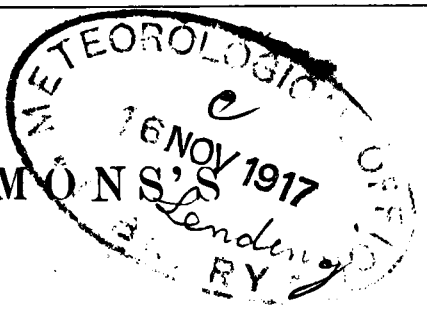

SYMONS'S

METEOROLOGICAL MAGAZINE.

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

VOLUME THE THIRTY-EIGHTH.

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LIST OF ILLUSTRATIONS.

AIDS TO RAINFALL OBSERVERS.

THE exhaustion of the edition of "Rules for Rainfall Observers" has afforded an opportunity for revising the little pamphlet originally edited by Mr. Symons, and throwing the gradual growth of experience into a more systematic form. The rules have been added to as occasion required, but, like all gradual growths, the time arrived when a revision almost equivalent to re-writing was required to restore the symmetry of the first edition while retaining the improvements of the last. The time is rapidly approaching when the records of imperfectly constructed or ill-exposed gauges can be dispensed with as useless, and the time has come when no new gauge should be recognised as satisfactory unless both funnel and measuring-glass have been scientifically tested and certified as accurate. No high-class instrument maker objects to submit his work to such tests, and the few extra shillings required for a certificate purchase for the observer a sense of confidence in his instruments which is a continual satisfaction. The new edition of the Rules drops some of the cautions as to the use of gauges made of improper materials, such as japanned or tinned iron, and directs attention to the importance of using recording gauges whenever it is possible to do so.

In response to many requests, Dr. H. R. Mill has designed a Pocket Rain Register for the use of observers. It takes the form of a little book with rounded corners, daintily bound in linen, and measuring only $5\frac{3}{4}$ inches by $2\frac{1}{2}$ inches. The double page at each opening gives space for recording the daily rainfall for a month for from one to four gauges, and room is provided also for remarks on each day. The book is planned to last for a year and in addition to the blank pages contains instructions for using the forms provided for comparing the actual rainfall of each month with the average, as well as a condensed series of rules for making rainfall observations. There are also tables of average monthly rainfall at seven British or Irish stations representing places with mean annual rainfalls of 20, 25, 30, 35, 40, between 50 and 60, and over 100 inches respectively. A short table of useful memoranda is added, including such points as the definition of "Rain" and of droughts, and the number of tons of water corresponding to an inch of rain on an acre, about which questions are continually being asked. Like all the publications of the Rainfall Organization, this book is sold to the public only through the publisher, Mr. Stanford, although observers may, if they prefer it, obtain copies (by post only) from the Editor.

In concluding the volume of this Magazine for 1903 we have to thank our readers for much consideration and help and to ask for more, so that it may be possible without serious loss to maintain the increase of 25 per cent. in the size of the Magazine throughout the coming year. The expense of advertising a journal appealing to so small a section of the public is prohibitory, but the Editor is always glad to send a specimen copy to any one whose name is sent to him as likely to be interested, and he asks his readers to mention this to their friends.

January, 1904.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXLV.] FEBRUARY, 1903. VOL. XXXVIII.

THE CANADIAN CLIMATE.

By R. F. STUPART, Director Meteorological Service, Dominion of Canada.

CANADIANS reading newspapers and journals published in Great Britain, cannot fail to be struck with the profound misconception which appears to be fairly general regarding the climate and geographical position of Canada. Perhaps Canadians may be to a certain extent guilty of having unwittingly assisted in spreading the erroneous notions regarding their country, by, annually at Christmas time, disseminating photographs of winter scenery to friends in the old land. It is the Christmas pictorial newspapers with their Santa Claus and reindeer, snowbanks and ice-palaces, fur-coats and snow-shoes, which find their way most frequently to England. It is at Christmas that persons wish to send home some small remembrance; what more interesting than a winter scene with people walking about dressed in furs with snow-shoes slung over the shoulder, or pictures of people sliding down ice covered hills in the wildly exhilarating sport of tobogganing? This going on year after year has constantly had a tendency to make Britishers associate Canada with the Polar Regions. As there is certainly fallacy in the conception of Canada as an exceedingly cold country, the writer will endeavour briefly to present certain facts regarding the Canadian climate in the hope that at least some erroneous impressions may be removed.

Canada is the northern half of a continent which stretches from the subtropics to the Arctic Sea, and the older provinces of the Dominion, viz., Ontario, Quebec and the Maritime Provinces lie wholly further south than does any portion of Great Britain. Toronto is 550 miles further south than London, Montreal 418 miles further south, and Halifax 478 miles further south. It may surprise many that a large portion of Ontario lies as far south as the South of France and northern Spain and Italy; Toronto is further south than Florence, and the southern point of Ontario is further south than Rome. In addition to this, portions of the North West Territories, a strip of territory 70 miles in width including parts of Manitoba, Assiniboia and Alberta are also further south than any portion of England. No portion of Canada's present wheat fields in Manitoba and the North West Territories lies as far north as Scot-

land, but it is the writer's belief that in the not distant future, some of the choicest grazing land of America will be found under the shelter of the Rocky Mountains in the basin of the Great Mackenzie River; from a latitude corresponding to the Scottish border, northward nearly to the Arctic circle. These geographical facts being recognized, is it not worth while stopping to consider whether erroneous notions regarding the Canadian climate may not be rather too prevalent in Europe? An English gentleman interested in meteorology, has, within the last three months, expressed surprise on discovering that our Canadian climate is milder than that of Siberia!

Canada stretches the whole breadth of the North American Continent, from the Atlantic on the east to the Pacific on the west; from the International boundary on the south to the Arctic Circle on the north, and in this vast extent of country we may expect to find a varied climate—the writer, therefore, proposes to give a brief synopsis of the more salient climatic features of each of the provinces which comprise our Canadian Dominion, hoping that such information may be of value to intending emigrants and others.

Vancouver Island, in the Pacific Ocean, occupies somewhat the same position in relation to the American continent that Great Britain, in the Atlantic, does to Europe; lying between nearly the same parallels of latitude. The climate, as in all other parts of British Columbia, varies much with the orographical features of the country. The annual rainfall along the exposed western coast of the island is very great, generally exceeding one hundred inches, but in the more eastern districts it is less than half that amount. May to September is usually a comparatively dry period, while copious rains fall between September and March. The mean monthly and mean annual temperatures correspond very closely with those found in parts of England; the summers are quite as long and severe frost scarcely ever occurs.

Crossing the Strait of Georgia to the mainland and considering the country south of the Canadian Pacific Railway, we are still in latitudes corresponding to the southern half of England. We here find a warm summer, and a winter increasing in severity as we ascend the Fraser valley and reach higher levels. At Agassiz, on the lower Fraser, about seventy miles from Vancouver, is situated one of the Dominion experimental farms; the average mean temperature of January at this place is 33° and of July 64°, with a daily range of 10° in the former month and 26° in the latter; the lowest temperature on record is $-13°$ and the highest 97°. Frosts seldom occur in May and there is no record of any during the summer months. The annual rainfall is 67 inches, 66 per cent. of which falls between October 1st and March 31st. This shows very approximately the climate of the lower Fraser valley.

To the eastward of the Coast Range in the Yale and West Kootenay districts the climate is distinctly different; the summers

are warmer and the winters are colder, and the rainfall rather scant; bright dry weather is the rule. The cold of winter is, however, scarcely ever severe, and the hottest days of summer are rendered pleasant from the fact that the air is dry and the nights are cool. In this region March is distinctly a spring month, and the temperature of April corresponds very closely with that of the same month in England. Grapes and peaches thrive, and tobacco is a crop which is yearly proving a greater success. In the mountainous region of East Kootenay the winters are colder again, but even here the summers are warmer and the winters not as cold as in St. Petersburg.

Passing to the eastward of the Rocky Mountains we come to the Prairies of the North-West, first the vast ranching areas of Alberta and western Assiniboia, and then the wheat-growing districts of eastern Assiniboia, Saskatchewan and Manitoba. In all the prairie country one of the most noticeable features is the crisp dryness of the winter air, and the almost constantly clear sky. The winters are cold, at times very cold, but all persons residing in the country are agreed that the dry cold of the prairies is not comparable with the more moderate cold of a damp climate; it is not uncomfortable, and persons can go about their daily avocations with the temperature at $-20°$ without experiencing inconvenience. Near the mountains spring opens earlier than in Manitoba, and the early part of April in Alberta often sees much spring plonghing, while in Manitoba it is usually the end of that month before the ploughing is well under way. Early in May the prairies are carpeted with flowers, and for six months the delightful exhilarating prairie air is perhaps to the settler an ample offset to the months of cold between November and March—particularly when in September, days of railway travel may be spent in passing through the finest and most prolific wheat fields of the world, or further west the eye may roam over the boundless prairie, dotted here and there with countless herds of fat cattle which cannot fail to enrich the rancher.

Ontario, with an area of 222,000 square miles, has its most northerly point in latitude 52°, a little further north than London in England, and its most southerly point in 41° 40′, a little further south than Rome. It forms the northern and eastern shore line of four of the Great Lakes of America—Superior, Huron, Erie and Ontario—and its western limits are over a thousand miles from its eastern confines; truly a magnificent territory. Its northern districts, rich in forests and minerals, have a colder climate than its southern districts, where the peach and grape ripen as readily as in southern France under skies scarcely less sunny and in latitudes the same as northern Spain. There is no component of the weather more necessary to the success of one of the largest industries of northern Ontario than a fairly heavy winter snowfall; the lumberman requires a good snow covering in order to draw out his timber to the streams easily, and again a small snowfall will mean low water in the spring freshets, which is disastrous, as the logs may not

be floated to the great water courses and the mills. The Ontario lumberman, the farmer, and the business man all pray for a winter with lots of snow and steady cold; these are conditions which mean prosperity, and when the snows begin to melt in March all may look forward with confidence to a short spring followed by a long delightful summer, which fades gradually into autumn with its golden tints which last to the middle of October, and not infrequently into November. The climate of southern Ontario is very appreciably warmer than that of the more northern parts of the province; were the month of March a little warmer it would be well nigh a perfect climate. Signs of spring begin to multiply early in April or indeed in March, and between the middle of May and the middle of September the whole district is included between the same isotherms as the greater portion of France, and it is only after a protracted autumn that winter sets in about the beginning of December. The winters are by no means severe, and the summers seldom oppressively hot; this being due to the tempering influence of the Great Lakes by which this portion of Ontario is surrounded. In the more southern and western counties of the province the April mean temperature corresponds nearly to that of the south of Scotland, and in May the mean temperature of the whole district is slightly higher than for the south of England. The summer months proper are distinctly warmer than in England, but in few districts does the mean temperature exceed 70°, hence the heat is by no means excessive. A gentleman who has now spent two winters in Canada, about a month ago on leaving for Scotland remarked to the writer, "I wish I were to remain in Canada this summer; I quite realize that Toronto between May and September enjoys a climate that cannot be excelled." The annual precipitation of the whole of Ontario lies between 30 and 40 inches, which is fairly evenly distributed throughout the year; in summer, however, the rain generally falls in thunderstorms, and cloudy wet days are of very rare occurrence.

(*To be continued.*)

THE TEMPERATURE OF AIR AND RIVERS.

THE REV. W. ANDSON, of Ivy Bank, Dumfries, recently read to the local Natural History and Antiquarian Society a paper discussing a series of observations on the temperature of the water of the river Nith and its estuary with reference to the temperature of the air. The observations had been carried on for a year from June 1st, 1901, to May 31st, 1902, and were undertaken at the request of Mr. Calderwood, the Inspector of Salmon Fishing under the Fishery Board for Scotland. At Mr. Calderwood's suggestion a maximum and a minimum thermometer were used, placed in a perforated copper vessel and hung in the current in such a way as to be continuously immersed. The thermometers were read daily, those in

the river at Dumfries being under the charge of Mr. Andson, those in the estuary at Glencaple under the charge of the Rev. James Malcolm. In the course of his paper Mr. Andson gave the following table, which we reprint with a summary of his explanatory remarks :—

Months.	River Water. Mean Temp.		Estuary. Mean Temp.		Air. Mean Temp.	
	°		°		°	
December	37·1		37·6		37·0	
January	38·1	36·5	40·0	37·5	39·2	36·7
February	34·5		34·9		34·0	
March	42·8		43·0		43·8	
April	45·2	46·0	44·0	45·6	46·0	45·7
May	50 0		50·0		47·3	
June	57·2		58·2		56·0	
July	66·1	61·0	65·6	61·9	64·6	59·9
August	59·9		62·1		59·2	
September	55·4		57·2		55·8	
October	48·5	48·2	49·9	50·1	48·3	48·4
November	40·8		43·1		41·3	

The range of the river temperatures is much more limited than that of the air or land. The highest temperature recorded for the river was 74°, on July 20th, and the lowest was 31°·5, say 32° to avoid fractions, on February 10th, giving a range of 42° for the year. In the air or land observations, on the other hand, the highest temperature was 90° on the same day in July, and the lowest 6°, on a day in February, which would give an annual range of 84°. As the above values, however, were abnormal, it is better to substitute for them a fifteen years' average of the highest single day temperatures, and a similar average of the lowest, which would alter the range to 84° for the highest and 14° for the lowest, and show an annual range of 70° for the air, as compared with 42° for the river. The mean maximum for the year being 49°·9, and the mean minimum 46°·3, the mean daily range would only be 3°·6. For the air the mean maximum was 54°·4, the mean minimum 40°·5, hence the mean daily range would be 14°·4. But now, when we compare the mean annual temperatures of air and water, we find a remarkable agreement. They almost exactly coincide. The one (air) is 47°·7 ; the other (water) is 47°·8. The use of self-registering minimum as well as maximum thermometers to record the temperature is fitted to secure greater accuracy ; and when the yearly mean, founded on such observations, is found to correspond with that of the air for the same period, it is only what might be expected, and may be regarded, indeed, as an evidence of the accuracy of the observations. This coincidence of annual means does not, however, necessarily imply a like coincidence in the monthly means. It will be seen from the table that the months in which they approximate most closely are the autumn and winter months, and those in which

they diverge most are in spring partly, but still more in summer. In August, September, October, November, December, February, and April there is only a difference of a fraction of a degree; but in January, March, May, June, and July from 1° in March to 2°·7 in May. If now we compare the temperature of the river with that of the estuary at Glencaple, we find a different result. The annual means, instead of coinciding, show an excess of almost 1° in favour of the estuary, viz., 48°·7. The annual mean of the river as ascertained by the observations ten years ago, was 48°·5, as compared with 47°·8. The explanation of this is very simple. The observations of the estuary having been taken always at or near high tide, and during the day, would, as a rule, be near the maximum, while those, both of the river and the air, were calculated from the combined maxima and minima of each day; and then the flow of the tide over a large extent of sand in warm, sunny weather must also necessarily have the effect of increasing the estuary temperature.

FOUR MONTHS WINTER RAINFALL, OCTOBER, 1902—JANUARY, 1903.

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	—1·53	82	Arncliffe	+ ·29	101	Braemar	+2·76	121
Tenterden	—1·21	88	Hull	— ·76	92	Aberdeen	+ ·25	102
Hartley Wintney	— ·92	90	Newcastle	— ·06	99	Cawdor	+ ·51	105
Hitchin	—1·57	82	Seathwaite	—4·07	93	Glencarron	+ ·15	100
Winslow	—2·01	77	Cardiff	+2·01	113	Dunrobin	—2·33	82
Westley	—2·74	69	Haverfordwest	+1·87	110	Darrynane	—1·81	91
Brundall	—2·77	69	Gogerddan	— ·86	96	Waterford	+3·79	126
Alderbury	—1·06	91	Llandudno	—1·07	92	Broadford	+1·32	110
Ashburton	+ ·02	100	Dumfries	+1·64	109	Carlow	+2·19	117
Polapit Tamar	+2·84	118	Lilliesleaf	+2·49	122	Dublin	+1·15	111
Stroud	+ ·03	100	Colmonell	+2·19	112	Mullingar	+2·19	117
Woolstaston	— ·65	94	Glasgow	+2·07	114	Ballinasloe	+ ·33	102
Boston	— ·91	87	Inveraray	—1·68	95	Clifden	—1·89	94
Hesley Hall	— ·34	96	Islay	—1·58	92	Crossmolina	+ ·21	101
Derby	— ·13	98	Mull	— ·82	97	Seaforde	+3·27	123
Bolton	— ·27	98	Loch Leven	+1·72	112	Londonderry	—1·26	92
Wetherby	+1·41	117	Dundee	+ ·24	102	Omagh	+1·55	110

It is generally recognised that for water storage, and especially for replenishing the underground supplies in wells and springs, the effective part of the year's rain is that which falls in the winter months, when evaporation and vegetation are at their minimum. We have accordingly compared the rainfall of the four months, October, 1902, to January, 1903, with the average of the corresponding months for the ten years, 1890-99, adjusted to the monthly incidence of rainfall of thirty years. The result is to show that over

by far the greater part of the British Isles the small rainfall of 1902 will not produce any immediate bad effects, because the heavy rainfall of December and January, though but a small part of the annual supply, has come at the most useful time. The figures published above show that over Cornwall, Devon, Somerset, Gloucester, Hereford and South Wales, the winter's rain is so far well in advance of the average. This is true also for the north-east of England, and for the whole of Ireland and Scotland, except their west and north coasts. The only parts of the country which have had as much as 10 per cent. less than the average fall for the four months appear to be the extreme north of Scotland and the south-east of England. The winter has been relatively driest in East Anglia, where the only stations here considered, one in Norfolk and one in Suffolk, report less than 70 per cent. of the normal fall, a very unsatisfactory state of matters.

For the first time for many months the differences from the average in our Rainfall Table are practically all excesses. January has proved a wet month over the whole of the British Isles, though in few places excessively so. As we write news comes in of very heavy rains in the early part of February over the north of England, and especially the south of Scotland, where extensive floods were caused.

ROYAL METEOROLOGICAL SOCIETY.

THE Annual General Meeting of this Society was held on Wednesday, January 21st, 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 had made steady progress, there being an increase of 20 in the number of Fellows. The Society's Howard Silver Medal, annually awarded to the cadets of H.M.S. *Worcester*, had been gained by Cadet R. T. Snape. The exhaustive Meteorological Bibliography, commenced many years ago by the late Mr. G. J. Symons, was being continued by the Society. As the Bibliography cannot be supposed to be complete, the Council invited the Fellows and others to send to the Society for record, a copy of all meteorological books and papers of which they may be the authors. The Council had also undertaken to furnish for the *International Catalogue of Scientific Literature* the titles of all works bearing on meteorology which are published in the British Isles.

The report having been adopted, votes of thanks were passed to the Council for their services during the past year, and also to the President and Council of the Institution of Civil Engineers for allowing the meetings to be held in the rooms of the Institution.

The President, in his address, dealt with "The method of kite-flying from a steam vessel, and meteorological observations obtained thereby off the West Coast of Scotland." In the spring of 1901 the Royal Meteorological Society appointed a Committee for the purpose

of making an investigation as to the temperature and moisture of the upper air, and the British Association, at the meeting in Glasgow, also appointed a committee to co-operate in the work. At the request of this joint committee Mr. Dines undertook to carry on the enquiry during the summer of 1902, and in this address he gave a full account of what he had done. After describing the apparatus (particulars of which will be found in *Symons's Met. Mag.* for May and October, 1902), he gave an account of the observations at a fixed station and also from a steam tug in the neighbourhood of Crinan, Argyllshire. He had acquired a considerable amount of information concerning meteorological phenomena, having obtained 71 observations of temperature at an average height of 4140 feet, and 38 charts from the self-recording instruments with an average of over 6000 feet. The greatest height attained was 15,000 feet with four kites on the wire. The temperature gradient over the sea was considerably less than its average value over the land, being about 1° for every 350 feet of height. The upper currents were found to differ in direction from those below much less than was expected. As a general rule the humidity increased up to about a mile and then decreased.

A hearty vote of thanks was accorded to Mr. Dines for carrying out the kite observations and also for his services as President during the past year.

The following gentlemen were elected the officers and council for the ensuing year:—

President, Capt. D. Wilson-Barker. *Vice-Presidents*, Mr. W. H. Dines; Capt. M. W. C. Hepworth, C.B.; Mr. E. Mawley and Dr. W. N. Shaw, F.R.S. *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; Mr. J. Y. Buchanan, F.R.S.; Capt. W. F. Caborne, C.B.; Capt. A. Carpenter, R.N., D.S.O.; Mr. R. H. Curtis; Mr. F. Druce; Mr. W. Ellis, F.R.S.; Mr. C. Hawksley; Mr. J. Hopkinson; Mr. R. Inwards; Mr. B. Latham and Mr. H. Mellish.

The meeting was preceded by a brief ordinary meeting, at which the following were elected Fellows of the Society:—Mr. W. R. Bell; Mr. A. M. Edwards; Mr. J. McConnell; Mr. W. E. Markham; Mr. W. F. Preedy; Dr. W. Prowse; Major V. S. Sandeman and Mr. T. Thornton.

Correspondence.

ON SOME PRECURSORS OF WEATHER CHANGE.

To the Editor of Symons's Meteorological Magazine.

1. *Fine weather preceded by calm at night.*—The fine weather which followed the thundery time August 4th–14th, 1895, was ushered in by a close and marvellously still night. The calm which prevailed was phenomenal, a stillness that might be felt. The whole animal world seemed to share in it. Not a leaf stirred nor a bird broke the

silence. Even the moths seemed to have ceased their nightly wanderings. The same stillness, followed by similar weather, was noted in July, 1900, and recently, 1902, has preceded the lovely harvest weather of September, after a wet Summer.

2. *Fine weather indicated by filmy Strato-cirrus.*—When the deep orange glow and fine crimson-tinted bands of cirrus and cirro-stratus ornament the upper sky, very fine, filmy thread-like lines come into view, being illumined by the rays of the descending sun. This appearance occurred before the glorious harvest weather at the end of August and beginning of September, 1895, before the drought of 1899, and was seen through the drought of 1901.

These lines are quite straight, and are sometimes flecked or barred by cross lines, giving a slightly matted appearance. Their visibility evidently depends on their position with regard to the sun, and they belong probably to the hazy thin sheets of cirrus and cirro-stratus in the upper sky, foreshortened by distance. This cloud showed itself on the evening of July 5th, 1900, about sunset, in very straight form. This was followed by a dry week of great heat, 137° in the sun, 93° in the shade, in London. The same form of cloud preceded the dry summer of 1899, appearing through the mists of early dawn in a rigidly straight line, dipping from S. to W.; 12° N. to E. at sunrise and S. to W. at sunset. It was also common during the drought of 1901.

On August 24th, 1902, a highly prismatic halo presenting in its upper arc two lines of refraction, was visible in the hazy blue-grey upper drift. This halo was right above the loose cirro-cumulus. Believing that it meant a change of atmospheric conditions, I took the following notes. Three fine days followed, not the imaginary storm popularly associated with halos. These optical appearances have been uncommon during the past rainy summer. On August 24th, 25th, the curious dead calm, above alluded to, was most noticeable, and the weather improved from that date. It seems that rooks, by their immensely elevated spiral soaring and their joyous cries and "churring," possess premonitory sensations indicating change to fine weather. At any rate they have shown these lively movements on almost every occasion of recent weather improvement.

SAMUEL BARBER.

Elmsett, Ipswich.

REVIEWS.

Natural Law in Terrestrial Phenomena. A study in the causation of earthquakes, volcanic eruptions, wind-storms, temperature, rainfall, with a record of evidence by WILLIAM DIGBY, C.I.E. London: W. Hutchinson & Co. 1902. Size 9 × 5½. Pp. xlvi. + 370.

THAT the weather of our planet is controlled by the moon is a venerable belief as old as the hills, and it would appear to be almost as easy to remove the hills themselves as to get some people, not

lacking in ordinary intelligence, to realize the fact that modern enquiry has failed to show the existence of any real foundation for its acceptance.

The most recent adventurer in the direction of formulating a theory of the moon's influence on the weather is Mr. Hugh Clements, whose name is probably already familiar to many of our readers as that of a lunarist whose "long distance" predictions of weather have not infrequently appeared in the public press.

A fundamental principle of Mr. Clements' theory is one which is common to nearly all believers in the moon's influence upon our weather—namely, that similar conditions of weather must always recur with the recurrence of the same relative positions of the Earth and moon; and it is upon this axiom that he rests a claim to be able to predict with accuracy the weather "for any number of days, weeks, months, or years ahead, upon a scientific system from which the element of chance is eliminated."

This axiom is elaborated at some length in the volume under review, in which the explanation of Mr. Clements' theory is accompanied by numerous statements intended to support and justify it. The book is not, however, from the pen of Mr. Clements, and this is somewhat curious, because he has already shown himself quite able to expound his own views, whilst Mr. Digby appears to be under the disadvantage of having first approached the study of the subject only a few months before the book was published. We are not told why so important a task was delegated to so recent a disciple; nor can we find that Mr. Digby has made any independent tests of the statements by which his judgment seems to have been convinced.

Put briefly, Mr. Clements finds a full explanation of all terrestrial weather phenomena, and also of seismic and volcanic phenomena, in the "tangential pull of the moon," slightly modified by the position of the sun; and he holds that "when once more the moon appears in the position she occupies to-day, with the sun in like position, the same phenomena as that which is passing under our eyes will be reproduced." This exact recurrence takes place, we are told, every 186 years, and on p. 281 we read that therefore "the years 1692 and 1693 were the exact meteorological counterpart of 1878 and 1879." This is a definite statement, made without qualification; but when a little further on we find the casual admission that no detailed information exists as to the weather of those early years, from which alone it would be possible to decide whether or not they corresponded meteorologically with the later ones named, we think ourselves justified in hesitating to accept without reserve the statement that they did do so.

Many references are made to Mr. Clements' predictions, and to the remarkable way in which they are said to have been fulfilled. Most of these statements cannot easily be verified, owing to the way in which they are given, as *e.g.*, "My predictions for the 17th, 18th, 19th and 20th agreed with Greenwich"; whilst elsewhere they are

exhibited by means of diagrams so drawn that they cannot readily be followed. But on pp. 330–331 there is given in parallel columns what purports to be the Meteorological Office prediction for each day of February, 1895, the weather actually experienced at Greenwich, and Mr. Clements' prediction for the same period. It is to be remembered that the Meteorological Office forecast embracing Greenwich covers the district of "South England," and comprises wind as well as weather; the part relating to wind has, however, been omitted by Mr. Digby.

From a general comparison of the three columns it is perfectly clear that the Meteorological Office forecasts better indicated the weather actually recorded than did those of Mr. Clements. But if we deal with them more specifically, and select for examination one element, viz., precipitation, we find that the Office indicated rain or snow for 21 days, on 13 of which one or the other occurred at Greenwich, whilst on the remainder the weather is described as having been "overcast" or "unsettled"—conditions certainly suggestive of rain. On one day rain fell although the Office had not predicted it. Mr. Clements, on the other hand, predicted rain or snow for 10 days, on only 5 of which did rain or snow occur, whilst on 8 others on which there was rain his prediction did not refer to it. Yet this is a selected forecast put forward in support of the statement that whilst "weather prediction (by the Meteorological Office) has become a by-word and a scorn, a thing for contemptuous comment" (p. 43), and its mistakes have been so grotesque and numerous that "No citizen considers himself so low in the scale of criticism that he feels it would be unseemly for him to jeer at the weather-prophet of Victoria Street" (p. 261), yet Mr. Clements is able by his system to forecast the weather for years ahead with absolute accuracy, "from which the element of chance is eliminated." We have made our comparison from the data given on the pages quoted. We may add, however, that neither the Meteorological Office forecasts for February, 1895, nor the weather actually recorded at Greenwich in that month, agree with Mr. Digby's description of them as given in the table.

On page 295 reference is made to a prediction by Mr. Clements of an earthqnake which should have occurred on the morning of April 17th, 1898. If this earthquake occurred no one seems to have recognized it, but Mr. Clements gravely tells us that since in April of the eight preceding years, "when the lunar and solar positions were similar, earthquakes occurred in either Greece or Italy, or both, therefore tremors or shocks of greater or less force must have occurred on this occasion also."

At the end of the book are a number of "Rules for Weather Prediction," some of which fairly puzzle us. What, for example, are we to understand when we are told that "to predict the daily height of the barometer for a month, a year, or several years, in advance it is necessary to have the mean daily heights for several years in

advance"? Elsewhere in the volume are other statements the exact meaning of which is not self evident; as e.g. when we are told that the "wind force 17" occurred at Greenwich; or again that "the pressure on the square foot was 28 and 36 lbs. respectively on the square inch." Had not the pressure per square inch been quoted elsewhere, more than once, we should have thought the use of the word in this instance accidental; as it is we fear that neither Mr. Clements nor Mr. Digby quite realizes what such figures mean. For the sake of the Astronomer Royal and his staff, not to mention the building itself, we trust the Greenwich Observatory will never have the ill-fortune to be subjected to a wind pressure of 36 lbs. per square inch.

R. H. CURTIS.

The Survey Atlas of England and Wales, a series of 84 plates of maps and plans, with descriptive text, illustrating the topography, physiography, geology, climate, and the political and commercial features of the country. Designed by and prepared under the direction of J. G. BARTHOLOMEW. Under the patronage of the Royal Geographical Society. Edinburgh: J. Bartholomew & Co. Price £2 12s. 6d., in 21 parts at 2s. 6d. each.

THE first part of this Atlas is before us, and the work promises to be as complete and serviceable for England as the similar "Atlas of Scotland" is for the northern kingdom. While the general maps, none of which are included in Part I, will doubtless be full of interest and value, the main ground for recommending the atlas as a whole is in our opinion the unique map of the whole country on the scale of half an inch to a mile. The detail in this map is both full and accurate, while the system of colouring according to altitude allows the physical configuration of the country to stand out in the most real way. Such a map supplies the answer to a multitude of questions regarding climate, for it exhibits at the same time the altitude and the exposure of any given station. The separate sheets have already won their way into the favour of cyclists and motorists, and the atlas when complete will be indispensable in the library of every country house and the study of every meteorologist in England.

METEOROLOGICAL NEWS AND NOTES.

METEORIC STONES have only been seen to fall in the British Isles on four occasions, so far as we are able to ascertain—namely, on December 13th, 1785, near Scarborough; on April 20th, 1876, near Wellington, Shropshire; on March 14th, 1881, at Middlesbrough; and on September 13th, 1902, at Crumlin, near Belfast. The last-named meteorite has just been acquired by the Natural History Department of the British Museum. The stone, which was $7\frac{1}{2}$ inches long, $6\frac{1}{2}$ inches wide, $3\frac{1}{2}$ inches thick, and weighed 9 lbs. $5\frac{1}{2}$ oz., was dug out still hot from a hole about 18 inches deep within a quarter of an hour of the time when it was seen to fall.

SIR JOHN ELIOT, F.R.S., who was knighted on the occasion of the Coronation Durbar at Delhi, on January 1st, will, we understand, resign his position as Meterological Reporter to the Government of India at the end of the present year. Mr. Gilbert T. Walker, of Trinity College, Cambridge, has been appointed Assistant Meteorological Reporter, and will proceed to India to take up his duties at an early date. Mr. Walker, who is a distinguished mathematician and physicist, will, we believe, succeed Sir John Eliot on his retirement.

A WEATHER FORECAST which saved £20,000 is chronicled in the Report of the U.S. Weather Bureau for 1901. On the morning of February 23rd, 1901, a special warning was telegraphed from Washington to Jacksonville, Florida, predicting a frost to occur that night with temperatures of from 20° to 25° F. at Jacksonville, and of 32° as far south as Tampa. More than five hundred telegrams were sent out from the local weather office and the fruit and vegetable growers took precautions to protect the blossom, then at an extremely sensitive stage. The frost came and the damage it would have done, if unforeseen, was estimated at more than 100,000 dollars. It is not often that the money value of scientific prescience can be estimated so definitely.

A REMARKABLE FALL OF DUST was observed at Kew, Invercargill, in the south of New Zealand, during the very wet and stormy weather of October and November last. A correspondent writing on the subject says: "After rain the roof of the house, galvanized iron, was covered with a thick sediment, about half-an-inch deep, of what seemed either volcanic dust, or else dust from the storms in Queensland, which had come down with the rain. It drained off the roof into the water tanks, which had to be emptied and cleaned out before we could get clean water fit for use."

The Abbé Maze.

1836-1902.

THE death of the Abbé Maze, on June 17th, removes an active worker in meteorology, and a prominent member of the French Meteorological Society, who had held the position of Secretary on several occasions. He had also been one of the editors of *Cosmos*, the well-known popular French review of cosmical physics, for nearly thirty years. The published writings of the Abbé were not of much permanent importance; but in announcing his death to the Société de Météorologie, the President stated that he had been engaged in the preparation of a history of the thermometer, for which he had brought together a quantity of material worthy of publication. Another unfinished work was an attempt to establish a periodicity of rainfall in two periods, one of six and one of forty-two years; a memoir on the periodicity of droughts, published at Brussels, in 1895, forming part of this work.

BOOKS RECEIVED.

WE have been unable to find space for the full titles of the following annual reports received last year, and in order to avoid further delay we present the list in an abbreviated form. (The date of publication in each case is 1902.)

Annual Reports of :—

Central Meteorological Observatory of Japan, Part II. for 1897, 1898 and 1899.
Royal Prussian Meteorological Institute for 1891.
Prussian Rainfall Tables for 1897 and 1898 (pub. 1901).
India, Rainfall for 1901.
Mysore, Meteorology for 1901.
Mysore, Rainfall for 1901.
Argentine Republic, Meteorology for 1901.
Ceylon, Meteorology for 1901.
Bouches du-Rhone, Meteorology for 1901.
South Australia, Rainfall for 1899.
Denmark, Nautical Meteorology for 1901.
Denmark, Meteorological Year Book for 1900 and 1901.
Maryland, Magnetic Survey, 1897 to 1901.
Hertfordshire, Meteorology, 1901.
Hertfordshire, Rainfall, 1901.
Margate, Meteorology, 1901.
Dorset, Rainfall, 1901.

Deutsche überseeische meteorologische Beobachtungen Heft XI. Meteorologische Beobachtungen in Deutsch-Ost-Afrika. [Meteorological Observations in German East Africa]. Gesammelt and bearbeitet von Dr. Hans Maurer. Zeil II. Hamburg : Deutsche Seewarte. Size 13 × 10, pp. 272.

Memorandum on the Meteorological conditions prevailing in the Indian Monsoon region before the advance of the south-west Monsoon of 1902, with an estimate of the probable distribution of the Monsoon Rainfall in 1902. By John Murray, M.A. Simla, 1902. Size 13 × 8½. Pp. 27.

The Climate of Hertfordshire, deduced from Meteorological Observations taken during the twelve years 1887–1898. By John Hopkinson, F.L.S. From the "Transactions of the Hertfordshire Natural History Society." Vol. XI., Part 4. Hertford, 1902. Size 5½ × 8½. Pp. 121–134.

Publications of West Hendon House Observatory, Sunderland. No. II. By T. W. Backhouse, F.R.A.S. Sunderland, 1902. Size 11½ × 9. Pp. viii. + 161. 60 plates. [Contains a paper on the frequency and possible periodicity of the aurora borealis.]

