...	·87	27	18	64·7	1	33·4	20	0	0
,,		Polapit Tamar [Launceston]..	5·24	+ 1·36	1·17	27	20	60·4	1	27·0	19	4	5
VI.		Stroud (Upfield)	2·40	— ·29	·55	8	14	55·0	1,6,7	28·0	20*b*	4	...
,,		Church Stretton (Woolstaston)	2·49	— ·29	·59	8	16	57·0	1	27·0	19*b*	5	...
,,		Worcester (Diglis Lock)	2·25	+ ·15	·35	27	16	...	...	...	...	...	...
VII.		Boston	1·24	— ·61	·35	30	8	58·0	10	28·0	22	...	...
,,		Hesley Hall [Tickhill].....	1·59	— ·35	·54	30	15	58·0	1	23·0	18*c*	8	...
,,		Derby (Midland Railway).....	1·69	— ·24	·22	28	15	59·0	1	30·0	20*d*	3	...
VIII.		Manchester (Plymouth Grove)	...	...	...	...	...	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ...	1·68	— ·28	·42	24	14	...	...	...	...	...	...
,,		Skipton (Arncliffe)	3·97	— 2·10	·76	8	18	...	...	...	...	...	...
,,		Hull (Pearson Park).....	1·34	— ·95	·42	24	12	61·0	1	28·0	22	5	10
X.		Newcastle (Town Moor)	1·21	— 1·25	·30	8	10	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	9·26	— 4·72	2·45	8	18	56·5	6	26·7	21	4	...
XI.	WALES.	Cardiff (Ely).....	4·62	+ ·66	1·29	8	19	...	...	...	...	...	...
,,		Haverfordwest	7·13	+ 2·27	1·08	27	19	56·6	6	25·4	19	3	11
,,		Aberystwith (Gogerddan) ...	3·18	— 1·77	·90	28	14	58·0	1, 6	20·0	19	9	...
,,		Llandudno.....	1·65	— 1·69	·56	28	20	59·0	1	31·8	21	1	...
XII.	SCOTLAND.	Cargen [Dumfries]	4·21	— ·33	·86	11	15	57·0	6	25·0	22	6	...
XIII.		Edinburgh (Royal Observatory)	·60	...	·20	8	11	58·5	6	29·8	22	2	10
XIV.		Colmonell	...	...	...	...	...	...	...	...	...	...	...
XV.		Tighnabruaich	5·85	...	1·38	28	20	50·0	6, 7	30·0	20*b*	2	...
,,		Mull (Quinish).....	5·70	— ·27	1·02	7	21	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·31	— 1·34	·46	25	12	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	2·90	+ ·09	·70	8	16	57·7	1	30·6	22	2	...
XVII.		Braemar	3·15	— ·62	·90	8	20	55·3	6	25·8	24	6	17
,,		Aberdeen (Cranford)	2·78	— ·58	·63	6	19	55·0	15	28·0	23	2	...
,,		Cawdor (Budgate)	·75	— 1·99	·35	8	10	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	1·95	— 3·70	·60	10	7	...	...	...	...	...	...
,,		Glencarron Lodge.....	3·40	— 6·52	1·02	2	17	61·9	15	32·0	18	1	...
XIX.		Dunrobin	1·10	— 2·19	·25	8	12	58·0	1	35·0	24	0	...
,,		S. Ronaldshay (Roeberry) ...	1·65	— 2·42	·25	9	18	53·0	13	35·0	30	0	...
XX.	IRELAND.	Darrynane Abbey.....	6·59	+ 1·64	·93	10	28	...	...	33·0	29	...	...
,,		Waterford (Brook Lodge) ...	7·31	+ 3·79	1·26	6	21	57·5	3	30·0	27	2	...
,,		Broadford (Hurdlestown) ...	4·90	+ 1·65	·78	6	23	54·0	1	29·0	19	6	...
XXI.		Carlow (Browne's Hill)	4·75	+ 1·68	1·04	6	18	...	...	...	...	...	...
,,		Dublin (Fitz William Square)	3·33	+ ·77	·88	6	18	58·9	1	35·2	27	0	5
XXII.		Ballinasloe	4·80	+ 1·23	1·14	6	25	56·0	1,2,3	21·0	20	9	...
,,		Clifden (Kylemore)	11·04	+ 3·10	2·06	10	21	...	...	...	...	...	...
XXIII		Seaforde.....	6·07	+ 2·37	1·01	11	22	55·0	1,4,6	29·0	28	3	5
,,		Londonderry (Creggan Res.).	2·92	— ·95	·73	8	21	...	...	...	...	...	...
,,		Omagh (Edenfel)	4·38	+ ·67	1·14	6	22	54·0	14	28·0	26	4	10

+ Shows that the fall was above the average ; — that it was below it.
a—and 30. *b*—and 21. *c*—and 22. *d*—and 21, 22.

SUPPLEMENTARY TABLE OF RAINFALL, NOVEMBER, 1902.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	1·93	XI.	Castle Malgwyn	4·74
II.	Dorking, Abinger Hall .	3·29	,,	Builth, Abergwesyn Vic.	...
,,	Sheppey, Leysdown	1·38	,,	Rhayader, Nantgwillt...	5·21
,,	Hailsham	3·07	,,	Lake Vyrnwy	3·61
,,	Crowborough.....	3·18	,,	Ruthin, Plâs Dráw	1·87
,,	Ryde, Beldornie Tower..	3·42	,,	Criccieth, Talarvor	3·17
,,	Emsworth, Redlands ...	3·56	,,	I. of Anglesey, Lligwy..	3·10
,,	Alton, Ashdell	3·44	,,	Douglas, Woodville.....	4·22
,,	Newbury, Welford Park	3·81	XII.	Stoneykirk, Ardwell Ho.	5·15
III.	Oxford, Magdalen Coll..	2·22	,,	Dalry, Old Garroch	6·53
,,	Banbury, Bloxham	2·25	,,	Moniaive, Maxwelton Ho.	4·79
,,	Pitsford, Sedgebrook ...	1·73	,,	Lilliesleaf, Riddell	1·76
,,	Huntingdon, Brampton.	1·55	XIII.	N. Esk Res. [Penicuick]	...
,,	Wisbech, Bank House...	1·50	XIV.	Glasgow, Queen's Park..	2·20
IV.	Southend	1·53	XV.	Inveraray, Newtown ...	5·77
,,	Colchester, Lexden	1·60	,,	Ballachulish, Ardsheal...	5·42
,,	Saffron Waldon, Newport	1·01	,,	Islay, Eallabus.....	5·39
,,	Rendlesham Hall	1·28	XVI.	Dollar.....	2·49
,,	Swaffham	1·30	,,	Balquhidder, Stronvar...	...
V.	Salisbury, Alderbury ...	4·21	,,	Coupar Angus Station...	4·65
,,	Bishop's Cannings	2·35	,,	Blair Atholl	5·05
,,	Blandford, Whatcombe .	...	,,	Montrose, Sunnyside ...	3·27
,,	Ashburton, Druid House	7·44	XVII.	Keith H.R.S.....	1·55
,,	Okehampton, Oaklands.	5·72	XVIII.	Fearn, Lower Pitkerrie..	·47
,,	Hartland Abbey	4·51	,,	S. Uist, Askernish	3·78
,,	Lynmouth, Rock House	4·10	,,	Invergarry.....	2·43
,,	Probus, Lamellyn	5·42	,,	Aviemore, Alvie Manse.	·63
,,	Wellington, The Avenue	4·25	,,	Loch Ness, Drumnadrochit	·75
,,	North Cadbury Rectory	3·37	XIX.	Invershin	1·62
VI.	Clifton, Pembroke Road	2·65	,,	Bettyhill	·60
,,	Ross, The Graig	2·64	,,	Watten H.R.S.....	·94
,,	Shifnal, Hatton Grange	1·77	XX.	Dunmanway, Coolkelure	...
,,	Wem, Clive Vicarage ...	1·67	,,	Cork, Wellesley Terrace	8·52
,,	Cheadle, The Heath Ho.	2·39	,,	Killarney, District Asyl.	7·88
,,	Coventry, Priory Row ..	1·94	,,	Caher, Duneske	...
VII.	Market Overton	2·24	,,	Ballingarry, Hazelfort...	4·76
,,	Grantham, Stainby	2·09	,,	Miltown Malbay	6·48
,,	Horncastle, Bucknall ...	1·19	XXI.	Gorey, Courtown House	4·44
,,	Worksop, Hodsck Priory	1·58	,,	Moynalty, Westland ...	3·26
VIII.	Neston, Hinderton	1·67	,,	Athlone, Twyford	4·57
,,	Southport, Hesketh Park	1·89	,,	Mullingar, Belvedere ...	3·85
,,	Chatburn, Middlewood.	2·17	XXII.	Woodlawn	4·98
,,	Duddon Val., Seathwaite Vic.	6·89	,,	Westport, Murrisk Abbey	6·44
IX.	Baldersby	1·79	,,	Crossmolina, Enniscoe ..	6·45
,,	Scalby, Silverdale	1·14	,,	Collooney, Markree Obs.	5·15
,,	Ingleby Greenhow Vic..	1·18	XXIII.	Enniskillen, Model Sch.	...
,,	Middleton, Mickleton ...	2·25	,,	Warrenpoint.....	5·83
X.	Beltingham	1·24	,,	Banbridge, Milltown ...	3·31
,,	Bamburgh	1·63	,,	Belfast, Springfield	3·67
,,	Keswick, The Bank.....	3·81	,,	Bushmills, Dundarave..	3·45
XI.	Llanfrechfa Grange	4·18	,,	Stewartstown	3·25
,,	Treherbert, Tyn-y-waun	7·79	,,	Killybegs	5·03
,,	Llandovery	3·69	,,	Horn Head	4·69

METEOROLOGICAL NOTES ON NOVEMBER, 1902.