Wind Velocity and Fluctuations of Water Level on Lake Erie. U.S. Weather Bureau ; Bulletin J. Prepared by A. J. Henry. Washington, 1902. Size 11½ × 9. Pp. 22 + 26 pp. of plates.

On Rainfall at Batavia as registered by Beckley's Self-Registering Rain Gauge, during 1879–1900, by Dr. S. Figee. Appendix to Vol. XXIII. of the "Observations" of the Royal Observatory at Batavia. Batavia, 1902. Size 14 × 10½. Pp. 21.

Annual Report of the Agricultural Department of the Government of H.H. the Sultan of Zanzibar for 1901. Zanzibar, 1902. Size 7½ × 6. Pp. [32]. [Contains meteorological observations for 1901 at Dunga and Zanzibar Town in Zanzibar Island, and at Banani in Pemba Island.]

Proceedings of the Second Convention of the Weather Bureau Officials, held at Milwaukee, Wis., Aug. 27, 28, 29, 1901. Edited by J. Berry and W. F. R. Phillips, Washington, 1902. Size 9 × 5½. Pp. 246, one plate.

LATE RETURNS IN 1902.

TABLE OF RAINFALL AND TEMPERATURE.

Jan.	Skipton, Arncliffe.....	5·01	—1·37	·97	3	19	..	..	..	..	..	..
June.	Hitchin	3·54	+1·76	·79	12	15	82·0	29	35·0	10	0	..
July.	Broadford, Hurdlestown	1·79	—1·19	·75	25	17	72·0	1& 5	44·0	20	0	..
Aug.	Dunrobin	1·31	—1·24	·30	22	9	67·0	24	40·0	11	0	..
Sept.	Glencarron Lodge	7·63	— ·90	2·33	3	20	67·0	3	34·0	19	0	..

SUPPLEMENTARY TABLE OF RAINFALL.

JANUARY.—Scalby, Silverdale, 1·29; Rhayader, Nantgwillt, 3·57; Enniskillen Model School, 3·69.

FEBRUARY.—Enniskillen Model School, 2·35.

MARCH.—Caher, Duneske, 2·24; Enniskillen Model School, 2·41.

APRIL.—Horncastle, Bucknall, 1·77; Keswick, The Bank, 3·87; Enniskillen Model School, 3·26.

MAY.—Shifnal, Hatton Grange, 3·08; Cork, Wellesley Terrace, 1·61; Enniskillen Model School, 2·68.

JUNE.—Bettyhill, 1·84; Enniskillen Model School, 1·68; Belfast, Springfield, 2·74.

JULY.—Ross, The Graig, ·66; Rhayader, Nantgwillt, 3·27; S. Uist, Askernish, 1·55; Enniskillen Model School, 4·17; Belfast, Springfield, 5·08.

AUGUST.—Beltingham, 2·05; Treherbert, Tyn-y-waun, 4·58; Enniskillen Model School, 1·90; Belfast, Springfield, 3·25.

SEPTEMBER.—Ryde, Beldornie Tower, ·66; Beltingham, 1·03; S. Uist, Askernish, 5·75; Miltown Malbay, 1·72; Enniskillen Model School, 3·14.

OCTOBER.—Enniskillen Model School, 2·53; Belfast, Springfield, 1·99.

NOVEMBER.—N. Esk Reservoir [Penicuick], 1·05; Balquhidder, Stronvar, 7·12; Enniskillen Model School, 4·36.

ERRATA.

CLIMATOLOGICAL TABLES.

Oct., 1901.—Cape Town	Min. on grass *should be* ..	not	50·2
Mauritius.....	,, ,, ,,	50·2	,,	65·8
Calcutta	,, ,, ,,	65·8	,,	66·3
Bombay	,, ,, ,,	66·3	,,	71·0
Colombo	,, ,, ,,	71·0	,,	32·0
Melbourne	,, ,, ,,	32·0	,,	35·3
Adelaide	,, ,, ,,	35·3	,,	40·3
Sydney	,, ,, ,,	40·3	,,	..
Wellington	,, ,, ,,	29·0	,,	41·0
Auckland	,, ,, ,,	41·0	,,	..
Grenada	,, ,, ,,	..	,,	22·7
Toronto	,, ,, ,,	22·7	,,	..
Dec., 1901.—Auckland	Abs. max. temp. ,,	75·0	,,	75·5

REGULAR TABLES.

April.	Broadford, Hurdlestown	diff. from aver. *should be* — ·08	not	+·08
July.	Bury St. Edmunds, Westley ..	,, ,, ,,	—1·69	,,	—·69
Oct.	Aberystwith, Gogerddan	,, ,, ,,	— ·27	,,	—·17

AGGREGATE RAINFALL.

P. 79. Broadford, Hurdlestown ..... diff. from aver. *should be* +1·20 not +1·30

P. 99. Heading *should be* Six months, not Five months.

SUPPLEMENTARY TABLES.

May. Douglas, Woodville, *should be* 3·48, not 3·40

RAINFALL AND TEMPERATURE, JANUARY, 1903.

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) ...	2·15	+ ·44	·76	4	17	53·8	5	22·1	16	9	16
II.		Tenterden	2·14	+ ·15	·59	4	18	53·2	6	20·0	15	7	13
,,		Hartley Wintney	2·58	+ ·63	·64	4	21	55·0	10	15·0	15	13	17
III.		Hitchin	2·52	+ ·81	·57	4	19	56·0	5	18·0	14*e*	9	...
,,		Winslow (Addington)	2·40	+ ·69	·73	4	19	53·0	5	19·0	14	13	15
IV.		Bury St. Edmunds (Westley)	1·90	+ ·21	·40	4	16	52·5	5, 26	19·0	15	...	...
,,		Norwich (Brundall)	1·68	+ ·01	·36	19	17	54·8	26	27·5	14	9	13
V.		Winterborne Steepleton	3·91	...	·89	4	20	51·8	4	20·8	15	9	12
,,		Torquay	4·03	...	1·19	4	19	54·9	5	30·0	13*f*	6	10
,,		Polapit Tamar [Launceston]..	5·14	+ 1·81	1·20	4	23	53·8	4	17·5	14	9	11
VI.		Stroud (Upfield)	3·33	+ 1·12	·78	4	20	52·0	6, 27	20·0	14	12	...
,,		Church Stretton (Woolstaston)	2·74	+ ·28	·62	4	20	51·5	26	19·0	14	12	...
,,		Worcester (Diglis Lock)	...	...	...	...	...	...	...	...	...	...	...
VII.		Boston	1·36	— ·02	·41	5	7	52·0	26	18·0	14	...	...
,,		Hesley Hall [Tickhill].....	1·69	+ ·28	·47	7	15	55·0	26	14·0	15	13	...
,,		Derby (Midland Railway).....	2·00	+ ·40	·35	4	20	53·0	6, 26	22·0	14*g*	12	...
VIII.		Bolton (The Park).....	3·20	+ ·15	·47	5	19	51·4	25	24·1	14	11	17
IX.		Wetherby (Ribston Hall) ...	2·21	+ ·55	·45	5	20	...	...	...	...	...	...
,,		Skipton (Arncliffe)	9·81	+ 3·43	2·38	26	20	...	...	...	...	...	...
,,		Hull (Pearson Park).	1·78	+ ·11	·35	5	19	55·0	26	19·0	13	9	18
X.		Newcastle (Town Moor)	2·63	+ ·82	·58	5	15	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	18·18	+ 3·33	3·74	26	21	50·5	25	19·4	14	13	...
XI.	WALES.	Cardiff (Ely).....	5·85	+ 2·29	1·70	4	24	...	...	...	...	...	...
,,		Haverfordwest	6·11	+ 1·49	1·20	4	24	52·6	5	20·9	13	7	13
,,		Aberystwith (Gogerddan) ...	5·38	+ 1·13	·91	4	17	52·0	6	10·0	13	11	...
,,		Llandudno.....	4·49	+ 1·96	·72	26	18	56·0	26	23·8	15	7	...
XII.	SCOTLAND.	Cargen [Dumfries]	6·24	+ 1·66	1·32	9	17	51·0	26	18·0	14	13	...
XIII.		Edinburgh (Royal Observatory)	3·96	...	1·15	9	22	53·5	26	21·6	15	13	19
XIV.		Colmonell	7·15	+ 2·31	1·10	1, 10	...	54·0	26*a*	18·0	13	12	...
XV.		Tighnabruaich	7·91	...	1·45	29	20	46·0	25*b*	20·0	12	13	...
,,		Mull (Quinish).....	6·69	+ ·46	·80	9	22	...	...	...	...	...	...
XVI.		Loch Leven Sluices	7·20	+ 3·90	1·46	27	17	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	3·85	+ 1·32	·75	6	19	52·3	25	16·7	14	11	...
XVII.		Braemar	4·57	+ 1·79	·65	27	19	47·3	26	1·0	13	17	25
,,		Aberdeen (Cranford)	4·98	+ 2·26	1·62	9	19	53·0	26*c*	14·0	13	13	...
,,		Cawdor (Budgate)	4·42	+ 2·20	·76	9	17	..	...	...	...	...	...
XVIII		Strathconan [Beauly]	8·72	+ 4·18	1·37	30	18	...	...	...	...	...	...
,,		Glencarron Lodge.....	14·01	+ 3·62	3·15	29	20	52·0	26	14·8	13	14	...
XIX.		Dunrobin	3·94	+ 1·32	·76	9	14	53·0	29	20·0	14	15	...
,,		S. Ronaldshay (Roeberry) ...	2·87	— ·42	·27	30	20	50·0	29	26·0	13	11	...
XX.	IRELAND.	Darrynane Abbey.....	6·15	+ ·89	·87	8	27	...	...	33·0	11	0	...
,,		Waterford (Brook Lodge) ...	6·04	+ 2·52	·93	16	22	53·0	25	24·0	12*h*	9	...
,,		Broadford (Hurdlestown) ...	4·67	+ 1·54	1·02	8	25	48·0	25*d*	25·0	11	8	...
XXI.		Carlow (Browne's Hill)	4·85	+ 1·78	·65	8	21	...	...	...	...	...	...
,,		Dublin (Fitz William Square)	3·27	+ 1·13	·58	8	20	55·9	26	25·7	13	7	9
XXII.		Ballinasloe	4·96	+ 1·52	·83	8	23	53·5	25	...	...	...	...
,,		Clifden (Kylemore)	9·26	+ 1·29	1·34	1	21	...	...	...	...	...	...
XXIII		Seaforde.....	5·14	+ 1·73	1·35	8	18	54·0	25*d*	20·0	12	12	13
,,		Londonderry (Creggan Res.).	4·31	+ ·65	·81	9	23	...	...	...	...	...	...
,,		Omagh (Edenfel)	6·19	+ 2·68	·75	5	21	53·0	25	16·0	11	12	19

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

a—and 27. *b*—and 29. *c*—and 29, 30. *d*—and 26. *e*—and 15. *f*—and 14. *g*—and 15, 16. *h*—and 13.

SUPPLEMENTARY RAINFALL, JANUARY, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	2·49	XI.	Llandefaelog-fach.....	4·79
II.	Dorking, Abinger Hall .	2·78	,,	New Radnor, Ednol.....	5·50
,,	Sheppey, Leysdown	2·03	,,	Rhayader, Nantgwillt...	8·77
,,	Hailsham	3·05	,,	Lake Vyrnwy	...
,,	Crowborough.....	3·50	,,	Ruthin, Plâs Draw	3·15
,,	Ryde, Beldornie Tower..	2·09	,,	Criccieth, Talarvor	4·14
,,	Bournemouth, Kempsey	2·44	,,	I. of Anglesey, Lligwy..	5·63
,,	Emsworth, Redlands ...	2·57	,,	Douglas, Woodville.....	5·29
,,	Alton, Ashdell	3·24	XII.	Stoneykirk, Ardwell Ho.	5·00
,,	Newbury, Welford Park	3·51	,,	Dalry, Old Garroch	10·20
III.	Oxford, Magdalen Coll..	2·40	,,	Moniaive, Maxwelton Ho.	8·49
,,	Banbury, Bloxham	2·58	,,	Lilliesleaf, Riddell	5·47
,,	Pitsford, Sedgebrook ...	1·99	XIII.	N. Esk Res. [Penicuick]	5·40
,,	Huntingdon, Brampton.	2·07	XIV.	Dalry, Blair	8·19
,,	Wisbech, Bank House...	1·43	,,	Glasgow, Queen's Park..	7·16
IV.	Southend	1·85	XV.	Inveraray, Newtown ...	10·60
,,	Colchester, Lexden	1·77	,,	Ballachulish, Ardsheal...	11·99
,,	Saffron Waldon, Newport	2·02	,,	Campbeltown, Redknowe	7·53
,,	Rendlesham Hall	2·03	,,	Islay, Eallabus.....	6·70
,,	Swaffham	1·74	XVI.	Dollar.....	5·64
V.	Salisbury, Alderbury ...	2·71	,,	Balquhidder, Stronvar...	...
,,	Bishop's Cannings	3·10	,,	Coupar Angus Station...	3·80
,,	Ashburton, Druid House	6·83	,,	Blair Atholl	5·82
,,	Okehampton, Oaklands.	6·76	,,	Montrose, Sunnyside ...	4·40
,,	Hartland Abbey	5·16	XVII.	Alford, Lynturk Manse..	2·94
,,	Lynmouth, Rock House	6·89	,,	Keith H.R.S.....	3·77
,,	Probus, Lamellyn	4·60	XVIII.	Fearn, Lower Pitkerrie..	2·59
,,	Wellington, The Avenue	4·07	,,	S. Uist, Askernish	5·41
,,	North Cadbury Rectory	3·18	,,	Invergarry.....	12·32
VI.	Clifton, Pembroke Road	4·29	,,	Aviemore, Alvie Manse.	5·63
,,	Ross, The Graig	3·51	,,	Loch Ness, Drumnadrochit	7·86
,,	Shifnal, Hatton Grange	1·82	XIX.	Invershin	3·77
,,	Wem, Clive Vicarage ...	2·05	,,	Bettyhill	4·61
,,	Cheadle, The Heath Ho.	2·34	,,	Watten H.R.S.....	2·81
,,	Coventry, Kingswood ...	2·43	XX.	Cork, Wellesley Terrace	8·07
VII.	Market Overton	1·67	,,	Killarney, District Asyl.	8·30
,,	Grantham, Stainby	1·83	,,	Glenam [Clonmel]	6·75
,,	Horncastle, Bucknall ...	...	,,	Ballingarry, Hazelfort...	4·57
,,	Worksop, Hodsck Priory	2·25	,,	Miltown Malbay	5·88
VIII.	Neston, Hinderton	2·37	XXI.	Gorey, Courtown House	5·16
,,	Southport, Hesketh Park	2·84	,,	Moynalty, Westland ...	5·63
,,	Chatburn, Middlewood.	5·07	,,	Athlone, Twyford	4·91
,,	Duddon Val., Seathwaite Vic.	9·35	,,	Mullingar, Belvedere ...	6·45
IX.	Langsett Moor, Up. Midhope	4·32	XXII.	Woodlawn	5·47
,,	Baldersby	2·48	,,	Westport, Murrisk Abbey	5·77
,,	Scalby, Silverdale	2·04	,,	Crossmolina, Enniscoe ..	6·79
,,	Ingleby Greenhow Vic..	3·08	,,	Collooney, Markree Obs.	5·34
,,	Middleton, Mickleton ...	5·12	XXIII.	Enniskillen, Portora ...	5·13
X.	Beltingham	4·28	,,	Warrenpoint.....	5·79
,,	Bamburgh	2·04	,,	Banbridge, Milltown ...	4·30
,,	Keswick, The Bank.....	10·70	,,	Belfast, Springfield	5·33
,,	Melmerby Rectory	3·82	,,	Bushmills, Dundarave..	5·79
XI.	Llanfrechfa Grange	6·25	,,	Stewartstown	6·64
,,	Treherbert, Tyn-y-waun	13·88	,,	Killybegs	5·98
,,	Castle Malgwyn	6·03	,,	Horn Head	6·17

METEOROLOGICAL NOTES ON JANUARY, 1903.

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.—In spite of a week of severe frost, ending on 17th, the month, as a whole, was remarkably mild. Mean temp. 40°·8, or 2°·7 above the average. Unsettled weather prevailed during the first week and, except during the frost, R was fairly frequent. Short TS on 3rd with heavy H. Remarkable silver thaw on the evening of 17th, causing many street accidents. Thick fog with great darkness at times on 18th, 20th and 21st.

ABINGER HALL.—Showery, with a short spell of real winter in the early part. Mild and open afterwards to the end. Fogs from 18th to 21st.

TENTERDEN.—Very windy in the first and last weeks. Three inches of S on 12th, and hard frost till 17th. Duration of sunshine 49 hours.

SHEPPEY, LEYSDOWN.—A very windy month. Frosty from 11th to 19th; the rest of the month mild with occasional night frosts.

CROWBOROUGH.—Wet and sunless except for a spell of frost from 11th to 16th. From 17th to 22nd dense mist, followed by rough unsettled weather till 27th, and a storm on the night of the 31st. Mean temp. 38°·8. W. and S.W. winds prevailed.

COLCHESTER, LEXDEN.—Very mild, dull and damp, except during hard frost from 11th to 17th, with three days' skating. Brief but intense TS on 3rd.

NORWICH, BRUNDALL.—Except for slight frosts and a little S in the middle of the month it was generally very mild. Mean temp. of the last 7 days 46°·2. L on 2nd. T and H on 3rd.

WINTERBOURNE STEEPLETON.—Except for a cold spell between 11th and 17th, the temp. was high, the mean temp. being 1°·8 above the average.

TORQUAY, CARY GREEN.—Mean temp. 44°·8, or 2°·6 above the average. Duration of sunshine 43·3 hours, or 20 hours below the average. Mean amount of ozone 6·8, max. 9·5 on 25th and 26th with S.W. wind: min. 1·0 on 21st with E. wind.

LYNMOUTH, ROCK HOUSE.—The heaviest R yet measured in January, except in 1899, when 8·25 in. fell. Cold from 10th to 18th, otherwise warm, but with no great amount of sunshine. T and L on 3rd.

WELLINGTON, THE AVENUE.—The first 9 days were generally mild and very wet. Sharp TSS on nights of 2nd and 3rd. Very cold from 11th to 17th, and from 18th to the close mild and damp. Violent gale on 31st followed by S.

NORTH CADBURY RECTORY.—Similar in type to November and December, being mild with one spell of bright dry frost. The general average of wind was the highest in 7 years, but few strong gales. Violent H storm with T and L on 3rd.

CLIFTON, PEMBROKE ROAD.—Mild and wet except a short spell of severe frost from 11th to 16th, with N.E. winds, followed by several foggy days. Strong W. and S.W. winds during the first and last weeks. TS between 2 and 3 a.m. on 4th.

ROSS, THE GRAIG.—The first 10 days were very wet, but the only other falls of any consequence were on 22nd and 27th, the total fall being about 25 per cent. above the average. Mean temp. 1°·5 above the average; but it varied greatly, the first ten days being 5° above the average, the next 10° below, and the last ten days 7° above. Bright, clear and enjoyable weather alternated with great winds, gloom, fog and R.

BOLTON, THE PARK.—The first ten days were changeable and mild, with R daily. An anticyclone then set in causing N. and E. winds and decided fall of temp. until 19th. After 20th mild but cloudy. Very little fog or S. Mean temp. 39°·0, or 1°·5 above the average. Duration of sunshine 12·5 hours, or little more than half the average.

HULL, PEARSON PARK.—Variable weather, with scarcely any sunshine. Total darkness on 3rd from 8 to 8.30 a.m., with very high wind, T, L and H. Severe wintry weather from 11th to 18th.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE.—Mild until 10th, then frost till 17th, very sharp on 14th and 15th. Temp. rising after 17th and very mild towards the end. L from 6.30 to 11 p.m. on 3rd.

HAVERFORDWEST.—Stormy and changeable, with large R and very little sun. Frost on 1st and 2nd, then wet to 10th, then hard frost to 16th; then, without change of wind, the temp. gradually rose and it remained mild and stormy to the end. Duration of sunshine 30·7 hours.

ABERYSTWITH, GOGERDDAN.—The first ten and last ten days had heavy R. A few severe frosts occurred in the middle, but there was no S nor sunshine.

DOUGLAS, WOODVILLE.—Very wet and stormy, with great deficiency of sunshine. Dry and cold, with strong E. gales from 11th to 18th. High winds occurred on 21 days, reaching the force of a gale on 18, and strong S.W. gales blew uninterruptedly with high channel seas from 22nd to the end.

SCOTLAND.

LILLIESLEAF, RIDDELL.—R abnormally heavy, no such fall having occurred since 1864. On 20th and 22nd, when the S melted rapidly, with heavy continuous R, there were heavy floods in the river. In the first half the wind was N.W., with cold and S, and in the latter S.W. with R.

BALLACHULISH ARDSHEAL.—The month opened with much R. From 10th to 17th dry and frosty. Strong gales from 25th to the end. T and L on 25th and 26th.

MULL, QUINISH.—Very strong and almost continuous wind, with high temp. and much R, from S. or S.W. from 20th to 31st. No excessive floods. T and L on 3rd and 27th, and H on 27th.

COUPAR ANGUS.—A continual succession of gales, with heavy falls of S during the first week. A cold snap occurred after the 8th, the mean temp. for the following week being 11° below the average, while the mean of the last week was 5° above the average of 20 years.

DRUMNADROCHIT.—R 4·35 in. above, or more than double, the average of 17 years.

BETTYHILL.—Generally very stormy, but fairly mild. During the first ten days gales, accompanied by heavy showers, prevailed. Then came an equal period of frost, followed by a return of boisterous weather.

WATTEN, H.R.S.—Storms of wind, R and S in the opening and closing portions. Frosty with gales in the middle. T and L on 28th and 29th.

IRELAND.

CORK, WELLESLEY TERRACE.—R more than double the average, the amount unequalled in January since 1879, when 8·32 in fell. A great storm occurred on 16th. Mean temp. 39°, or 2° below the average. Heavy H on 5th.

GLENAM [CLONMEL].—The wettest January for 20 years. Very little sunshine, and only two days free from clouds. From the 6th there was a continuance of heavy gales and strong winds, some very cold from S.E. and S.W.

DUBLIN, FITZWILLIAM SQUARE.—Changeable, stormy and rainy. The weather was generally open, but a cold spell lasted from 10th to 18th. Strong S.W. winds blew almost incessantly from the 22nd to the end, and the temp. rose. Mean temp. 42°·1, or 0°·5 above the average. Duration of sunshine 56·5 hours.

MURRISK ABBEY.—A harsh month with continuous storms, accompanied by S and sleet.

BELFAST, SPRINGFIELD.—Very stormy and inequable, frost and R alternating throughout. The wettest January since 1886.

OMAGH, EDENFEL.—The remarkably heavy R and S of the first ten days were followed by a dry, cold period, with frost of much intensity, the mean temp. of the five days ending 16th being 26°·5. The remainder was mild and wet, with frequent gales.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 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	79·9	29	44·0	11	71·2	53·0	53·9	75	122·8	39·3	3·69	18	7·2
Malta	99·3	10	64·9	15	88·9	71·3	66·1	65	148·3	60·2	·00	0	0·6
Cape Town	69·2	22	38·3	18	61·9	48·8	48·6	79	...	...	3·88	20	5·5
Durban, Natal	79·0	12	48·4	19	73·4	55·9	...	...	131·5	...	3·90	12	4·3
Mauritius	80·3	8	51·9	12	78·5	62·0	60·7	74	145·0	63·5	·58	11	...
Calcutta	94·2	13	74·7	11	89·8	78·6	77·8	83	159·0	73·7	14·01	16	8·1
Bombay	88·2	7	74·4	21	85·8	78·3	76·0	82	139·7	73·5	16·53	24	7·5
Madras	100·3	3	72·9	25	93·8	77·7	74·4	76	153·0	72·4	3·26	14	6·5
Kodaikanal	67·5	11	50·9	29	64·2	53·4	52·9	85	142·7	43·8	4·01	16	7·7
Colombo, Ceylon	89·2	4*a*	75·0	17	87·5	78·1	74·6	81	150·0	72·0	2·76	13	6·9
Hongkong	90·6	30	74·2	10	86·9	77·4	75·8	83	145·5	...	26·51	17	6·1
Melbourne	68·5	29	29·6	14	56·2	39·7	40·8	78	125·0	21·3	·88	9	5·9
Adelaide	70·1	19	39·0	8, 25	61·8	44·3	42·6	71	127·7	31·2	1·13	13	5·6
Coolgardie	77·0	31	34·0	7	66·8	43·2	45·0	70	142·2	27·8	1·71	5	3·4
Sydney	65·1	30	40·3	1	59·4	46·9	45·6	83	101·9	31·8	6·32	20	5·1
Wellington	61·0	18*b*	35·0	31	54·6	42·6	40·7	73	100·0	28·0	2·06	19	5·4
Auckland	62·5	7	39·0	4	56·5	44·7	40·1	67	130·0	37·0	2·33	16	4·6
Jamaica, Negril Point	89·9	1, 9	70·9	6	87·6	73·0	73·6	78	...	...	6·77	14	...
Trinidad	90·0	15*c*	70·0	8	86·9	72·2	77·1	93	168·0	67·0	11·67	19	...
Grenada	86·0	17	70·0	21	83·7	74·6	70·6	76	146·4	...	12·12	26	3·2
Toronto	85·2	3	47·0	16	75·2	55·8	56·8	77	106·0	38·0	2·38	10	4·7
Fredericton, N.B.	83·9	1	39·5	28	73·1	52·7	53·9	63	...	...	3·50	13	5·9
Winnipeg	91·2	5	38·3	21	77·6	50·9	...	...	...	...	·93	7	5·0
Victoria, B.C.	84·4	9	46·2	29	68·8	52·7	...	...	...	...	·43	4	3·2
Dawson	72·4	1, 9	34·5	28	66·3	44·7	...	...	...	...	2·15	12	5·4

a—and 11, 25. *b*—and 21. *c*—and 18.

MALTA.—Mean temp. of air 79°·2, or 1°·3, above average. Mean hourly velocity of wind 6·9 miles or 0·5 below average. Mean temp. of sea 81°·2. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·2 above, dew point 1°·2 above, and R 1·79 in. below, and mean hourly velocity of wind 2·3 miles below their averages. T. F. CLAXTON.

MADRAS.—Mean temp. of air 0°·7 above, humidity 6 above and R 5·43 in. below average, sunshine 106·0 hours, or 27·4 per cent. of possible amount. A. MOFFAT.

KODAIKANAL.—Bright sunshine 112·3 hours. A very cloudy month. C. MICHIE SMITH.

COLOMBO.—Mean temp. of air 1°·7 above, of dew point 1°·5 above, and R ·92 in. below their averages. Mean hourly velocity of wind 8 miles. H. O. BARNARD.

HONGKONG.—Mean temp. 81°·8. Bright sunshine 231·2 or 34 hours above average. R 11·65 in. above average. Mean hourly velocity of wind 10·2 miles. F. G. FIGG.

Adelaide.—Mean temp. 53°·0 or 0°·9 below, and R 1·13 in. below their averages. Except in the extreme S.E. R was from 40 to 70 per cent. short of the average. Highest mean bar. in August for 45 years (30·30). C. TODD, F.R.S.

Sydney.—Mean temp. 1°·6 below, humidity 9°·3 above, and R 3·10 in. above their averages. H. C. RUSSELL, F.R.S.

Wellington.—Mean temp. 0°·6 above and R 3·14 in. below averages. R. B. GORE.

Auckland.—Mean temp. 2°·1 and R quite 2 in. below averages. T. F. CHEESEMAN.

Trinidad.—R 1·54 in. above the 40 years' average. J. H. HART.

SYMONS'S

METEOROLOGICAL MAGAZINE.

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THE GREAT DUSTFALL OF FEBRUARY, 1903.

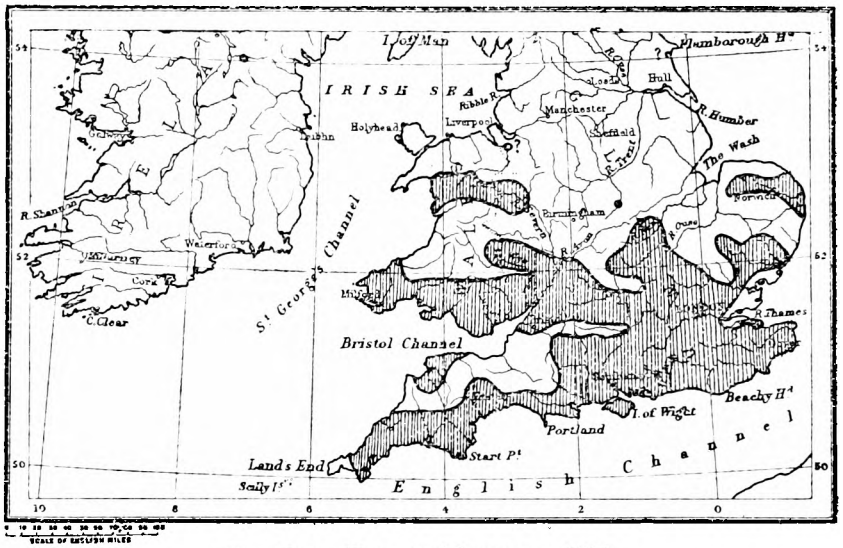
BETWEEN the 21st and 23rd of February observers in nearly all parts of Wales and southern England reported a fall of atmospheric dust, or muddy rain, similar to that which occurred in the south-west of England and Wales on January 22nd, 1902. This together with the abnormally steep barometric gradients, the severe gales and the remarkable mildness, makes the month of February just past more than usually interesting from a meteorological point of view, and makes us feel the restricted space at our disposal despite the enlargement of this number. The fall of dust is remarkable in several ways. It was far more extensive in its distribution than that of last year, and at most places considerably more intense, for it was quite as frequently observed in the form of a dense dry fog as in that of muddy rain.

We are greatly obliged to many correspondents for their kindness in forwarding particulars of the phenomenon and samples of the dust, and we have endeavoured to acknowledge this kindness by preparing a preliminary report on the distribution of the dustfall at the earliest possible opportunity. A complete discussion has been undertaken, and will be carried out by collaboration between the Meteorological Office, the Royal Meteorological Society and the British Rainfall Organization. This will necessarily be a work of time, and at present, pending the microscopic examination of the numerous samples received, we express no opinion as to the origin of the dust beyond stating that, until the contrary is proved, this dustfall, like those of 1901 and 1902, may be assumed to come from the deserts of northern Africa. The similarity in appearance of dust collected on the same day at points hundreds of miles apart disproves the possibility of any local origin, and the simultaneous fall over England, Holland, Belgium, Germany, Switzerland and Austria, suggests that the origin lay somewhere beyond the borders of Europe.

We have received from correspondents, and through the newspapers, reports of more than 200 cases of the fall of dust in 32 counties in England and Wales, and one in Ireland, a list of which is appended, and although the names of the observers are omitted on

account of exigencies of space, we have pleasure in repeating to all the expression of our hearty thanks, which we have already sent to each.

The accompanying map shows the observed distribution of the dustfall over the British Isles. The scale does not admit of the stations being shown by separate dots, but it may be assumed that dust fell over the whole of the shaded area. The outline of that area was drawn on a large-scale map, where the position of each station reporting dust was marked, by drawing the line so that it was always within 10 miles of one of the stations. In other words, no part of the shaded area is more than 10 miles distant from a recorded case of dustfall on one of the days in question. Isolated instances (Leicester and Cavan) are shown by dots, and two cases where the date did not correspond with the majority of instances are marked with a query.



THE DUST FALL OF FEBRUARY, 1903.

It must be remembered that absence of information does not necessarily mean that no dust fell; although in some places, such as Somersetshire, where there are many careful rainfall observers who state definitely that they noticed nothing, it is very probable that the fall did not take place. In mid-Wales, on the other hand, where there is a very sparse population and extremely few observers, it is quite likely that the phenomenon might occur without attracting attention. It may be stated with confidence that dust fell over the greater part, if not quite over the whole, of the country from Falmouth to the South Foreland and from North Wales to Norfolk, the total extent being 300 miles from west to east and 200 miles from north to south. It appears that the dust fell most thickly in two areas, South Wales and the Weald district of Kent, Surrey and Sussex.

As to the nature of the actual fall, we have only space to cite the following typical descriptions which are samples of many :—

Mrs. Foster writes from Witley, Godalming :—"On Saturday, February 21st, we had a remarkable dust-storm, worst about midday. The wind was very high at 7 a.m. and continued so all day, there was also a great "fog," which is unusual with a high wind, though we do sometimes get "sea-fret" with a southerly wind. Several people who went out of doors complained of the dreadful dust in their eyes and nostrils, and on interrogating our gardener, who has lived here for over 30 years, I learned that the supposed fog was not damp but dry, very fine dust, and he had never seen anything like it before. On Monday morning, after the rain of Sunday, the 22nd, I saw yellow dust on the south and west window sills, but it was like cement and could not be swept up, so it had to be washed off."

Dr. Edwin Freshfield states that at Juniper Hill, near Reigate :—"On Saturday, February 21st. the wind from 9 to 11 a.m. was W.S.W. to S S.W., and increased in severity to sundown when it shifted to W., fell later, and calmed by 9 p.m. From 9 a.m. till 2 p.m. the sun was shining brightly through a haze similar to the Khamsin haze in Egypt, then the semi-obscured sky cleared of mist about 4 p.m. Evergreen trees were noticed to be covered with chocolate-coloured dust at 11 a.m., and by 4 p.m. the trees were all of one uniform colour. The dust was silky to the touch, slightly iridescent and must have fallen between sunrise and 4 p.m. No rain fell till 9 p.m."

Mrs. Silver writes from Highfield Vicarage, Southampton :—"On Sunday, February 22nd, between 11 a m. and noon the sky was completely covered with a thick yellow cloud exactly like a London fog, too thick for sufficient light to penetrate to read by. The darkness lasted about an hour, and when it had passed the windows which had, I suppose, been damp were covered with yellow sand. North, east and south were equally covered, and the upper storeys were as dirty as the lower ones. The backs of the chairs in the garden were also covered with a layer of yellow sand, which adhered to the wood where it was damp."

Mr. G. D. Hope writes from Havering Grange, near Romford :—"On Saturday, 21st February, a great amount of gray dust fell at Havering, and owing to the previous showers adhered to the branches and stems of the trees, hedges, buildings, etc. The conifers collected most, and looked as if they had been powdered with flour. The dust did not fall with the rain, but before it. It came from the west and south-west in all cases and adhered only to that side of the trees, etc."

Mr. E. E. Glyde writes from Whitchurch, Tavistock :—"On Sunday morning, February 22nd, at 9 a.m., I found the water in my rain-gauges very discoloured, especially that registered since 9 p.m. on the 21st. A buff or reddish-yellow sediment lay at the bottom of

the rain-bottles and a similar sediment on window ledges facing S.W., on the edges of roofs, and on cabbages, etc., in the garden."

Mr. F. H. Perkins writes from Tonn, Llandovery:—"Rain commenced falling slightly before 9 a.m. on February 22nd, and soon after that hour very heavy clouds of a peculiar dark yellowish appearance came over from the S.W. and rain fell heavily for a few minutes. After the storm passed I happened to notice that the water in a collecting cask, which before the storm was quite clear, had become a deep yellow clay-colour, and on examining the rain-gauge, which had been emptied shortly before the storm commenced, I found that the water in it was of the same colour."

It would be a favour if any reader who has noted the occurrence of a similar phenomenon at any place not included in the following list, would send particulars of it to Dr. H. R. Mill, 62, Camden Square, London, N.W.; but to save unnecessary trouble it is well to state that unless the date of the occurrence can be definitely fixed the observations are not required.

LIST OF PLACES RECORDING DUSTFALLS.

(*The date is almost everywhere the* 22*nd, except in the south-east of England, where the dust fell dry on the* 21*st and with rain on the* 22*nd.*)

Middlesex.—New Barnet, Enfield, Ealing.

Surrey.—Hindhead, Shottermill, Witley, Ewhurst, Guildford, Farnham, Holmwood, Reigate, Merstham, Leatherhead, Woking, Cheam, Sutton, Bagshot, Chertsey, Wimbledon.

Kent.—Hawkhurst, Tenterden, Biddenden, Hythe (3 stations), Folkestone, Dover (3 stations), St. Margaret's, South Foreland, Groombridge, Tunbridge Wells, Rusthall, Southborough, Pembury, Tonbridge (3 stations), Edenbridge, Hildenborough, Ashford, Wateringbury, Upper Deal, Canterbury, Sevenoaks, Beckenham, Westgate-on-Sea, Sheerness.

Sussex, West.—Bosham Creek, Chichester, Compton, Rogate, Slinfold, Horsham (3 stations).

Sussex, East.—Lancing, Falmer, Lewes, Henfield, Burgess Hill, Udimore, Horeham Road, Battle, Etchingham, Crowborough (3 stations), Wadhurst, Three Bridges, Steel Cross, East Grinstead.

Hampshire.—Yarmouth (Isle of Wight), Brockenhurst, Ringwood, Emsworth, Southampton, Bitterne, Botley, Swarraton, Alton, Hartford Bridge, Andover.

Berkshire.—Wokingham, Ashbury, Wantage, Lockinge, Denchworth.

Hertfordshire.—Watford, Welwyn.

Buckinghamshire.—Slough, Hulcote, Bulbourne, Bletchley.

Oxfordshire.—Henley, Culham, Banbury.

Northamptonshire.—Wellingborough.

Essex.—Havering, Romford, Witham.

Suffolk.—Ipswich, Stansfield, Fritton.

Norfolk.—Dereham, Wroxham.

Wiltshire.—Salisbury, Donhead St. Mary, Westbury, Market Lavington.

Dorsetshire.—Portland, Swanage, Wareham, Dorchester, Bridport, Beaminster, Wimborne.

Devonshire.—Brixton, Stoke Damerel, Ivybridge, South Brent, Staverton, Delamore, Plympton (2 stations), Bere Ferrers, Torquay (2 stations), Teignmouth, Whitchurch, Marystow, Newton Abbot (3 stations), Dawlish (2 stations), Sidmouth, Rousdon, Tiverton, Torrington (2 stations), Fremington, Arlington Court, Lynmouth.

Cornwall.—Penzance, Falmouth, Gunnislake, Ponsanooth, Scorrier, Menheniot, Merrymeet, Liskeard, Altarnon, Trewint.

Somersetshire.—Milverton (on 25th).

Gloucestershire. — Avonmouth, Lydney, Cirencester, Stroud (2 stations), Stonehouse, Coleford, Langleaves, Ruardean, Brockworth, Gloucester, Tewkesbury.

Herefordshire.—Dilwyn, Kington.

Shropshire.—Nantmawr, Petton, Oswestry.

Worcestershire.—Malvern.

Leicestershire.—Leicester.

Monmouthshire.—Magor, Llanfrechfa Grange, Abersychan, Abertillery, Monmouth, Llantilio Court.

Glamorganshire.—Llantwit Major, Barry, Dinas Powis, Porthcawl, Treharris, Swansea, Neath, Pontardulais, Ammanford.

Carmarthenshire.—Kidwelly, Laugharne, St. Clears, Whitland, Llandilo, Llandovery.

Pembrokeshire.—Haverfordwest, Clynderwen, Treffgarne, Newport.

Cardiganshire.—St. Dogmaels.

Breconshire.—Crickhowell.

Radnorshire.—Llandrindod Wells.

Montgomeryshire.—Llansaintffraid, Llanffyllin.

Merioneth.—Dinas Mawddwy, Llanbedr.

IRELAND.—*Cavan.*—Cavan.

REVIEW.

Elementary Physical Geography. By WILLIAM MORRIS DAVIS. Boston, U.S.A., and London: Ginn and Company. 1902. Size $7\frac{1}{2} \times 5$. Pp. xviii. + 402, Plates.

THIS is a simplified edition of the somewhat larger "Physical Geography" of the same author, and the chapter on the atmosphere deserves some attention, because it is designed for a purpose which must excite some surprise in this country—for use in schools. It has been enlarged in some parts compared with the original. To give in a single chapter a clear and simple statement of the general principles of meteorology is about as difficult a problem as could be set to any man. Success cannot be expected; but Professor Davis comes within sight of it, for he avoids error, and many points which are so lightly touched on as to remain obscure in the text will become clear when they are thought over, and could easily be expounded by a teacher. An excellent general account is given of the prevailing winds of the Earth's surface.

FIVE MONTHS WINTER RAINFALL, OCTOBER, 1902—FEBRUARY, 1903.

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	—2·17	78	Arncliffe	+4·62	115	Braemar	+6·92	143
Tenterden	—1·52	87	Hull	—1·51	86	Aberdeen	+ ·31	102
Hartley Wintney	—1·18	89	Newcastle	— ·27	98	Cawdor	+2·04	116
Hitchin	—2·00	80	Seathwaite	+5·01	107	Glencarron	+6·37	113
Winslow	—2·71	74	Cardiff	+1·43	108	Dunrobin	—1·67	89
Westley	—4·00	62	Haverfordwest	+1·62	107	Darrynane	—2·52	90
Brundall	—3·95	62	Gogerddan	— ·49	98	Waterford	+3·63	120
Alderbury	—1·54	89	Llandudno	+ ·41	103	Broadford	+1·81	112
Ashburton	+ ·03	100	Dumfries	+3·68	117	Carlow	+2·67	117
Polapit Tamar	+2·83	116	Lilliesleaf	+4·16	131	Dublin	+1·43	112
Stroud	— ·42	96	Colmonell	+2·13	110	Mullingar	+3·99	125
Woolstaston	— ·46	97	Glasgow	+6·54	138	Ballinasloe	+2·11	113
Boston	—1·79	79	Inveraray	+3·61	110	Clifden	— ·59	98
Hesley Hall	— ·81	91	Islay	+ ·33	101	Crossmolina	+2·38	109
Derby	— ·43	95	Mull	+2·71	110	Seaforde	+3·63	121
Bolton	+1·14	107	Loch Leven	+5·90	135	Londonderry	— ·04	100
Wetherby	+2·17	122	Dundee	+1·41	111	Omagh	+2·95	117

With exceptions that hardly require notice the rainfall in February (see Table on p. 36) was well below the average in south and central England, where Camden Square and Addington, Winslow, had little more than half the average fall of the month, while Boston had just about one-third and Westley, near Bury St. Edmunds, and Brundall, near Norwich, had barely one-fifth. On the other hand, the rainfall of Ireland, the north of England and Scotland was far above the average, at Seathwaite the fall for the shortest month of the year reached the enormous total of almost 21 inches, or one and three quarters of the average, while Arncliffe, near Skipton, had nearly twice its average fall. These figures, however, become insignificant compared with the enormous excesses of rainfall in Scotland, where Braemar had more than two and a half times, and Loch Leven two and three quarter times their usual February fall.

The result of this condition of things (which is fully explained by the barometrical conditions described in Mr. Brodie's letter) is that the irregularity of the cumulative winter's rainfall referred to last month, has been rendered more remarkable. Speaking generally, the winter's rainfall has been below the average over the whole of eastern and central England, and above the average in Cornwall, Devon, Somerset, Wales, the north of England, Scotland and Ireland. The centre of greatest deficiency is in East Anglia, where less than two-thirds of the normal supply of the ten years, 1890-99 (a period in itself very dry), has been received. The centre of greatest excess is in the centre and south of Scotland, where the rainfall for the five winter months exceeds the ten years' average by one-third, and in that part of the country the ten year period in question had a normal rainfall.

THE FORCE OF THE WIND DURING THE GALE OF FEBRUARY 26TH–27TH.

THE maximum wind forces recorded during the gale of the 26th and 27th of February, 1903, were suchas to justify us in regarding it as one of the most sevȩre storms which has visited the British Isles for several years.

As is usually the case with gales which reach us from the south-west or west, the strongest forces were felt almost exclusively in the districts adjacent to our western littoral, and a quite remarkable agreement is shown in the maximum wind velocities registered over that part of the kingdom by pressure-tube anemometers, which are the only instruments by which at present this feature of wind-force can be satisfactorily measured.

At Pendennis Castle, which faces the sea at the entrance to Falmouth harbour, a maximum rate of 88 miles per hour was reached just before midnight of the 26th, and the rate exceeded 80 miles per hour many times between 9 p.m. on the 26th and 1 a.m. on the 27th, when the gale began to subside. At Holyhead the maximum rate was 87 miles per hour, recorded five hours later than the extreme at Falmouth, and here the force began to decrease at 6 a.m. At Bidston the maximum velocity of the gale probably missed registration owing to the supply of ink in the pen of the pressure-tube anemometer failing, and the highest velocity recorded was only 78 miles per hour, at 5.20 a.m. At Southport the extreme rate reached was 92 miles per hour, at about 6 a.m. on the 27th.

These very high velocities correspond to a wind-pressure of from 23 lbs. to 25 lbs. per square foot; and the actual pressures recorded at Holyhead and at Southport, by pressure-plate anemometers constructed to eliminate the large inertia errors, which there is good reason for believing always exist in the Osler instrument, were 23 lbs. and 28 lbs. respectively, thus agreeing very closely with the pressure-tube results. At Bidston, however, a pressure of 47 lbs. was registered by the Osler plate, and this, although a high record, is considerably below many pressures which have been registered there in previous gales apparently not more severe than this.

Along the south coast the recorded velocities were considerably lower. At Rousdon the maximum was only 61 miles, which is less than might have been expected seeing that at Shoeburyness it reached a rate of 73 miles per hour, which is equal to a pressure of 16 lbs. per square foot. At Greenwich the Osler plate recorded 33 lbs. per square foot, or four pounds less than it did two days earlier, in a gale which at Shoeburyness and at Kew was much less severe than that under discussion. The explanation of this anomaly is found in the fact that the extent to which the records of such instruments as that still used at Greenwich are exaggerated, depends a good deal upon the way in which, after having been struck by a gust, the vibrating plate is "followed up" by other gusts immediately succeeding the first.

A few years ago a portion of a train passing along an exposed part of a "light" railway on the Kerry coast was overturned by the wind; but so far as we know—with the exception of the Tay Bridge accident in 1879, when the wind was only one contributing cause amongst others—that is the only instance in which such an accident has occurred on any railway in the British Islands since 1867, when a brake van and a Post Office van were blown over upon their sides, after the train of which they formed a part had been brought to a standstill by the wind, upon an exposed bank not far from Aber in North Wales.

In the present gale, however, the wind was able to surpass that feat and to overturn ten passenger coaches and vans, whilst a train was on the Leven viaduct, near Ulverston. The force required to overturn an ordinary railway carriage may be taken as about 30 lbs. per square foot, so that a squall not much stronger than the strongest recorded at Southport was probably all that was needed to do the damage on this occasion, especially as the train was not heavily laden.

The Robinson cup anemometers do not record the extreme force of the wind; but the mean hourly velocities they registered during the gale were from 60 to 66 miles per hour (true), the latter amount being the record at Kingstown, in which neighbourhood, and in Dublin, much damage was wrought by the gale. On the east coast of England the force recorded was much less, and in the Orkneys the gale was by no means severe. R. H. C.

Correspondence.

THE GALE OF FEBRUARY 27TH.

To the Editor of Symons's Meteorological Magazine.

As the Marshside anemograph station of this observatory appears to have been exposed to the full force of the recent "storm" (force 11), the following hourly velocities of the wind, deduced from the traces of the Dine's pressure tube recording anemometer, may possibly be of interest to some of your readers. Following the Meteorological Office system, the values are in each case the means for the period from 30 minutes before until 30 minutes after the exact hour. The directions have been obtained in the same way from the traces of my recording anemoscope.

February 27th, 1903.

	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.
Velocity in miles..	37	36	38	47	50
Direction	S.S.E.	S. by E.	S. by W.	S.W.	S.W.
	6 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.
Velocity in miles...	63	67·5	66	59	53
Direction	S.W. by W.	S.W. by W.	S.W. by W.	W.S.W.	W.S.W.
	11 a.m.	Noon.	1 p.m.	2 p.m.	3 p.m.
Velocity in miles...	50	44	39	36	31
Direction	W.S.W.	W.S.W.	W.S.W.	W.S.W.	W.S.W.

By midnight the velocity had fallen to 13 miles, and the direction had veered to W. by N. The rate of movement during the strongest momentary gust was 92 miles per hour, there being, in all, four gusts of 90 miles or upwards.

The maximum pressure registered by Dine's non-oscillating pressure plate anemometer was 28·8 lbs. per square foot. This is higher than the 92 miles would represent, though the maxima from our improved forms of the two instruments now usually agree very closely. The probability would appear to be that the plate, although mounted somewhat below the "head" of the tube, was struck by a stronger gust than any encountered by the latter.

JOSEPH BAXENDELL.

The Fernley Observatory, Southport, March 3rd, 1903.

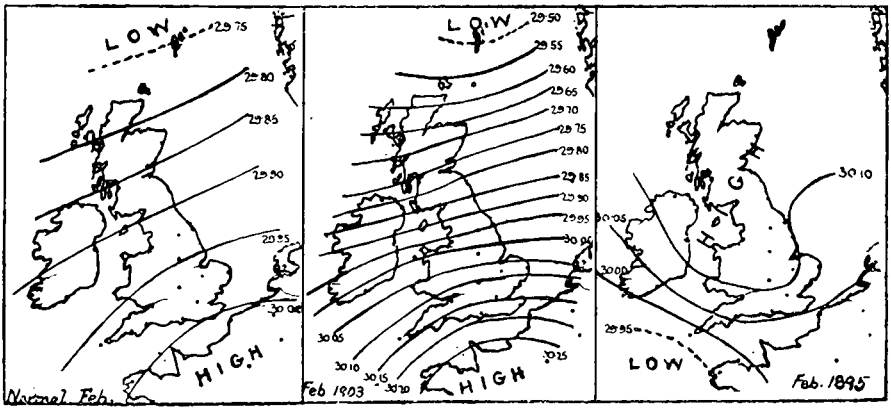
ATMOSPHERIC PRESSURE IN FEBRUARY.

To the Editor of Symons's Meteorological Magazine.

IN connection with the very exceptional weather of last month the accompanying little maps may, perhaps, be of some interest. Each map shows by isobars, drawn for every half-tenth of an inch, the monthly mean distribution of barometrical pressure over the United Kingdom at 8 a.m.

Map 1 gives the normal distribution in February, and is based upon the 30 years' average 1871–1900. It will be seen that in an average February the mean pressure ranges from a little above 30·00 inches over the eastern part of the English Channel to about 29·75 inches in the Shetlands, the distribution being favourable for moderate breezes from the south-westward.

Map 2 shows the distribution of mean pressure as it existed last month. In this case the values ranged from about 30·25 inches over the southern part of the Channel to about 29·90 inches in the Shetlands. The general trend of the isobars was very similar to that shown in the normal map; but as the actual values in the extreme



FEBRUARY ISOBARS.

south were nearly a quarter of an inch above the average, while those in the extreme north were just as much below it, the barometrical gradient for south-westerly winds was immensely steeper in 1903 than in the normal February. In the normal map only six isobars are shown, while in that for February, 1903, there are no fewer than sixteen, the actual difference in pressure from south to north being nearly three times as great as usual. So striking a result was due to the fact that in the course of the month an almost constant succession of cyclonic systems swept past our north-western and northern coasts, each disturbance causing a great depression of the barometer in those regions and thus leading, in a cumulative way, to the reduction shown by the monthly mean values. According to the map the south-westerly winds should have blown last month with three times their usual strength; and, if they did not quite do this, their constant presence was sufficient to give us an exceptionally high mean temperature, with frequent heavy rains in the west and north, and especially along the Atlantic seaboard.

As a matter of curiosity I reproduce in Map 3 the pressure conditions existing in February, 1895—a month, it will be remembered, of intense frost and burst water-pipes, but of little rain. In that case the mean distribution was distinctly anticyclonic, the area of lowest pressure having been shifted from its usual place in the north to the neighbourhood of our south-west coasts. Maps 2 and 3 afford a striking example of the weather possibilities our changeable climate is capable of affording.

FREDK. J. BRODIE.

12, Patten Road, Wandsworth Common, S. W.,
9th March, 1903.

THE HIGH TEMPERATURE OF FEBRUARY, 1903, IN LONDON.

THE persistently mild character of the past month is strikingly brought out by an examination of the records of temperature at Camden Square, as shown in the following table:—

	Mean temp.	Maximum.		Minimum.		Earth temp. 1 foot. Mean.
		Mean.	Highest.	Mean.	Highest.	
Average (1858-97)...	39°·8	45°·5	55°·2	34°·7	45°·4	38°·9
February, 1903.....	45·1	50·8	59·0	40·0	52·0	42·4
Difference	+ 5·3	+ 5·3	+ 3·8	+ 5·3	+ 6·6	+ 3·5

The month of February is probably liable to a greater range of temperature than any of the other winter months; and, as February, 1895, was the coldest, February, 1903, seems to have

been almost, if not quite, the warmest winter month since observations were commenced in 1858. The mean temperature, 45°·1, has only been exceeded in 1867 with 45°·3, and in 1869 with 45°·9, during the 45 years. The mean shade maximum, 50°·8, was passed in 1869 with 51°·7, and in 1872 with 51°·1; but the absolute maximum, 59°·0, has been surpassed on six occasions, the highest being the remarkable reading of 64°·8 on February 10th, 1899. The most notable figures in 1903, however, occur among the shade minima; for although the mean, 40°·0, was very slightly exceeded in February, 1867, with 40°·2, and in 1869 with 40°·6, it has not once been reached in March, and is 0°·3 higher than the average for April. The highest minimum reading, 52°·0, on 21st, has never been approached in February or March, and is a figure rarely attained in April. The earth temperatures supply a good indication of protracted warmth, particularly with respect to its effect on vegetation, and though the mean, at 1 foot below the surface, 42°·4, was no higher than in 1872 (43°·1) and 1877 (42°·4), the figure exceeded the average for March by 1°·7.

Coupled with the almost rainless weather of the first three weeks, the high temperature imparted to the month a prematurely spring-like aspect, to be rudely dispelled by the storms and rain of the last week.

THE CANADIAN CLIMATE.

By R. F. STUPART, Director Meteorological Service, Dominion of Canada.

(*Continued from p. 4.*)

THE summers of western Quebec are as warm as in western Ontario; in July the 70° isotherm passes not far south of Montreal, the 65° line passes through Quebec City, and most of the Gaspé Peninsula has a mean temperature somewhat below 60°. The winters are cold, but dry and bracing, and may very fairly be compared with those of St. Petersburg and Moscow. Zero temperatures, while not infrequent, are not the rule, and it is only on a few occasions in each winter that exceedingly cold dips are experienced. The third week in April sees the trees along the St. Lawrence budding, and it is not until late in November that the last red sear leaves fall.

The opening of spring in the maritime provinces is usually a little later than in southern and western Ontario and the North-West Territories, and somewhat earlier than in the lower St. Lawrence Valley; on the other hand, the summer lingers longer, especially in the Annapolis Valley. The summers are, as a rule, not quite so warm as in western Canada, great heat being seldom experienced, except very occasionally in the inland stations of New Brunswick.

The average precipitation of these provinces is between forty and forty-five inches, except along the southern coast-line of Nova Scotia, where it is nearly ten inches greater.

A trip through the Annapolis Valley in Nova Scotia in October

will amply repay the tourist, as nothing can be conceived more beautiful than the gorgeous autumn tints which everywhere enhance the loveliness of the landscape; but whether in the land of Evangeline or in the region of the great fresh water seas which lave Ontario's shores, the unbiassed individual must allow that in truth the most salient feature of Canada's climate is not the cold of winter, but the perfection of the summer and autumn.

The whole of Canada, with the exception of near the coast in British Columbia, is favoured with more sunshine than any portion of Great Britain, Germany, Holland or northern France. Nearly all parts of the Dominion have an annual percentage of over 40, and a summer percentage of between 53 and 59, whereas it is only in the more southern parts of England that a normal annual percentage of 36 is reached, and the summer figures, while in a few instances up to 50, are more generally between 35 and 45. At German stations the August maximum averages under 50 per cent., and in a few cases reaches 52. In the south of Europe much higher values are obtained: Vienna 54, Zurich 57, Trieste 66, Lugano 67, Rome 75, Madrid 84. These figures show that it is only the southern parts of Europe that have more sunshine than Canada.

A few facts regarding the climate of the "Golden" Klondyke may, perhaps, be acceptable to some persons. Its geographical position is as follows:—Yukon Territory has nearly the shape of a right-angled triangle, of which the base is an arc of the 60th parallel, the perpendicular an arc of the 141st meridian, and the hypothenuse the Rocky Mountains. To reach the Klondyke the traveller now lands at Skagway on the Pacific coast, crosses the coast range of mountains by railway, passing through superb scenery, and then has a trip of 430 miles by steamer down the Yukon River. The distance from Toronto to Dawson City is 2700 miles as the crow flies.

A somewhat broken series of observations at Dawson and various other places in Yukon Territory between 1895 and 1898, and a continuous series at Dawson during the past three years, afford data for estimating with a fair degree of accuracy the average climatic conditions of the Klondyke. The average annual mean temperature is about 22°; the mean of the three summer months is about 57°, July being 61°; and of the three winter months, —16°, with January, —23°. Spring may be said to open towards the end of April, the last zero temperature of the winter usually occurring about the 5th of that month. May, with an average temperature of 44°, is by no means an unpleasant month, and the 23rd is the average date of the last frost of spring. Daily observations during five summers indicate that, on the average, the temperature rises to 70° or higher on 46 days, and to 80° or higher on 14 days; 90° was recorded in Dawson in June, 1899, and 95° in July of the same year. These temperatures, with much bright sunshine and an absence of frost

during three months, together with the long days of a latitude within a few degrees of the Arctic Circle amply account for the success so far achieved by market gardeners near Dawson in growing a large variety of garden produce, including lettuce, radish, cabbage, cauliflower and potatoes, and warrant the belief that the hardier cereals might possibly be a successful crop, both in parts of the Yukon Territory and in the far northern districts of the MacKenzie Basin. August 23rd would appear to be the average date of the first autumnal frost, the temperature rapidly declining towards the close of that month. Although night frosts are not infrequent in September, the month as a whole is mild with a mean temperature of 42°. October may be fairly termed a winter month, the mean temperature being but 22°·5, and the first zero of the winter is recorded on the average about the 18th. Ice usually begins to run in the Yukon about the second week of October, but it is not until quite the end of the month, or early in November, that the river is frozen fast. The temperature on the average during a winter falls to 20° below zero or lower on 72 days, to 40° below or lower on 21 days, to 50° below or lower on 7 days, and to 60° below or lower on 2 days. In January, 1896, 65° below zero was registered at Fort Constantine, and in January, 1901, —68° was recorded at Dawson.

Observations of rain and snow have until the close of last summer been very fragmentary, but it is probable that the summer rainfall near Dawson is usually between seven and nine inches, and that the total snowfall of autumn and winter is between fifty and sixty inches.

Dawson being situated near the river, with high hills or mountains on all sides, is well protected from the winds, and a feature of the town, and, indeed, of the neighbouring country, is the occurrence of long periods of calm weather.

(*To be continued.*)

ROYAL METEOROLOGICAL SOCIETY.

THE usual monthly meeting was held on Wednesday evening, February 18th, at the Society's rooms, 70, Victoria Street, Westminster. Capt. D. Wilson-Barker, President, in the chair.

The following gentlemen were elected Fellows of the Society :— Mr. Hari D. Das, Mr. H. E. Goldsmith, Mr. W. G. Groves, Khan Bahadur A. Lateef, Dr. G. Oliver, and Dr. P. Horton Smith.

The President announced the death of Mr. J. Glaisher, F.R.S., on February 7th, and spoke of the valuable services which he had rendered to English meteorology.

Mr. A. Brewin, as one of the oldest Fellows in the Society, and a personal friend of Mr. Glaisher, moved the following resolution :—

"The Council and Fellows of the Royal Meteorological Society have heard with regret of the death of Mr. James Glaisher, F.R.S., who was one of the founders of the society. He held the office of

Secretary from 1850 until 1872, excepting for the two years 1867-8, when he was President, and he was a member of Council in 1873. The Council and Fellows desire to record their high sense of the valuable assistance which Mr. Glaisher rendered to the society in the early years of its existence, and of his great and long continued service in the promotion of the science of meteorology. The Council and Fellows desire to express their sympathy with his son, Dr. J. W. L. Glaisher, F.R.S."

The resolution was seconded by Mr. R. Inwards, supported by Mr. H. Southall and Mr. W. Marriott, and unanimously agreed to.

Mr. E. Mawley read his "Report on the Phenological Observations for 1902." In all parts of the British Isles the phenological year ending November 30th was generally cold and sunless. Rain fell at unusually frequent intervals, so that although the total quantity proved deficient, there were no periods of drought. Wild plants were everywhere behind their mean date in coming into flower, but the departures from the average were as a rule slight, until about the middle of May. After that time until the end of the flowering season the dates of the blossoming were later than in any other year since the present series of records was instituted except 1891 and 1900, as will be seen from the accompanying table.

Mean results for 13 plants.

ENGLAND.

Year.	S.W.		South.		Midlands.		East.		N.W.	
	Day of year.	Diff. from average.	Day of year.	Diff. from average.	Day of year.	Diff. from average.	Day of year.	Diff. from average.	Day of year.	Diff. from average.
		Days.		Days.		Days.		Days.		Days.
1891...	144	+10	144	+ 9	150	+11	147	+11	150	+ 7
1892...	139	+ 5	138	+ 3	144	+ 5	143	+ 7	147	+ 4
1893...	118	—16	122	—13	125	—14	123	—13	128	—15
1894...	126	— 8	130	— 5	135	— 4	127	— 9	137	— 6
1895...	139	+ 5	138	+ 3	141	+ 2	138	+ 2	144	+ 1
1896...	125	— 9	128	— 7	132	— 7	130	— 6	134	— 9
1897...	130	— 4	132	— 3	136	— 3	132	— 4	142	— 1
1898...	133	— 1	135	0	138	— 1	136	0	141	— 2
1899.	136	+ 2	136	+ 1	141	+ 2	138	+ 2	145	+ 2
1900...	142	+ 8	141	+ 6	144	+ 5	143	+ 7	152	+ 9
1901...	138	+ 4	139	+ 4	141	+ 2	139	+ 3	144	+ 1
1902...	139	+ 5	140	+ 5	145	+ 6	142	+ 6	152	+ 9
Mean	134	...	135	...	139	...	136	...	143	...

— signifies *early*, and + *late*.

The swallow, cuckoo, and nightingale were a few days earlier than usual in making their appearance.

The most remarkable feature as regards the weather and its effect on vegetation was the way in which it favoured the growth of all farm crops, except potatoes and hops, for it is seldom that in the same year the yield of wheat, barley, oats, beans, peas, turnips, mangolds and grass, is alike abundant, even in a single district, much less in all parts of the kingdom, as was the case in 1902. On the other hand, all the fruit crops were more or less deficient, with the exception of strawberries, which yielded well, but were, like most other fruits, lacking in flavour.

The President, Mr. R. G. K. Lempfert, Mr. H. Southall, Mr. R. H. Curtis, Mr. C. Harding, and Mr. W. Marriott, took part in the discussion, and Mr. E. Mawley replied.

METEOROLOGICAL NEWS AND NOTES.

THE SCOTTISH ANTARCTIC EXPEDITION will, contrary to the original plan, endeavour to find a safe wintering place as far south as possible in the Antarctic regions south of South America, and spend the next six months in a high latitude. Mr. Mossman writes that he is looking forward to this opportunity for securing a unique series of records of polar weather. As yet he has been able to reduce and discuss his observations on the voyage out, month by month, and this he hopes to continue to do, so that they will be ready for immediate publication on his return.

THE INTERNATIONAL COUNCIL FOR THE STUDY OF THE SEA met for the second time at Copenhagen in the last week of February. The question of meteorological observations, with special reference to kite-work at sea, was discussed by an informal committee consisting of the representatives interested in physical work, which included Dr. Nansen (Christiana), Professor Pettersson (Stockholm), Professor Homén (Helsingfors), Dr. Knudsen (Copenhagen), Professor Krümmel (Kiel), Dr. Wind (de Bilt), Professor Gilson (Louvain), and Dr. H. R. Mill (London). It is understood that a great deal of information as to the surface temperature of the North Sea has already been obtained by means of observations carried out on board the regular trading steamers, which will continue to supplement the quarterly cruises of the ten special research steamers of the associated countries.

CYCLES OF RAINFALL IN UTAH are discussed by Mr. L. H. Murdoch in the *Monthly Weather Review* for October, 1902. He carries back the curve of rainfall fluctuations to 1827, by utilizing the relation between the level of Great Salt Lake and the amount of rainfall, which is very intimate and sympathetic. An extremely dry period prevailed from 1827 to 1863, in the latter year the fall was as little as 7 in., the lowest recorded; in 1867 it was 28 in., the highest recorded, and until 1879 it never fell so low as 16 in.; since that time it has never been so high as 20 in., and twice has been as low as 11 in. In view of the immense money value of a knowledge as to how long the present dry period may last, the author endeavoured to trace a relation between sunspot and other natural cycles and the rainfall, but without success.

RAINFALL AND TEMPERATURE, FEBRUARY, 1903.

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) ...	·83	— ·64	·30	27	10	59·0	20	25·7	18	4	8
II.		Tenterden ...	1·39	— ·31	·77	27	8	59·8	20	27·0	2	4	11
,,		Hartley Wintney ...	1·37	— ·26	·37	27	14	58·0	20	27·0	2	7	9
III.		Hitchin ...	1·03	— ·43	·24	24	12	59·0	9	25·0	17	6	...
,,		Winslow (Addington) ...	·76	— ·70	·28	24	9	60·0	19	26·0	18	4	6
IV.		Bury St. Edmunds (Westley)	·28	— 1·26	·04	22*a*	10	59·5	9	25·0	18	6	...
,,		Norwich (Brundall) ...	·34	— 1·18	·10	21	8	58·6	9	24·8	17	6	10
V.		Winterborne Steepleton ...	1·78	...	·56	27	14	52·0	12	23·0	18	3	8
,,		Torquay ...	2·61	...	·63	27	14	57·1	9	34·6	2	0	5
,,		Polapit Tamar [Launceston]..	2·60	— ·01	·62	26	17	58·8	19	26·1	14	3	7
VI.		Stroud (Upfield) ...	1·47	— ·45	·39	24	12	55·0	9*b*	28·0	17	4	...
,,		Church Stretton (Woolstaston)	2·19	+ ·19	·95	23	13	54·5	9	30·0	2	3	...
,,		Worcester (Diglis Lock) ...	1·92	+ ·41	·56	24	13	...	...	...	...	...	...
VII.		Boston ...	·47	— ·88	·16	24	5	58·0	8	26·0	18	...	...
,,		Hesley Hall [Tickhill]...	·98	— ·47	·20	22	11	59·0	8, 19	29·0	18*f*	3	...
,,		Derby (Midland Railway)...	1·15	— ·30	·34	24	10	60·0	9	28·0	18	5	...
VIII.		Bolton (The Park)...	3·85	+ 1·41	·88	21	22	53·5	20	31·2	2	2	...
IX.		Wetherby (Ribston Hall) ...	2·20	+ ·76	·65	21	13	...	...	...	...	...	...
,,		Skipton (Arncliffe) ...	9·15	+ 4·33	1·64	21	21	...	...	...	...	...	...
,,		Hull (Pearson Park).	·97	— ·75	·26	21	10	60·0	8	30·0	2	5	13
X.		Newcastle (Town Moor) ...	1·26	— ·21	·32	26	13	...	...	..	...	...	...
,,		Borrowdale (Seathwaite)...	20·85	+ 9·08	3·47	4	24	52·5	8	30·3	28	3	...
XI.	WALES.	Cardiff (Ely)...	2·51	— ·38	·53	25	22	...	...	...	...	...	...
,,		Haverfordwest ...	3·09	— ·25	·62	24	19	53·7	19	32·5	13	0	12
,,		Aberystwith (Gogerddan) ...	3·52	+ ·37	·65	25	17	55·0	19*c*	22·0	17	7	...
,,		Llandudno...	3·43	+ 1·48	·74	21	18	57·0	20	34·8	28	0	...
XII.	SCOTLAND.	Cargen [Dumfries] ...	5·70	+ 2·04	1·18	24	18	53·0	8*d*	29·0	28	1	...
XIII.		Edinburgh (Royal Observatory)	3·99	...	1·43	8	16	54·5	19	31·3	2	4	10
XIV.		Colmonell	3·35	— ·06	·80	26	18	56·0	19	32·0	27	1	...
XV.		Tighnabruaich	8·41	...	1·96	7	21	49·0	9	29·0	1	5	...
,,		Mull (Quinish)...	7·92	+ 3·53	1·11	25	27	...	...	...	...	...	...
XVI.		Loch Leven Sluices ...	6·96	+ 4·18	1·96	9	17	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	3·30	+ 1·17	1·30	8	16	55·3	19	29·3	13	4	...
XVII.		Braemar	6·74	+ 4·16	1·45	24	19	52·7	19	28·2	28	9	18
,,		Aberdeen (Cranford)	2·47	+ ·06	1·15	8	17	57·0	19	30·0	12*g*	9	...
,,		Cawdor (Budgate) ...	3·47	+ 1·53	·63	8, 25	19	..	...	...	...	...	...
XVIII		Strathconan [Beauly] ...	7·05	+ 2·86	1·25	28	14	...	...	...	...	...	...
,,		Glencarron Lodge...	13·54	+ 6·22	1·41	3	27	54·7	20	29·5	28	9	...
XIX.		Dunrobin ...	3·08	+ ·66	·90	8	16	55·0	10	31·0	24	...	2
,,		S. Ronaldshay (Roeberry) ...	3·14	+ ·58	·42	25	23	53·0	19	28·0	1	7	...
XX.	IRELAND.	Darrynane Abbey...	3·31	— ·71	·60	26	22	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	2·75	— ·16	·52	26	14	54·5	9	30·0	28	2	...
,,		Broadford (Hurdlestown) ...	2·71	+ ·49	·54	21	20	54·0	9*e*	30·0	1	4	...
XXI.		Carlow (Browne's Hill) ...	3·03	+ ·48	·55	26	15	...	...	..	...	...	...
,,		Dublin (FitzWilliam Square)	2·23	+ ·28	·64	26	15	59·0	8	31·7	28	1	3
XXII.		Ballinasloe	4·21	+ 1·78	·51	26	18	55·0	8, 9	26·0	27	10	...
,,		Clifden (Kylemore)	7·21	+ 1·30	1·12	27	22	...	...	...	...	...	...
XXIII		Seaforde...	3·15	+ ·36	·77	26	20	55·0	8, 22	25·0	27	6	7
,,		Londonderry (Creggan Res.).	3·93	+ 1·22	·68	26	19	...	...	...	...	...	...
,,		Omagh (Edenfel) ...	4·00	+ 1·40	·65	7	19	57·0	19	28·0	27	4	9

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

a and 24, 25, 26. *b* and 19, 20. *c* and 20. *d* and 9, 10. *e* and 10, 19. *f* and 28. *g* and 15, 23, 26, 27.