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.

ENGLAND AND WALES.

LONDON, CAMDEN SQUARE.—Mild and cloudy, with a fair amount of fog and slightly deficient R. Frost in the third week. Mean temp. 44°·8, or 1°·8 above the average.

ABINGER HALL.—Very showery to 11th, with nasturtiums and other flowers in full bloom. Cold and dry from 11th to 24th. Showers later. R still needed, the soil being perfectly dry under shrubs.

TENTERDEN.—Max. temp. over 52° for the first fortnight; third week very cold; last week warm and rainy. Duration of sunshine 58 hours.

SHEPPEY, LEYSDOWN.—The first three weeks were particularly fine and bright, with no fog. Very cold from 16th to 21st. The last three days accounted for more than half the total R.

CROWBOROUGH.—Damp and misty; mild on the whole notwithstanding a cold spell from 17th to 22nd. Very light showers of S on 19th and 20th.

WINSLOW, ADDINGTON.—Very dull, with little sunshine. Very cold from 18th to 22nd.

PITSFORD, SEDGEBROOK.—R ·69 in. below the average. Mean temp. 43°·5.

BURY ST. EDMUNDS, WESTLEY.—Very mild till 17th; then a cold snap for a week. Great want of water felt, many deep chalk wells being dry.

NORWICH, BRUNDALL.—The mean temp. of the first fortnight was 4°·7 higher than that of the first fortnight of May, 1902. The mean temp. of the week ending 22nd was however 10°·2 lower than that of the previous week. Fewer days with R than in any November in 20 years.

WINTERBOURNE STEEPLETON.—A cold spell occurred in the third week, between two wet periods. R nearly an inch above the average of 10 years.

TORQUAY, CARY GREEN.—R 1·16 in. above the average. Mean temp. 49°·4, or 2° above the average. Duration of sunshine 69·2 hours, or 6·0 hours above the average. Mean amount of ozone 5·4, max. 9·0 on 5th, 8th, 11th, and 28th; min. 1·0 on 3rd, 20th and 27th.

POLAPIT TAMAR.—Generally wet, especially the last 10 days, but warm, although the wind was frequently easterly.

OKEHAMPTON, OAKLANDS.—When dry there was a very cold E. wind.

LYNMOUTH, ROCK HOUSE.—Except between 16th and 21st it was mild, with very few bright days and no violent gales.

WELLINGTON, THE AVENUE.—The first part was mild, with a good deal of R at times, but some very fine days. From 16th to 21st was cold, and from 22nd to end wet and mild. R about an inch above the normal amount.

NORTH CADBURY RECTORY.—A curious month, with 20 maxima at or above 52°·5, and also with the four coldest consecutive November days for several years. Remarkably fine and dry from 12th to 21st.

CLIFTON, PEMBROKE ROAD.—Mild and rainy till 11th; dry, with E. winds and slight frost from 12th to 21st, and dull and rainy from 22nd to 30th. R nearly half-an-inch below the average, but a full number of rainy days.

ROSS, THE GRAIG.—Notwithstanding a very cold week from 16th to 22nd, the temp. was rather above the average. Seldom have so many plants continued in such perfection of flowering as up to November 7th, tender plants not being injured till 18th, the latest on record.

COVENTRY, PRIORY ROW.—For the most part mild and open, with a sharp snap of dry frost from 17th to 22nd. Vegetation continued growing until the frost, and the cold would not have been severe but for the rasping E. wind.

HULL, PEARSON PARK.—Very dull generally, with frequent fogs, the latter half being characterised by very cold E. and S.E. winds. Duration of sunshine 23¼ hours.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE.—Temp. very low from 18th to 23rd.

HAVERFORDWEST.—After 5 dry and cold days a gale occurred on 6th, and wet and stormy weather lasted till 15th, when the wind shifted to E., and cold gloomy weather prevailed to 24th, thereafter mild and wet. Duration of sunshine 37·7 hours.

ABERYSTWITH, GOGERDDAN.—Not many fogs but a fair amount of wet and dull weather. Rather sharp and sudden frost in the third week, cutting off the foliage of fruit trees.

DOUGLAS, WOODVILLE.—The first fortnight was mild, very wet, and somewhat stormy, succeeded by an extremely cold, dry week. The rest was again wet, with average temp. The wind, which was persistently in the E., blew more or less strongly nearly every day, though rarely reaching the force of a moderate gale. No frost.

SCOTLAND.

MONIAIVE, MAXWELTON HOUSE.—R ·06 in. above the average of 10 years.

LILLIESLEAF, RIDDELL.—R on 13 days, but the rest of the month was remarkably dull, dark and drizzly. Little frost and very mild weather. Two apple trees bearing blossom on December 1st.

TIGHNABRUAICH.—For 16 days the wind was steady from E., and on 9 others it blew part of the 24 hours from the E., though upper cloud motion was from S.

BALLACHULISH, ARDSHEAL.—Exceptionally dry, R 2·28 in. below the average.

COUPAR ANGUS.—Generally open and warm, with mean temp. 42°·7, or about 3° above the average. The remarkable feature was the excessive R, and November redeems the deficiency of the previous months.

AYIEMORE, ALVIE MANSE.—Unprecedentedly dry.

DRUMNADROCHIT.—R abnormally small, being 2·45 in. below the average of 16 years, and ·40 in. less than the previous smallest. The total fall of the first 11 months was 7·57 in. below the average.

BETTYHILL.—Unusually dry; bright, with frequent strong winds and some slight frosts about the middle.

IRELAND.

CORK, WELLESLEY TERRACE.—R the greatest for 37 years. Storms on 8th and 21st; during the latter, bar. fell 1 inch in 24 hours.

DARRYNANE ABBEY.—Wet and, on the whole, mild.

MILTOWN MALBAY.—Almost one continual downpour, the total being more than any previous three months of the year put together. One week, about the 20th, was very cold.

DUBLIN, FITZWILLIAM SQUARE.—A fitting sequal to the dreary wet months which preceded it. There was indeed a remarkable anti-cyclonic period, cold, rainless, and squally, from 14th to 21st, but for the rest R fell almost daily and often heavily. Mean temp. 47°·5, or 2°·1 above the average. High winds on 20 days, reaching the force of a gale on three. Foggy on 6 days. L on 9th. Sleet and H on 20th and H on 29th.

COLLOONEY, MARKREE OBSERVATORY.—The early part was much broken, having heavy R and high wind on some days. From 17th to 21st was bitterly cold, yet fine and dry. Warmer afterwards, but frost set in towards the end.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1902

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	84·5	28	39·2	10	68·8	50·7	49·6	66	129·1	37·7	3·13	19	6·4
Malta	90·9	11	56·5	20	79·1	63·9	58·7	70	140·1	51·½	·00	0	2·4
Cape Town	75·0	18	39·9	9	61·9	49·1	50·2	81	...	...	4·64	21	7·3
Durban, Natal	78·3	27	47·4	14	73·3	52·6	...	...	130·3	...	·73	3	1·3
Mauritius	81·4	24	60·1	4*a*	78·1	64·7	62·8	75	138·5	49·5	1·65	14	5·0
Calcutta	97·5	23	70·7	4	92·2	78·7	77·6	79	153·7	70·9	5·47	13	7·7
Bombay	94·9	3	75·4	13	89·9	81·0	77·3	78	143·5	73·6	9·77	14	5·8
Madras	107·8	5	74·5	20	99·4	82·5	72·6	64	148·2	74·3	·39	6	5·1
Kodaikanal	70·3	2	51·0	21	66·2	53·9	51·4	76	145·3	42·8	3·67	15	6·5
Colombo, Ceylon	91·7	18	73·0	20	88·5	78·4	75·1	80	147·0	71·0	9·84	20	7·2
Hongkong	89·3	6	71·9	29	84·2	77·6	74·8	83	150·6	...	15·44	19	9·0
Melbourne	60·6	30	35·3	29*b*	56·1	42·3	44·1	85	119·9	26·1	2·70	14	7·0
Adelaide	69·3	4	36·9	26	61·1	46·1	45·3	77	123·5	31·2	3·88	18	6·1
Coolgardie	78·4	1	35·3	18	62·2	43·4	42·0	67	138·0	29·9	1·35	4	4·9
Sydney	68·5	20	42·3	29	61·1	48·3	43·0	77	111·3	34·1	·63	10	3·9
Wellington	60·0	24	33·0	30	54·5	45·2	41·8	74	95·0	26·0	4·84	24	7·6
Auckland	62·5	13	40·0	30	58·1	48·2	44·2	72	118·0	36·0	3·22	12	5·0
Jamaica, Negril Point	89·9	30	72·4	28	87·0	74·8	74·4	78	...	...	3·82	14	...
Trinidad	90·0	2	69·0	3*c*	87·6	71·6	75·3	84	163·0	64·0	10·05	19	...
Grenada	86·2	5	68·4	30	82·8	74·7	73·0	79	147·2	...	9·18	25	4·4
Toronto	81·2	3	38·2	6	70·1	49·9	50·4	74	104·8	30·4	3·55	12	6·3
Fredericton, N.B.	84·7	2	33·0	1	66·9	44·6	44·4	60	...	...	6·27	17	6·6
Winnipeg	79·3	2	37·0	19	67·1	46·9	...	...	...	...	3·46	14	7·2
Victoria, B.C.	79·1	20	57·3	3	64·1	50·4	...	...	...	...	·08	3	6·9
Dawson	84·6	30	27·0	10	72·1	43·7	...	...	...	...	·86	3	3·9

a—and 21. *b*—and 30. *c*—and 28.