SUPPLEMENTARY RAINFALL, FEBRUARY, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	·75	XI.	Llandefaelog-fach.....	3·59
II.	Dorking, Abinger Hall .	2·18	,,	New Radnor, Ednol.....	4·27
,,	Sheppey, Leysdown	1·26	,,	Rhayader, Nantgwillt ...	5·82
,,	Hailsham	1·50	,,	Lake Vyrnwy	5·51
,,	Crowborough.....	2·02	,,	Ruthin, Plâs Drâw	2·60
,,	Ryde, Beldornie Tower..	1·42	,,	Criccieth, Talarvor	1·95
,,	Bournemouth, Kempsey	1·95	,,	I. of Anglesey, Lligwy..	4·40
,,	Emsworth, Redlands ...	1·57	,,	Douglas, Woodville.....	3·06
,,	Alton, Ashdell	2·34	XII.	Stoneykirk, Ardwell Ho.	2·17
,,	Newbury, Welford Park	1·77	,,	Dalry, Old Garroch	10·24
III.	Oxford, Magdalen Coll..	·75	,,	Moniaive, Maxwelton Ho.	6·44
,,	Banbury, Bloxham	1·15	,,	Lilliesleaf, Riddell	3·79
,,	Pitsford, Sedgebrook ...	·96	XIII.	N. Esk Res. [Penicuick]	6·25
,,	Huntingdon, Brampton.	·75	XIV.	Dalry, Blair	6·59
,,	Wisbech, Bank House...	·66	,,	Glasgow, Queen's Park..	7·27
IV.	Southend	1·12	XV.	Inveraray, Newtown ...	11·17
,,	Colchester, Lexden	·45	,,	Ballachulish, Ardsheal...	12·89
,,	Saffron Waldon, Newport	·68	,,	Campbeltown, Redknowe	3·64
,,	Rendlesham Hall	·26	,,	Islay, Eallabus..... ...	5·57
,,	Swaffham	·44	XVI.	Dollar.....	3·38
V.	Salisbury, Alderbury ...	1·60	,,	Balquhidder, Stronvar...	15·13
,,	Bishop's Cannings	1·93	,,	Coupar Angus Station...	3·69
,,	Ashburton, Druid House	4·38	,,	Blair Atholl	5·91
,,	Okehampton, Oaklands.	4·43	,,	Montrose, Sunnyside ...	2·93
,,	Hartland Abbey	2·32	XVII.	Alford, Lynturk Manse..	3·06
,,	Lynmouth, Rock House	3·12	,,	Keith H.R.S.....	2·45
,,	Probus, Lamellyn	1·82	XVIII.	Fearn, Lower Pitkerrie..	1·97
,,	Wellington, The Avenue	1·96	,,	S. Uist, Askernish	5·01
,,	North Cadbury Rectory	1·53	,,	Invergarry.....	16·88
VI.	Clifton, Pembroke Road	2·01	,,	Aviemore, Alvie Manse.	4·20
,,	Ross, The Graig	2·15	,,	Loch Ness, Drumnadrochit	6·59
,,	Shifnal, Hatton Grange	1·27	XIX.	Inversbin	3·94
,,	Wem, Clive Vicarage ...	1·41	,,	Bettyhill	4·45
,,	Cheadle, The Heath Ho.	1·17	,,	Watten H.R.S.....	2·21
,,	Coventry, Kingswood ...	1·21	XX.	Cork, Wellesley Terrace	3·37
VII.	Market Overton	·97	,,	Killarney, District Asyl.	5·17
,,	Grantham, Stainby	·97	,,	Glenam [Clonmel]	3·89
,,	Horncastle, Bucknall ...	·47	,,	Ballingarry, Hazelfort...	3·35
,,	Worksop, Hodsck Priory	·95	,,	Miltown Malbay	5·17
VIII.	Neston, Hinderton	1·45	XXI.	Gorey, Courtown House	2·38
,,	Southport, Hesketh Park	2·18	,,	Moynalty, Westland ...	4·19
,,	Chatburn, Middlewood.	5·23	,,	Athlone, Twyford	3·42
,,	Duddon Val., Seathwaite Vic.	8·41	,,	Mullingar, Belvedere ...	4·45
IX.	Langsett Moor, Up. Midhope	4·97	XXII.	Woodlawn	4·58
,,	Baldersby	1·82	,,	Westport, Murrisk Abbey	6·10
,,	Scalby, Silverdale	1·73	,,	Crossmolina, Enniscoe ..	6·36
,,	Ingleby Greenhow Vic..	1·83	,,	Collooney, Markree Obs.	5·19
,,	Middleton, Mickleton ...	3·93	XXIII.	Enniskillen, Portora ...	3·74
X.	Beltingham	4·98	,,	Warrenpoint.....	3·17
,,	Bamburgh	1·40	,,	Banbridge, Milltown ...	1·84
,,	Keswick, The Bank.....	9·45	,,	Belfast, Springfield	3·02
,,	Melmerby Rectory	4·21	,,	Bushmills, Dundarave..	3·11
XI.	Llanfrechfa Grange	2·84	,,	Stewartstown	1·75
,,	Treherbert, Tyn-y-waun	7·11	,,	Killybegs	6·09
,,	Castle Malgwyn	4·10	,,	Horn Head	5·29

METEOROLOGICAL NOTES ON FEBRUARY, 1903.

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.—See as to temperature p. 30. The first three weeks were practically rainless but mostly dull. Frost on 17th and 18th. Frequent R and squalls in the last week.

TENTERDEN.—The first three weeks were very dry. A succession of gales from 20th to 28th.

SHEPPEY, LEYSDOWN.—Remarkably fine for the first three weeks. On 21st the wind blew with terrific force from S.W., and a succession of S. and S.W. gales culminated on the night of 25th in a perfect hurricane.

CROWBOROUGH.—On the whole fine and sunny, and except for the first three days remarkably mild. Till 21st the R was scanty, but the heavy R of the last week brought the total to nearly the average. Heavy gales on 7th and 26th.

COLCHESTER, LEXDEN.—Very mild and spring flowers well forward. Several beautiful days. Gales from W. or S.W. during the last 10 days.

BURY ST. EDMUNDS, WESTLEY.—Very dry, windy and mild; only 3 drier Februaries in 46 years.

NORWICH, BRUNDALL.—Mean temp. 44°·3, the highest in February since observations commenced in 1883. Very early start of vegetation; an apricot tree in bloom in the open before the close and many spring flowers a month earlier than usual. Great gale on the night of 26th with terrific gusts.

TORQUAY, CARY GREEN.—R ·08 in. below the average. Mean temp. 4°·6 above the average. Duration of sunshine 78·4 hours, or 3·4 hours below the average, with 9 sunless days. Mean amount of ozone 6·7; max. 9·0 on 1st with W. wind and 8th with S.W. wind; min. 4·0 on 16th with N.N.W. wind.

LYNMOUTH, ROCK HOUSE.—Cold at the beginning, then mild, and the last 8 days stormy with H, S, R and colder nights, and T and L on 25th. Vegetation was at least a fortnight earlier than last year.

NORTH CADBURY RECTORY.—Till 21st very pleasant and dry, but the last week was so excessively stormy as to make the wind average the highest for 7 years, and to bring the R near to the normal.

ROSS, THE GRAIG.—The 25 days ending on 21st were exceptionally fine with only ·16 in. of R; the five days ending on 26th yielded 2·08 in. Almost constant gales from 20th to 28th, the force in some of the gusts being very great, especially on the morning of 27th, recalling 28th February, 1860, and 21st February, 1861.

CHURCH STRETTON, WOOLSTASTON.—Very mild on the whole, but most exceptionally windy and with remarkably little S.

BOLTON, THE PARK.—On 25th, during a brief TS, one concussion was sufficient to shake the buildings of the town, and at Ainsworth a tall mill chimney was destroyed. On 27th occurred the severest gale for many years, its force being almost equal to that of the memorable gale of December 9th, 1886. Mean temp. 42°·9, or 5°·4 above average and 2°·2 above previous highest.

MELMERBY, BALDERSBY.—Violent S.W. gale on 26th and 27th. Many trees uprooted and houses unroofed.

HULL, PEARSON PARK.—A few bright days, but generally dull and cold. Gales on 24th and 27th. H on 21st. Sunshine 44¾ hours.

WALES AND THE ISLANDS.

HAVERFORDWEST.—Mild, wet and very stormy. Continuous gales from 18th to 27th, reaching hurricane force on 26th. The most stormy February for 50 years. Sunshine 26·8 hours.

ABERYSTWITH, GOGERDDAN.—Again wet, but mild until the last week, when the great storm did some damage. No S, but heavy H at times.

DOUGLAS, WOODVILLE.—Wet and very stormy with much deficiency of sun. Though the temp. was unusually high throughout vegetation was extremely backward. A storm of probably almost unprecedented violence on 26th and 27th did much damage to churches, houses, trees and gardens, and had the season been less backward the injury would have been most serious.

SCOTLAND.

CARGEN [DUMFRIES].—The mean temp.. 44°, was the highest since observations commenced in 1860. The gale on 27th caused considerable damage to timber and houses.

LILLIESLEAF, RIDDELL.—R excessive, being the highest since 1864 except 1894. Unprecedentedly rough and stormy, with wind velocity of 55 miles an hour day after day. Remarkably high temp.

MULL, QUINISH.—The wettest and stormiest February ever known here.

COUPAR ANGUS.—The fourth month in succession with abnormally heavy R, the total being about 2 inches above the average. All rivers, particularly the Tay, were in the highest flood for very many years. Mean temp. 41°·6, the highest for 22 years.

S. UIST, ASKERNISH.—The stormiest month experienced within general recollection. Winds mostly from S.S.W. and S.E., rising to a full gale almost every day, and sometimes to hurricane force. Very little S.

WATTEN, H.R.S.—A series of storms of wind and R, often blowing a gale, with some intervals of fine weather.

IRELAND.

CORK, WELLESLEY TERRACE.—Chiefly remarkable for great storms. That on 26th, judging by its disastrous results both on land and sea, was the greatest for many years. R ·07 in. below the average. Mean temp. 42°·2, or 0°·5 above the average.

DARRYNANE ABBEY.—Mild with much mist. The gale on 26th was said to be the worst remembered.

BROADFORD, HURDLESTOWN.—The gale on 26th was the worst since "the night of the big wind" on January 6th, 1839. Much damage was done, some very old trees were blown down, large ricks of hay were blown clean away and lost, and cattle were killed by the houses falling on them. The iron roof of a large cow-house was carried 200 yards.

MILTOWN MALBAY.—Cold, wet and stormy, the last 10 days being as bad as ever experienced, with H, S, sleet and storm. A great storm doing incalculable damage to houses, trees and farm produce on the night of 26th.

DUBLIN, FITZWILLIAM SQUARE.—Mean temp. 47°·5, or 5° above the average; a record month for warmth. A hurricane on the night of 26th-27th unequalled since the "big wind" of January 6th, 1839. In Phœnix Park the storm uprooted nearly 3,000 trees, chiefly elms, and much havoc was wrought in Dublin amongst buildings, roofs and chimneys. Duration of bright sunshine for month 63·5 hours.

ATHLONE, TWYFORD.—The greatest storm since "the night of the big wind" on January 6th, 1839, raged on 26th. Trees were laid low all over the country, and in some cases almost whole woods.

BALLINASLOE.—Generally very stormy. Violent gale on 26th. Houses were unroofed and thousands of trees blown down all over the district. TS on 27th. Floods very high.

MARKREE OBSERVATORY.—The early part was mild and gloomy, with very heavy showers at times. Very bad weather from 18th, with T and L very often at night. Heavy gale on 26th, doing a lot of harm in the district.

BELFAST, SPRINGFIELD.—Dull and wet, and on the whole disappointing for farmers. Very destructive hurricane on the morning of 27th.

OMAGH, EDENFEL.—Generally fine and seasonable until 20th, with high mean temp., especially about 8th and 19th. The remainder was extremely unsettled and inclement, with a violent gale on the night of the 26th, doing, however, less damage than further south.

Other reports from Ireland describe the devastation wrought by the storm of February 26th-27th as of the most serious kind. On one estate near Birr 2,000 trees were uprooted and 4,000 on an estate in Kilkenny. Prof. C. J. Joly, Dunsink Observatory, Dublin, asks for a loan of any barograph records of the storm in Ireland.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPTEMBER, 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	76·0	22	38·3	19	67·0	48·7	50·8	80	121·3	35·2	1·00	9	5·7
Malta	91·6	4	63·2	...	84·1	70·6	67·2	75	141·0	58·9	2·58	4	2·8
Cape Town	72·0	19	44·2	26	64·1	52·2	49·7	75	...	...	5·98	16	5·7
Durban, Natal	105·6	23	51·5	3	77·3	57·9	...	...	156·1	...	2·54	13	6·0
Mauritius	81·8	19	55·4	16	79·5	63·4	61·0	71	146·5	46·1	1·25	15	5·0
Calcutta	92·2	4	75·2	30	89·5	78·9	77·7	83	158·8	71·4	6·98	12	7·8
Bombay	87·1	12	73·3	17	84·6	76·9	76·0	86	137·5	69·7	27·11	21	6·9
Madras	98·7	3	72·1	18	92·3	76·9	74·5	79	151·3	70·7	4·65	16	6·1
Kodaikanal	67·2	4	51·1	7	64·0	52·8	51·8	82	141·9	42·3	3·07	16	7·2
Colombo, Ceylon	90·0	28	72·0	4	86·8	75·4	74·2	83	150·0	71·0	8·18	20	6·9
Hongkong	91·2	22	69·6	28	87·3	76·2	68·3	65	146·5	...	·64	6	4·0
Melbourne	80·0	25	35·0	17	62·1	44·8	44·2	72	138·9	27·1	3·30	10	6·4
Adelaide	86·5	30	38·8	14	68·1	48·5	46·0	64	139·7	32·6	1·64	16	5·3
Coolgardie	83·6	4	38·0	13	71·5	48·3	45·6	60	152·2	33·0	1·92	6	3·2
Sydney	78·1	7	44·4	13	65·9	52·2	48·2	70	118·0	33·7	2·10	16	4·1
Wellington	60·0	2, 6	34·0	23*a*	54·7	42·1	39·6	73	112·0	26·0	3·11	21	6·9
Auckland	63·5	19	41·0	10	56·9	45·4	41·1	69	128·0	38·0	6·21	22	5·2
Jamaica, Negril Point	89·8	16	69·8	24	88·1	73·2	73·6	78	...	...	7·14	18	...
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	88·8	13	72·2	1	85·1	75·0	68·7	57	158·2	...	7·08	23	2·0
Toronto	79·0	23	38·0	15	68·9	51·8	54·7	82	101·2	31·9	3·35	14	6·3
Fredericton, N.B.	79·3	2	31·0	26	68·3	46·8	47·9	67	...	...	3·83	9	5·2
Winnipeg	80·0	7	28·0	12	65·0	40·6	...	...	...	...	2·01	9	5·3
Victoria, B.C.	79·0	11	38·7	28	63·9	49·1	48·3	75	...	...	2·31	8	4·0
Dawson	62·0	8	26·4	28	50·4	35·5	...	...	...	...	1·17	9	5·5

a—and 24.

MALTA.—Mean temp. of air 76°·1, or 1°·0, above average. Mean hourly velocity of wind 6·5 miles or 1·2 below average. Mean temp. of sea 76°·7. TSS on 6 days, L on 3 days, H on 28th. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·1, dew point 1°·0 above; rainfall ·13 in. and mean hourly velocity of wind 1·1 mile below their averages. T. F. CLAXTON.

MADRAS.—Temp. below normal generally. L on 11 days, T on 9 days, and a TS on one day. Sunshine 113·6 hours, or 31·2 per cent. of possible. A. MOFFAT.

KODAIKANAL.—Bright sunshine 106 hours. A very cloudy month. C. MICHIE SMITH.

COLOMBO.—Mean temp. of air 80°·9, or 0°·1 above, of dew point 1°·0 above, and R 2·24 in. above, their respective averages. Mean hourly velocity of wind 8·3 miles, prevailing direction, S.W. TSS on 3 days. H. O. BARNARD.

HONGKONG.—Mean temp. 80°·8. Sunshine 225 hours, or 25 hours above average. R 12·01 in. below average. Mean hourly velocity of wind 8·0 miles. F. G. FIGG.

Adelaide.—Mean temp. 58°·3 or 1°·2 above, and R ·08 in. below, average. C. TODD.

Sydney.—Mean temp. 0°·2 above, humidity 0°·4 below, and R ·88 in. below averages. H. C. RUSSELL, F.R.S.

Wellington.—Mean temp. 2°·5 below, and R 1·15 in. below, averages. A. H. GORE.

Auckland.—Mean temp. 3°·5 below average, R nearly 3 in. above the average. Unusually wet and stormy. T. F. CHEESEMAN.

SYMONS'S

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THE RAINFALL OF THE WINTER MONTHS.

THE year may be conveniently divided for some rainfall purposes into a winter and a summer half, and the winter half-year just concluded presents some special features as a whole, and in its several parts, to which reference must be made.

March has proved a wet month at all stations in the British Isles, except a very few on the east coast. It will be noticed in our table on p. 56 that only Newcastle, Aberdeen, Dunrobin, and Roeberry, in Orkney, show readings below the average March fall for the ten years 1890-99. In some cases twice the average fall was experienced, and in most there was an excess of from a half to two-thirds. At Seathwaite, and several other stations in the Lake District, and at some stations in Scotland, rain was reported on every day of the month. While a considerable part of the east of England had less than two inches of rain, the whole of Ireland (except a little patch round Dublin) had more than four inches, and a large area in the west Highlands of Scotland, had a rainfall exceeding 12 inches, and in some places reaching 20 inches. In the Lake District the gauge at The Stye collected 30·3 inches of rain. The distribution of rainfall was similar to that of February, though the contrast between the south-east and north-west was not nearly so great. The prevalence of S.W. and W. winds continued, due to the same cause, the passing of a procession of cyclonic disturbances towards the N.E. off our west coasts.

Table I. gives for 25 representative stations the rainfall in inches for each of the three months of 1903, and the total for three months, followed by the difference in inches from the ten years' average for each month and for the three months.

The values range from $3\frac{3}{4}$ inches for Brundall near Norwich, where the fall fell short of the average by one-quarter, to no less than $61\frac{1}{4}$ inches for Seathwaite in Borrowdale, where the fall exceeded the average by nearly two-thirds. At two of the Scottish stations it will be noticed each of the three months had more than ten inches of rain, an unusual circumstance even in the wetter parts of the Highlands.

TABLE I.—*Rainfall of the First Three Months of* 1903.

STATIONS.	RAINFALL.				DIFF. FROM AVERAGE.			
	Jan.	Feb.	Mar.	Total.	Jan.	Feb.	Mar.	Total.
	in.	in.	in.	in.	in.	in.	in.	in.
London	2·15	·83	2·30	5·28	+ ·44	— ·64	+ ·84	+ ·64
Hitchin	2·52	1·03	3·22	6·77	+ ·81	— ·43	+ 1·78	+ 2·16
Westley	1·90	·28	2·12	4·30	+ ·21	—1·26	+ ·49	— ·56
Brundall	1·68	·34	1·73	3·75	+ ·01	—1·18	+ ·12	— 1·05
Ashburton	6·83	4·38	8·72	19·93	+1·39	+ ·01	+ 5·13	+ 6·53
Polapit Tamar	5·14	2·60	5·86	13·60	+1·81	— ·01	+ 3·58	+ 5·38
Woolstaston	2·74	2·19	4·81	9·74	+ ·28	+ ·19	+ 3·04	+ 3·51
Wetherby	2·21	2·20	3·50	7·91	+ ·55	+ ·76	+ 1·87	+ 3·18
Arncliffe	9·81	9·15	10·69	29·65	+3·43	+4·33	+ 5·57	+13·33
Seathwaite	18·18	20·85	22·23	61·26	+3·33	+9·08	+11·57	+23·98
Cardiff	5·65	2·51	5·75	13·91	+2·09	— ·38	+ 3·19	+ 4·90
Haverfordwest	6·11	3·09	6·44	15·64	+1·49	— ·25	+ 3·70	+ 4·94
Gogerddan	5·38	3·52	6·02	14·92	+1·13	+ ·37	+ 3·18	+ 4·68
Dumfries	6·24	5·70	10·15	22·09	+1·66	+2·04	+ 7·10	+10·80
Lilliesleaf	5·47	3·79	5·03	14·29	+3·12	+1·67	+ 2·79	+ 7·58
Glasgow	7·16	7·27	7·96	22·39	+3·72	+4·47	+ 5·48	+13·67
Inveraray	10·60	11·17	11·20	32·97	+2·51	+5·29	+ 5·36	+13·16
Loch Leven	7·20	6·96	6·56	20·72	+3·90	+4·18	+ 3·98	+12·06
Braemar	4·57	6·74	6·96	18·27	+1·79	+4·16	+ 4·64	+10·59
Aberdeen	4·98	2·47	1·92	9·37	+2·26	+ ·06	— ·28	+ 2·04
Glencarron	14·01	13·54	11·45	39·00	+3·62	+6·22	+ 4·51	+14·35
Waterford	6·04	2·75	5·95	14·74	+2·52	— ·16	+ 3·43	+ 5·79
Carlow	4·85	3·03	5·98	13·86	+1·78	+ ·48	+ 3·77	+ 6·03
Mullingar	6·45	4·45	6·16	17·06	+3·48	+1·80	+ 3·72	+ 9·00
Omagh	6·19	4·00	7·03	17·22	+2·68	+1·40	+ 4·45	+ 8·53

TABLE II.—*Six Months' Winter Rainfall, October,* 1902—*March,* 1903.

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	—1·33	88	Arncliffe +	10·19	129	Braemar +	11·56	163
Tenterden	— ·95	93	Hull	— ·53	96	Aberdeen	+ ·03	100
Hartley Wintney	+1·23	110	Newcastle	—1·07	92	Cawdor	+3·04	121
Hitchin	— ·22	98	Seathwaite +	16·58	121	Glencarron +	10·88	120
Winslow	—1·03	91	Cardiff	+4·62	121	Dunrobin	—2·01	89
Westley	—3·51	71	Haverfordwest	+5·32	121	Darrynane	+ ·61	102
Brundall	—3·83	68	Gogerddan	+2·69	111	Waterford	+7·06	135
Alderbury	+1·29	109	Llandudno	+2·73	116	Broadford	+4·87	128
Ashburton	+5·16	117	Dumfries +	10·78	143	Carlow	+6·44	136
Polapit Tamar	+6·41	132	Lilliesleaf	+6·95	144	Dublin	+3·23	123
Stroud	+1·76	113	Colmonell	+4·54	118	Mullingar	+7·71	143
Woolstaston	+2·58	117	Glasgow +	12·02	161	Ballinasloe	+6·14	133
Boston	— ·17	98	Inveraray	+8·97	121	Clifden	+4·32	110
Hesley Hall	+ ·33	103	Islay	+3·05	111	Crossmolina	+7·81	125
Derby	+1·58	115	Mull	+6·31	119	Seaforde	+6·51	134
Bolton	+2·46	112	Loch Leven	+9·88	151	Londonderry	+2·38	111
Wetherby	+4·04	135	Dundee	+1·83	112	Omagh	+7·40	137

Turning now to the six months' winter rainfall as a whole, Table II. shows the condition of the country.

It will be seen that, except along the east coast, where Norfolk and Suffolk have received little more than two-thirds of their usual supply, the country has been well watered. In Ireland the winter rainfall shows on the average an excess of one-third, the centre of Scotland has the very unusual excess of one-half, while in Wales and the west of England, the excess averages one-fifth. The winter months have thus been wet not only relatively to the recent run of dry years, but relatively to the normal rainfall of a very long period. The consequences may be unpleasant for the farmer, but they will ensure a water-supply which will relieve the water-works engineer from anxiety as to the possible dryness of the summer half-year.

THE TEMPERATURE OF MARCH, 1903.

IT would probably be difficult to find any month in any year which was not in some way unique with regard to its weather, so distinct is the individuality which the grouping of the multitudinous conditions of climate can confer. But it is not often that the month of March pushes itself so far in advance of the season as it has done this year, at least in the south of England. In the north of England, in Scotland and in Ireland, the excessive rainfall has drowned all other considerations, but everywhere in the British Isles March has been unduly mild.

The average values for the daily mean, 9 a.m., 9 p.m., maximum and minimum thermometer readings for the whole month of March at Camden Square were as follows for the average of 40 years, 1858-95, for 1903, and for the occasion of highest value previously recorded.

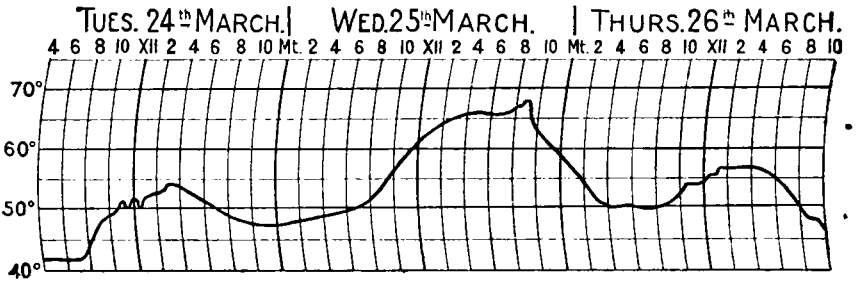
	Average Mean.	9 a.m.	9 p.m.	Max.	Min.
Average March	42·1	41·8	41·3	50·2	35·5
March, 1903	**46·4**	**46·1**	**46·0**	**53·9**	**39·5**
Difference	+4·3	+4·3	+4·7	+3·7	+4·0
Highest previous ...	46·3	46·7	45·7	56·6	39·9
Year	1859	1859	1896	1893	1859&'96

It will be noticed that March, 1859, was very nearly as warm on the average as March, 1903.

The main feature of the temperature of the month was the warmth of one day, the 25th. The mean temperature of that day at Camden Square was 58°·3, the warmest March day recorded previously (March 24th, 1858) having had a mean of 56°·0. The maximum temperature on a Glaisher stand was 67°·9, which has been exceeded in three years out of the last forty-six, viz.: March 16th, 1884 (68°·0), March 24th and 26th, 1871 (68°·4 and 68°·7), and March 24th, 1858 (70°·1). The unprecedented nature of the day was due to the fact that the maximum temperature was not reached until nearly two hours after sunset, and the 9 p.m. reading

was 64°·2, the highest ever previously recorded at that hour having been 57°·2 on March 22nd, 1896.

Mr. F. Campbell Bayard has kindly sent us the trace of his thermograph at Wallington, near Croydon, which is reproduced in order to show the peculiar nature of the day. After the normal maximum about 4 p.m. the temperature fell slightly until 6 p.m., and then rose steadily until about 8.30 p.m., when an abrupt fall occurred. Mr. G. von U. Searle informs us that his thermograph at West Kensington showed a maximum of 68°·3 at 8 p.m. precisely.



The fall of temperature was simultaneous with a sudden rise of the barometer resembling the first half of a typical thunderstorm curve. A slight thunderstorm was noted in London, but it seems to have been more severe to the south west. Lady Jenkyns, of Botley Hill, Botley, writes :—

"The 25th was our one warm day at Botley. From 1 p.m. till 5 p.m. the distant thunder was almost continuous, and so unlike thunder sometimes that people said it must be the sound of guns; but guns would not have gone on so long. As it grew dark there was a good deal of lightning, some forked, but that never came nearer. All this was to the south-west of us, towards Southampton; perhaps it was in the Isle of Wight or at sea."

Colonel Ward, writing from Upton Park, Slough, says :—

"On the 25th the temperature went up to 67° at 2 p.m., and at 4 it was 65°, where it remained until a heavy thunderstorm passed over from the south-west about 7 p.m. Between 9 and 10 a.m. very distant thunder was heard almost continuously in the south-west and south. At 2 p.m. heavy clouds came up from the south-west, and at 5 p.m. they were real 'pocky clouds' such as one sees in the north of Scotland, and which my old friend Clement Ley called mammato-cumulus. The day reminded me of one in the sixties or late fifties in Wiltshire, when we heard what we then thought was thunder, but it turned out to be the French and British fleets saluting at Cherbourg."

Several observers comment on the remarkably low relative humidity of the day, the depression of the wet-bulb exceeding 11° at 9 p.m.

At Greenwich Observatory the mean temperature was 58°·2, or 15°·8 above the normal mean temperature of March 25th as shown by a record of fifty years.

THE SHORTAGE OF WATER.

A CONFERENCE on the present shortage of water available for supply was held in the Parkes Museum, Margaret Street, London, under the auspices of the Sanitary Institute, on Wednesday, February 11th, Sir A. R. Binnie, C.E., in the chair. Mr. W. Whitaker, F.R.S., opened the conference by showing that in all parts of England the level of underground water had been sinking in recent years, in some cases at an alarming rate. This he attributed in part to a diminution of the rainfall, which, he suggested, might possibly be of the nature of a progressive change, though on this point he would not express a decided opinion. In part it was undoubtedly due to the excessive pumping of water from the permeable water-bearing strata, sometimes for the purpose of manufactures or water-supply; but frequently, as in the case of the Severn tunnel, and of many mines and quarries, simply to clear the workings, the water pumped being absolutely wasted. Mr. Whitaker urged the importance of legislation as to property in underground water.

Mr. J. Hopkinson followed with explicit details as to the very remarkable diminution in the supply of water from the deep wells in Hertfordshire, where the dearth of water was becoming a serious matter, especially in the valley of the Lea.

Dr. H. R. Mill pointed out that rainfall statistics did not bear out the theory of a secular diminution of rainfall. Taking the average rainfall of the British Isles as a whole, he showed that out of the 37 years, 1865-1901 (regarding which data were available in "British Rainfall") the seven years, 1865-71, had on the average the same annual fall as the whole period, the 15 years, 1872-86, had an average excess of eight per cent., and the 15 years, 1887-1901, had an average deficiency of eight per cent. During the last 15 years the rainfall of the country as a whole had only been above the average on three years. The deficiency was scarcely noticeable in Ireland, or Wales; in the West of Scotland, the English Lake District and the north-west of Yorkshire, there had been an actual excess, but the deficiency in the central parts of England had been very great, reaching 16 or 17 per cent. for the ten years, 1890-99. We were at present in a dry period, but it was impossible to say whether we were near the end of it or not.

Mr. Baldwin Latham pointed out a number of historical occasions when the dearth of water in particular areas was much greater than at present, and he made special reference to the conditions determining the evaporation and percolation of rain-water on the ground. He believed the average rainfall would ultimately be re-established.

Mr. Verney, of the London County Council, said it was the duty of the citizens of London to secure such a water supply that no period of local drought, however prolonged, would lead to the risk of a water famine.

Mr. Clayton Beadle gave particulars of the drying-up of streams and the sinking of the water-level in the chalk in the north of Kent, where the inhabitants were becoming seriously alarmed.

Mr. Douglas Archibald said that the statistics of rainfall appeared to him to leave little room for any theory of secular change; but on the contrary, they showed evidence of periodical variations agreeing in so striking a way with Brückner's 35½-year cycle that, without making a prediction, he would not be surprised if the present dry period were to terminate in the year 1905 or 1906.

Sir Alexander Binnie briefly summed up the discussion, and thanked Mr. Whitaker for his opening paper. A vote of thanks to the Chairman terminated the meeting.

James Glaisher, F.R.S.

1809–1902.

THE death of so distinguished a meteorologist as the late James Glaisher, requires more than a mere record of the fact in the pages of any English magazine devoted to meteorology.

Mr. Glaisher was born so long ago as the year 1809, and at the time of his death he was within a couple of months of completing his 94th year. His early life was spent not far from the Royal Observatory, and his determination to follow a scientific career was, probably, largely due to an intimate friendship he formed in those days with a member of the Observatory staff. At the age of twenty Glaisher obtained an appointment upon the trigonometrical survey of Ireland, and for about three years he remained in that country, occupied for the most part in field work. He then became assistant to Professor G. B. Airy, who was at that time the Director of the Observatory at Cambridge. Subsequently, when Airy became Astronomer Royal, Glaisher was offered a post on the Greenwich staff, of which he continued to be a member from the year 1835 until his retirement in 1874.

Glaisher's early work, both at Cambridge and at Greenwich, was wholly astronomical, and it was not until, in the course of re organization of the Observatory, the Magnetical and Meteorological Department was established that he entered upon the study of the science in which he made his mark. When this new department was established Airy placed it under Glaisher's superintendence, and probably a better choice for the post could hardly have been made. He lost no time in getting to work, not only upon organization, and observational details, but also in carrying out various investigations which presented themselves in his new field of research.

One of the earliest of these was an enquiry into "the amount of heat radiated at night from the surface of the earth," published in the *Philosophical Transactions* for 1847; and this was followed by his tables of correction for diurnal range, which appeared in the next volume of the same publication. About the same time, too, he was busy upon the production of the Hygrometrical Tables, which are so familiar, and so useful, to every meteorologist, and without which determinations of the dew-point, the humidity of the air, and its

elastic force, would be a far more difficult and intricate business than it now is; the fifth edition of these tables was issued in 1869.

The year 1849 was an important one to Glaisher because he then became a Fellow of the Royal Society, and also because it was in that year that he began to furnish to the Reports of the Registrar General, the quarterly meteorological returns for England, which have regularly appeared there ever since, and which Mr. Glaisher himself continued to supply until last year. This was the first attempt ever made to organize a body of volunteer meteorological observers for such co-operative work, and in it we have the germ of the system which became so largely developed under the late Mr. Symons, in the British Rainfall Organization, and which has also been adopted and extended by the Meteorological Office, and by the Meteorological Societies, in their corps of climatological observers.

In the year 1850 the Meteorological Society was founded by Dr. Lee and others, of whom Glaisher was one, and Glaisher becoming its first Secretary, and seventeen years later its tenth President. The prominent part he took in the early development of the society is generously acknowledged in the following words, written by the late Mr. Symons in anticipation of the Jubilee of the society, held three years ago,—words which, alas! had to be spoken by another—"during the first half of its career the society was largely guided by its original secretary, and our oldest Fellow, Mr. James Glaisher, F.R.S., who nursed it through its infancy and youth, and left it to other hands only when it was old enough and strong enough to walk alone." By the death of Mr. Glaisher the last of the ten men who first constituted the Meteorological Society has passed away.

But the work which most of all drew public attention to Mr. Glaisher was that done by him, at the instigation of the British Association, in exploring the upper regions of the atmosphere by means of balloons. This work was spread over a period of five years, and embraced about 30 ascents, the most remarkable of which was also one of the earliest, and was made from Wolverhampton on September 5th, 1862, when a height estimated at about 7 miles was reached, and both Glaisher and his aeronaut, Coxwell, narrowly escaped losing their lives. Subsequently these "free" ascents were supplemented by others, made with a large "captive" balloon at Chelsea.

Thenceforward the subject of aërostation occupied a great deal of Mr. Glaisher's attention. He wrote the article on Aëronautics (23 pp.) in the ninth edition of the *Encyclopædia Britannica*, and besides many smaller contributions to various magazines, he edited English translations of works on the subject by the French writers, M.M. Tissandier and Flammarion.

Space will not allow us to name the subjects dealt with in the 52 works with which he is credited in the Royal Society's catalogue of scientific papers, the latest of which was on the "variation of temperature with altitude in the neighbourhood of the ground" and

appeared in the *Comptes Rendus* of the Paris Academy of Sciences, and in *Nature*, in 1877; but the subjects covered a great deal of ground, chiefly on the statistical and climatological side of meteorology.

Strong both physically and mentally, Mr. Glaisher's was an active life throughout, and he was ever a keen controversialist. Up to the end he maintained his interest in the several learned societies to which he belonged, besides continuing to take an active part in the directorate of more than one public company.

He died on February 7th, 1903, and was buried at Shirley, near Croydon. R.H.C.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on March 18th, at the Institution of Civil Engineers, Great George Street, Westminster, Capt. D. Wilson-Barker, F.R.S.E., President, in the chair.

The following gentlemen were elected Fellows:—Mr. A. E. Abbott, M. L. Teisserenc de Bort, Mr. B. P. Evans and Mr. A. F. Waterhouse.

This was the "popular" meeting of the session, and was very numerously attended by the Fellows and their friends. Mr. C. V. Boys, F.R.S., at the request of the Council, gave a lecture on "The Transmission of Sound through the Atmosphere," which he illustrated by experiments and lantern slides.

The lecturer began by stating that his object was not to give examples of observations of the anomalous manner in which sound sometimes either passes to great distances or fails to pass to moderate distances, but to give some account of the physical causes of such anomalous behaviour. Sound is transmitted as a compression and rarefaction wave in the air. Mr. Boys contrasted the apparent differences in the behaviour of waves of water, sound waves, and light waves, and showed that these were merely an effect of the relative wave lengths and the means of observation. He pointed out the perfection of the behaviour of ripples as compared with larger water waves in obeying the laws of reflection and refraction, and exhibited some beautiful illustrative slides.

Experiments with sound waves of a similar kind require apparatus on the scale of magnitude of houses or hills, unless sound waves too short to be audible are employed. By the aid of a sensitive flame the lecturer showed the absolute obedience to the ordinary laws of radiation of sound waves too short to produce audible effects.

When a sound wave is passing through the air there is an alternate condensation and rarefaction. Even though this may be very small, the variation amounting generally to far less than $\frac{1}{1000}$ of the whole pressure, the air, so compressed, or rarefied, is, to an almost infinitesimal extent, more slowly or more quickly traversable by light, *i.e.*, it is almost infinitesimally more or less refractive to light. This opens up the possibility of seeing and photographing a sound wave. Mr. Boys exhibited photographs of rifle bullets travelling at a speed greater

than that of sound. In such cases there is no time for the air to pass round and get to the other side of the bullet. It is compressed in front, so that a wave like a ship's wave is produced, the limbs travelling outwards with the velocity of sound, while the highly compressed wave in front travels twice or perhaps three times as fast, according to the speed of the bullet By means of the animatograph representations were given of Mr. Ryves' observation of the shadow of the sound of a great explosion, and also of Prof. R. W. Wood's photographs of sound waves.

He concluded by referring to mirage and looming in optics, and stated that the corresponding phenomena in acoustics give rise to abnormal audibility of sound.

On the motion of the chairman a hearty vote of thanks was accorded to Mr. Boys.

IRISH BAROGRAMS OF THE STORM OF FEBRUARY 26TH.

By PROFESSOR C. J. JOLY, *Royal Astronomer for Ireland.*

I HAVE examined about one hundred barograms obtained during the week of the recent storm, culminating on the night of February 26th–27th, which were kindly sent to me from many parts of Ireland, nearly every county being represented. Assuming that the trough of the depression was a straight line and that it moved with uniform velocity across the country, I combined the records so as to get rid of uncertainty in the time as much as possible, and the results of my calculations showed that the trough travelled at the rate of about 47 miles an hour from the south-west, or more exactly from a point 50½ degrees west of south. The data at my disposal hardly warrant any more definite conclusion on account of the uncertainty in the time. This uncertainty is partly due to carelessness in setting the instrument and in taking account of the error in the clock driving the drum, and partly owing to defects in the barograph sheets. I feel sure, from cases that have come under my own observation, that owners of barographs do not always insist on being supplied with sheets made specially for their type of instrument. From this cause an error of an hour or more may occur in parts of the curve. Moreover some sheets appear to be most carelessly manufactured. This may be seen by partially superposing two sheets of the same make so that on looking through them in a strong light the time lines of the first part of the week on one sheet may cover as nearly as possible the time lines of the second part of the week on the other sheet. With well-made sheets the coincidence should be exact, but I have seen sheets in which there is a divergence of nearly half an hour.

In the same way I investigated the depth of the depression, from a well-marked summit immediately preceding the storm, to the lowest point of the curve. I assumed, in the first place, that the curves of equal depression across the country were straight lines, and

that the depression increased uniformly at right angles to these lines. The results showed that this assumption was not strictly accurate though it appears to be a very fair approximation. These lines of equal depression make an angle of about 11 degrees with the line of advance of the trough; in fact, looking along one of these lines towards the east, the direction is about 28½° north of east. I drew these lines for depressions of ·9 in., 1·0 in., 1·1 in., 1·2 in., 1·3 in. and 1·4 in., the distance between neighbouring lines representing about 31 miles, and the means of the observed depressions adjacent to the lines I found to be respectively ·86 in., 1·00 in., 1·12 in., 1·28 in., 1·30 in. and 1.29 in. The divergence is apparent, and the depressions are very large near the fourth line which runs nearly from Galway to Dundalk. The first line runs just south of Cork and Waterford.

Comparison of the shapes of the barograph curves is very interesting but difficult to describe without diagrams. Speaking generally, the first thought on superposition of a shallow and a deep curve is that the latter has simply grown deeper from the former, the upper parts of the curves remaining much the same. There is, however, a multitude of minute characteristics which can be traced from one locality to another, and after a little study it would be quite possible to predict the place from which a curve had been sent. One of the most striking peculiarities consists in the thickening and roughening of the lower parts of the curve caused by vibration of the pen. This seems to indicate rapid alterations in the pressure. It is not much marked on the southern curves with smoothly rounded blunt bends; it becomes very much marked indeed on the sharp curves from the neighbourhood of Dublin and along the line from that place to Ennis, and also on the south east, but curves north of Ennis and of Dublin show hardly a trace of the vibration. They become deeper and the bend consists of a smooth small round curve.

I think it is a pity that more is not done to encourage owners of barographs to keep careful records, for I believe that the barograph would prove to be a most valuable instrument for scientific purposes, if even one-tenth the attention were given to it that the mercurial barometer has received. A thorough discussion of all the available records for a year might lead to very important results, and I hope, even if this laborious task is not undertaken, that some one with more leisure than I have will completely work up the barograms of the recent storm.

[In our last number we gave some particulars of the great damage wrought by the storm, the barograms of which have been collected and discussed in so interesting a manner by Professor Joly. We have now the pleasure of reproducing two striking photographs taken by Mr. Greenwood Pim, of Monkstown, Co. Dublin. They illustrate the fate of many thousand trees in all parts of Ireland; their fall may be viewed as a trace from nature's recording anemometer, the marks of which will not soon be obliterated.—ED. *S.M.M.*]

Photograph by Greenwood Pim, Esq.]
TREES UPROOTED BY THE GALE AT MONKSTOWN, CO. DUBLIN, FEBRUARY 26TH, 1903.

Photograph by Greenwood Pim, Esq.]
TREE UPROOTED BY THE GALE AT GLASNEVIN, BOTANIC GARDENS, FEBRUARY 26TH, 1903.

REVIEWS.

The Meteorology of the Ben Nevis Observatories. Part II, containing the observations for the years 1888, 1889, 1890, 1891 *and* 1892 *with Appendices.* Edited by ALEXANDER BUCHAN, LL.D., F.R.S., and ROBERT TRAIL OMOND. (Forming Vol. **42** of the "Transactions of the Royal Society of Edinburgh.") Edinburgh, 1902. Size 12½ × 9½. Pp. xiv. + 552.

THE high-level observatory on Ben Nevis was opened in 1883, and the hourly readings of the various instruments from December 1st, 1883, to December 31st, 1887, were printed in full in vol. **34** of the *Transactions* of the Royal Society of Edinburgh. The present volume contains the hourly readings for the following five years, 1888-92, and also those for the low-level observatory which was founded as one of the five observatories of the Meteorological Council in 1890. The cost of preparing the volume has been shared by the Royal Societies of London and Edinburgh.

The hourly tables present a mass of honest hard work such as has very rarely been put on record before, for since the severe climatic conditions of the summit of Ben Nevis make it impossible to leave ordinary recording instruments in the open air, every reading at every hour, summer and winter, day and night, has been made by direct personal observation. The difficulties of the task are briefly touched upon in the introduction, and for the most part the records show that these have been bravely and successfully met. One difficulty, however, has not been got over, and that is the measurement of wind-force. A Robinson cup-anemometer is used in summer, but on account of the accumulation of ice-crystals deposited from fog it cannot be employed in winter. So far as we are aware a Dines' anemometer which, we believe, could readily be adapted to the conditions of Ben Nevis, has not been tried, and the strength of the winds has to be estimated without instrumental aid; a serious matter, for the velocity on extreme occasions is stated to exceed 150 miles per hour. The importance of obtaining trustworthy anemometric observations at so great a height is one argument for the continuance of the observatory and the extension of its equipment; indeed, without such observations, a great deal of the most valuable part of the work cannot be fully utilized. It is shown very clearly by Dr. Buchan in the appendix that the readings of the barometer require a large correction during gales; the mercury being depressed as much as one-hundredth of an inch by the suction of the wind at 20 miles an hour blowing past the barometer room; while a wind of 80 miles an hour produces a depression of one-tenth of an inch. As a violent gale may be raging at Ben Nevis, while a calm reigns in Fort William, it is plain that the whole value of the barometric observations depends on determining the wind factor. This is, of course, not a local effect, and a similar correction must doubtless be applied to barometers at sea-level read in windy weather, so that the whole

question of the relation of wind-force to barometric gradient is opened up for discussion.

The numerous papers in the appendix show that solid results have already been obtained; but we deplore the absence of diagrams which are really essential to the clear comprehension of any discussion involving time-changes of phenomena. The scientific world is indebted to the Ben Nevis directors for their splendid enterprise, which has been carried out in a way that is an honour, not only to Scotland, but to the British Empire and to the world at large. The work can be extended and improved at the observatories; it can be discussed for scientific purposes with the certainty of success: and it may very well be that thorough discussion of the records will give to the Observatory a permanent place in weather forecasting, though as yet the way in which this may be done has not been discovered. If the whole series of Ben Nevis observations could be discussed by some competent specialist, who would be relieved from all other work until the task was finished, we believe that the result would justify the expense; and could not a temporary chair of meteorology in the University of Edinburgh be instituted for this purpose by the Carnegie Trust?

Temperature Tables for the British Islands. Supplement. Difference Tables for each five years for the extrapolation of mean values. Size 12 × 10. Pp. viii + 36. Price 3s.

Hourly means of the readings obtained from the self-recording instruments at the five observatories under the Meteorological Council. 1899. Size 12 × 10. Pp. xii. + 240. Price 37s. 6d.

Meteorological Observations at Stations of the Second Order, for the year 1899. *With frontispiece Map.* Size 12 × 10. Pp. xiv. + 182. Price 22s. 6d. Published by Direction of the Meteorological Council. London, 1902.

THE occasional delay in noticing new publications, necessitated by the abundance of other matters of interest pressing on our restricted space, has at least the incidental advantage, that we are sometimes able to notice together several works of kindred aim, or similar origin, as in the case of the three publications of the Meteorological Office named above. The volume to which the first named is a supplement (see this magazine for July, 1902, p. 93) gave the mean monthly values for temperature for 117 stations, but not in all cases for the same period of years. The present publication gives the mean monthly values for the same stations grouped in five-year periods, showing the correction to be applied to bring any period to the mean value for 30 years wherever so long a period exists. As the stations are arranged under the Meteorological Office forecasting divisions, it is easy in cases of shorter records to see, by inspecting the values for neighbouring stations, what correction is required to deduce the 30 years mean from the mean of any five years.

The second volume is a record of the hourly values of the various meteorological elements which are registered automatically at the Meteorological Office observatories at Valencia, Fort William, Aberdeen, Falmouth and Kew. It is in all respects similar to the issues for earlier years, and supplies information which for many purposes is of great value. For other purposes, however, the results as published cannot be utilized. It is natural to wish to compare the duration of sunshine with the duration of rainfall; but the tables only offer a comparison of the duration of sunshine with the intensity of rainfall per hour, when any rain happened to fall in a given hour, and as the rainfall "hour" called 2 is that extending from 1 o'clock to 2 o'clock, while the sunshine hour called 2 is that extending from 1.30 to 2.30, the attempt to utilize these tables even for such a purpose is wholly vain.

The third volume is also on the familiar lines and it permits of the comparison of the 9 a.m. and 9 p.m. observations at 80 stations, the geographical positions of which as shown on the map leave large tracts of country in some places unrepresented, while in others two or even three stations are close together. Where, as in the case of Fort William and Ben Nevis, the adjacent stations differ greatly in their elevation, or exposure, their vicinity of course adds much to the interest of the comparison.

We regret to see the disparity between the dates of observation and publication, and we regret still more to see the high prices placed upon reports which can never, by their sale, pay more than a fraction of the cost of production. If the observers—most of them voluntary and unpaid—whose work is here set forth, receive a copy of the publications in return for their observations the high price may be accepted as a delicate compliment; but the delay in publication would deprive the compliment of much of its value, even if the hypothesis put forward could be accepted.

BOOKS RECEIVED.

County Borough of Bolton. Annual Report of the Museums and Meteorological Observatory for 1902. [By W. W. Midgley.] Bolton, 1903. Size 8½ × 5½. Pp. 20 and table.

U.S. Department of Agriculture. Weather Bureau. Bulletin I. Eclipse Meteorology and allied problems. By Frank H. Bigelow, Professor of Meteorology. Washington, 1902. Size 11½ × 9½. Pp. 166.

Meteorological History of the Seven Monsoon Seasons, 1893-1899, in relation to the Indian Rainfall. By W. L. Dallas. Indian Meteorological Memoirs, Vol. XII. Pp. 409–486.

Meteorological Data of the Wirral Peninsula, Liverpool and District and Southport. By the Rev. J. Cairns Mitchell. [From *Liverpool Flora*, 1902.] Size 8½ × 5½. Pp. 12.

United States Magnetic Declination Tables and Isogonic Charts for 1902. By L. A. Bauer. Washington, 1902. Size 11½ × 7½. Pp. 405. *Plates and illustrations.*

Report on the Meteorology of Margate, 1882-1901. By John Stokes. Margate, 1902. Size 9½ × 6. Pp. 8.

METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

RAINFALL.—EXTREMES.

Months.	MONTHLY TOTALS.					MAXIMUM FALL IN MONTH.					RAINY DAYS.					No. of Falls of 1·00 in. or more in the whole period.
	Mean 40 Years	EXTREMES.				Mean Max. Fall.	EXTREMES.				Mean.	EXTREMES.				
		Highest Month.		Lowest Month.			Highest.		Lowest.			Highest.		Lowest.		
		Depth.	Date.	Depth.	Date.		Depth.	Date.	Depth.	Date.		Days	Date.	Days	Date.	
	in.	in.		in.		in.	in.		in.							
January...	2·02	4·74	1877	·31	1880	·47	1·20	10th, '66	·13	22nd, '92	15·3	25	'77 &' 94	5	1880	4
February..	1·61	3·77	1879	·01	1891	·40	·76	10th, '79	·01	7th. '91	13·3	24	1879	1	1891	0
March.....	1·71	3·69	1862	·32	1893	·43	·95	3rd, '70	·08	12th, '74	13·7	25	1896	5	'58 & '80	0
April ...	1·66	4·97	1878	·24	1893	·51	2·56	10th, '78	·08	4th, 12th, 13th, 14th & 29th, '96	12·1	21	1867	3	1893	2
May	1·92	4·79	1886	·14	1896	·60	1·71	7th, '78	·12	17th, '95 / 21st, '96	12·1	21	1887	3	1896	7
June	2·23	6·71	1878	·30	1895	·70	3·28	23rd, '78	·20	18th, '95	11·6	25	1860	3	1887	10
July	2·39	5·10	1880	·45	1868	·71	1·82	25th, '67	·18	3rd, '64	12·7	26	1888	3	'63 & '68	6
August ...	2·39	6·72	1878	·45	1880	·68	1·71	27th, '92	·14	9th, '86	13·3	26	1860	4	1880	6
September	2·39	5·51	1896	·55	1865	·69	1·66	26th, '59	·17	14th, '91	13·1	27	1866	2	1895	7
October ...	2·71	6·22	1865	·56	1897	·66	1·35	30th, '94	·14	18th, '97	15·2	23	'82 & '86	7	'64 & '88	8
November	2·30	4·65	1861	·53	1858	·58	1·42	13th, '61	·17	27th, '58	14·3	22	1877	4	1867	3
December	2·13	6·25	1876	·36	1864	·54	1·82	26th, '86	·12	19th, '64	15·1	27	1868	8	'64 & '73	2
Year*	25·46	34·08	1878	16·93	1864	1·31	3·28	June 23, 1878	·75	Dec. 2nd, 1896	161·8	204	'60 & '72	106	1858	55

* The values in this line relate to the year as a whole, not to the months.

RAINFALL AND TEMPERATURE, MARCH, 1903.

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)	2·30	+ ·84	·37	2	18	67·9	25	29·9	11*f*	3	14
II.		Tenterden	2·26	+ ·57	·36	2, 17	20	66·0	25	27·0	11	2	12
,,		Hartley Wintney	3·97	+ 2·41	·60	23	22	64·0	25	26·0	11	9	14
III.		Hitchin	3·22	+ 1·78	·65	23	21	66·0	25	29·0	10	7	...
,,		Winslow (Addington)	3·20	+ 1·68	·71	23	19	66·0	25	29·0	11	8	11
IV.		Bury St. Edmunds (Westley)	2·12	+ ·49	·47	23	18	64·0	26	29·0	12	5	...
,,		Norwich (Brundall)	1·73	+ ·12	·33	23	19	64·6	25	28·2	12	4	12
V.		Winterborne Steepleton	4·82	...	·78	5	21	56·4	25	27·5	12	2	10
,,		Torquay	4·24	...	·72	1	23	57·9	22	36·0	11	0	4
,,		Polapit Tamar [Launceston]	5·86	+ 3·58	·48	17*a*	26	58·0	22	32·0	11	1	5
VI.		Stroud (Upfield)	3·86	+ 2·18	·51	1, 26	25	63·0	22	32·0	5	1	...
,,		Church Stretton (Woolstaston)	4 81	+ 3·04	·62	13	26	57·5	24	30·0	2	5	...
,,		Worcester (Diglis Lock)	...	..	...	...	...	...	...	...	...	...	...
VII.		Boston	2·81	+ 1·62	·45	23	16	65·0	25	30·0	6	...	...
,,		Hesley Hall [Tickhill]	2·54	+ 1·14	·60	17	16	58·0	13*b*	30·0	11	4	...
,,		Derby (Midland Railway)	3·43	+ 2·01	·73	17	23	62·0	25	28·0	12	2	...
VIII.		Bolton (The Park)	4·04	+ 1·32	·76	17	25	59·8	22	31·2	2	...	...
IX.		Wetherby (Ribston Hall)	3·50	+ 1·87	·77	17	22	...	...	...	...	...	...
,,		Skipton (Arncliffe Vicarage)	10·69	+ 5·57	1·57	19	29	...	...	...	...	...	...
,,		Hull (Pearson Park)	2·64	+ ·98	·79	17	16	65·0	25	32·0	11	1	16
X.		Newcastle (Town Moor)	1·14	— ·80	·22	20	16	...	...	...	...	...	...
,,		Borrowdale (Seathwaite)	22·23	+11·57	2·09	20	31	55·5	31	31·3	2	1	...
XI.	WALES.	Cardiff (Ely)	5·75	+ 3·19	·65	1	25	...	...	...	...	...	...
,,		Haverfordwest	6·44	+ 3·70	·95	18	24	55·3	21	33·2	10	0	12
,,		Aberystwith (Gogerddan)	6·02	+ 3·18	1·08	13	19	56·0	22*c*	...	...	...	...
,,		Llandudno	4·26	+ 2·32	·78	17	23	59·0	23	33·2	18	0	..
XII.	SCOTLAND.	Cargen [Dumfries]	10·15	+ 7·10	1·22	19	28	55·0	31	32·0	4*g*	4	...
XIII.		Edinburgh (Royal Observatory)	4·10	...	·48	22	26	54·5	22	30·7	15	4	13
XIV.		Colmonell	5·65	+ 2·41	·90	22	23	54·0	22	33·0	9	0	...
XV.		Tighnabruaich	8·62	...	·82	16	30	52·0	31	31·0	7, 13	4	...
,,		Mull (Quinish)	7·77	+ 3·60	·88	8	29	...	...	...	...	...	...
XVI.		Loch Leven Sluices	6·56	+ 3·98	·59	21	26	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	2·40	+ ·42	·30	22	27	55·9	22*d*	28·0	7	6	...
XVII.		Braemar	6·96	+ 4·64	·86	18	27	50·0	21	23·2	7	11	25
,,		Aberdeen (Cranford)	1·92	— ·28	·40	16	24	58·0	23	26·0	6	15	...
,,		Cawdor (Budgate)	3·24	+ 1·00	·51	18	20	...	..	...	...	...	...
XVIII		Strathconan [Beauly]	7·47	+ 3·25	1·13	19	16	...	...	...	...	...	...
,,		Glencarron Lodge	11·45	+ 4·51	1·21	21	29	55·2	21	26·0	2	11	...
XIX.		Dunrobin	2·10	— ·34	·40	19	19	52·0	21	29·0	7	6	...
,,		S. Ronaldshay (Roeberry)	2·03	— ·66	·31	27	25	51·0	25	30·0	1, 2	4	...
XX.	IRELAND.	Darrynane Abbey	6·25	+ 3·13	·90	22	30	...	...	...	...	...	...
,,		Waterford (Brook Lodge)	5·95	+ 3·43	·63	12	28	54·0	31	31·0	8, 10	4	...
,,		Broadford (Hurdlestown)	5·26	+ 3·06	1·00	22	27	59·0	18	30·0	12*h*	4	...
XXI.		Carlow (Browne's Hill)	5·98	+ 3·77	·94	12	30	...	...	...	...	...	...
,,		Dublin (Fitz William Square)	3·62	+ 1·80	·81	12	26	60·7	22	34·1	2	0	4
XXII.		Ballinasloe	6·45	+ 4·03	·98	22	30	55·0	22	19·0	31	17	...
,,		Clifden (Kylemore)	10·10	+ 4·91	1·33	24	25	...	...	...	...	...	...
XXIII		Seaforde	5·29	+ 2·88	·61	19	27	58·0	26	28·0	7*i*	12	12
,,		Londonderry (Creggan Res.)	5·11	+ 2·42	·80	16	28	...	...	...	...	...	...
,,		Omagh (Edenfel)	7·03	+ 4·45	1·06	23	27	54·0	21*e*	28·0	1	8	15

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

a and 23, 26. *b* and 20, 21, 26. *c* and 24. *d* and 31. *e* and 25. *f* and 12. *g* and 7, 10, 14. *h* and 13. *i* and 8, 23.

SUPPLEMENTARY RAINFALL, MARCH, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	3·52	XI.	Llandefaelog-fach.....	6·61
II.	Dorking, Abinger Hall .	3·39	,,	New Radnor, Ednol.....	7·97
,,	Sheppey, Leysdown	1·52	,,	Rhayader, Nantgwillt...	12·49
,,	Hailsham	2·69	,,	Lake Vyrnwy	...
,,	Crowborough.....	3·66	,,	Ruthin, Plâs Dráw	5·73
,,	Ryde, Beldornie Tower..	2·70	,,	Criccieth, Talarvor	4·76
,,	Bournemouth, Kempsey	3·31	,,	I. of Anglesey, Lligwy..	5·71
,,	Emsworth, Redlands ...	2·83	,,	Douglas, Woodville.....	3·90
,,	Alton, Ashdell.....	5·12	XII.	Stoneykirk, Ardwell Ho.	4·00
,,	Newbury, Welford Park	4·49	,,	Dalry, Old Garroch	13·35
III.	Oxford, Magdalen Coll..	2·77	,,	Moniaive, Maxwelton Ho.	11·66
,,	Banbury, Bloxham	3·40	,,	Lilliesleaf, Riddell	5·03
,,	Pitsford, Sedgebrook ...	3·20	XIII.	N. Esk Res. [Penicuick]	6·75
,,	Huntingdon, Brampton.	2·48	XIV.	Dalry, Blair	6·56
,,	Wisbech, Bank House...	2·25	,,	Glasgow, Queen's Park..	7·96
IV.	Southend	1·36	XV.	Inveraray, Newtown ...	11·20
,,	Colchester, Lexden	1·32	,,	Ballachulish, Ardsheal...	13·54
,,	Saffron Waldon, Newport	2·34	,,	Campbeltown, Redknowe	5·24
,,	Rendlesham Hall	1·64	,,	Islay, Eallabus..... ...	6·15
,,	Swaffham	2·30	XVI.	Dollar.....	5·11
V.	Salisbury, Alderbury ...	4·51	,,	Balquhidder, Stronvar...	18·31
,,	Bishop's Cannings	3·72	,,	Coupar Angus Station...	3·91
,,	Ashburton, Druid House	8·72	,,	Blair Atholl	7·02
,,	Okehampton, Oaklands.	6·05	,,	Montrose, Sunnyside ...	3·19
,,	Hartland Abbey	5·54	XVII.	Alford, Lynturk Manse..	1·69
,,	Lynmouth, Rock House	7·30	,,	Keith H.R.S.....	1·07
,,	Probus, Lamellyn	5·23	XVIII.	Fearn, Lower Pitkerrie..	2·52
,,	Wellington, The Avenue	4·28	,,	S. Uist, Askernish	5·96
,,	North Cadbury Rectory	3·54	,,	Invergarry.....	15·94
VI.	Clifton, Pembroke Road	4·44	,,	Aviemore, Alvie Manse.	4·11
,,	Ross, The Graig	3·34	,,	Loch Ness, Drumnadrochit	6·69
,,	Shifnal, Hatton Grange	4·22	XIX.	Invershin	2·69
,,	Wem, Clive Vicarage ...	3·98	,,	Bettyhill	2·23
,,	Cheadle, The Heath Ho.	4·52	,,	Watten H.R.S.....	...
,,	Coventry, Kingswood ...	4·33	XX.	Cork, Wellesley Terrace	5·45
VII.	Market Overton	3·20	,,	Killarney, District Asyl.	12·87
,,	Grantham, Stainby	2·17	,,	Glenam [Clonmel]	7·50
,,	Horncastle, Bucknall ...	3·23	,,	Ballingarry, Hazelfort...	5·33
,,	Worksop, Hodsck Priory	2·58	,,	Miltown Malbay	7·99
VIII.	Neston, Hinderton	3·58	XXI.	Gorey, Courtown House	4·79
,,	Southport, Hesketh Park	2·96	,,	Moynalty, Westland ...	5·64
,,	Chatburn, Middlewood.	5·90	,,	Athlone, Twyford	5·15
,,	Duddon Val., Seathwaite Vic.	10·92	,,	Mullingar, Belvedere ...	6·16
IX.	Langsett Moor, Up. Midhope	6·56	XXII.	Woodlawn	6·48
,,	Baldersby	3·13	,,	Westport, Murrisk Abbey	7·97
,,	Scalby, Silverdale	2·12	,,	Crossmolina, Enniscoe ..	9·55
,,	Ingleby Greenhow Vic..	2·89	,,	Collooney, Markree Obs.	6·84
,,	Middleton, Mickleton ...	3·91	XXIII.	Enniskillen, Portora ...	6·25
X.	Beltingham	3·65	,,	Warrenpoint.....	5·54
,,	Bamburgh	1·29	,,	Banbridge, Milltown ...	3·87
,,	Keswick, The Bank.....	12·98	,,	Belfast, Springfield	4·77
,,	Melmerby Rectory	4·47	,,	Bushmills, Dundarave..	4·26
XI.	Llanfrechfa Grange	6·39	,,	Stewartstown	4·52
,,	Treherbert, Tyn-y-waun	15·84	,,	Killybegs	7·82
,,	Castle Malgwyn	7·94	,,	Horn Head	6·28

METEOROLOGICAL NOTES ON MARCH, 1903.

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.—Generally unsettled and showery, with fine intervals. Remarkably mild. (See p. 43.)

TENTERDEN.—A warm month. Early foliage and blossom were abnormally forward. Duration of sunshine 154·5 hours. TS in S.E. on evening of 26th.

SHEPPEY, LEYSDOWN.—Almost incessant strong winds and gales from S. and S.W. At 7 p.m. on 25th, the shade temp. was 64°. L on 23rd, 24th and 25th.

CROWBOROUGH. — Very wet, R 1·26 in. above the average of 27 years. Mean temp. 43°·8, and ground frost on 11th and 12th only. Much sun and more than usual strong wind. H on 7th, 16th and 30th.

EMSWORTH, REDLANDS.—Continual gales. The 25th, a very warm day, wound up with a short TS. T and L on 1st and 25th and L on 26th.

HITCHIN.—An extraordinary month for temp. The mean on 25th, 55°, was the highest ever recorded. The mean for the month, 44°·1, was the highest except 1893, 44°·8, and a singular contrast to 1883, with 32°·9.

WINSLOW, ADDINGTON.—R very much above average, and, with one exception, 3·60 in. in 1876, the greatest since 1871. Vegetation very forward.

PITSFORD, SEDGEBROOK.—Remarkable for excessive R, high temp. and strong winds. R 1·50 in. above the average of 10 years. Mean temp. 45°·1.

NORWICH, BRUNDALL.—Mean temp. 45°·6, being higher than any March since 1882. Vegetation very forward. Much L in evening on 25th.

TORQUAY, CARY GREEN.—R 1·71 in. above the average. Duration of sunshine 133·1 hours, or 6·6 hours below the average. Mean temp. 47°·7, or 3°·8 above the average. Mean amount of ozone 6·3; max. 8·5 on several days, min. 3·5 on 11th, with W. wind.

LYNMOUTH, ROCK HOUSE.—Mild throughout, with strong winds from S.W. or W., and no frost. H on 4 days. T and L on 31st.

WELLINGTON.—One of the stormiest and wettest Marches for many years.

NORTH CADBURY RECTORY.—The windiest month ever experienced, with only two quiet days. All this wind blew from S.—W., mostly S.S.W., with extraordinary pertinacity and vehemence. Though R was frequent, the roads kept dry, but the fields soaking, making seeding most difficult. High temp., especially at night, with small range. Vegetation very forward.

CLIFTON, PEMBROKE ROAD.—Very wet, with no settled weather. R nearly double the average, and the greatest since 1889. H on 1st and 6th.

ROSS, THE GRAIG.—A record month. No frost in screen, and only three frosts since January 18th. R 1¾ times the average and number of rainy days in excess of any previous March. Mean temp. 46°·0. The mean max., 51°·9, has been frequently exceeded, but the mean min., 40°·2, is the highest since at least 1859, and probably much longer. Frequent heavy gales from S.W. and W. Vegetation the earliest remembered.

BOLTON, THE PARK.—Mild, changeable and windy. Vegetation was fully a month ahead of the average at the end. The distance travelled by the wind exceeded the average by 36 per cent. Mean temp. 42°·7, or 3°·3 above the average. Duration of sunshine 51 hours 50 minutes, or 28 hours below the average. Two inches of S, the heaviest of the season, fell on 2nd, and a smaller fall on 17th. H on 28th and 30th.

ARNCLIFFE VICARAGE.—January, February and March were the wettest three months ever known in this district.

HULL, PEARSON PARK.—Wind generally S.W., and at times strong, but on the whole warm. S on 2nd and 3rd; L on 25th; TS on 26th.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE.—Unusually wet and stormy, with the heaviest R in March since observations began in 1865, the nearest approach being 6·03 in. in 1873. T, L and H on 26th.

HAVERFORDWEST.—Gales 1st and 2nd, and from 17th to 25th. Almost entire absence of frost. Blackthorn in bloom on 22nd; vegetation forward, but farm work impeded by the continual wet. Duration of sunshine 77·5 hours.

DOUGLAS, WOODVILLE.—March, like January and February (but worse), was wet, very rough and stormy, no consecutive 24 hours being calm, and very sunless. Probably the worst and stormiest three months within general memory. Although mild, there was little sign of spring at the end, the direct effect of the wind.

SCOTLAND.

CARGEN [DUMFRIES].—Nothing like the R of this month has been experienced since observations were commenced, the nearest being 5·91 in. in 1897. The fall for the first three months of the year is 22·09 in., a figure not reached till September 3rd of last year. Farm work is terribly backward, not a seed sown and much land unfit for horse labour. Vegetation, on the other hand, is unusually forward. Strong S.W. winds prevailed.

MONIAIVE, MAXWELTON HOUSE.—Very wet and stormy. R on 31 days and 8·22 in. above the average. The fall for the last three months was 26·59 in., or 15·46 in. above the average. All low ground was constantly flooded and farming operations were stopped.

LILLIESLEAF, RIDDELL.—Very remarkable for frequency and quantity of R, and for continuous high wind. In 39 years there has been nothing like it, and the previous highest was 3·72 in. in 1897. The temp. was much higher than usual. The hedges and young larches came out before the middle of the month, in sheltered places. Ploughing was checked for every field was a bog.

DALRY, BLAIR.—Not one day without R, making 41 rainy days in succession.

TIGHNABRUAICH. — Only one day on which R did not fall, and since January 1st R has been excessive, the total being 24·94 in. Many gales and frequent sheet L.

BALLACHULISH, ARDSHEAL.—R 7·75 in. above the average. A heavier monthly fall has only twice been recorded. Continued gales from 18th to 29th, preceded by T and L on 17th.

COUPAR ANGUS.—Absence of morning frosts and of bright sunny days. High mean temp., and R almost double the average. Mean temp. 40°·9.

BLAIR ATHOLL.—High temp., and the most excessive R for 25 years.