REMARKS.

MALTA.—Mean temp. of air 70°·3, or 1°·3, below, and mean hourly velocity of wind 9·8 or 1·1 above, average. Mean temp. of sea 70°·4. T on 27th. J. F. DOBSON.

Mauritius.—Mean temp. of air 2°·0, dew point 2°·0 above, and R ·26 in. below, their respective averages. Mean hourly velocity of wind 9·8 miles, or 1·5 below average; extremes 24·5 on 22nd, and 1·6 on 11th, prevailing direction E.S.E. to S.E. T. F. CLAXTON.

MADRAS.—Sunshine 139·8 hours, or 36·3 per cent. of possible amount. L on 12 days. Evaporation 8·94 in. A. MOFFAT.

KODAIKANAL.—Bright sunshine 135·2 hours. C. MICHIE SMITH.

COLOMBO, CEYLON.—Mean temp. of air 82°·8 or 1°·8 above, of dew point 75°·1 or 1°·0 above, and R 9·84 in., or 1·56 in. above, their respective averages. Mean hourly velocity of wind 9 miles, prevailing direction S.W. TS on 2 days. H. O. BARNARD.

HONGKONG.—Mean temp. of air 80°·3. Sunshine 84·7, or 71 hours below average. Mean hourly velocity of wind 14·5 miles, prevailing direction S.S.E. F. G. FIGG.

Adelaide.—R 1·03 in. above average of 45 years. Good rain all over agricultural areas, but dry on the outlying pastoral country. C. TODD, F.R.S.

Coolgardie.—Nearly all R fell during first week, after which the weather was fine and fresh. W. ERNEST COOKE.

Auckland.—Mean temp. slightly, and R 1½ in. below, average. T. F. CHEESEMAN.

TRINIDAD.—R 1·73 in. above the 40 years' average. J. H. HART.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXLIV.] JANUARY, 1903. VOL. XXXVII.

THE GOVERNMENT AND METEOROLOGY.

The Times of December 15th, 1902, published amongst its political notes the following paragraph, which is of interest in connection with our article on the Ben Nevis Observatories, on p. 101 of this volume :—

"The First Lord of the Treasury has appointed a Committee to inquire and report as to the administration by the Meteorological Council of the existing Parliamentary grant, and as to whether any changes in its apportionment are desirable in the interests of meteorological science, and to make any further recommendations which may occur to them, with a view to increasing the utility of that grant. The committee will consist of :—

The Rt. Hon. Sir Herbert E. Maxwell, Bart., M.P. (Chairman).
Mr. J. Dewar, M.P.
Sir W. de W. Abney, K.C.B., F.R.S.
Sir F. Hopwood, K.C.B., Board of Trade.
Sir T. H. Elliott, K.C.B., Board of Agriculture.
Mr. R. T. Glazebrook, F.R.S.
Mr. T. L. Heath, Treasury.
Mr. Joseph Larmor, F.R.S.
Mr. G. L. Barstow, of the Treasury, will act as Secretary to the Committee."

It will be observed that, although there is no meteorologist on the Committee, three out of the eight members are distinguished men of science, including the Secretary of the Royal Society.

THE RAINFALL OF 1902.

Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver	Station.	Diff. from Aver.	Per cent. of Aver.
	in.			in.			in.	
London	—1·94	91	Arncliffe	—18·99	69	Aberdeen	—2·06	94
Tenterden	—5·23	80	Hull	—3·51	86	Cawdor	—3·50	88
Hartley Wintney	—3·27	87	Newcastle.....	—3·92	85	Strathconan ...	—11·80	78
Hitchin	—1·54	93	Seathwaite ..	—39·97	70	Glencarron ...	—11·46	88
Winslow.....	—5·77	76	Cardiff	—4·36	89	Dunrobin	—5·45	82
Westley.....	—3·63	86	Haverfordwest	—2·47	94	Darrynane ...	—10·10	80
Brundall.....	—2·69	89	Gogerddan ...	—8·59	81	Waterford ...	+1·69	104
Blandford	...	...	Llandudno ...	—5·49	82	Broadford.....	—3·87	88
Polapit Tamar ...	—1·83	95	Dumfries	—7·34	83	Carlow	+ ·85	103
Stroud	—2·06	92	Lilliesleaf	—2·60	91	Dublin	+2·08	108
Woolstaston	+1·55	105	Colmonell.....	...	...	Mullingar.....	—5·82	84
Worcester	+1·85	104	Glasgow	—5·62	85	Ballinasloe ...	—6·31	83
Boston	+1·60	108	Islay	—3·14	93	Clifden	—17·99	77
Hesley Hall	— ·70	97	Mull	—3·69	93	Crossmolina ...	—6·33	88
Derby.....	+ ·68	103	Loch Leven ...	—8·28	77	Seaforde	+6·41	118
Manchester	...	...	Dundee	—4·40	84	Londonderry..	—4·86	88
Wetherby	—1·48	94	Braemar	—2·67	92	Omagh	— ·37	99

The table given above summarizes the relation of the rainfall of the year 1902 to the average of the ten years, 1890-99, the first column giving the difference of the year's fall from the ten years' average in inches, and the second the ratio of that fall to the ten years' average taken as 100. It shows that out of the 47 stations quoted no less than 39 had a rainfall below that average, and only 8 above it. The wetter stations are all contained in the extreme south and east of Ireland, and in a small area in the centre of England. Practically all the rest of the country suffered from a deficiency of rain, this deficiency being most conspicuous in the north-west of England, where the fall of rain was 30 per cent. less than the average of ten years. Taking the British Isles as a whole, the total rainfall of 1902 has been rather more than 10 per cent. less than the average for the ten years 1890-99. But it has been shown in *British Rainfall*, 1901, p. 23, that this decade had a rainfall 4 per cent. less than the average for the 30 years 1870-99, which there is reason to believe may be taken as a true average, that is, as practically equal to the average of a century. Hence, in 1902 there was over the whole British Isles a deficiency of about 15 per cent. as compared with a true average year. The same result was obtained by a different method, using different stations and calculating the ratios directly in terms of the 30 years' average, hence it may be accepted with confidence. It so happened that during the 10 years 1890-99 the centre of England was remarkably dry and the north-west of England unusually wet, a fact which accounts for the more uniform distribution of rain in 1902 giving an

excess above the average of the ten years in the former area and a large deficit in the latter. As pointed out in a discussion of the rainfall of the year by Mr. H. Sowerby Wallis and Dr. H. R. Mill in *The Times* of January 10th, the percentage of the true average annual rainfall which was measured in 1902 may be taken as for England 82 per cent., for Wales 85 per cent., for Scotland 87 per cent., and for Ireland 90 per cent. So far as regards England, a drier year than 1902 has not been recorded since 1893.

AN OLD SCOTTISH WEATHER RECORD.

CALENDAR OF WEATHER FROM DIARY OF ANDREW HAY, OF CRAIGNETHAN, LANARK.

(*concluded from p.* 172.)

SEPTEMBER, 1659.

1 September, Thursday, 7 a'cloak.—Fair befor, & very foule afternoone.

2 Fryday, 7 a'cloak.—A rainie day and cold.

3, Saturnday, 7 a'cloak.—Ane east wind, but faire.

4 Septembr, The Lord's day, 7 hors.—A foule rainie day.

5, Munday, 7 a'cloak.—A most fearfull constant raine all day.

6 Septr, Twysday, 7 a'cloak.—A warme, louring, closse day.

7, Wednesday, 7 a'cloak.—A fair, seasonable day.

8 Septr, Thursday, 7 a'cloak.—A great raine and east wind.

9, Fryday, 8 a'cloak—East wind and raine all day.

10 Septr, Saturnday, 7—8 a'cloak.—A very seasonable harvest day.

11, The Lord's day, 7 a'cloak.—A very cold day, but faire & east wind.

12 Septr, Munday, 6—7 a'cloak.—A prettie good harvest day.

13, Twysday, 7 a'cloak.—"About 3 a'cloak · · · · rode to Humbie, but found the waters and wayes so broken by the late storm as no man ever saw it in his life." A faire seasonable day.

14 Septr, Wednesday, 7 o'cloak.—"I find the late rain had filled all the low roumes of Humbie, so as they brok the wall." A fair day for the most pt.

15, Thursday, 7 a'cloak.—A very seasonable day & the wind west.