DRUMNADROCHIT.—As in February, R was the second largest for the last 17 years, more than double the average. The fall for the first three months of 1903 was 21·14 in., or 11·94 in. above the average. Extensive and serious flooding of low lands accompanied by the bursting of river banks and injury to roads.

S. RONALDSHAY, ROEBERRY.—Very unsettled and windy. Several severe gales from S.W. and W., from which direction it blew with very few exceptions, the entire month. Mean temp. 40°·5, or 1°·5 above the average.

IRELAND.

CORK, WELLESLEY TERRACE.—The greatest R for 25 years, except 1897 with 5·57 in. Mean temp. 40°·6. The R of the first three months of the year was 6·99 in. over the average.

MILTOWN MALBAY.—The most inclement, wet and stormy March in memory, with heavy H, T and sheet L. No agricultural work could be done.

WATERFORD, BROOK LODGE.—Very wild and wet, being the wettest March for over 50 years. Mean temp. 44°·2.

BROADFORD, HURDLESTOWN.—The wettest March on record.

CARLOW, BROWNE'S HILL.—The R exceeded that of any March since the record was commenced in 1866.

DUBLIN, FITZWILLIAM SQUARE. — Stormy, blustering, rainy and open. Though the mean temp., 45°·6, was 2°·0 above the average, it was 1°·9 below the mean of February, 1903. R very frequent and often heavy. The wind reached gale-force on 11 days. S or sleet on 4 days and H 4 days.

BALLINASLOE.—The worst March for 32 years. Constant R and heavy storms.

OMAGH, EDENFEL.—R was by far the heaviest in March in 38 years, the next being 4·47 in 1868.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCTOBER, 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	66·2	10	32·7	19	57·2	44·7	46·3	87	102·9	29·3	1·46	17	7·5
Malta	82 9	11	55·2	27	76·0	65·2	62·6	80	136·1	50·9	6·35	9	4·7
Lagos, W. Africa	88·1	12	70·1	2,3	84·5	75·0	74·6	80	148·0	...	3·30	10	...
Cape Town	83·8	8	48·7	18	70·9	54·8	52·9	70	...	...	4·72	8	4·2
Durban, Natal	91·2	13	51·3	5	77·6	59·8	...	...	144·4	...	2·23	17	5·9
Mauritius	85·8	17	61·0	23	82·4	66·9	63·8	71	151·4	53·0	1·94	9	5·6
Calcutta	93·0	12	69·6	26	88·4	74·0	71·7	74	155·9	65·9	2·78	4	4·1
Bombay	92·9	28	74·2	14	89·6	78·9	75·7	77	142·5	69·8	·78	5	4·0
Madras	92·7	18	68·6	20	87·9	73·9	73·5	83	147·7	65·2	20·69	18	5·3
Kodaikanal	67·5	1	45·7	21	62·4	51·1	52·3	89	145·0	37·2	16·85	21	6·8
Colombo, Ceylon	90·7	1	72·7	25*a*	86·5	74·1	73·4	85	152·0	71·0	31·47	29	7·3
Hongkong	86·3	3	65·4	31	81·1	73·3	66·3	70	142·1	...	·94	4	3·6
Melbourne	82·5	2	39·0	16	67·0	49·0	47·6	75	144·1	31·0	·76	7	6·0
Adelaide	95·0	21	42·9	11	74·2	53·7	46·4	56	151·3	39·8	1·77	14	5·0
Coolgardie	94·0	12	40·3	2	77·4	50·7	...	...	165·3	33·4	3·09	5	3·6
Sydney	81·1	10	50·4	17	69·4	57·4	...	73	121·4	44·7	10·81	16	5·6
Wellington	65·0	14*a*	35·0	3	59·0	43·8	42·8	74	119·0	28·0	3·06	13	5·6
Auckland	68·0	31	41·0	6	60·0	48·9	44·1	68	132·0	38·0	2·74	16	6·0
Jamaica, Negril Point	88·6	17	76·1	29	86 7	72·8	75·3	80	...	...	5·58	17	...
Trinidad	93·0	31	69·0	sevl	87·9	70·3	76·1	92	169·0	66·0	7·40	12	...
Grenada	88·0	6	71·4	21	84·5	74·6	72·4	77	160·0	...	5·63	15	2·8
Toronto	68·1	19	26·4	30	57·3	39·9	42·8	79	88·0	20·4	2·78	11	6·0
Fredericton, N.B.	70·0	2	18·9	24	55·4	35·7	33·8	59	...	...	4·99	8	5·7
Winnipeg	72·0	5	14·0	9	53·3	30·5	...	...	...	...	1·23	7	5·4
Victoria, B.C.	70·4	3	38·7	19	57·9	46·9	48·1	86	...	...	1·09	13	6·3
Dawson	68·0	1	7·8	22	35·8	23·8	...	...	...	...	·92	7	4·3

a—and 28.

MALTA.—Mean temp. of air 69°·3, or 0°·2, below average. Mean hourly velocity of wind 10·6 miles or 1·8 above average. Mean temp. of sea 73°·5. TS8 on 3 days, J. F. DOBSON.

Mauritius.—Mean temp. of air 1·3 above, of dew point 1°·6 above, rainfall ·36 in. above, and mean hourly velocity of wind 0·4 mile below, average. T. F. CLAXTON.

MADRAS.—Sunshine 138·7 hours, or 38·0 per cent. of possible amount.—A. MOFFAT.

COLOMBO.—Mean temp. of air 0°·9 above, of dew point 0°·5 above, and R 17·44 in. above, average. Mean hourly velocity of wind 5·2 miles, TS8 on 14 days. H. O. BARNARD.

HONGKONG.—Mean temp. 76°·7. Bright sunshine 234·7, or 20 hours above average. R 4·42 in. below average of 39 years. Mean hourly velocity of wind 14·1 miles; prevailing direction E. F. G. FIGG.

Adelaide.—Mean temp. 64°·0, or 2°·0 above average. Fair average rains in the agricultural districts, but no relief from drought in the interior. C. TODD, F.R.S.

Coolgardie.—Mean temp. 1·3 in. below average. R in excess of average. W. ERNEST COOKE.

Sydney.—Mean temp. 0°·1 below, humidity 4°·9 above, and R 7·85 in. above, average. H. C. RUSSELL, F.R.S.

Wellington.—Mean temp. 2°·2 below, and R 1·31 in. below, average. A. H. GORE.

Auckland.—Mean temp. quite 3°·0 below the average of 33 years. T. F. CHEESEMAN.

Trinidad.—R ·63 in. above the 40 years' average. J. H. HART.

SYMONS'S
METEOROLOGICAL MAGAZINE.

No. CCCCXLVIII.] MAY, 1903. VOL. XXXVIII.

METEOROLOGY ON THE BRITISH ANTARCTIC EXPEDITION NEAR MOUNT EREBUS.

THE relief ship "Morning" succeeded in communicating with the "Discovery" and bringing home a full account of the most important Antarctic voyage which has yet been made. After a cruise along the edge of the great ice barrier in the southern summer of 1901–02 the "Discovery" went into winter quarters in a sheltered position 21 miles from Mount Erebus in latitude 77° 49′ S., longitude 166° E., and here the winter was passed farther south than men had ever wintered before. During the Antarctic summer of 1902–03 sledging expeditions went out in various directions, and Captain Scott, the leader of the expedition, with Dr. Wilson and Lieutenant Shackleton, succeeded in reaching 82° 17′ S. along a newly-discovered coast line, thus getting 207 nautical miles beyond the farthest south previously attained. The "Discovery" remained fast in the ice when the "Morning" left.

We have received letters from the captain, officers, and scientific staff describing their experiences and giving a preliminary account of their results. While the interest is on the whole mainly geographical, the letter (dated 16th February, 1903) from Lieutenant Charles Royds, R.N., who is in charge of the meteorological observations on board, will be welcome to our readers as giving new and thoroughly trustworthy information about the Antarctic climate. We publish the subjoined extracts with the approval of Captain Scott and Sir Clements Markham :—

"We are in a good southern latitude for observations, and without doubt are much influenced by the ice barrier. Actually in our winter quarters we are protected and sheltered by hills from N. through E. to S.S.E., and our temperatures are accordingly higher than those recorded clear of the land. The winds, on the other hand, which always blow from the E. and S.E., often have a force of 4 to 5 Beaufort at the ship, while a mile clear of the land there are only light airs or a calm. Our gales during the winter began from the E., working round to S. and S.W., when it blew its hardest, and gradually working back to E. The barometer gave absolutely no warning of gales during the winter, but during the summer the barometer generally falls for a blow. Northerly winds seem most prevalent during the summer months, and I do not think they were ever recorded in winter.

"Mount Erebus has been most useful for recording the direction of the upper air-currents, and the trend of the smoke from the crater was always logged when seen. The upper winds appear to be usually south-westerly or westerly.

"The auroral displays were not very brilliant, but although I have not really gone into the question, I believe we generally got a blow after a more than usually bright aurora.

"During the winter the wet bulb never worked, and always read some degrees higher than the dry; but once the temperature got above zero it was all right. During the winter I made some experiments for humidity by weighing a dish of water (ice) daily, and got some pleasing results which may prove useful when taken in conjunction with the readings of the hair hygrograph. All recording instruments are most troublesome, as they get choked up during blizzards. The Dines anemometers, small and recording patterns, have been at work; but when it is snowing or drifting much the vanes have to be cleared two-hourly. The recording instruments always got choked in the highest wind, so that no record was obtained above 50 miles an hour; but 65 to 70 miles an hour has been indicated here by the Robinson anemometer, which once showed 90 miles an hour off Coulman Island in a howling gale. The sunshine recorder has worked excellently, and we have about two dozen 24-hourly records.

"It was impossible to measure the snow-fall, for in the southerly blizzards we could not say whether snow was falling or only drifting, and the gauges were absolutely useless. These blizzards are pretty specimens of what pranks Nature can play, and Heaven protect the man who gets more than a couple of yards away from the shelter of the ship unless he has something to guide him, as the air is a mass of whirling drift (or snow) and you absolutely can see nothing, and unless you can keep your head (as you cannot help keeping cool!) you soon find that you are lost.

"According to my calculations, which are rough and from the uncorrected temperatures, our daily mean for the year is about zero Fahrenheit. Even as early as March I got a temperature of $-42°$ on the barrier while doing an autumn journey, and the lowest recorded by the thermometer $1\frac{1}{2}$ miles away from the ship was $-62°$ in August, while on board at the same time it was $-50°{\cdot}5$. The highest readings were 39° in December, 1902, and January, 1903, and $41°{\cdot}5$ in January, 1902. The range of temperature between the monthly maximum and minimum varies from about 30° in summer to about 60° in winter. It is a very remarkable thing that during our southerly blizzards in mid-winter the temperature invariably rose sometimes to $+19°$ F., and then fell again to $-30°$ or under as soon as the wind returned to the eastward.

"During the sledge journeys observations were made every two hours to compare with those at the ship, and I think these should prove very valuable."

Mr. Royds sends the following table of mean and extreme temperatures at winter quarters for January, 1903, and February to December, 1902 :—

Temp.	Jan.	Feb	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Mean..	24·9	15·8	7·3	— 7·5	—12·9	—16·4	— 8·6	—17·2	—13·2	— 9·0	12·2	23.4	— 0·1
Max....	39·0	29·2	27·5	19·5	19·0	13·0	15·0	6·0	15·0	11·8	27·8	39·0	39·0
Min..	8·0	— 0·8	—13·2	—31·6	—39·5	—47·0	—38·0	—50·5	—44·5	—41·8	0·0	4·2	—50·5

The yearly mean of the uncorrected barometer was 29·228 inches, the highest monthly mean 29·542 in November, the highest reading 30·088; the lowest monthly mean was 28·762 in August, and the lowest reading 28·096.

The high temperature of the southerly wind blowing straight from the Pole at mid-winter must not be taken as an indication of a warmer climate farther south. It is probably a Föhn effect due to the thermo-dynamic heating of air descending from the summits of the great mountain ranges which were seen to the south. Similar phenomena have, however, been observed in the Arctic regions, especially during the drift of the "Fram," when there were no mountains near, and it may be that a descending rush of air is brought about near the Poles by some other agency.

Correspondence.

THE TEMPERATURE OF APRIL, 1903.

To the Editor of Symons's Meteorological Magazine.

The cold weather of April, 1903, though unusual, is not unprecedented even in recent years. The average minimum temperature here for fourteen consecutive nights has been, in 1903, April 13th–26th (inclusive) 29·4, while in 1892 for the ten days ending April 19th, the average minimum was only 26·4; in the latter period the lowest minima were 20·2 and 21·7 on the 19th and 14th respectively; while in 1903 the lowest were 26·6 and 26·7 on the 19th and 18th. In 1891 also the average temperature of the whole month was 40·4 against 41·8 in 1903.

The really unusual feature about the past month is that it was colder than *both* February and March. I have examined the published records for Edinburgh, London, and Paris, from which it appears that we have to go back to 1809 for a similar instance, in which year April was colder than both the preceding months in London and Paris, but not in Edinburgh. In the year 1790 also London and Edinburgh show the same feature, the Paris records not extending so far back.

I may note also that the rainfall here in March this year was the largest since 1881, 7·89 in., or more than double the average.

CHARLES L. BROOK.

Harewood Lodge, Meltham, 3rd May, 1903.

THE FORMATION OF CUMULUS CLOUD.

To the Editor of Symons's Meteorological Magazine.

I suppose no one doubts that a cumulus cloud is formed by an upward current of air, but when experimenting with a kite on April 29th I had a plain proof of the fact. A kite was left flying at the end of 2700 feet of wire, and flew at an angle of about 40°. A large and well-defined cumulus cloud then passed over, and the angular elevation of the kite increased rapidly until it reached the high value of 74°; an angle exceeding 70° being maintained for quite ten minutes while the cloud was overhead. The wind was blowing from south-south-west at a rate of, perhaps, 18 miles per hour, judged by the pull upon the wire, and was very uniform up to a height of 2500 feet. In such a wind the ordinary angle of the kite with 2700 feet of wire would be rather over 45°, so that we must suppose that the wind at a height of 2500 feet was inclined upwards at an angle of nearly 30°. This would give an upward component to the air of from 12 to 15 feet per second. A few heavy drops of rain fell from the cloud, and a fairly heavy shower seemed to be falling from it when it had passed a few miles away to the north. Its lower surface was above 2550 feet high, how much above I cannot say, as it was not reached by the kite. The temperature at the ground level was 57° F., at 2550 feet it was 43° F.

Oxshott, April 30th, 1903. W. H. DINES.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Easter Wednesday, April 15th, at the Institution of Civil Engineers, Great George Street, Westminster. Capt. D. Wilson-Barker, F.R.S.E., President, in the chair.

Mr. J. R. Sutton, M.A., was elected a Fellow of the Society.

Mr. F. J. Brodie read a paper on "The prevalence of gales on the coasts of the British Islands during the thirty years, 1871-1900," being a continuation of a paper on the same subject which he communicated to the Society last year. The average annual numbers of gales were: West coasts, 29·6; north coasts, 25·7; south coasts, 19·1; and east coasts, 15·6. The most stormy years were: West coasts, 1877 with 41 gales; north coasts, 1877 with 40 gales; south coasts, 1883 with 34 gales; and east coasts, 1877 and 1883 both with 26 gales. On the west coasts the actual maximum of gale prevalence occurs at two different times in the year, once in the five-day period, November 12th–16th, and again in the periods December 27th–31st, and January 1st-5th. On the north coasts the maximum prevalence occurs in the five-day period January 21st–25th, secondary maxima being shown in the early parts both of that month and of December. On the south coasts the actual maximum occurs in the five-day period November 7th–11th, but subsidiary maxima of almost equal intensity are recorded at precisely the same time in December and in the period January 21st–25th. On the east coasts the maximum frequency is very pro-

nounced, and occurs in the five-day period November 7th–11th, the succeeding five days being, however, almost as stormy.

Dr. R. H. Scott said that he was glad to find that Mr. Brodie's figures proved that the old idea of equinoctial gales was groundless, and that they did not exist as a constant occurrence.

Mr. C. Harding referred to the relationship between barometric pressure and wind, and said that it did not necessarily follow that the stormiest month had the isobaric lines lying most closely together; but generally in the month when storms were most frequent the variations and range of pressure were very marked.

Mr. W. H. Dines said that from his experience with kite-flying he had found that inland it was often blowing very hard at 2000 feet elevation when it was nearly calm at the surface, but that this rule did not hold when kites were flown from a vessel over the sea. Inland the isobars gave a perfectly reliable estimate of the wind force at an elevation of 1000 to 2000 feet, but they only gave a rough approximation to the wind force at the surface; it seemed likely, therefore, that winds blowing from the land would be much lighter on the coast than they would be 20 miles or so out at sea.

The President, Mr. F. C. Bayard, and Mr. R. H. Curtis also took part in the discussion, and Mr. F. J. Brodie briefly replied.

A paper by Mr. J. Baxendell on "The Duration of Rainfall" was read by the Secretary. The author referred to various patterns of self-recording raingauges and pointed out their defects and advantages, and also stated that it is hardly possible to determine from some of them the rate at which rain falls, especially in very small quantities. The records of a Halliwell self-recording raingauge, which had been in operation at Southport during 1902 gave the total rainfall for the year as 25·42 inches, and the duration 640·1 hours. The author showed that the hourly duration values give a striking curve of diurnal variation, the early morning maximum being most pronounced; the afternoon maximum is also present, but is much less protracted and of far less amplitude than the former. Minima occur about mid-day and in the evening. Mr. Baxendell concluded his paper by giving a description of the improved gauge referred to.

Mr. R. H. Curtis exhibited diagrams showing the mean hourly amounts of rain recorded by the Beckley self-recording raingauge at Valencia, Aberdeen, Falmouth, and Kew.

Mr. Baldwin Latham said he would like to see self-recording raingauges placed all over the country. Last year at Croydon the average hourly rate of rainfall was small, being only ·039 inch, but the number of hours (539·3) was considerable.

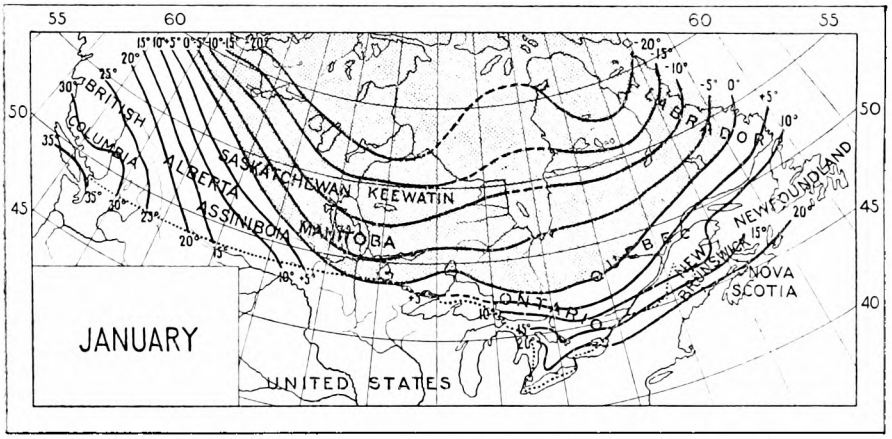
Mr. J. Hopkinson said that the peculiarity at Southport last year of the small total rainfall but great number of days of rain would probably be found to have been general over England. It was similar to that experienced in Hertfordshire, where the number of rainy days was excessive in comparison with the amount of rainfall, which was much below the average. Both "total" and "partial" droughts were absent, and the little rain which did fall was so frequent and continuous as to give a general impression that it was a wet year.

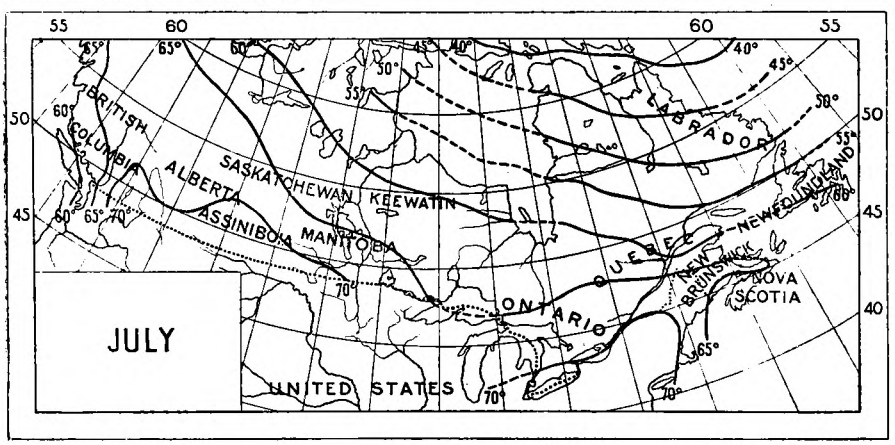
THE CANADIAN CLIMATE.

By R. F. STUPART, Director Meteorological Service, Dominion of Canada.

(*Concluded from p. 33.*)

THE following maps and tables indicate the observed temperatures, uncorrected for height above the sea, at representative stations in all parts of the Dominion of Canada.





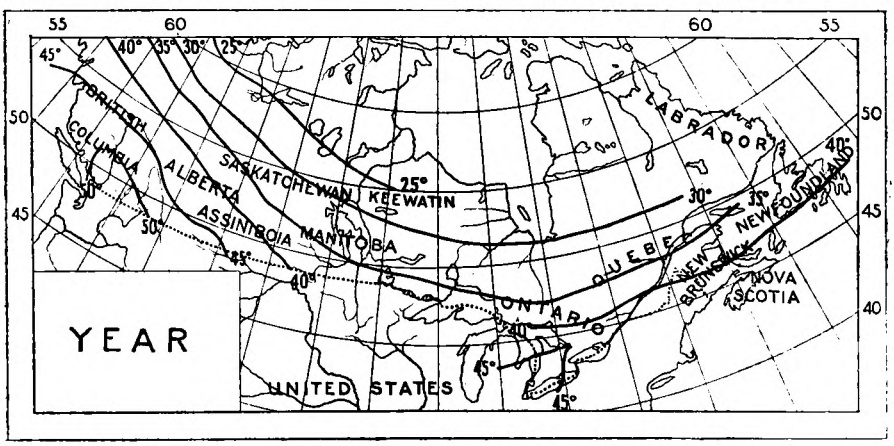


TABLE I.—*The Average Mean Highest, Mean Lowest and Mean Temperature; the Highest and Lowest Temperature and Mean Daily Range; also Percentage of Cloud and Precipitation in inches at various stations in Canada.*

Temperatures not reduced to sea-level. Mean temp. is taken as $\frac{\text{Max.}+\text{Min.}}{2}$

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	YEAR.
VICTORIA, B.C. ....(16 years)													
Lat. 48° 24′ N.; Long. 123° 19′ W. Height 85 ft.													
Mean Highest	41·9	44·1	48·9	54·9	61·6	65·5	70·9	69·2	63·8	55·8	48·3	45·5	70 9
,, Lowest	33·1	34·1	36·1	39·4	44·2	47·8	49·6	49·8	46·1	43·7	38·8	37·0	33·1
,, Temperature	37·5	39·1	42·5	47·2	52·9	56·6	60·3	59·5	55·0	49·7	43·6	41·3	48·8
,, Daily Range	8·8	10·0	12·8	15·5	17·4	17·7	21·3	19·4	17·7	12·1	9·5	8·5	...
Absolute Highest.....	56	60	68	75	83	86	90	88	85	70	63	59	90
,, Lowest	-1	6	17	29	31	36	37	37	30	22	17	8	-1
Per cent. of Cloud	78	75	67	65	61	60	42	42	53	67	79	79	64
Precipitation (Rain and Melted Snow)	5·28	4·03	2·92	2·42	1·44	1·20	0·40	0·60	2·16	2·37	6·97	7·98	37·77
KAMLOOPS, B.C. ..... (12 years)													
Lat. 50° 41′ N.; Long. 120° 29′ W. Height 1193 ft.													
Mean Highest	30·7	33·7	46·9	60·5	70·2	75·6	81·8	82·1	69·5	56·8	40·0	35·3	82·1
,, Lowest	17·7	18·5	27·6	37·6	45·9	51·3	54·8	54·9	46·1	39·1	28·3	24·9	17·7
,, Temperature	24·2	26·1	37·2	49·0	58·0	63·5	68·3	68·5	57·8	48·0	34·2	30·1	47·1
,, Daily Range	13·0	15·2	19·3	22·9	24·3	24·3	27·0	27·2	23·4	17·7	11·7	10·4	...
Absolute Highest.....	56	64	69	78	100	101	101	101	87	82	65	56	101
,, Lowest	-27	-27	-5	25	26	39	44	39	31	16	-22	-16	-27
Per cent. of Cloud	69	69	51	56	58	56	48	50	46	58	65	70	58
Precipitation.....	0·86	0·79	0·51	0·37	1·11	1·42	1·61	1·09	0·85	0·61	1·46	0·78	11·16

TABLE I.—(*continued.*)

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	YEAR.
CALGARY, N.W.T. ..... (18 years) Lat. 51° 2′ N.; Long. 114° 2′ W. Height 3389 ft.													
Mean Highest	21·9	24·3	35·9	52·6	63·6	68·9	74·9	73·7	63·7	54·9	35·9	30·1	74·9
,, Lowest	0·0	1·8	12·4	26·7	35·7	42·4	46·5	44·9	36·8	28·1	13·9	10·8	0·0
,, Temperature	11·0	13·0	24·2	39·6	49·7	55·6	60·7	59·3	50·3	41·5	24·9	20·5	37·5
,, Daily Range	21·9	22·5	23·5	25·9	27·9	26·5	28·4	28·8	26·9	26·8	22·0	19·3	...
Absolute Highest.....	58	59	75	77	90	94	95	95	89	85	70	58	95
,, Lowest	-40	-49	-34	-14	12	26	31	30	17	-8	-31	-39	-49
Per cent. of Cloud	41	48	48	51	53	49	43	37	44	41	42	47	45
Precipitation.....	0·52	0·66	0·75	0·67	1·78	2·45	2·68	2·14	1·36	0·48	0·88	0·59	14·96
WINNIPEG, MANITOBA...(22 years) Lat. 49° 53′; Long. 97° 7′. Height 760 ft.													
Mean Highest	3·6	12·0	24·3	47·0	64·2	74·9	78·1	75·8	64·1	49·5	26·9	14·1	78·1
,, Lowest	-17·8	-13·0	0·4	24·6	38·6	49·9	53·4	50·2	40·6	28·6	8·7	-5·9	-17·8
,, Temperature	- 7·1	- 0·5	12·3	35·8	51·4	62·4	65·7	63·0	52·3	39·0	17·8	4·1	33·0
,, Daily Range	21·4	25·0	23·9	22·4	25·6	25·0	24·7	25·6	23·5	20·9	18·2	20·0	23·0
Absolute Highest.....	40	46	62	90	95	96	96	98	94	86	64	45	98
,, Lowest	-48	-46	-38	-14	15	21	36	30	19	-3	-34	-53	-53
Per cent. of Cloud	52	50	48	50	51	49	45	45	53	63	63	57	52
Precipitation.....	0·86	0·97	1·00	1·59	2·21	3·29	3·08	2·67	2·03	1·70	1·08	0·91	21·39
TORONTO ..... (60 years) Lat. 43° 40′; Long. 79° 24′ W. Height 350 ft.													
Mean Highest	28·9	29·6	35·6	48·9	61·3	72·0	77·4	75·6	67·5	54·1	42·0	32·2	77·4
,, Lowest	14·9	14·5	21·4	32·8	42·9	52·7	57·9	57·0	49·9	38·7	29·9	19·6	14·5
,, Temperature	21·9	22·0	28·5	40·8	52·1	62·4	67·6	66·3	58·7	46·4	36·0	25·9	44·1
,, Daily Range	14·0	15·1	14·2	16·1	18·4	19·3	19·5	18·6	17·6	15·4	12·1	12·6	...
Absolute Highest.....	58	54	70	90	93	93	98	99	94	81	67	61	99
,, Lowest	-26	-25	-16	6	25	28	39	40	28	16	-5	-21	-26
Per cent. of Cloud	74	69	63	58	57	52	50	50	50	62	75	76	61
Precipitation.....	2·90	2·58	2·67	2·42	3·06	2·88	2·99	2·87	3·27	...	...	...	...

TABLE I.—(*continued.*)

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	YEAR.
MONTREAL ..... (24 years) Lat. 45° 30′ N.; Long. 73° 35′ W. Height 187 ft.													
Mean Highest	20·7	23·4	30·7	49·0	64·0	73·7	77·4	75·1	66·5	52·9	38·7	26·2	77·4
,, Lowest	4·4	7·4	16·9	32·8	45·8	56·4	60·8	58·9	50·8	34·0	26·6	12·1	4·4
,, Temperature	12·3	15·6	24·3	40·6	54·7	65·0	68·9	66·8	58·5	46·0	31·7	19·2	42·0
,, Daily Range	16·3	16·0	13·8	16·2	18·2	17·3	16·6	16·2	15·7	13·9	12·1	14·1	...
Absolute Highest.....	52	50	57	77	92	98	94	90	91	78	68	59	98
,, Lowest	-26	-24	-15	8	25	38	46	45	33	22	-1	-21	-26
Per cent. of Cloud	61	59	56	53	58	53	52	53	49	59	72	66	58
Precipitation.....	3·73	3·07	3·79	2·24	2·95	3·53	4·29	3·57	3·30	3·13	3·74	3·65	40·99
FREDERICTON, N.B...... ..(24 years) Lat. 45° 57′; Long. 66° 36′. Height 164 ft.													
Mean Highest	23·3	26·3	35·2	48·9	63·2	72·2	75·9	73·6	65·5	52·3	41·7	27·3	75·9
,, Lowest	2·8	3·9	16·0	28·1	39·9	49·1	54·4	53·5	44·9	34·4	24·9	9·0	2·8
,, Temperature	11·8	15·8	25·4	37·9	51·1	60·6	66·0	64·1	56·2	44·1	32·0	18·6	40·3
,, Daily Range	20·5	22·4	19·2	20·8	23·3	23·1	21·5	20·1	20·6	17·9	16·8	18·3	...
Absolute Highest.....	52	51	65	77	92	97	96	95	88	82	64	58	97
,, Lowest	-34	-30	-27	4	24	32	38	39	25	15	-16	-31	-34
Per cent. of Cloud	52	55	52	53	58	55	51	53	55	55	64	54	55
Precipitation.....	2·43	3·76	4·12	2·59	4·23	3·64	3·79	4·18	3·21	3·93	4·21	3·62	43·71
CHARLOTTETOWN, P.E.I. (24 years) Lat. 46° 14′; Long. 63° 10′. Height 38 ft.													
Mean Highest	24·0	25·3	31·3	41·4	54·8	66·4	71·6	72·2	63·7	52·8	40·1	29·8	72·2
,, Lowest	6·2	7·0	16·0	27·4	37·7	49·0	56·2	57·1	49·7	40·2	28·3	15·9	6·2
,, Temperature	15·1	16·1	23·7	34·4	46·3	57·7	63·9	64·7	56·7	46·5	34·2	22·9	40·2
,, Daily Range	17·8	18·3	15·3	14·0	17·1	17·4	15·4	15·1	14·0	12·6	11·8	13·9	...
Absolute Highest.....	50	47	53	68	79	85	88	88	82	74	63	52	88
,, Lowest	-27	-17	-14	2	26	36	42	44	34	26	1	-18	-27
Per cent. of Cloud	61	58	64	57	57	58	53	59	52	70	71	71	61
Precipitation.....	4·06	3·25	3·09	2·61	3·06	2·60	3·43	3·96	3·35	4·65	3·74	3·98	41·78

TABLE I.—*(continued.)*

HALIFAX, NOVA SCOTIA (24 years) Lat. 44° 39 N.: Long. 63° 36′ W. Height 97 ft.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	YEAR.
Mean Highest	30·9	31·6	36·5	46·6	58·4	68·2	73·9	74·3	67·6	56·2	44·2	34·3	74·3
,, Lowest	13·1	13·9	20·8	29·9	38·9	47·0	54·4	55·4	48·8	39·8	32·2	19·7	13·1
,, Temperature	22·0	22·7	28·7	38·2	48·7	57·6	64·2	64·8	58·2	48·0	38·2	27·0	43·2
,, Daily Range	17·8	17·7	15·7	16·7	19·5	21·2	19·5	18·9	18·8	16·4	12·0	14·6	...
Absolute Highest	55	50	55	76	88	93	93	93	85	80	65	55	93
,, Lowest	-16	-17	-9	7	24	33	41	42	32	23	4	-11	-17
Per cent. of Cloud	61	59	64	61	62	61	58	57	53	54	64	64	60
Precipitation	5·63	4·94	5·15	4·00	4·43	3·68	3·43	3·96	3·53	5·21	5·26	5·52	54·74

TABLE II.—*Percentage of Bright Sunshine at Thirteen Stations in the Dominion* (100 *being constant sunshine*).

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	YEAR.
Victoria, British Columbia	20	23	38	39	41	41	56	55	44	35	20	15	36
Agassiz, ,, ,,	18	19	25	24	31	33	46	45	31	28	17	13	28
Battleford, North West Territories	32	39	49	52	49	54	58	54	49	56	31	27	46
Indian Head ,, ,,	30	34	37	38	46	47	55	49	42	34	24	24	38
Brandon, Manitoba	40	46	44	44	47	56	56	55	49	36	40	36	46
Winnipeg, ,,	42	47	51	50	54	56	57	59	47	36	34	36	47
Woodstock, Ontario	21	29	31	43	54	53	58	55	49	39	25	20	40
Barrie, ,,	19	28	38	45	44	51	56	56	48	34	19	16	38
Toronto, ,,	27	36	43	50	50	56	60	59	58	42	28	23	44
Lindsay, ,,	24	35	44	51	47	55	57	55	53	38	25	21	42
Kingston, ,,	27	36	44	49	47	54	58	57	51	41	27	26	43
Montreal, Quebec	33	42	46	51	51	55	59	58	54	42	28	27	45
Fredericton, New Brunswick	40	44	42	46	45	47	50	50	48	43	32	31	43

REVIEW.

London Fog Inquiry, 1901-02. *Report to Meteorological Council, by* Captain ALFRED CARPENTER, R.N., D.S.O. London: Printed for H.M. Stationery Office, 1903. Size 12 × 10. Pp. 28. Plates.

THE London County Council, after receiving Captain Carpenter's report on the Fog Inquiry, has, we regret to say, resolved to discontinue the subsidy which had made it possible to carry on systematic observations during the winter of 1901-02. This is unfortunate, because the first season's work with a body mainly composed of inexperienced observers is necessarily largely a matter of organizing and training a staff, which in a second season would be much more efficient, and immediate results which would enable fogs to be predicted with unerring precision could not be expected.

There were 46 places of observation at parks, fire brigade, police, and coastguard stations in all parts of London and the immediate surroundings, but they were not all at work until January 5th, 1902. Three varieties of fog were noted: (1) thin fog or mist, which slightly hinders traffic by river and rail but not by road; (2) moderately thick fog which hinders all traffic and makes it impossible to discern a man by day more than 100 yards away; and (3) dense fog which stops all traffic on the river and makes it very slow by road or rail, while in the daytime an object cannot be distinguished across the street. In addition to this, darkness due to high fog, but not interfering with lights at the street level was also taken into account. Special observations were made at considerable heights on the top of the dome of St. Paul's and on the Victoria Tower of the Palace of Westminster.