16 Septr, Fryday, 7 a'cloak.—Two hours raine about noone.

17, Saturnday, 8 a cloak.—Windie in the morning and raine afternoone.

18 Septr, The Lord's day, 5—6 a'cloak.—A faire day but very cold.

19, Munday, 7 a'cloak.—Frost in the morning, then cold and faire.

20 Septr. Twysday, 7 a'cloak.—Very rainie till nonne, thereafter fair.

21, Wednesday, 7 a'cloak.—A very rainie night and morning, faire afternoone.

22 Septr, Thursday, 7 a'cloak.—Very rainie till neer night.

23, Fryday, 7 a'cloak.—A louring grey day, rainie at nyt.

24, Saturnday, 7 a'cloak.—Foule in the forenoon, & faire afternoone.

25, The Lord's Day, 7 a'cloak.—A gouling, windie, faire day.

26 Septr, Munday, 7 a'cloak.—A louring morning, raine afternoone.

27, Twysday, 7 a'cloak.—A rainie day wt wind.

28 Septr Wednesday, 7 a'cloak.—A very great raine all day.

29, Thursday, 7 a'cloak.—A very windie & rainie afternoone.

30 Septr, Fryday, 6 a'cloak.—Rainie most part all day.

OCTOBER.

1 October, Saturnday, 7 a'cloak.—A fair day, wt some easterly wind.
2 October, The Lord's day, 7 a'cloak.—A great drying winde all day.
3 October, Munday, 7—8 a'cloak.—A prettie fair cold day.
4 October, Twysday, 7 a'cloak.—A prettie dry day.
5, Wednesday, 6 a'cloak.—A very windie day with some raine.
6 Octobr, Thursday, 6—7 a'cloak.—Great raine till noone yrafter mixed.
7, Fryday, 6 a'cloak.—A windie day wt some raine.
8 Octobr, Saturnday, 7 a'cloak.—A very fair day and frostie.
9, The Lord's day, 7 a'cloak.—A very stormie rainie day.
10, Munday, 7 a'cloak.—Foule till noone therafter fair.
11, Twysday, 7 a'cloak.—A very great raine all day.
12 October, Wednesday, 7 a'cloak.—A prettie fair, louring day.
13, Thursday, 6 a'cloak.—A very fair, seasonable day.
14 October, Fryday, 7 a'cloak.—A very fair seasonable day.
15, Saturnday, 7 a'cloak.—A very fair day after 9 hours.
16 October, The Lord's day, 7 a'cloak.—Fair in the morning, very rainie afternoone.
17, Munday, 6—7 a'cloak.—A very vehement raine all day.
18 Octobr, Twysday, 7 a'cloak.—A soft day and raine at nyt.
19, Wednesday, 7 a'cloak.—Most pairt raine, especially at nyt.
20 October, Thursday, 7 a'cloak.—Frost in the morning, therafter faire.
21, Fryday, 7 a'cloak.—A very warme louring day.
22 Octobr, Saturnday, 7 a'cloak.—Thick rouk* in the morning, yrafter warme & fair.
23, The Lord's day, 7 o'cloak.—A great frost & very faire all day.
24 Octobr, Munday, 7 a'cloak.—A prettie faire cold day.
25, Twysday, 7 a'cloak.—A terrible rainie nyt & a faire day.
26, Wednesday, 7 a'cloak.—A great wind all day after nyt's raine.
27, Thursday, 7 a'cloak.—A very fair seasonable day.
28 October, Fryday, 7 a'cloak.—A fair windie day and dry.
29 Octobr, Saturnday, 7 a'cloak.—A fair seasonable day.
30 October, The Lord's day, a'cloak.—A seasonable, fair, louring day.
31, Munday, 6—7 a'cloak.—A very faire seasonable day.

NOVEMBER.

1 Novembr, Twysday, 4 a'cloak.—Raine till noone therafter fair.
2, Wednesday, 7 a'cloak.—Fair and dry all day.
3 Novembr, Thursday, 7 a'cloak.—Fair till noone therafter rainie.
4, Fryday, 7 a'cloak.—Fair and windy all day.
5 Novembr, Saturnday, 7 a'cloak.—A fair, cold, dry day.
6, The Lord's day, 4 a'cloak.—Cold and raine afternoone.
7 Novembr, Munday, 7 a'cloak.—Cold and haill afternoone.
8, Twysday, 7 a'cloak.—Raine and haill most pt.
9 Novembr, Wednesday, 7 a'cloak.—A very foule day of raine and haill.
10, Thursday, 7 a'cloak.—A very rainie day.
11 Novembr, Fryday, 6 a'cloak.—Frost all day and snow at night.
12, Saturnday, 7 a'cloak.—Snow all nyt and frost all day. "Much snow being fallen in the night durst not venture home."

* Rouk, Mist.

13 Novr, The Lord's day, 7 a'cloak.—Frost in the morning therafter raine.
14, Munday, 7 a'cloak.—A fair louring day.
15 Novembr, Twysday, 7 a'cloak.—A sore day of raine and wind.
16, Wednesday, 8 a'cloak.—A great raine till neer night.
17 Novembr, Thursday, 7 a'cloak.—Fair and somqt. frostie.
18, Fryday, 1 a'cloak.—A great frost till neer night.
19 Novembr, Saturnday, 8 a'cloak.—A louring soft day.
20, The Lord's day, 7 a'cloak.—A fair, gray, louring day.
21 Novr, Munday, 7 a'cloak.—A fair cold day.
22, Twysday, 7 a'cloak.—A very fair warme day.
23 Novr, Wednesdoy, 7 a'cloak.—A very windie louring day.
24, Thursday, 7 a'cloak.—A very rainie foule day.
25 Novembr, Fryday, 7 a'cloak.—A faire day, hard frost.
26, Saturnday, 7 a'cloak.—A faire day and hard frost.
27 Novr, The Lord's day, 7 a'cloak.—A fair day and hard frost.
28, Munday, 7 a'cloak.—A soft day and louring.
29 Nov., Twysday, 6—7 a'cloak.—A soft, cold, windie day.
30, Wednesday, 3—4 a'cloak.—A bitter cold day, and slete.

DECEMBER.

1 December, Thursday, 7 a'cloak.—A raw, louring, soft day.
2, Fryday, 7 a'cloak.—A fair day and hard frost.
3 Decr, Saturnday, 6 a'cloak.—Hard frost all day & snow drift at night.
4 Decr, The Lord's day, 7 a'cloak.—A strong frost and very cold.
5 Decr, Munday, 7 a'cloak.—A very hard frost and cold.
6 Decr, Twysday, 7 a'cloak.—A very hard frost, and fair.
7 December, Wednesday, 7 a'cloak.—A louring day, somqt soft and thaw.
8, Thursday, 8 a'cloak.—A very hard frost all day.
9 December, Fryday, 7 a'cloak.—A hard frost all day.
10, Saturnday, 6—7 a'cloak.—A frost ryme all day.
11 Decembr, the Lord's day, 6—7 a'cloak.—A thaw and misty day.
12, Munday, 7 a'cloak.—Partlie thaw and partly snow & frost.
13 December, Twysday, 7 a'cloak.—A hard frost and some snow.
14, Wednesday, 10 a'cloak.—A very hard frost.
15 December, Thursday, 7 a'cloak.—A very hard frost.
16, Fryday, 8 a'cloak.—A very hard frost & thick rouk.
17 December, Saturnday, 9 a'cloak.—A very vehement frost.
18, The Lord's day, 7 a'cloak.—A very hard frost and cold.
19 Decr, Munday, 7 a'cloak.—A very hard frost and cold.
20, Twysday, 7 a'cloak.—A very hard frost.
21 Decr, Wednesday, 7 a'cloak.—A very hard frost all day.
22, Thursday, 7 a'cloak.—A very hard frost all day.
23 Decr, Fryday, 8 a'cloak.—A very hard frost and mistie.
24, Saturnday, 8 a'cloak.—A very hard frost and cold.
25 Decr, 7 a'cloak.—Snow in the night and soft all day.
26, Munday, 8 a'cloak.—A misty, softening frost.
27 Decr, Twysday, 7 a'cloak.—A continued frost, except one hour at midday.
28, Wednesday, 7 a'cloak.—Hard frost & a great snow at nt.
29 Decr, Thursday, 6—7 a'cloak.—A hard frost and some snow.
30, Fryday, 7 a'cloak.—A hard frost all day.
31 Decr, Saturnday, 6—7 a'cloak.—A hard frost all day.

JANUARY, 1660.

1 Januarii, 1660, The Lord's day, 7 a'cloak.—A very cold day and strong frost.
2 Janr, Munday, 7 a'cloak.—A great frost and snowie afternoone.
3, Twysday, 7 a'cloak.—A very hard frost and cold.
4 Janr, Wednesday, 7 a'cloak.—A hard frost & some drift & snow.
5, Thursday, 7 a'cloak.—A hard frost and some snow.
6 Janr, Fryday, 6—7 a'cloak.—A hard frost and snowie.
7 Saturnday a'cloak.—A very great snow & drift & frost.
8 Januar, The Lord's day, 7 a'cloak.—A very cold, sharp, frostie day.
9, Munday, 7 a'cloak.—A very hard frost, but fair.
10 January, Twysday, 7 a'cloak.—A very thorough thaw this day.
11, Wednesday, a'cloak.—A very fair day and raw frost.
12 January, Thursday, 7 a'cloak.—A fair day and hard frost.
13, Fryday, 7 a'cloak.—A fair day and very hard frost.
14 January, Saturday, 8 a'cloak.—A fair day but hard frost.
15, The Lord's day, 7 a'cloak.—A very bitter frosty day, & some snow.
16 January, Munday, 7 a'cloak.—A very cold day and frost.
17, Twysday, 7 a'cloak.—A fair day but a hard frost.
18 January, Wednesday, 7 a'cloak.—A very fair frostie day.
19, Thursday, 7 a'cloak.—A hard frost, and fair.
20 Januar, Fryday, 7 a'cloak.—A fair day but softer nor ordinary.
21, Saturnday, 7 a'cloak.—A thick rouck and frost.
22 Januarie, The Lord's day, a'cloak.—A cold and frostie day.
23, Munday, 7 a'cloak.—A very cold day & strong frost.
24 January, Twysday, a'cloak.—A thaw and west wind all day.
25, Wednesday, 7 a'cloak.—A frost and strong east wind againe.
26 January, Thursday, 7 a'cloak.—A very hard frost and cold.
27, Fryday, 7 a'cloak.—A fair frostie day.
28 January, Saturnday, 7 a'cloak.—A through thaw all day.
29, The Lord's Day, a'cloak.—A cold day and some little frost.
30 Janr, Munday, 6 a'cloak.—A good soft day.
31 Janr, Twysday, 8 a'cloak.—A good soft day, but cold.

Diarius quintus finitus,
Jany. 31, 1660.
LAUS DEO.

MAP OF THE CLIMATOLOGICAL STATIONS.

THE frontispiece to the present volume shows the position of all the stations from which reports have been received during the year for the Climatological Table of the British Empire. The boundaries of the larger portions of the empire are shown in a bolder outline than the rest of the land, and the situation of each station is represented by a star. The range in latitude is from Dawson, close to the Arctic circle, to Colombo, close to the Equator. In the Antarctic area the regions now being explored by the two expeditions under the British flag in the "Discovery" and the "Scotia," and that in which the German expedition on board the "Gauss" is believed to be at work, are also marked.

THE THUNDERSTORM OF JANUARY 3RD, 1903.

To the Editor of Symons's Meteorological Magazine.

ON Saturday last (January 3rd) a thunderstorm of singular abruptness and of considerable intensity swept over the Thames Valley about mid-day, and for half-an-hour strikingly illustrated the variability of our English weather.

Save for a few flashes of distant lightning, noticed about 9 p.m. on the previous day, there was nothing in the early morning of Saturday to presage what was coming. The air was fresh, the birds were singing and there was a blue sky overhead. As late as a quarter past eleven an almost summer's day prevailed and the powerful sun—now at its nearest to the Earth—brought out, the different colours and objects with a distinctness pleasant to the eye, the air being still limpid after the rain of several previous days. I was arranging the remainder of the day's work with the gardener for carting, returfing and transplanting some shrubs, when a quarter of an hour later a dark high bank of cloud came up over Taplow, rising very fast, and speedily enveloping the western half of the skyscape in an ominous gloom. The effect at this moment was very remarkable. The grass after the mild damp winter was refreshingly green. The blazing sun caught the snow white stems of the silver birch trees, contrasting them against their inky background with a vividness that was absolutely startling. Some tall cotoneasters robbed by winter of their green leaves still retained high aloft great clusters of scarlet or crimson berries and these, their surfaces perhaps a little moist, shone like electric lights in front of an almost end-of-the-world-like darkness, while some ordinary sombre hued dark green spruces stood out from the devilish blackness behind them a brilliant apple green as if new arrivals from the tropics. The concentrated rays of the sun gave a lime-light intensity to all the objects within its range, now rapidly contracting, that was almost theatrical.

A few minutes later a superb vertical flash of lightning, the greatest and the first, with hardly a deviation from the upright in its whole length, rent the sable cloud from top to bottom, accompanied rather than followed by a grand series of reverberations; and the sunlight disappeared. Instinctively one called out "stand firm" and a few seconds later a mighty blast of wind suddenly swept over the ground lifting the stalwart gardener several steps backwards before he could adjust himself to its violence, and then a smiting hail loudly descended which whitened the lawns in a few seconds. The stones were nearly as large as pigeon's eggs, and being very sharp angled cut one painfully and compelled a hasty retreat into shelter. Another very beautiful flash followed—there were no intervening or "minor flashes" in this storm—an almost horizontal one, apparently so close to the ground that in the swiftness and beauty of its undulations it seemed to skip from cloud to cloud with all the grace of movement of a hare at full speed. This was succeeded by a partial rainbow in the

north-west, and a few minutes later a cessation of the storm occurred, and the sun once more asserted itself. Though again a fine and placid day, in the interval the ground had been changed to pulp and the grass become sodden by the melting of the hailstones, so our garden programme had to be entirely recast by this episode of half-an-hour. The amount measured in the rain gauge was ·18 in.

At Windsor considerable damage was done to glass by the hail, and business at the Guildhall was temporarily suspended until the noise of it had ceased.

Upton, Slough, January 8th, 1903. RICHARD BENTLEY.

THE storm so pictorially described by Mr. Bentley was experienced with considerable severity at Camden Square, where the first brilliant flash of lightning was noted at 12.5 p.m.

By the reports in the press we learn that the high spire of St. Michael's Church, Highgate, was struck by lightning, but not much damaged. At Colchester a lady was struck by lightning in her garden and seriously injured, while a tree was set on fire.—ED. *S.M.M.*

A SMART thunderstorm passed over this place on Saturday, 3rd January, about 11 a.m., coming from the west. There were several claps of thunder, but only one flash of lightning was seen, which struck a cottage about a mile-and-a-half from here, destroying the roof but not injuring the people. ROSE E. STANTON.

Upfield, Stroud, January 5th, 1903.

ON January 3rd a sharp thunderstorm occurred shortly after noon. Loud thunder and occasional lightning were noted from 12.4 to 12.15 p.m. From that time to 12.30 rain and hail descended heavily, with violent squalls from W.N.W., but no damage was done in this neighbourhood. The rain measured at the end of the storm was ·10 in. D. W. HORNER.

Clapham Park, S. W.

LONDON SMOKE IN THE COUNTRY.

To the Editor of Symons's Meteorological Magazine.

THE following letter appeared in a recent issue of the *Standard*:—

"SIR,—It would be interesting to know how far London smoke travels. The north-east wind has brought it here this morning (half-past twelve) so thickly that it is impossible to read without lights.

I am, Sir, your obedient servant, H. C. MALDEN."

Godalming, December 3rd.

On December 3rd the morning here was very gloomy but not unseasonable; at a little before noon it became so dark that I had to light a lamp to write by, although the room was well lighted with two windows. Could this have been due to London smoke? It lasted till about 1 p.m., and the oldest inhabitant had never seen it so dark at noon. J. P. MACLEAR.

Beaconscroft, Chiddingfold.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, December 17th, at the Institution of Civil Engineers, Great George Street, Mr. W. H. Dines, B.A., President, in the chair.

The following were elected Fellows of the Society:—Mr. A. C. Allen, Miss E. Aston, B.Sc., Dr. A. Buchan, F.R.S., Prof. G. H. Darwin, F.R.S., Mr. A. E. Eastwood, Mr. G. T. W. Olver, Mr. F. E. Phillips, Mr. T. A. Routh, and Sir W. Willcocks, K.C.M.G.

M. Alfred Angot, of the Bureau Central Météorologique de France, Paris, and Prof. Willis L. Moore, Chief of the U.S. Weather Bureau, Washington, were elected Honorary Members of the Society.

A paper by Mr. C. V. Bellamy, M.Inst.C.E., on the "Climate of Cyprus," was read by the Secretary. This island, which lies towards the extreme eastern end of the Mediterranean Sea, corresponds in area to the three counties of Sussex, Kent and Surrey together. It is divided by the Central Plains, which run east and west, and are bounded on the north by the Kyrenia Mountains and on the south and south-west by the Troödos Mountains. These mountain ranges have a considerable influence upon the temperature of the Central Plains, and especially upon the climate of the capital city, Nicosia, which has a population of about 14,000 inhabitants. The mean temperature for the year at Nicosia (calculated from a few years' observations) is 67°·2, the extreme highest temperature noted had been 108° and the extreme lowest 28°. The annual rainfall of about 14 inches falls mostly in the winter months. Owing to the position of the mountain ranges the wind is deflected across the central plain, and blows usually in a north-westerly or south-easterly direction. The author gave particulars as to the meteorological conditions at Troödos, the sanitorium and summer resort of Cyprus, which is situated in the mountains, at an altitude of over 5,000 feet.

Mr. J. A. Curtis said the paper was interesting and informing, but he thought the author should have availed himself of the very full observations taken at six Government stations in Cyprus since 1881. Mr. Bellamy's observations, however, appeared to agree with those at the Government station in Nicosia.