It was found that light fogs were so frequent that they could be considered to be permanent features of London in winter, and so they are left out of account as far as regards frequency. Regent's Park and Kingsland Road, N., had fog on 59 days between 15th December and 14th March; Bermondsey came next with 42 days; Camberwell, Clerkenwell, and Regent Street had 26 days; Southwark, Poplar, and the Isle of Dogs had from 13 to 10 days; and Dulwich had the distinction of having only one. Fogs were least frequent on Mondays (87 occasions), and most frequent on Fridays (163 occasions), and the hours of greatest density were from 6 a.m. to noon. The density of fog was not found to diminish appreciably with height above the ground, and the appearance of fog was very often simultaneous over the area, while in no case did fog drift up the estuary into London. Fogs never appeared in cyclonic conditions, but 33 out of 52 observed cases were formed during anticyclonic weather. No severe fogs occurred when the air temperature was above 40°.

The result of the inquiry is to satisfy Captain Carpenter that something might be done to predict fogs if the records of thermographs in all parts of London could be compared, and readings obtained from thermometers suspended over London from balloons.

RAINFALL AND TEMPERATURE, APRIL, 1903.

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) ...	2·14	+ ·62	·44	26*a*	13	61·1	29	27·8	18	9	17
II.		Tenterden	2·20	+ ·43	1·05	26	13	60·0	30	26·0	17	8	14
,,		Hartley Wintney	1·81	+ ·17	·55	28	12	59·0	28*c*	25·0	19*e*	17	19
III.		Hitchin	1·55	+ ·03	·33	28	14	58·0	29	26·0	17*f*	12	...
,,		Winslow (Addington)	1·48	— ·08	·40	28	12	60·0	25	23·0	19	12	16
IV.		Bury St. Edmunds (Westley)	1·96	+ ·43	·30	1	15	60·0	28	26·0	16*g*	...	...
,,		Norwich (Brundall)	2·52	+ 1·01	·35	1	22	60·0	29*b*	28·6	20	7	16
V.		Winterborne Steepleton	4·31	...	1·14	25	11	56·2	8	25·0	18	10	18
,,		Torquay	1·34	...	·33	29*b*	9	57·8	11	32·0	17	1	8
,,		Polapit Tamar [Launceston]..	2·23	+ ·07	·53	30	16	57·1	9	23·8	18	8	9
VI.		Stroud (Upfield)	2·30	+ ·46	·80	28	13	60·0	28*d*	29·0	13*h*	7	...
,,		Church Stretton (Woolstaston)	1·47	— ·41	·60	28	13	62·5	28	21·0	18	9	...
,,		Worcester (Diglis Lock)	1·78	+ ·35	·56	28	13	...	...	...	...	...	...
VII.		Boston	1·74	+ ·36	·44	30	12	61·0	28	25·0	16	10	...
,,		Hesley Hall [Tickhill].....	1·29	— ·05	·54	30	12	60·0	28	26·0	23	12	...
,,		Derby (Midland Railway).....	1·90	+ ·35	·60	30	15	61·0	30	27·0	18*i*	11	...
VIII.		Bolton (The Park).....	2·30	+ ·11	·43	3, 14	17	56·2	28	27·3	18	9	...
IX.		Wetherby (Ribston Hall) ...	1·43	— ·31	·30	30	14	...	...	...	...	...	...
,,		Arncliffe Vicarage.....	3·26	— ·10	1·20	3	15	...	...	...	...	...	...
,,		Hull (Pearson Park).....	1·99	+ ·40	·42	30	17	60·0	28	26·0	13	11	18
X.		Newcastle (Town Moor)	1·44	— ·22	·40	14	15	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	4·81	— 1·53	2·00	3	17	56·3	8, 28	25·4	18	9	...
XI.	WALES.	Cardiff (Ely).....	2·32	+ ·14	·84	25	15	...	...	...	...	...	...
,,		Haverfordwest	2·91	+ ·49	1·10	25	14	59·3	10	27·3	18	7	13
,,		Aberystwith (Gogerddan) ...	2·99	+ ·42	·75	25	12	65·0	28	20·0	15*j*	13	...
,,		Llandudno.....	1·28	— ·50	·36	30	12	56·0	10*d*	31·0	18	1	...
XII.		Cargen [Dumfries]	1·53	— ·80	·83	29	6	58·0	8	24·0	18	14	...
XIII.		Edinburgh (Royal Observatory)	1·06	...	·29	29	14	54·0	8	26·5	15	10	18
XIV.		Colmonell	1·10	— 1·07	·45	3	7	60·0	30	25·0	23	10	...
XV.		Tighnabruaich	2·48	...	·83	3	12	57·0	30	28·0	12*k*	9	...
,,		Mull (Quinish).....	2·35	— ·44	·72	3	17	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·29	— ·70	·36	28*b*	8	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·00	— ·54	·45	27	11	58·9	8	28·1	17	14	...
XVII.		Braemar	2·29	+ ·20	·51	27	22	53·8	30	23·0	24	18	24
,,		Aberdeen (Cranford)	2·14	+ ·30	·21	14	24	58·0	6	28·0	16*h*	13	...
,,		Cawdor (Budgate)	1·40	— ·17	·23	11	20	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	...	...	...	...	...	...	...	...	...	...	...
,,		Glencarron Lodge.....	7·14	+ 2·48	1·06	5	18	57·9	25	22·6	16	14	...
XIX.		Dunrobin	2·69	+ ·92	·50	6	18	59·0	9	30·0	14*g*	8	...
,,		S. Ronaldshay (Roeberry) ...	2·45	+ ·53	·29	20	22	51·0	30	25·0	16	11	...
XX.	IRELAND.	Darrynane Abbey.....	2·14	— 1·36	·42	25	17	...	...	32·0	13	1	...
,,		Waterford (Brook Lodge) ...	1·40	— 1·22	·62	28	11	59·0	8	26·0	14	7	...
,,		Broadford (Hurdlestown) ...	1·84	— 0·24	·61	28	17	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	1·87	— ·42	·46	25	12	...	...	...	...	...	...
,,		Dublin (Fitz William Square)	1·05	— ·92	·34	25	17	61·1	6	29·9	17	4	7
XXII.		Ballinasloe	1·44	— ·85	·23	3	18	62·0	30	25·0	17	12	...
,,		Clifden (Kylemore)	3·44	— 1·83	·66	5	12	...	...	...	...	...	...
XXIII		Seaforde.....	1·37	— 1·06	·35	14	14	64·0	27	25·0	17	14	16
,,		Londonderry (Creggan Res.).	2·14	— ·32	·47	14	19	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·40	+ ·04	·45	14	17	59·0	30	26·0	17	9	13

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

a and 28. *b* and 30. *c* and 29. *d* and 29, 30. *e* and 20. *f* and 22. *g* and 18. *h* and 17. *i* and 19, 20. *j* and 16, 17, 18, 19. *k* and 14.

SUPPLEMENTARY RAINFALL, APRIL, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	2·28	XI.	Llandefaelog-fach.....	2·24
II.	Dorking, Abinger Hall .	2·60	,,	New Radnor, Ednol.....	2·91
,,	Sheppey, Leysdown	1·74	,,	Rhayader, Nantgwillt ...	2·69
,,	Hailsham	1·98	,,	Lake Vyrnwy	2·22
,,	Crowborough.....	2·81	,,	Ruthin, Plâs Dráw	1·85
,,	Ryde, Beldornie Tower..	2·44	,,	Criccieth, Talarvor	2·05
,,	Bournemouth, Kempsey	3·00	,,	I. of Anglesey, Lligwy..	1·75
,,	Emsworth, Redlands ...	2·72	,,	Douglas, Woodville.....	1·83
,,	Alton, Ashdell	2·54	XII.	Stoneykirk, Ardwell Ho.	1·28
,,	Newbury, Welford Park	3·06	,,	Dalry, Old Garroch	2·32
III.	Oxford, Magdalen Coll..	2·13	,,	Moniaive, Maxwelton Ho.	1·33
,,	Banbury, Bloxham	1·96	,,	Lilliesleaf, Riddell	1·57
,,	Pitsford, Sedgebrook ...	1·76	XIII.	N. Esk Res. [Penicuick]	1·50
,,	Huntingdon, Brampton.	1·35	XIV.	Dalry, Blair	2·30
,,	Wisbech, Bank House...	1·50	,,	Glasgow, Queen's Park..	1·34
IV.	Southend	1·74	XV.	Inveraray, Newtown ...	3·24
,,	Colchester, Lexden	1·88	,,	Ballachulish, Ardsheal...	3·13
,,	Saffron Waldon, Newport	1·74	,,	Campbeltown, Redknowe	1·77
,,	Rendlesham Hall	2·01	,,	Islay, Eallabus.....	2·37
,,	Swaffham	1·92	XVI.	Dollar.....	1·12
V.	Salisbury, Alderbury ...	2·65	,,	Balquhidder, Stronvar...	1·91
,,	Bishop's Cannings	3·23	,,	Coupar Angus Station...	1·31
,,	Ashburton, Druid House	2·22	,,	Blair Atholl	1·11
,,	Okehampton, Oaklands.	1·99	,,	Montrose, Sunnyside ...	1·38
,,	Hartland Abbey	1·80	XVII.	Alford, Lynturk Manse..	3·22
,,	Lynmouth, Rock House	1·84	,,	Keith H.R.S.....	3·08
,,	Probus, Lamellyn	1·91	XVIII.	Fearn, Lower Pitkerrie..	1·98
,,	Wellington, The Avenue	2·16	,,	S. Uist, Askernish	1·62
,,	North Cadbury Rectory	3·57	,,	Invergarry.....	2·39
VI.	Clifton, Pembroke Road	3·25	,,	Aviemore, Alvie Manse.	1·75
,,	Ross, The Graig	2·31	,,	Loch Ness, Drumnadrochit	1·65
,,	Shifnal, Hatton Grange	1·37	XIX.	Invershin	4·07
,,	Wem, Clive Vicarage ...	...	,,	Bettyhill	2·88
,,	Cheadle, The Heath Ho.	2·09	,,	Watten H.R.S.....	2·32
,,	Coventry, Kingswood ...	1·62	XX.	Cork, Wellesley Terrace	1·82
VII.	Market Overton	1·86	,,	Killarney, District Asyl.	2·19
,,	Grantham, Stainby	1·98	,,	Glenam [Clonmel]	1·78
,,	Horncastle, Bucknall ...	1·35	,,	Ballingarry, Hazelfort...	1·56
,,	Worksop, Hodsck Priory	1·12	,,	Miltown Malbay	2·31
VIII.	Neston, Hinderton	1·71	XXI.	Gorey, Courtown House	1·08
,,	Southport, Hesketh Park	1·78	,,	Moynalty, Westland ...	1·55
,,	Chatburn, Middlewood.	2·93	,,	Athlone, Twyford	1·28
,,	Duddon Val., Seathwaite Vic.	3·16	,,	Mullingar, Belvedere ...	1·96
IX.	Langsett Moor, Up. Midhope	2·30	XXII.	Woodlawn	1·68
,,	Baldersby	1·11	,,	Westport, Murrisk Abbey	2·01
,,	Scalby, Silverdale	2·78	,,	Crossmolina, Enniscoe ..	2·43
,,	Ingleby Greenhow Vic..	1·82	,,	Collooney, Markree Obs.	2·27
,,	Middleton, Mickleton ...	1·54	XXIII.	Enniskillen, Portora ...	1·65
X.	Beltingham	1·84	,,	Warrenpoint.....	1·61
,,	Bamburgh	1·50	,,	Banbridge, Milltown ...	·88
,,	Keswick, The Bank.....	1·48	,,	Belfast, Springfield	1·82
,,	Melmerby Rectory	1·33	,,	Bushmills, Dundarave..	1·82
XI.	Llanfrechfa Grange	2·17	,,	Stewartstown	1·32
,,	Treherbert, Tyn-y-waun	3·79	,,	Killybegs	4·09
,,	Castle Malgwyn	2·44	,,	Horn Head	2·36

METEOROLOGICAL NOTES ON APRIL, 1903.

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.—Changeable and unsettled, with a period of dry but cold weather in the middle. S falling on 4 days. The mean temp. was 45°·2, or 2°·9 below the average. This was 1°·2 below the mean temp. of March, 1903, and only 0°·1 above that of February.

TENTERDEN.—The middle of the month was very cold and dry, with strong N. winds. S on 16th and ice over ¼ inch thick on 17th. Sunshine 165 hours.

CROWBOROUGH.—The chief feature was the unseasonable cold period which lasted from 12th to 25th, with mean temp. of 39°·7.

HARTLEY WINTNEY.—The period of cold weather from 9th to 26th, with N. wind, grass frost each night and occasional showers of sleet, has never been equalled. Ozone on 25 days with a mean of 5·0.

PITSFORD, SEDGEBROOK.—Very cold with bitter northerly winds during the day time and sharp frosts at night. Fruit much damaged. S on 12th and 13th.

COLCHESTER, LEXDEN.—Cold till 25th especially from 11th to 21st, when N. wind prevailed with occasional S, seriously checking the forward vegetation.

WINTERBORNE STEEPLETON.—Mean temp. 2°·9 below the average of 10 years, and less than in any year in that period. The R was greater than in any April except 1897.

TORQUAY, CARY GREEN.—R 1·07 in. below the average. Mean temp. 47°·1, or 0°·8 below the average. Duration of sunshine 180·6 hours, or 0·4 hours above the average. Mean amount of ozone 5·2; max. 8·5 on 5th with W.S.W. wind; min. 3·0 on 28th with S.S.W. wind.

WELLINGTON, THE AVENUE.—Very low temp., especially from about 12th to 24th, with 8 night frosts in the screen, the same number as in January.

NORTH CADBURY RECTORY.—The coldest April in 7 years after the warmest March. In spite of 5 warm nights at the end, the average min. in shade and on grass was lower than any of the winter months.

CLIFTON, PEMBROKE ROAD.—Mostly dry and cold, with frequent night frosts till 25th, when a change occurred, with 34 hours R. Remainder mild and rainy; 3·00 in. of R fell in the last 6 days.

ROSS, THE GRAIG.—Another extraordinary month, just the reverse of last. The first 11 days, except 3rd, were warm and fine. Vegetation very forward. From 12th to 25th every day was below the average temp. with severe frosts. No such April remembered except 1837 and possibly 1847.

BOLTON, THE PARK.—Cold period from 9th to 19th, but by no means without precedent. Mean temp. 41°·1, or 3°·1 below the average. Duration of sunshine 125¼ hours, on 24 days, being 14½ hours above the average.

HULL, PEARSON PARK.—Very unsettled, with heavy showers. Frequently very cold and unpleasant. H on 6 days. An inch and a half of S on 16th.

WALES AND THE ISLANDS.

HAVERFORDWEST.—From 11th to 24th the weather was very severe, the unequalled cold spell being preceded and followed by wet mild weather.

DOUGLAS, WOODVILLE.—The beginning was very cold and unseasonable with biting N.W. and W. winds and gales, such as characterised the preceding months. From 11th to 19th was intensely cold with frost and S. Easter Monday had a temp. 10° below that of Boxing Day. Vegetation backward.

SCOTLAND.

CARGEN [DUMFRIES].—The mean temp., 42°·2, although only slightly below that of 43 years, was lower than that of the two preceding months. Notwithstanding the previous heavy R the neighbourhood suffered severely from the

dry weather, until the end of the month. Frost between 20th and 25th with cold winds and considerable sunshine, caused great destruction among early vegetables. T and L on 30th.

LILLIESLEAF, RIDDELL.—From 11th to 26th N.E. wind prevailed, with night frosts, doing a little damage to fruit. Very heavy TS on 30th at about 3 p.m., for half an hour, with ·18 in. of R.

TIGHNABRUAICH.—April, if dry, was cold and wintry. On 14th there was 2½ inches of S, succeeded for several days by sharp frost, doing considerable damage to fruit blossom and garden plants.

COUPAR ANGUS.—The first month since October with deficient R, the total being ·39 in. below the average. A long spell of low temp. from 11th to 26th had a mean nearly 5°·0 below the average for April.

LYNTURK MANSE.—S fell on 11 days.

DRUMNADROCHIT.—The dull and wet first half coming after the heavy R of the previous three months, kept the ground water-logged, and spring operations have rarely been so far behind.

IRELAND.

CORK, WELLESLEY TERRACE.—R 1·06 in. below the average, but for the past 4 months an excess of 5·79 in. Mean temp. was the lowest in April for 20 years.

DUBLIN, FITZWILLIAM SQUARE.—Mean temp. 45°·9, or 1°·7 below the average, and only 0°·3 warmer than March. Polar winds predominated. Mean temp. for the week 12th to 18th, was 39°·5. High winds occurred on 7 days, reaching the force of a gale on 7th only. Fog on 4 days. L on 30th.

BELFAST, SPRINGFIELD.—Warm and pleasant, except for brief S and H showers from 12th to 14th. Distinctly a boon to farmers.

OMAGH, EDENFEL.—Although the R was but little over the average, the saturation of the soil from the extraordinary R of the first quarter continued to delay farming operations, and the unusual cold of the middle week seriously checked vegetation. Better conditions, however, prevailed at the close. Martins appeared on 10th and swallows on 19th, but did not remain.

THE FOUR MONTHS' RAINFALL OF 1903.

Aggregate Rainfall for January—April, 1903.

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	+1·26	120	Arncliffe	+13·23	167	Braemar	+10·79	211
Tenterden	+ ·84	112	Hull	+ ·74	111	Aberdeen	+2·34	126
Hartley Wintney	+2·95	144	Newcastle	— ·41	94	Cawdor	+4·56	157
Hitchin	+2·19	136	Seathwaite	+22·45	151	Glencarron	+16·83	157
Winslow	+1·59	125	Cardiff	+5·04	145	Dunrobin	+2·56	128
Westley	— ·13	98	Haverfordwest	+5·43	141	Darrynane	+1·95	112
Brundall	— ·04	99	Gogerddan	+5·10	140	Waterford	+4·57	140
Alderbury	+3·43	143	Llandudno	+5·26	164	Broadford	+4·85	150
Ashburton	+5·61	134	Dumfries	+10·00	173	Carlow	+5·61	155
Polapit Tamar	+5·45	153	Lilliesleaf	+7·26	184	Dublin	+2·29	129
Stroud	+3·31	143	Colmonell	+3·59	126	Mullingar	+8·62	183
Woolstaston	+3·10	138	Glasgow	+13·22	226	Ballinasloe	+6·48	161
Boston	+1·08	120	Inveraray	+12·84	155	Clifden	+5·67	123
Hesley Hall	+ ·90	116	Islay	+6·81	149	Crossmolina	+8·59	152
Derby	+2·46	141	Mull	+7·15	141	Seaforde	+3·91	135
Bolton	+2·99	129	Loch Leven	+11·36	207	Londonderry	+3·97	135
Wetherby	+2·87	144	Dundee	+2·37	129	Omagh	+8·57	178

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOVEMBER, 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	59·3	6	26·7	21	50·0	40·0	41·7	91	83·6	22·2	1·80	11	6·9
Malta	78·0	2	47·8	24	67·2	55·5	53·0	78	124·5	41·9	7·02	10	3·5
Lagos, W. Africa	90·1	18*a*	75·1	var.	86·5	77·5	75·2	77	148·0	...	·16	1	...
Cape Town	89·7	23	47·7	18	70·3	53·0	51·1	67	...	...	·85	7	3·6
Durban, Natal	92·3	20	57·1	11	79·6	62·2	...	...	143·3	...	5·15	19	6·3
Mauritius	89·9	20	59·3	4	86·4	67·7	65·6	69	152·7	51·8	1·32	7	5·3
Calcutta	88·1	3	56·9	26	82·5	63·4	62·2	69	152·9	51·2	·05	1	1·4
Bombay	91·4	8	72·6	30	88·6	75·8	68·6	66	139·8	61·9	·01	1	1·8
Madras	88·9	7	69·6	12	84·2	74·0	72·1	83	139·0	66·8	10·51	17	6·0
Kodaikanal	67·1	24	47·2	30	61·5	50·5	51·6	89	135·2	36·4	9·38	16	6·5
Colombo, Ceylon	90·7	28	71·5	6	87·4	74·0	73·2	83	152·0	70·2	20·10	24	7·4
Hongkong	80·1	21	62·8	25	75·9	67·6	63·0	74	131·6	...	5·40	13	5·5
Melbourne	101·4	25	45·0	29	76·8	53·7	49·5	59	155·2	35·8	·98	7	5·8
Adelaide	101·8	3	47·5	21	83·6	59·7	49·1	45	159·3	42·5	·56	6	4·1
Coolgardie	106·2	23	46·2	27	84·1	55·2	...	...	171·6	...	·97	3	3·1
Sydney	95·0	7	56·8	1	76·4	63·0	58·6	67	139·0	47·0	2·80	18	5·4
Wellington	69·0	7, 9	38·0	25	61·6	47·6	46·1	74	129·0	30·0	2·96	15	6·3
Auckland	72·5	23	48·0	5	64·4	52·2	44·7	60	136·0	45·0	·88	12	5·2
Jamaica, Negril Point	90·4	17	68·3	24	86·5	71·7	71·6	78	...	...	2·22	6	...
Trinidad	93·0	29*b*	68·0	22*c*	88·9	71·1	76·3	88	162·0	66·0	2·74	11	...
Grenada	87·6	7	72·0	19	84·0	74·8	71·7	76	155·0	...	7·85	22	2·6
Toronto	65·1	12	16·2	29	50·3	35·5	39·1	82	78·2	11·2	1·70	12	7·1
Fredericton, N.B.	56·8	2	13·8	26	43·6	26·4	26·8	65	...	...	1·64	8	6·7
Winnipeg	57·0	2	— 7·0	26	35·3	16·7	...	...	...	...	1·02	5	6·4
Victoria, B.C.	54·9	10	33·4	29	48·1	41·1	41·0	88	...	...	6·15	24	8·2
Dawson	20·4	1	—48·0	28	—0·9	—11·2	...	...	...	...	1·10	4	4·4

a—and 20, 21. *b*—and 30. *c*—and 28.

MALTA.—Mean temp. of air 60°·4, or 1°·9, below average. Mean hourly velocity of wind 9·5 miles or 0·1 above average. Mean temp. of sea 66°·4. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·3, dew point 1°·5 above, and rainfall ·57 in., and mean hourly velocity of wind 1·8 miles below, averages. L and T on 25th. T. F. CLAXTON.

MADRAS.—Sunshine 107·3 hours, or 31·2 per cent. of possible. R. D. JONES.

KODAIKANAL.—Mean temp. of air 54°·6. Sunshine 73·9 hours. *pro* C. MICHIE SMITH.

COLOMBO.—Mean temp. of air 79°·9 or 0°·1 above, of dew point 0°·9 above, and R 7·33 in. above, averages. Mean hourly velocity of wind 5·7 miles; prevailing direction N., N.E. and N.W. TS8 on 24 days, causing numerous casualties. In one case several persons were knocked down by a return flash. Close to the spot where they were standing a small fissure over 6 feet deep and very narrow was found, the ground having been disturbed all round in a circle 10 inches in diameter and 9 inches deep. H. O. BARNARD.

HONGKONG.—Mean temp. 71°·5 or 2°·3 above, sunshine 150·8 or 45 hours below, R 4·23 in. above, their respective averages. Mean hourly velocity of wind 11·4 miles; prevailing direction E.N.E. F. G. FIGG.

Adelaide.—Mean temp. 71°·6; highest on record for November in 46 years, being 4°·5 above average. R ·42 in. below average. C. TODD, F.R.S.

Auckland.—Mean temp. 2° below the average and R not one-third of the average. An unusually cool and dry November. T. F. CHEESEMAN.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCXLIX.] JUNE, 1903. VOL. XXXVIII.

METEOROLOGICAL EXHIBITION AT SOUTHPORT.

WE have pleasure in calling the attention of our readers to the following circular which has recently been issued, and to which it is hoped there will be a hearty response.

METEOROLOGICAL OFFICE, S.W., *May 19th*, 1903.

DEAR SIR,—In connection with the meeting of the International Meteorological Committee, at Southport, during the session of the British Association in September next, it is proposed to make arrangements for an Exhibition of Meteorological appliances and other objects of Meteorological interest.

Upon the initiative of the Meteorological Council, with the co-operation of the Royal Meteorological Society and the Scottish Meteorological Society, who have appointed representative members, a Committee has been formed to carry out this proposal.

In order to divide the work of collection and organisation it is proposed to group the exhibits into four classes; those who are willing to co-operate are requested to communicate at once with the gentlemen named below, who have kindly undertaken to receive, on behalf of the Committee, intimations and suggestions as to objects of meteorological interest proposed for exhibition.

A. Meteorological Statistics Dr. H. R. Mill, 62, Camden Square, N.W.

B. Weather Telegraphy ... Mr. W. N. Shaw, 63, Victoria Street, S.W.

C. Atmospheric Physics ... Capt. Wilson-Barker, H.M.S. Worcester, Greenhithe, Kent.

including (*a*) Meteorological Photography; (*b*) Instruments, and Instrumental records; (*c*) High Level Stations, Balloons and Kites; observations and records; (*d*) Experimental illustrations.

D. The relation of Meteorology to other branches of Physics Mr. A. R. Hinks, The Observatory, Cambridge.

The opportunities for a gathering of the meteorologists of other countries in the United Kingdom have been comparatively rare. The committee invite workers in meteorology and allied branches of physics to co-operate on this occasion in the formation of an Exhibition which shall adequately represent the position of this country with regard to the prosecution of those sciences.

The Meteorological Council have sanctioned a proposal to have a selection of the official telegraphic reports repeated daily to Southport during the meeting, to be charted and dealt with by a member of the staff of the Office in connection with the Exhibition.

I am, dear sir, yours faithfully, W. N. SHAW.

Correspondence.

THE THUNDERSTORMS OF MAY 30TH AND 31ST.

To the Editor of Symons's Meteorological Magazine.

PERHAPS some few particulars of the violent storms that occurred here last Saturday will be welcome. When I got back from London, at 3.30 p.m., and was in this road, I noticed thunder clouds (cumulo-nimbus) to the N.W., N.E. and S.W. of this house. The N.W. storm seemed to pass away, but the N.E. and S.W. storms seemed to coalesce just over this house. The rain, and hail, and lightning began at 4.10 p.m., the thunder having been heard since 3.30 p.m. At 4.26 p.m. there was a terrific flash of lightning, followed instantly by a violent peal of thunder. This flash, it afterwards appeared, struck two houses in this road, doing damage to the roofs and chimney, and also one in the Manor Road, close by, breaking a window and burning the frame, and doing damage to a chimney. From 4.10 to 5.10 the rain and hail came down in torrents, practically sweeping the paths of all mud and sand. At 5.10 the rain began to abate, and at 5.15 only a very few drops were falling; so I measured the water in the gauge and found 2·77 in., all of which fell in 1 hr. 5 min. A few drops were still falling, and it came on again much heavier with hail, and thunder, and lightning. At 6.20 the rain ceased, so I measured the gauge again, and found ·25 in. in 1 hr. 5 mins., making a total of 3·02 in. in 2 hrs. 10 mins. It continued fine till midnight, when another storm came up from the S.E. This storm, with lightning and thunder, lasted till 3 a.m. on the 31st. The rain beginning at 2 a.m., lasted, as near as I can make out, an hour. When measured at 9 a.m. there was ·11 in.; making a total of 3·13 in. Under the railway bridge, where the rain always collects, there must have been over 3 feet of water, for it reached the point of the collar of our milkman's pony. There was 2 ft. 9 in. of water in my greenhouse. My next door neighbour, who had lived over nine years in Ceylon, had never before seen such rain. The damage to our roads is estimated at over £1,000. One of the largest hailstones measured $\frac{3}{4}$ in. in diameter. I have the following returns for the 30th exceeding 1·00 in.: Beddington Corner, 3·67 in. (3·50 in. fell in just under one hour); Wallington, 3·13 in. as stated above; Beddington, 2.29 in. (2·10 in. fell between 4.15 and 6 p.m.); Wimbledon Sewage Works, 2·26 in. (1·58 in. fell between 4.10 and 5.30 p.m.); Duppas House, Croydon, 1·85 fell in 2·84 hours (·80 in. fell in 15 minutes); Waddon New Road, Croydon, 1·85 in. (1·75 in. fell between 4.30 and 6.15 p.m.); Richmond, 1·34 in.; Brimstone Barn, Croydon, 1·32 in.; Park Hill Rise, Croydon, 1·32 in.; and Morden, 1·15 in.

F. CAMPBELL BAYARD.

Cotswold, Wallington, Surrey, 8th June, 1903.

ON May 28th a sharp thunderstorm passed over this district (East Surrey) between 11.20 a.m. and noon, the lightning being very vivid and the thunder following without any appreciable interval.

On the 30th, after a "close," though fine, forenoon (shade temperature 75°), a heavy thunderstorm approached from the westward shortly after 3 p.m., and from 4.5 to 4.48 p.m. lightning and thunder were incessant, not a drop of rain falling the while. The "time interval" varied from two or three seconds to a negligible quantity. Between 5.8 and 6.15 p.m. rain descended fairly heavily, 0·49 in. being found in the gauge at the latter time. Hail fell with great force for a very short period.

On the 31st, at 2 a.m., an even more violent storm occurred, it being impossible to count the time interval from that hour to 2.30 a.m., on account of the continual illumination of the sky by lightning and the incessant rumble of thunder. A tree was "scorched" in the garden here. The rainfall during this storm amounted to 0·24 in., which practically all descended in ten minutes, 2.30—2.40 a.m.

I should not venture to trespass upon your space with these notes, were it not for the fact that a succession of thunderstorms of such a violent character is very unusual in this neighbourhood.

D. W. HORNER.

Clapham Park, S.W., June 8th, 1903.

A TERRIFIC thunderstorm visited this locality on the 30th to 31st of May. Time taken by marine chronometer checked by regulator, both of known rate, 11.55 p.m. 30th, to 2 a.m. 31st, G.M.T. Lightning and thunder almost continuous. Severe vibration of doors and windows. Lightning at times apparently going up from the ground. I thought I saw globular lightning, but am probably mistaken, as this is of course very rare. The rainfall was ·60 in. Intense heat was experienced both on the 30th and 31st. Slight thunderstorms followed on June 1st, 6.10 p.m., and 8.10 a.m. June 2nd; the rainfall of which together was ·29 in.

F. H. PHILLIPS, F.R.Met.Soc.

Burgess Hill, Sussex, 2nd June, 1903.

IN case you wish for any details of the great storms of Saturday and Sunday last, I may mention that thunder began about 2 p.m. Rain began at 4 p.m., and was very heavy until 5.30, ceasing about 6 p.m. The lightning and thunder were very nearly simultaneous about 4.30 to 5 p.m. Another storm came on about 2 a.m. on the 31st, with sharp but short rain. Total rain, measured 9 a.m. of 31st, 1·06 in., of which about ·90 in. fell in the first storm, ·16 in the second.

G. SEARLE.

30, Edith Road, West Kensington, June 2nd, 1903.

[At Camden Square the thunderstorms were characterised by brilliant lightning and loud long-continued reverberations of thunder, especially on the early morning of the 31st. The remarkable feature was the absence of rain, only ·05 in. being recorded in the twenty-four hours, of which ·025 in. fell between 5.30 and 6.45 p.m. on the 30th, after the first storm, and ·025 in. between 2.30 and 3.20 a.m. on the 31st.

The extremely local nature of the rainfall is well brought out by the letters of our correspondents. We had hoped to discuss the rainfall of May in some detail, as the distribution is remarkable in several ways, but for some cause, which we can only surmise to be the unusual date of the Whitsuntide holidays, so many of our most faithful monthly observers have failed to send in their reports in time, that the intention has to remain unfulfilled.—ED. *.SM.M.*]

SYSTEMATIC CLOUD PHOTOGRAPHY.

To the Editor of Symons's Meteorological Magazine.

A GOOD deal is being done now towards the study of cloud forms by means of photography, but, so far as I know, at no station are photographs of the face of the sky taken regularly as part of the daily observations. One reason for this may be that on many days it is not possible to take any photographs, but I venture to think that for forecasting purposes, or at any rate, as part of the records of the station, photographs taken daily as often as practicable would be of value.

It is difficult by any description to give an accurate impression of the state of the sky as regards cloud forms, and in the hands of a skilled observer the camera should be able to afford useful and exact information.

I do not know whether the Rev. S. Barber has photographed the cirrus cloud form which he has described in his letter in the February number headed "On some Precursors of Weather Change," and which he has several times found to precede fine weather; such a photograph would be valuable, and if it be found that certain types or sequences of types of cloud go before or accompany certain phases of weather something will have been gained. For this purpose the series of daily photographs should be compared with the published weather maps. FRANCIS DRUCE.

65, Cadogan Square, S. W., May 3rd, 1903.

THE ORIGIN OF CYCLONE HEAT.

BY L. C. W. BONACINA.

IN endeavouring to ascertain the precise causes of the observed development and distribution of cyclone heat, we have obviously to deal with the combined thermal effect of a number of different temperature factors. Evidently, then, we must first of all strive to

disassociate these factors, in order that, when we consider more particularly the effect due to one of them, we may be able to detect, and make proper allowance for, the influence of each of the others. In the present article we propose to discuss solely the cyclones of North-Western Europe, for although the broad features of these low pressure systems* are the same all over the world, there are so many minor peculiarities distinguishing between British storms and those of the tropics, that the laws controlling their energy and movements are not the same in the several climatic zones.

We may classify the chief agents which exert a more or less direct influence upon the temperature of the lower air in a cyclonic disturbance under the following heads: (*a*) radiation, solar or terrestrial, (*b*) the physical conditions of that portion of the Earth's surface which the cyclone is traversing, (*c*) the direction of the wind, (*d*) the condensation of vapour into clouds and rain, (*e*) the peculiar properties of cyclone action itself. The influence of radiation need not concern us much in our investigation into the origin of cyclone heat, provided, of course, that we are always mindful of its existence, so as to be able to judge to what extent a given degree of heat or cold may be due to its operation. Every one, of course, knows that the high temperature experienced in the front of a cyclone is not the result of direct solar radiation, inasmuch as the sky is almost invariably thickly overcast. Moreover, in these latitudes the altitude of the midwinter sun is so low that the direct rays, even when freely transmitted through the atmosphere, do not appreciably warm that portion of it in contact with the soil, as we know from the fact that in frosty anti-cyclonic weather the mid-day shade temperature frequently remains below the freezing point, though the ground may be free from snow.

It is quite conceivable that a body of warm water such as, for instance, the Gulf Stream, should be capable of effecting a very considerable rise of temperature in any mass of air that may happen to be crossing its track. Now, knowing that the specific gravity of air as compared with water is $\frac{1}{773}$, and the specific heat ·2375 (Cp.) we can easily calculate that one cubic metre of water cooling 1 degree suffices to raise 773 cubic metres of air 4·2 degrees in temperature, or, in a more general form, x cubic metres of water in cooling t degrees emit enough heat to raise the temperature of $773x$ cubic metres of air $\frac{t}{4\cdot2}$ degrees. Hence we see how potent must be the influence of a stream of warm water, like the Gulf Stream, in heating the super-incumbent air. Now we most readily allow that when, as often happens, a westerly or south-westerly current of air blows straight across these islands from off the

* We must be careful to use the word "cyclone" in the meteorological and not in the popular sense. Tornadoes, waterspouts and storms of that class, which are usually styled "cyclones" are of a totally different nature, and are not influenced by the Earth's axial rotation.