Mr. E. Atkin said that he had resided for 4½ years in Cyprus, chiefly at Nicosia, and he agreed with the author as to the prevalence of the west-north-west winds. While living in the island he had been struck by the variation of the rivers fed from the mountains, and this not only in spring. Upon one occasion he had crossed the dry bed of the Pedias at 4.30, and on returning at 5.30 found six feet of water in the river, caused by the rapid melting of the snow on Troödos. The clearness and non-corrosive quality of the air was most remarkable, and he had seen in the chapel of a castle of the fifteenth century, of which the roof had long fallen in, paintings and figures upon the walls in excellent preservation.

Mr. F. C. Bayard, Mr. E. Mawley, Dr. R. H. Scott, Mr. Baldwin Latham, and Mr. R. H. Curtis also took part in the discussion.

A paper by Mr. H. Helm Clayton, of the Blue Hill Observatory, U.S., on "The Eclipse Cyclone of 1900," was also communicated by the Secretary. The author, in a former paper, discussed the meteorological observations made along the path of the total solar eclipse in the United States, on May 28th, 1900, and stated that he found that a cyclone followed in the wake of the eclipse—though the changes were very minute and feeble—the fall of temperature developing a cold air cyclone in an astonishingly short time. This theory was not readily accepted by meteorologists, and was criticised by Prof. Bigelow, who has discussed all the observations received by the U.S. Weather Bureau. The author now examines Prof. Bigelow's discussion, and points out that the observations really confirm the conclusions at which he had arrived concerning the meteorological effects of eclipses.

Mr. W. H. Dines said the subject was in his opinion one of great interest, and from the theoretical side, one of extreme importance. The eclipse provided an external source of cooling to the air, passing over the lighted portion of the hemisphere at a definite rate, and afforded the only means available of determining the changes of pressure that may be produced by a change of temperature over a rapidly shifting area. Probably the cooling produced by the shadow only extended to a few hundred feet in elevation; taking it as 500 feet, and supposing that the air temperature to this height fell 5°, the corresponding rise of the barometer should be ·005 inch. The air being cooled would occupy less space, and the rise of the barometer could only be produced by there being time for the surrounding air to flow in above and fill this space. It appeared from Mr. Clayton's diagrams that notwithstanding the speed with which the shadow moved, there was ample time to set up the motion and characteristics of a cyclone. He was inclined to think that the author had established his case.

REVIEW.

Elementi di Geografia Fisica, Fisica Terrestre e Meteorologia. FRANCESCO PORRO. Rome, &c. G. B. Paravia & Co. 1902. Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. viii. + 280. *Illustrations.*

THIS little book is written for the secondary schools of Italy, and it may be said to present an epitome of physical geography from the point of view of the atmosphere. Of the eleven chapters, five are purely meteorological, one is devoted to glaciers, one to the waters of the land, and one to the sea.

The book is brightly written, and lightened by several happy quotations from Dante, and a few illustrations of unusual merit. A particularly clear diagram illustrates the föhn wind, and the fascinating subject of the forms of snow crystals receives considerable attention. But while the author keeps the attractive side of his subject to the front as befits a book for young students, he has read widely, and gives the latest results of many workers in all countries.

Heinrich von Wild.

ZURICH, 17 DECEMBER, 1833—5 SEPTEMBER, 1902.

THOUGH he died in his native republic of Switzerland, the name of Professor Wild will always be associated with the empire of Russia, where for more than thirty years he presided at the Central Physical Observatory of St. Petersburg. Wild's first published paper on cosmical physics was concerned with terrestrial magnetism, and appeared in 1859, immediately after his appointment as Professor of Physics in the University of Bern. In 1868 he accepted the post of Director of the Central Physical Observatory in St. Petersburg, where his career as a man of science and as an official earned him world-wide fame and many honours.

Professor von Wild was an indefatigable experimenter and a most prolific writer. He will be long remembered for his investigation of the effects of various exposures on meteorological instruments, a research leading to the adoption in Russia of his thermometer screen, which combined the principles of a current of air driven over the thermometers and a louvre-boarded shelter. His name is associated with many other improvements in instrumental methods. Amongst his writings there were many papers on the climate of the Russian empire, including a very important treatise on the temperature, published in 1881. Wild's *Repertorium fur Meteorologie*, founded in 1869, acquired high distinction as a meteorological journal.

Robert Rubenson.

STOCKHOLM, 10 APRIL, 1829—14 OCTOBER, 1902.

PROFESSOR ROBERT RUBENSON, studied at the University of Upsala, and after some years spent in travelling through southern Europe, he returned to the Observatory in that city. During the years 1865 to 1869 he arranged for hourly meteorological observations being carried on by a voluntary association of students, and this work was not relinquished until self-recording instruments had been introduced. Dr. Rubenson discussed and published the results, and was appointed Lecturer on Meteorology in the University. In 1873 the Swedish Meteorological Institute was founded, under the auspices of the Academy of Sciences, and Professor Rubenson was called to Stockholm to be its first chief, a post he retained until very shortly before his death.

METEOROLOGICAL NEWS AND NOTES.

THE MEMORY OF FATHER SECCHI, the illustrious Italian astronomer and physicist, is to be celebrated in Rome on the occasion of the twenty-fifth anniversary of his death, on February 26th, 1903. A special committee is arranging the details of the celebration.

THE SCOTTISH ANTARCTIC EXPEDITION on board the *Scotia*, reached Port Stanley, Falkland Islands, on January 6th, all well.

DECEMBER, 1902.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1890-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·51	— ·42	·50	17	12	56·8	17	22·5	7	6	15
II.		Tenterden	2·27	+ ·04	·69	1	18	54·0	17	21·0	7	11	17
,,		Hartley Wintney	1·60	— ·54	·39	17	12	55·0	25	14·0	5	15	17
III.		Hitchin	1·35	— ·59	·27	17	15	55·0	17	16·0	6	11	...
,,		Winslow (Addington)	1·24	— ·77	·28	28	14	55·0	17	19·0	7	13	17
IV.		Bury St. Edmunds (Westley)	1·29	— ·82	·31	17	12	56·0	17	17·0	7	...	...
,,		Norwich (Brundall)	1·62	— ·46	·37	1	19	56·0	16	26·0	4	6	15
V.		Winterborne Steepleton	2·39	...	·98	1	13	53·9	16	22·0	5, 7	11	17
,,		Torquay	2·81	...	·77	1	14	..	...	...	...	...	...
,,		Polapit Tamar [Launceston]..	4·55	+ ·89	·83	28	18	54·1	16	16·9	7	13	15
VI.		Stroud (Upfield)	2·13	— ·10	·50	17	12	53·0	17	21·0	4, 6	13	...
,,		Church Stretton (Woolstaston)	2·14	— ·41	·49	14	15	54·0	16	18·0	7	12	...
,,		Worcester (Diglis Lock)	1·49	— ·43	·46	1	16	...	...	...	...	...	...
VII.		Boston	1·39	— ·16	·35	1, 17	9	56·0	16	28·0	4	...	...
,,		Hesley Hall [Tickhill].....	1·66	— ·20	·68	1	11	57·0	16	18·0	7	11	...
,,		Derby (Midland Railway).....	1·69	— ·17	·67	1	15	57·0	17	22·0	7	10	...
VIII.		Manchester (Plymouth Grove)	...	...	...	...	...	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ...	2·57	+ ·65	·79	1	17	...	...	...	...	...	...
,,		Skipton (Arncliffe)	6·56	+ ·10	1·00	15	18	...	...	...	...	...	...
,,		Hull (Pearson Park).	2·13	— ·07	·83	1	16	56·0	16*a*	28·0	4	9	16
X.		Newcastle (Town Moor)	3·01	+ ·58	·63	1	18	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	15·06	+ ·13	3·29	14	18	53·5	15	24·4	4	9	...
XI.	WALES.	Cardiff (Ely).....	4·01	— ·08	·73	28	20	...	...	...	...	...	...
,,		Haverfordwest	3·77	— ·94	·77	14	14	54·4	17	22·0	7	6	18
,,		Aberystwith (Gogerddan) ...	4·60	+ ·05	1·16	16	14	49·0	13*b*	14·0	4	15	...
,,		Llandudno.....	2·65	— ·25	·63	14	15	59·0	14	23·2	5	5	...
XII.	SCOTLAND.	Cargen [Dumfries]	5·66	+ ·94	1·34	14	16	53·0	16	19·0	7	9	...
XIII.		Edinburgh (Royal Observatory)	1·63	...	·63	14	14	53·4	14	24·0	8	10	15
XIV.		Colmonell	...	...	...	...	...	...	...	...	...	...	...
XV.		Tighnabruaich	6·45	...	1·01	1	20	...	...	22·0	7	13	...
,,		Mull (Quinish).....	6·02	— ·23	·95	15	22	...	...	...	...	...	...
XVI.		Loch Leven Sluices	4·48	+ ·83	·77	3	18	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	3·00	+ ·19	·85	1	18	54·5	21	19·9	7	8	..
XVII.		Braemar	5·30	+ 2·29	1·42	14	19	50·2	21	14·0	7	14	28
,,		Aberdeen (Cranford)	3·32	+ ·34	·63	1	20	54·0	24*d*	22·0	31	12	..
,,		Cawdor (Budgate)	3·91	+ 1·30	·70	29	16	..	...	...	...	...	..
XVIII		Strathconan [Beauly]	5·03	— ·92	1·03	29	12	...	...	...	...	...	..
,,		Glencarron Lodge.....	12·43	+ 2·00	2·52	24	22	...	...	...	...	...	..
XIX.		Dunrobin	3·64	+ ·18	·87	25	14	57·0	1	26·5	17	18	..
,,		S. Ronaldshay (Roeberry) ...	2·83	— 1·15	·41	15	22	50·0	26*e*	29·0	31	5	..
XX.	IRELAND.	Darrynane Abbey.....	3·23	— 2·10	·46	1	26	...	...	...	...	...	..
,,		Waterford (Brook Lodge) ...	2·72	— 1·15	·84	14	14	56·0	13	28·5	29	4	..
,,		Broadford (Hurdlestown) ...	2·62	— ·64	·38	15	19	56·0	18	26·0	7	9	..
XXI.		Carlow (Browne's Hill)	2·92	— ·46	·70	15	16	...	...	...	...	...	...
,,		Dublin (Fitz William Square)	1·56	— ·79	·27	14	13	58·0	17	29·6	7	3	
XXII.		Ballinasloe	2·98	— ·61	·50	16	21	52·5	20	19·0	8	14	..
,,		Clifden (Kylemore)	6·23	— 1·99	1·55	15	21	...	...	...	...	...	...
XXIII		Seaforde.....	4·19	+ ·76	1·32	1	15	55·0	15	34·0	28*f*	7	
,,		Londonderry (Creggan Res.).	4·43	+ ·31	1·10	29	20	...	...	...	...	...	...
,,		Omagh (Edenfel)	3·39	— ·55	·60	29	16	54·0	15	24·0	6	12	1

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

a—and 17. *b*—and 15, 20. *d*—and 25, 27. *e*—and 27. *f*—and 29.

SUPPLEMENTARY TABLE OF RAINFALL, DECEMBER, 1902.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	1·61	XI.	Castle Malgwyn	4·50
II.	Dorking, Abinger Hall .	1·44	,,	Builth, Abergwesyn Vic.	...
,,	Sheppey, Leysdown	1·20	,,	Rhayader, Nantgwillt ...	6·64
,,	Hailsham	1·83	,,	Lake Vyrnwy	6·04
,,	Crowborough.....	2·84	,,	Ruthin, Plâs Dráw	3·02
,,	Ryde, Beldornie Tower..	1·67	,,	Criccieth, Talarvor	2·85
,,	Emsworth, Redlands ...	1·66	,,	I. of Anglesey, Lligwy..	4·66
,,	Alton, Ashdell	2·13	,,	Douglas, Woodville.....	4·41
,,	Newbury, Welford Park	2·19	XII.	Stoneykirk, Ardwell Ho.	3·47
III.	Oxford, Magdalen Coll..	1·28	,,	Dalry, Old Garroch	8·08
,,	Banbury, Bloxham	1·68	,,	Moniaive, Maxwelton Ho.	6·43
,,	Pitsford, Sedgebrook ...	1·18	,,	Lilliesleaf, Riddell	4·55
,,	Huntingdon, Brampton.	1·18	XIII.	N. Esk Res. [Penicuick]	3·45
,,	Wisbech, Bank House...	1·19	XIV.	Glasgow, Queen's Park..	4·84
IV.	Southend	1·15	XV.	Inveraray, Newtown ...	7·51
,,	Colchester, Lexden	1·28	,,	Ballachulish, Ardsheal...	8·81
,,	Saffron Waldon, Newport	1·26	,,	Islay, Eallabus.....	4·57
,,	Rendlesham Hall	1·44	XVI.	Dollar.....	4·15
,,	Swaffham	1·42	,,	Balquhidder, Stronvar...	9·87
V.	Salisbury, Alderbury ...	1·56	,,	Coupar Angus Station...	4·60
,,	Bishop's Cannings	1·76	,,	Blair Atholl	4·41
,,	Blandford, Whatcombe .	...	,,	Montrose, Sunnyside ...	2·78
,,	Ashburton, Druid House	4·99	XVII.	Keith H.R.S.....	4·61
,,	Okehampton, Oaklands.	4·62	XVIII.	Fearn, Lower Pitkerrie..	1·95
,,	Hartland Abbey	2·70	,,	S. Uist, Askernish	4·92
,,	Lynmouth, Rock House	4·35	,,	Invergarry.....	8·34
,,	Probus, Lamellyn	3·30	,,	Aviemore, Alvie Manse.	3·40
,,	Wellington, The Avenue	2·90	,,	Loch Ness, Drumnadrochit	5·28
,,	North Cadbury Rectory	1·94	XIX.	Invershin	4·54
VI.	Clifton, Pembroke Road	3·28	,,	Bettyhill	2·87
,,	Ross, The Graig	1·57	,,	Watten H.R.S.....	3·04
,,	Shifnal, Hatton Grange	1·63	XX.	Dunmanway, Coolkelure	...
,,	Wem, Clive Vicarage ...	1·92	,,	Cork, Wellesley Terrace	3·06
,,	Cheadle, The Heath Ho.	2·45	,,	Killarney, District Asyl.	6·97
,,	Coventry, Priory Row ..	1·73	,,	Caher, Duneske	...
VII.	Market Overton	1·54	,,	Ballingarry, Hazelfort...	2·77
,,	Grantham, Stainby	1·55	,,	Miltown Malbay	4·40
,,	Horncastle, Bucknall ...	1·46	XXI.	Gorey, Courtown House	2·66
,,	Worksop, Hodsck Priory	1·77	,,	Moynalty, Westland ...	2·93
VIII.	Neston, Hinderton	2·37	,,	Athlone, Twyford	2·88
,,	Southport, Hesketh Park	2·85	,,	Mullingar, Belvedere ...	2·40
,,	Chatburn, Middlewood.	4·53	XXII.	Woodlawn	3·19
,,	Duddon Val., Seathwaite Vic.	10·30	,,	Westport, Murrisk Abbey	4·59
IX.	Baldersby	2·17	,,	Crossmolina, Enniscoe ..	5·32
,,	Scalby, Silverdale	3·10	,,	Collooney, Markree Obs.	5·06
,,	Ingleby Greenhow Vic..	2·82	XXIII.	Enniskillen, Model Sch.	...
,,	Middleton, Mickleton ...	3·80	,,	Warrenpoint.....	3·26
X.	Beltingham	3·46	,,	Banbridge, Milltown ...	2·35
,,	Bamburgh	2·94	,,	Belfast, Springfield	3·71
,,	Keswick, The Bank.....	9·19	,,	Bushmills, Dundarave..	3·47
XI.	Llanfrechfa Grange	4·37	,,	Stewartstown	2·32
,,	Treherbert, Tyn-y-waun	9·41	,,	Killybegs	5·36
,,	Llandovery	4·16	,,	Horn Head	3·87

METEOROLOGICAL NOTES ON DECEMBER, 1902.

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.

ENGLAND.

LONDON, CAMDEN SQUARE.—A gloomy month though fairly dry. The first half was generally frosty with cold E. winds, but the latter part particularly mild. Mean temp. 41°·2, or 2°·0 above the average.

ABINGER HALL.—Some extremely cold weather in the early part with N.E. wind, was followed by alternate rainy and fine periods; mild and showery at the end.

TENTERDEN.—Very cold from 4th to 12th, with several inches of S on 4th. T on 17th. L on 28th and 30th, Duration of sunshine 39 hours. Wells were lower, but ponds higher than in 1901.

SHEPPEY, LEYSDOWN.—A fine month; seven consecutive rainless days occurred twice. A cold spell from 3rd to 6th, and frosty again at the end.

CROWBOROUGH.—Except from 4th to 11th, the 25th and the last three days which were cold, the month was mild. A succession of gales from 14th to 17th. S from 3rd to 5th.

WINSLOW, ADDINGTON.—A very low even temp. prevailed from 3rd to 12th, giving a mean of 33°·4. Much milder from 13th to 29th, but cold on the last few days.

COLCHESTER, LEXDEN.—Dull and cold, with prevalence of E. wind and grass frosts from 2nd to 12th. The latter half was mild and remarkably dry.

NORWICH, BRUNDALL.—Mild on the whole, but very cold winds with frost and some S during the first 10 days. Magnificent weather during the Christmas holidays, more like May than December. Snow-drops in flower in the open on 23rd. L on 29th.

WINTERBOURNE STEEPLETON.—Very cold from 4th to 12th, then warmer. The smallest R in December in 10 years, being 3·05 in. below the average.

TORQUAY, CARY GREEN.—R 1·09 in. below the average. Duration of sunshine 52·6 hours, or 1·4 below the average. Mean temp. 44°·2, or 0°·8 above the average. Mean amount of ozone 5·1; max. 9·0 on 29th. with W. wind, min. 1·0 on 11th and 12th, with E.N.E., and 24th, with N.N.W. wind.

WELLINGTON, THE AVENUE.—The type of weather which was at first mild completely changed on 3rd, when a very cold spell commenced, lasting until 12th. Until 28th it was unusually mild and at times very stormy. The last three or four days were colder, with some sleet or S. R about 1·25 in. below the normal, although fairly frequent.

NORTH CADBURY RECTORY.—Temp. on the whole rather below the average. Cloudy, with a high average of wind, but no dangerous gale.

CLIFTON, PEMBROKE ROAD.—Sharp frost from 3rd to 9th, with keen E. winds. Very wet with westerly gales from 14th to 17th. The last week was very stormy with westerly winds and gales, ending with two fine days. R slightly above the average. H storm on 28th and S shower on 29th.

ROSS, THE GRAIG.—Very dry except from 12th to 17th, and total R about an inch below the average. Mean temp. 40°·5. The day temp. was little more than 0°·5 above the average, but the min., on account of the severe frost from 4th to 8th, was 2°·3 below the average of 30 years. From 6th to 16th the day temp. rose 27° in 10 days.

COVENTRY, PRIORY ROW.—Generally dark and cloudy with an absence of sunshine and for the most part mild and calm.

SEATHWAITE VICARAGE.—The greatest total fall and the heaviest individual R of any month in the year. Mild throughout, except a cold dry spell from 3rd to 11th inclusive.

HULL, PEARSON PARK.—Severe wintry weather for the first few and last few days, with S, sleet and H. Very cloudy and dull throughout, with only 7·25 hours of sunshine.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE.—Sharp frost from 4th to 8th, with very cold N. winds. Much milder afterwards.

HAVERFORDWEST.—A continuation of the wet weather of November. Frost from 2nd to 8th, with strong E. winds increasing in severity; afterwards overcast, gloomy and piercingly cold to 11th. Mild and wet to 20th after which dry, cloudy and mild to 26th. The month ended wet and stormy. Duration of sunshine 31·8 hours; total for the year 1302·8 hours.

ABERYSTWITH, GOGERDDAN.—Rather wet with one or two severe frosts and very little sun. A good deal of high N.W. wind, with heavy H storms and a little sleet.

DOUGLAS, WOODVILLE.—Severe S.E. gale with heavy R on 1st was succeeded by 9 rainless days, with rasping cold E. winds. A S.W. gale on 13th brought milder weather, with heavy R daily to 17th. High and increasing temp. obtained to 28th, another rainless period of 9 days, with violent W. gales. Slight S on 28th with a furious N.W. gale, and S and frost on 29th. T and L at 7 p.m. on 30th, and H on 31st. The R, 4·41 in., was the highest in any month in 1902, whilst the rainy days, 14, were the fewest.

SCOTLAND.

LILLIESLEAF, RIDDELL.—The most remarkable feature was the prevalence of easterly winds which continued from November 14th to December 13th, with low temp., great dryness and cold. But, being dry, plants did not suffer and the apple blossom reported at the end of November formed fruit of quite an appreciable size. All agricultural work progressed favourably and the weather was bright, warm and charming. The only frost of any severity was on 31st.

TIGHNABRUAICH.—A month of strong winds and heavy R. TS accompanied by heavy H and sleet on 27th.

COUPAR ANGUS.—Despite the severe but short snap of low temp. on 7th and 8th the temp. was above the average for the fourth month in succession. Mean temp. 37°·4.

WATTEN, H.R.S.—The first half was windy, dry and frosty; storms of wind and R in the latter.

S. RONALDSHAY, ROEBERRY.—The first half was fine; afterwards stormy and wet. Mean temp. 39°·7, or 0°·5 above the average of 12 years.

IRELAND.

CORK, WELLESLEY TERRACE.—Most changeable; the first 10 days cold, then 7 with R, followed by 10 mild, dull and foggy days. The month closed with R, sleet, S and frost. R 1·48 in. below the average. Mean temp. 39°·1, or 3°·0 below the average.

DARRYNANE ABBEY.—Mild on the whole but cold snaps in the beginning and end.

MILTOWN MALBAY.—Generally very cold, without much severe frost. The last week was stormy with heavy falls of H.

DUBLIN, FITZWILLIAM SQUARE.—Very open, though cold periods occurred between 3rd and 8th and from 28th to the close. Mean temp. 44°·1, or 2°·4 above the average. High winds on 19 days, attaining the force of a gale on 7. S or sleet on 28th and 29th. Duration of sunshine 53·25 hours.

COLLOONEY, MARKREE OBSERVATORY.—Very frosty at first, the min. reaching 20°·5 on 8th; then mild, gloomy, dull and cloudy. Bad weather set in after 20th with frequent gales and slight showers of H and S. Last 3 or 4 days cold and stormy with sleet, H and heavy R. T and L on 29th.

OMAGH, EDENFEL.—After the drenching R of 1st, followed 10 days of uninterrupted dry and cold weather with more or less severe frosts. Thence to 27th the weather was mild, rainy and unsettled, with occasional strong winds and gales. A return to cold and considerable S terminated the month.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1902

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	85·1	15	44·9	12	73·4	53·1	51·6	65	132·1	40·9	1·40	11	5·9
Malta	99·7	25	64·9	1, 5	89·9	70·9	66·8	67	147·1	60·1	·00	0	0·5
Cape Town	77·0	2	38·9	20	61·7	47·4	48·6	79	...	...	4·59	16	6·0
Durban, Natal	88·0	22	49·5	11	74·4	53·5	...	...	135·2	...	·27	4	2·1
Mauritius	78·3	24	56·2	15	76·4	65·7	61·2	76	141·3	47·5	2·06	15	5·4
Calcutta	93·4	12	74·9	30	88·5	78·5	77·7	85	154·0	73·8	15·52	16	9·2
Bombay	90·3	1	76·4	21	85·7	79·0	77·4	85	142·8	73·7	16·96	30	8·9
Madras	101·9	26	74·5	2	96·9	79·4	72·6	69	149·0	72·1	4·24	16	6·6
Kodaikanal	67·8	27	51·2	22	62·8	53·1	55·1	83	144·4	42·2	3·73	21	8·1
Colombo, Ceylon	88·2	27	74·5	5	86·0	76·8	74·1	83	154·8	71·8	4·63	18	7·2
Hongkong	92·2	27	74·0	6	86·1	78·3	75·8	82	142·9	...	16·26	23	7·7
Melbourne	64·4	5	31·0	15	56·8	42·1	40·9	75	119·4	22·4	·57	6	6·2
Adelaide	70·0	3	36·9	9 *a*	60·8	44·9	43·1	72	122·2	30·9	1·41	15	4·9
Coolgardie	70·0	27	31·9	30	61·0	40·7	39·8	66	136·2	24·0	·64	7	4·3
Sydney	71·9	30	41·4	18	59·4	46·1	42·0	81	110·0	35·0	9·24	15	4·9
Wellington	62·0	30	32·0	17	53·0	40·0	37·4	74	92·0	24·0	2·34	14	4·3
Auckland	60·0	31	38·5	17	54·9	44·5	40·2	70	115·0	33·0	2·14	17	4·6
Jamaica, Negril Point	90·2	1	69·9	24	87·7	73·2	73·9	79	...	...	7·31	13	...
Trinidad	90·0	6	69·0	10 *b*	86·8	71·3	72·7	82	165·0	62·0	5·20	19	...
Grenada	84·2	30	69·2	11	82·6	74·3	71·6	79	149·0	...	12·02	30	3·6
Toronto	91·0	8	50·0	1	78·7	59·1	60·9	79	107·8	43·9	4·37	16	5·3
Fredericton, N.B.	83·7	9	42·5	6	74·8	52·4	52·6	59	...	...	2·94	11	4·8
Winnipeg	90·2	23	...	...	80·0	55·7	...	...	...	...	1·33	11	4·7
Victoria, B.C.	86·2	19	45·8	8	67·9	52·7	...	...	...	...	·37	5	4·4
Dawson	81·6	1	42·4	20	73·3	50·5	...	...	...	...	3·32	8	5·3

a—and 10. *b*—and 13, 16.

REMARKS.

MALTA.—Mean temp. of air 79°·1, or 1°·5, above, and mean hourly velocity of wind 5·8 or 1·8 below, average. Mean temp. of sea 78°·9. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·2 above, and R ·19 in. and mean hourly velocity 1·4 miles below their respective averages for 28 years. T. F. CLAXTON.

MADRAS.—Sunshine 114·9 hours, or 29·1 per cent. of possible amount. L on 6 days, distant T on 7 other days, and TSS on 2 days. A. MOFFAT.

KODAIKANAL.—Cloudy month, 86·2 hours of bright sunshine. C. MICHIE SMITH.

COLOMBO.—Mean temp. of air 80°·6, of dew point 74°·1, both close to average. Mean hourly velocity of wind 9·1 miles, prevailing direction S.W. H. O. BARNARD.

HONGKONG.—Mean temp. of air 81°·8. Sunshine 158·7, or 39·0 below average. Mean hourly velocity of wind 14·3 miles, prevailing direction S.E. F. G. FIGG.

Adelaide.—Mean temp. of air 52°·9, or 0°·6 above, R 1·14 in. below their respective averages. Very dry inland. C. TODD, F.R.S.

Sydney.—Mean temp. of air 0°·5 and R 4·66 above average. H. C. RUSSELL, F.R.S.

Wellington.—Mean temp. of air 1°·1 below and R 4·00 in. below their respective averages. R. B. GORE.

Auckland.—Mean temp. of air 3° below the average. R less than one-half of the average for the previous 33 years. T. F. CHEESEMAN.

17