Atlantic, a fairly uniform distribution of high temperature will be experienced, due to the convection of thermal energy from the waters of that ocean river. We are not entitled, however, to assume, as is frequently done in text books of physical geography, that the high temperatures associated with the wet and stormy weather of winter cyclones, are mainly due to the fact that storm systems usually cross the Gulf Stream before they reach us; for we have every reason to believe that the motion of propagation of a cyclone is of the nature of a wave, and that the wind is not moved forward by the system in its progress, the atmospheric disturbance always affecting fresh masses of air. Thus the winds revolving around the baric minimum do not partake of the motion of translation of the depression, but as the low pressure area advances fresh draughts of air are continually drawn in, which, in turn, are speedily left behind. Such facts as these are sufficient to warrant the belief that the direct influence of the Gulf Stream is imperceptible during the passage of a cyclonic disturbance across these islands.

It may be taken as a general rule that a south-westerly wind blowing across Great Britain from a considerable distance, will tend to deflect the isotherms north-eastwards, while conversely, a north-easterly draught of air flowing over the country from the Arctic regions, will tend to drive them south-westwards, and doubtless, the relative distribution of heat and cold is in large measure determined by this element; but it cannot be denied that the effect is greatly over-estimated. That the high temperature of a cyclone front is not altogether due to the southerly direction of the wind is proved by the fact that, when, as rarely happens, a depression moves westwards, the greatest development of heat occurs with northerly winds, which then blow in front of it; in addition to this we have the fact that the easterly winds of the northern half of an ordinary eastward moving cyclone, are characterized by the same quality of heat as the westerly winds of the southern half, though in a less marked degree. Since, however, the influence of the direction of the wind upon the temperature of the air in a cyclone will depend largely upon the shape, size and intensity of the system, as well as on the surrounding distribution of pressure and temperature, we ought not to state too definitely what the normal effect may be. Suffice it to say, that the magnitude of this influence is a considerable, though very variable quantity, being essentially dependent upon the temperature of the region from which the wind is blowing.

The latent heat liberated by the condensation of moisture into clouds and rain owing to the ascending motion of the atmosphere, is often urged as the primary cause of the excessively high temperatures observed in cyclone fronts; but this can only be influential in retarding the cooling of the ascending masses of air, or in checking the formation of frost, and would certainly be incompetent to produce the great increase of temperature

from near the freezing point to well over 50° F., such as constantly marks the passage of a deep cyclonic disturbance across Great Britain in winter time. Moreover, Abercromby has shown that, though the greatest development of both damp and heat is usually associated with the right front quadrant of a depression, there is no mutual relationship between the height of the thermometer and the amount of rainfall, inasmuch as the heaviest precipitation sometimes occurs in the rear of the trough, after temperature has commenced to fall. The true explanation of cyclone heat would seem to be that afforded by Abercromby in 1875, who suggested that the air in the front portion of a cyclone underwent a compression, adequate to produce the observed high temperature. He took the analogous case of a leaf swirl and called attention to the fact that the leaves were most densely packed together on that side of the swirl where the motions of rotation and translation coincided.

The present writer, however, is disposed to think that the thermal energy evolved in a cyclonic eddy is not merely the result of simple compression, but is also due to internal friction or viscosity consequent upon the enormous shearing stress to which the revolving particles of air must be subjected, part of the energy of this shearing being ultimately dissipated as heat. That there is great aërial compression will be evident when we consider the precise nature of cyclonic circulation. In the first place we know that in a cyclone the air moves spirally inwards towards the centre, in a direction, in this hemisphere opposite to that of the hands of a watch. We also know that the air does not flow directly into the centre, but tends more and more in virtue of centrifugal force exerted upon it, to keep away therefrom, thus increasing the barometric gradient.

The velocity of the wind, *cæteris paribus*, increases as the distance from the central area is diminished, and the centrifugal force then increases as the square root of the cube of the increase of velocity. The result must be obvious to anyone possessed of the true conception of the nature of a cyclone whirl. If there be a constant influx of air into the cyclonic vortex, and if this very air, as it draws near the central calm area, tends as a body to keep away from it, flowing into it only very gradually, the whole whirling mass must undergo great compression, sufficient to produce important thermal effects.

Passing from these theoretical considerations to the observed facts, we find that the greatest inflow of wind, as well as the steepest gradients, occurs in the right front quadrant of a cyclone, the very region which is characterized by the highest temperatures. The justice of these remarks will, we think, be acknowledged by all those who make a systematic study of synoptic charts. It is a noteworthy fact, moreover, that a depression of temperature almost invariably accompanies the rear of a cyclone, where the wind blows nearly parallel to the isobars, being frequently even a little out-curved, instead of in-curved, as in the front. There will thus be no abnormal development of heat due to compression in the rear portion;

in fact, the tendency will not uncommonly be towards a rarefaction of the air, and in this way we may account for the unusual reduction of temperature, occasionally experienced after the barometer has begun to rise along the line of the trough. The inference, then, that we draw from these considerations is, that the air in the front of a cyclone is dynamically warmed by a compression and agitation of its particles, consequent upon the action of centrifugal force at the centre, with a concomitant force, due to the steepness of the barometric gradients, causing air to be sucked into the vortex from all points at the outskirts.

In conclusion, we would observe that we are not justified in expecting to be able to detect any indication of compression upon an isobaric chart. We are only entitled to assert that pressure increases far more rapidly and irregularly outwards from the centre than it would do if compression effects were absent; in other words, if we could conceive of a cyclone characterised by the action of no centrifugal force and consequent compression, both the depth and intensity of the system would be diminished, that is to say, the centre baric minimum would be higher, and the barometric gradients less steep and irregular than those actually observed.

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 20th, Capt. D. Wilson-Barker, F.R.S.E., President, in the chair.

Lieut. C. St.B. Sladen, R.E., was elected a Fellow of the Society.

Mr. C. P. Hooker read a paper on "The relation of the Rainfall to the depth of water in a Well," in which he gave the weekly measurements of the depth of water in a well 101 feet deep at Further Barton, Cirencester, compared with the weekly rainfall for the 16 years 1887-1902. The author's conclusions are as follows:—

The depth of water in the well depends on how much rain penetrates the soil, and this is determined by the amount of rain, the rapidity of its fall, and the existing condition of the soil, which in turn depends on the frequency of the falls of rain and the amount of evaporation. Therefore winter rains penetrate easily, summer rains with difficulty; but summer rains, especially when accompanied by lessened evaporation, tend to moisten the soil, and the water-level does not fall so rapidly. Evaporation has but little effect till April or May; but from that time until the end of September the evaporation is almost as great as the rainfall, and sometimes even greater. However heavy the winter rains are, and however full the well becomes in consequence, it by no means precludes the possibility of scarcity in the summer or autumn; but should the well be full in March, want is not probable. The well is filled sufficiently every winter, and no amount of extra rain will improve matters; therefore

scarcity in summer or autumn depends on what happens later, and especially in the spring months, when a deficiency of rain and subsequent heat and evaporation are important factors. After the early spring months, but little rain usually penetrates to the well, so that a timely forewarning at that season might prove of great value by enabling the existing supplies to be husbanded at an early period.

Considering how narrow the boundary is between sufficiency and want, and looking to the fact that every year sees further demands made on our water supplies, it is of the utmost importance that attention should be paid to the storage of the surplus winter rains. This might be done by the formation of large hill reservoirs, and doubtless such measures as the re-afforesting of extensive tracts of land would check the rapidity with which the rains reach the rivers, and are so lost.

In the discussion which followed the President, Admiral J. P. Maclear, Mr. Baldwin Latham, Colonel T. English, Dr. H. R. Mill, Mr. Clayton Beadle, Mr. J. Hopkinson, and Mr. R. H. Hooker took part, and Mr. C. P. Hooker replied.

Mr. W. Marriott gave an account of the "Frost of April, 1903." The weather from January 19th to March 31st was very mild, the mean temperature at Greenwich for this period of 72 days being 45°·2, which was 5°·7 above the average. Normal or cooler weather prevailed during the first 11 days of April, but on the 12th (Easter Sunday) an abrupt change took place which continued until the 27th. During this time low temperatures prevailed, accompanied by keen northerly winds and great dryness.

The main features are shown by the following values for the Royal Observatory, Greenwich :—

1903.	Jan. 19th-March 31st.	April.	April 12th-25th.
	°	°	°
Temperature—Mean	45·2	44·1	40·8
,, Mean Max. ...	51·2	52·0	49·6
,, Mean Min. ...	39·2	36·7	32·5
Dew Point Temperature	38·9	35·2	29·5
Relative Humidity	79%	71%	64%

Taking England and Wales as a whole there were 10 nights during April on which the temperature fell to 32° or below, 9 of which were between the 12th and 25th. The number of frosts on the grass was very great, there being as many as 23 during the month at Hodsock, and 22 at Bennington and Churchstoke. Snow and hail showers were frequent between the 12th and 17th, especially in the north-east and east of the country. The snow was general over most parts of the Continent, and was so heavy in Denmark and Russia as to stop railway traffic.

One of the special features of the period 12th–25th was the great radiation, the minimum temperature on the grass at several stations being 12° below that in the air, while at Southport the great difference of 16° was recorded on the 17th. Owing to the mildness

of the weather during February and March vegetation was in a very forward condition, and consequently suffered severely from the frost. The destruction of the fruit blossom was great and general.

In the discussion which followed the President, Mr. H. Southall, Mr. Baldwin Latham, Mr. C. Harding, and Mr. D. W. Horner took part, describing the effects of the frost in their respective neighbourhoods.

REVIEW.

Handbook of Climatology. By DR. JULIUS HANN. *Part I., General Climatology.* Translated by ROBERT DE COURCY WARD. New York: The Macmillan Company. London: Macmillan & Co., Ltd., 1903. Size 9 × 6. Pp. xvi. + 438. Price 12s. 6d. net.

PROFESSOR WARD of Harvard has conferred a benefit on the English-speaking world by the publication of Professor Hann's standard treatise on Climatology in an English translation. The translation is so well done and the translator has incorporated so many references to points specially interesting to his readers that the book has a just claim to be treated as an original contribution to science. Like everything emanating from Professor Hann the *Climatology* is characterised by a union of accurate detail and wide grasp of principles, unapproached by any other meteorological writer.

The book under review must not, however, be looked upon as a complete work, for it is the first of three volumes, the two which have not been translated dealing with the more geographical aspect as this one deals with the more meteorological aspect of climatology. The translation of the other volumes Professor Ward found impracticable, and indeed they are so crammed with facts and figures that the language is almost unimportant; any serious student without a special knowledge of German can refer to their pages with a very moderate use of a dictionary. It is different with the general volume, which is adapted for reading as the others are suited for reference; hence our gratitude to Professor Ward.

To some extent the book is edited as well as translated; there are some omissions concerning "matters of special interest to European students only" and some additions which concern the American student mainly. While very fair reference is made to the sources of information as to British climate, readers in this country will miss many illustrations that might have been adduced in the text to throw light on general principles. If we may venture to criticise the plan of the work in one particular we think that marine climates receive less attention than they deserve, while mountain climates have got perhaps more than their share of space; Continental and Marine occupy together 94 pages, while Mountain Climates fill 153 pages. The disparity of course does not extend to the untranslated volumes on Special Climatology. It is much to be wished that this

sound and sensible treatise would be widely read by the general public, who would thereby learn to respect the scientific treatment of difficult problems and to distrust the assertions of empirics. For this reason alone we regret the retention of the centigrade degree and the metric system; but for these our journalists would we doubt not have made much use of the volume, greatly to the improvement of newspaper notes on climatic cycles and the like.

METEOROLOGICAL NEWS AND NOTES.

THE EARTHQUAKE of March 25th, 1903, which was severely felt in the North Midland Counties, was hardly noticeable in Northamptonshire. Mr. C. A. Markham informs us that the most southerly point at which the earthquake occurred was at Kettering. At that town Mr. C. W. Stringer states that he was sitting in his office writing a letter at about 1.27 and distinctly felt his table heave twice, the wave being southerly to northerly, and heard very slight shaking of the windows, &c., and a slight rumbling sound. He recognised it at once as an earthquake and called out to his junior clerk and the office-boy, who were then the only others in the building, enquiring if they had felt it, but they had not; nor had it been felt by any of his family or servants in his house close to the office, nor by several other persons of whom he enquired. At Easton-on-the-Hill the shock was felt by Mr. N. Day, and at Burghley House by Stamford Town, the earthquake was distinctly felt by the Marquis of Exeter, whilst he was lunching, and also by his servants.

THE CLOUD WORLD is the title of a new work on the forms and phenomena of clouds, by the Rev. Samuel Barber, which will shortly be published by Mr. Elliot Stock.

THE SOCIÉTÉ MÉTÉOROLOGIQUE DE FRANCE celebrated the fiftieth anniversary of its foundation on June 3rd, 1903, when telegrams of congratulation were received from the Royal Meteorological Society and from other foreign well-wishers of the Paris society.

THE TREASURY COMMITTEE on the administration of the Parliamentary grant to the Meteorological Council has, we understand, completed the hearing of evidence and is now preparing its Report.

AN INTERNATIONAL KITE COMPETITION will be held on the Sussex Downs on June 25th, under the auspices of the Aëronautical Society of Great Britain, when the Society's silver medal is to be awarded for the highest flight of a single kite (above 3,000 feet) carrying a weight equivalent to that of a meteorograph.

THE VISITATION OF GREENWICH OBSERVATORY took place on Saturday, June 6th, when exceptionally fine weather favoured the inspection of the instruments, and made this annual meeting of scientific men more than usually agreeable.

RAINFALL AND TEMPERATURE, MAY, 1903.

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) ...	2·99	+ 1·43	·78	9	17	80·9	30	34·9	13	0	1
II.		Tenterden	2·34	+ ·53	·58	6	13	79·3	30	32·5	13	0	3
,,		Hartley Wintney	3·09	+ 1·23	·53	3	18	79·0	31	32·0	13	1	1
III.		Hitchin	3·42	+ 1·68	1·41	9	14	...	...	...	...	...	...
,,		Winslow (Addington)	3·70	+ 1·99	1·01	9	15	77·0	22	32·0	13	1	4
IV.		Bury St. Edmunds (Westley)	2·54	+ ·70	·71	9	13	79·0	30	35·0	13*f*	0	...
,,		Norwich (Brundall)	1·58	— ·23	·62	8	11	75·2	22	32·0	13	1	4
V.		Winterborne Steepleton	3·36	...	1·06	28	14	75·5	31	31·2	13	2	5
,,		Torquay	3·15	...	·69	2	16	71·3	31	40·3	13	0	0
,,		Polapit Tamar [Launceston]..	2·68	+ ·44	·52	2	19	71·9	25*a*	51·2	30	1	4
VI.		Stroud (Upfield)	4·18	+ 2·29	·56	8	20	75·0	22	39·0	12	0	...
,,		Church Stretton (Woolstaston)	4·70	+ 2·40	1·18	5	18	71·5	22*a*	32·5	12	0	...
,,		Worcester (Diglis Lock)	6·10	+ 4·36	1·85	28	19	...	...	...	...	...	...
VII.		Boston	3·26	+ 1·76	·85	8	14	84·0	31	35·0	12	0	...
,,		Hesley Hall [Tickhill].....	2·51	+ ·97	·47	3	15	79·0	22	29·0	12*g*	3	...
,,		Derby (Midland Railway).....	3·15	+ 1·30	·68	1	20	84·0	31	34·0	13	0	...
VIII.		Bolton (The Park).....	3·78	+ 1·04	·94	2	20	76·4	31	33·9	12	0	2
IX.		Wetherby (Ribston Hall) ...	4·38	+ 2·71	·98	9	17	...	...	...	...	...	...
,,		Arncliffe Vicarage.....	3·48	+ ·09	.49	13	22	...	...	...	...	...	...
,,		Hull (Pearson Park).	2·96	+ 1·15	·90	8	15	71·0	22	30·0	11*h*	2	6
X.		Newcastle (Town Moor)	2·39	+ ·64	·34	1	15	...	...	..	...	...	...
,,		Borrowdale (Seathwaite).....	7·94	+ ·60	1·14	16	20	75·8	31	32·3	12	1	...
XI.	WALES.	Cardiff (Ely).....	3·02	+ ·67	·92	16	14	...	...	...	...	...	...
,,		Haverfordwest	3·37	+ 1·08	1·15	8	14	71·8	26	34·1	12*i*	0	4
,,		Aberystwith (Gogerddan) ...	2·29	— ·23	·56	16	11	78·0	24	22·0	11	3	...
,,		Llandudno.....	1·70	— ·13	·40	3	16	73·0	22*b*	33·5	12	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·81	+ 1·17	·74	4	17	74·0	25*j*	33·0	11	0	...
XIII.		Edinburgh (Royal Observatory)	1·17	...	·35	4	13	68·2	31	35·5	11	0	4
XIV.		Colmonell	3·20	+ ·74	·50	16*k*	16	78·0	27*c*	33·0	18	0	...
XV.		Tighnabruaich	3·46	...	·52	13	15	69·0	26*d*	34·0	10	0	...
,,		Mull (Quinish).....	3·32	+ ·17	·73	16	16	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·63	— ·66	·40	5	11	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·25	— ·51	·40	3	10	71·5	25	32·0	11	1	..
XVII.		Braemar	1·26	— ·93	·31	4	13	72·4	26	28·1	19	4	13
,,		Aberdeen (Cranford)	2·75	+ ·74	·87	4	13	70·0	31	32·0	8	1	...
,,		Cawdor (Budgate)	2·25	+ ·15	·64	4	14	..	...	...	...	...	...
XVIII		Strathconan [Beauly]	2·20	+ 1·12	...	...	...	...	...	...	...	...	...
,,		Glencarron Lodge.....	4·31	— ·94	1·07	13	17	73·5	27	33·0	19	0	...
XIX.		Dunrobin	...	...	...	...	...	...	...	...	...	...	...
,,		S. Ronaldshay (Roeberry) ...	...	...	...	...	...	...	...	...	...	...	...
XX.	IRELAND.	Darrynane Abbey.....	2·97	+ ·53	·70	2	18	...	...	41·0	10	0	...
,,		Waterford (Brook Lodge) ...	2·29	— ·36	·89	2	16	71·5	27	35·0	18	0	...
,,		Broadford (Hurdlestown) ...	3·77	+ 1·54	·83	29	19	72·0	26*d*	36·0	1	0	...
XXI.		Carlow (Browne's Hill)	3·01	+ ·71	·79	7	16	...	...	...	...	...	...
,,		Dublin (Fitz William Square)	2·38	+ ·48	·48	29	17	68·0	25*c*	40·9	17	0	0
XXII.		Ballinasloe	1·91	— ·54	·35	2	17	74·0	28	35·0	24	0	...
,,		Clifden (Kylemore)	4·35	— ·27	·50	21	18	...	...	...	...	...	...
XXIII		Seaforde.....	3·14	+ ·83	·75	16	19	82·0	25*e*	32·0	10*f*	2	2
,,		Londonderry (Creggan Res.).	2·40	— ·24	·46	4	18	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·56	+ ·02	·35	4, 16	19	77·0	26	35·0	10	0	1

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

a and 31. *b* and 24. *c* and 28. *d* and 27. *e* and 26, 27. *f* and 18. *g* and 13. *h* and 12. *i* and 19. *j* and 27 and 30. *k* and 29.

SUPPLEMENTARY RAINFALL, MAY, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	3·95	XI.	Llandefaelog-fach.....	2·78
II.	Dorking, Abinger Hall .	3·48	,,	New Radnor, Ednol.....	4·09
,,	Sheppey, Leysdown	3·32	,,	Rhayader, Nantgwillt...	4·96
,,	Hailsham	2·33	,,	Lake Vyrnwy	3·03
,,	Crowborough.....	2·40	,,	Ruthin, Plâs Drâw	3·15
,,	Ryde, Beldornie Tower..	2·40	,,	Criccieth, Talarvor	2·29
,,	Bournemouth, Kempsey	2·73	,,	I. of Anglesey, Lligwy..	1·85
,,	Emsworth, Redlands ...	3·05	,,	Douglas, Woodville.....	2·96
,,	Alton, Ashdell	3·49	XII.	Stoneykirk, Ardwell Ho.	3·94
,,	Newbury, Welford Park	3·77	,,	Dalry, Old Garroch	3·38
III.	Oxford, Magdalen Coll..	4·16	,,	Moniaive, Maxwelton Ho.	2·63
,,	Banbury, Bloxham	5·05	,,	Lilliesleaf, Riddell	2·02
,,	Pitsford, Sedgebrook ...	2·89	XIII.	N. Esk Res. [Penicuick]	2·35
,,	Huntingdon, Brampton.	2·52	XIV.	Dalry, Blair	3·48
,,	Wisbech, Bank House...	2·46	,,	Glasgow, Queen's Park..	...
IV.	Southend	2·22	XV.	Inveraray, Newtown ...	2·98
,,	Colchester, Lexden	3·35	,,	Ballachulish, Ardsheal...	3·25
,,	Saffron Waldon, Newport	2·31	,,	Campbeltown, Redknowe	3·69
,,	Rendlesham Hall	1·82	,,	Islay, Eallabus.....	1·94
,,	Swaffham	2·14	XVI.	Dollar.....	1·73
V.	Salisbury, Alderbury ...	3·13	,,	Balquhidder, Stronvar...	...
,,	Bishop's Cannings	4·18	,,	Coupar Angus Station...	1·23
,,	Ashburton, Druid House	2·71	,,	Blair Atholl	1·66
,,	Okehampton, Oaklands.	2·53	,,	Montrose, Sunnyside ...	1·61
,,	Hartland Abbey	1·95	XVII.	Alford, Lynturk Manse..	2·26
,,	Lynmouth, Rock House	2·74	,,	Keith H.R.S.....	2·59
,,	Probus, Lamellyn	2·49	XVIII.	Fearn, Lower Pitkerrie..	1·24
,,	Wellington, The Avenue	3·60	,,	S. Uist, Askernish	1·48
,,	North Cadbury Rectory	2·60	,,	Invergarry.....	2·86
VI.	Clifton, Pembroke Road	3·38	,,	Aviemore, Alvie Manse.	2·02
,,	Ross, The Graig	4·22	,,	Loch Ness, Drumnadrochit	2·11
,,	Shifnal, Hatton Grange	2·68	XIX.	Invershin	1·80
,,	Wem, Clive Vicarage ...	...	,,	Bettyhill	1·48
,,	Cheadle, The Heath Ho.	2·74	,,	Watten H.R.S.....	1·63
,,	Coventry, Kingswood ...	3·36	XX.	Cork, Wellesley Terrace	3·04
VII.	Market Overton	3·54	,,	Killarney, District Asyl.	3·07
,,	Grantham, Stainby	4·06	,,	Glenam [Clonmel]	4·09
,,	Horncastle, Bucknall ...	1·65	,,	Ballingarry, Hazelfort...	1·71
,,	Worksop, Hodsck Priory	2·49	,,	Miltown Malbay	2·80
VIII.	Neston, Hinderton	3·10	XXI.	Gorey, Courtown House	2·42
,,	Southport, Hesketh Park	2·39	,,	Moynalty, Westland ...	2·58
,,	Chatburn, Middlewood.	3·81	,,	Athlone, Twyford	1·77
,,	Duddon Val., Seathwaite Vic.	3·74	,,	Mullingar, Belvedere ...	1·43
IX.	Langsett Moor, Up. Midhope	4·27	XXII.	Woodlawn	2·63
,,	Baldersby	4·27	,,	Westport, Murrisk Abbey	2·40
,,	Scalby, Silverdale	3·22	,,	Crossmolina, Enniscoe ..	2·49
,,	Ingleby Greenhow Vic..	2·72	,,	Collooney, Markree Obs.	2·31
,,	Middleton, Mickleton ...	2·52	XXIII.	Enniskillen, Portora ...	2·46
X.	Beltingham	2·62	,,	Warrenpoint.....	2·29
,,	Bamburgh	·80	,,	Banbridge, Milltown ...	2·31
,,	Keswick, The Bank.....	2·56	,,	Belfast, Springfield	2·74
,,	Melmerby Rectory	2·89	,,	Bushmills, Dundarave..	2·60
XI.	Llanfrechfa Grange	4·27	,,	Stewartstown	3·06
,,	Treherbert, Tyn-y-waun	5·92	,,	Killybegs	3·09
,,	Castle Malgwyn	2·64	,,	Horn Head	2·69

METEOROLOGICAL NOTES ON MAY, 1903.

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.—The earlier part was unsettled with a good deal of R, ·78 in. falling in TSS on 8th. Finer weather prevailed from 12th to 15th. TSS and H on 17th and fine till 27th; broken only by a slight TS on 22nd. Heavy TS at mid-day on 28th, and TSS on 30th and 31st. Mean temp. 55°·0 or 1°·0 above the average.

TENTERDEN.—First part rather wet and cold; fine and warm after 20th; and the last three days very hot with T, but no severe storm. Duration of sunshine 219 hours. TSS on 10th and 31st.

SHEPPEY, LEYSDOWN.—Fine until 6th. On 9th ·54 in., principally H, was recorded in about half-an-hour. Very fine from 18th to 28th. T on four days.

CROWBOROUGH.—The early days were extremely wet, a continuation of the rainy period which began on April 25th. From 8th to 13th was unusually cold, with a little sleet on 12th and ground frost on 13th. It then became warmer and the month closed exceedingly hot. Severe TS from 10 p.m. on 30th to 2 a.m. on 31st.

HARTLEY WINTNEY.—The first part was exceedingly wet and the whole month bitterly cold. No ozone was registered. TSS on 4 days and L on 3.

COLCHESTER, LEXDEN.—R was measured on 17 consecutive days ending on May 11th; this period was mild with little sunshine. The latter half was warm and bright with light winds from N. or E. On 10th and 11th 1·98 in. of R fell in 26 hours, causing the highest floods since 1894. TS on 9th.

WINTERBORNE STEEPLETON.—R 1·77 in. above the average of 10 years. Mean temp. 51°·5 or 1°·2 higher than the average of 10 years. TS on 28th.

TORQUAY, CARY GREEN.—R 1·19 in. above the average. Duration of sunshine 221·3 hours, being 9·4 hours below the average. Mean temp. 53°·8 or 0°·7 above the average. Mean amount of ozone 5·2. Max. 7·5 on 3rd with S.E. wind; min. 2·0 on 5th with W.N.W., and on 28th with N.E. wind.

LYNMOUTH, ROCK HOUSE.—Cold in the early part, especially on 16th, 17th and 18th. The latter part was warm with very light E. airs.

NORTH CADBURY RECTORY.—Changeable with no extremes. R considerable and temp. decidedly high. Grass frosts were very few and slight. T on 3 days and L on one.

CLIFTON, PEMBROKE ROAD.—Rainy and unsettled till 17th with a cold spell from 9th to 12th. Fine and warm from 21st to 26th with cloudless skies, then thundery and sultry to the end. TSS on 4 days and T only on 2. R 1·15 in. above the average.

ROSS, THE GRAIG.—Mean temp. 53°·5 or 0°·8 above the average of 33 years. R nearly double the average, the fall for 37 days ending on 31st being the highest yet measured in that period of the year except in 1886. No frost in the screen, and only 0°·2 on one night on grass.

BOLTON, THE PARK.—Strong contrasts of cloudiness and sunshine, cold and warm periods. R fell each day till 11th, being persistent from the morning of 2nd to the evening of 5th; the amount of R during the 11 days was 3·03 in., and the duration of sunshine only 4 hrs. 25 mins. Remarkably warm and bright from 21st to the end. Mean temp. 49°·8 or 0°·1 above the average. Bright sunshine occurred on 23 days, totalling 121 hrs. 40 mins., or 34 hrs. 5 mins. below the average.

WALES AND THE ISLANDS.

ABERYSTWITH, GOGERDDAN.—Very cold on several occasions; 10° of frost on 11th, working havoc with fruit, flower and vegetable.

DOUGLAS, WOODVILLE.—Cold, wet and wintry to 20th, when it suddenly changed to brilliant sun all day, albeit accompanied by cold E. winds and nightly frosts. The sunshine had a marvellous effect in bringing out the belated foliage of earlier forest trees, but otherwise was no "unmixed blessing" horticulturally. Ash and poplar still showed little sign even of bud at the end.

SCOTLAND.

LILLIESLEAF, RIDDELL.—The wind continued in the E. for over two-thirds of the month. The prevalence of easterly winds for the last six months is very remarkable. Sudden change in temp. on 22nd, and on 31st shade max. was 77°.

MULL, QUINISH.—Cold, wet and backward until 22nd, when wind shifted to the S. with heavy R. The summer heat of the rest of the month worked wonders and brought on crops and foliage marvellously.

COUPAR ANGUS.—Although not severe, it was cold and harsh up to the 24th, when a sudden change set in, and a noteworthy feature of the month was the abnormally high day temp. of the last week. Mean temp. for the month 42°·0.

BETTYHILL.—There was but little R, and the weather was favourable for out-door work. Except during the last week the wind was cold and dry.

WATTEN, H. R. S.—The opening week was cold, cloudy and wet; the middle cloudy, with cold N. winds; the last week mild and fine.

IRELAND.

CORK, WELLESLEY TERRACE.—R ·86 in. above the average, and for the past five months 6·65 in. above the average. On the afternoon of 30th ·50 in. of R fell in 45 mins. Mean temp. 1°·9 below the average. T and L on 6th.

DARRYNANE ABBEY.—The first three weeks were wet and ungenial, and the last 10 days fine and warm with a TS on the afternoon of the 29th.

MILTOWN MALBAY.—May opened genial and seasonable with fine vegetation till 9th, when chilling cold winds from N. set in with occasional R and blustery weather up to 23rd, when heat returned. T 5th and 7th, T and L on 29th.

DUBLIN, FITZWILLIAM SQUARE.—Two seasons were presented by May, 1903, cold, dull and rainy during the first 16 days, whereas the second half was fair, bright, dry and summerlike, except on 29th and 30th, when heavy R fell. Mean temp. 52°·9 or 0°·8 above the average. H on 12th and L on 19th.

OMAGH, EDENFEL.—The weather of the first half was apparently but little improvement on that of April. The day temp. was below the normal, and most of the R fell by day, but the night temp. and the mean of the first fortnight were above the average. The second half was, however, in all respects, the most favourable for many years. With a max. temp. of 77° on 26th and 5 consecutive days above 70°, all the season's lee-way was made up.

THE FIVE MONTHS' RAINFALL OF 1903.

Aggregate Rainfall for January—May, 1903.

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	+2·69	135	Arncliffe	+ ...	...	Braemar	+ 9·86	182
Tenterden	+1·37	115	Hull	+1·89	122	Aberdeen	+3·08	128
Hartley Wintney	+4·18	148	Newcastle	+ ·23	103	Cawdor	+4·71	147
Hitchin	+3·87	149	Seathwaite	+ 23·05	145	Glencarron	+ 15·89	146
Winslow	+3·58	145	Cardiff	+5·71	142	Dunrobin	...	...
Westley	+ ·57	107	Haverfordwest	+6·51	142	Darrynane	+2·48	114
Brundall	— ·27	97	Gogerddan	+4·87	132	Waterford	+4·21	130
Alderbury	+4·87	150	Llandudno	+5·13	151	Broadford	+6·39	154
Ashburton	+5·86	131	Dumfries	+ 11·17	169	Carlow	+6·32	151
Polapit Tamar	+5·89	147	Lilliesleaf	+7·36	170	Dublin	+2·77	128
Stroud	+5·60	159	Colmonell	+4·33	127	Mullingar	+7·48	158
Woolstaston	+5·50	153	Glasgow	+ ...	...	Ballinasloe	+5·94	146
Boston	+2·84	142	Inveraray	+ 11·93	144	Clifden	+5·40	119
Hesley Hall	+1·87	126	Islay	+6·47	140	Crossmolina	+8·04	141
Derby	+3·76	148	Mull	+7·32	135	Seaforde	+4·74	136
Bolton	+4·03	131	Loch Leven	+ 10·70	183	Londonderry	+3·73	126
Wetherby	+5·58	169	Dundee	+1·86	119	Omagh	+8·59	163

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 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	56·8	17	22·5	7	44·9	37·6	38·5	91	66·2	18·9	1·51	12	7·5
Malta	67·0	1	41·0	26	60·3	50·7	47·6	76	109·6	38·5	3·23	13	5·0
Lagos, W. Africa	91·1	14	66·1	29	88·2	76·9	75·8	80	142·0	...	·00	0	...
Cape Town	94·0	23	45·7	26	78·1	59·2	56·1	65	...	...	·29	2	3·1
Durban, Natal	91·4	9	58·2	20	83·3	66·2	...	...	147·3	...	3·96	18	6·6
Mauritius	88·5	1	68·0	31	84·4	73·4	71·1	79	153·5	63·3	9·85	27	7·5
Calcutta	84·0	18	48·4	30	77·2	56·1	51·9	61	137·0	43·9	·66	1	2·0
Bombay	88·2	2	67·1	21	83·9	72·0	67·2	71	137·7	56·9	·81	5	3·3
Madras	86·3	11	63·9	29	82·9	71·9	70·1	83	140·1	59·0	9·18	11	5·8
Kodaikanal	67·1	30	42·2	29	60·8	49·4	48·7	82	129·2	30·1	9·84	13	5·5
Colombo, Ceylon	89·4	18	71·6	30	86·9	73·9	72·0	80	151·5	69·0	6·43	11	5·6
Hongkong	76·9	2	51·1	14	68·6	61·0	56·5	75	130·1	...	2·97	13	8·2
Melbourne	101·7	5	48·0	30	75·5	55·6	52·0	68	160·1	39·8	4·35	11	6·4
Adelaide	99·0	4	48·9	1	80·4	58·7	50·9	51	161·1	40·1	2·57	10	5·3
Coolgardie	108·6	20	47·8	10	89·5	59·1	...	...	166·2	...	·17	3	3·8
Sydney	100·0	24	60·5	1	78·3	65·0	60·9	68	140·1	53·0	2·80	16	5·7
Wellington	71·0	12	41·0	4	63·6	50·1	45·5	65	136·0	33·0	3·74	19	6·2
Auckland	75·5	14	50·0	7	67·4	54·5	47·7	62	138·0	46·0	2·83	17	4·7
Jamaica, Negril Point	87·7	11	66·2	21*a*	84·9	70·8	70·4	78	...	...	4·73	8	...
Trinidad	97·0	1	66·0	7	87·5	69·5	75·3	92	164·0	60·0	2·89	7	...
Grenada	85·0	16	72·0	8	82·7	73·5	71·7	76	148·8	...	5·27	22	2·9
Toronto	45·8	3	—3·3	9	31·1	17·6	22·0	81	62·4	—10·2	2·22	17	7·5
Fredericton, N.B.	51·8	23	—16·8	13	26·7	7·8	6·0	60	...	...	4·35	14	5·6
Winnipeg	35·2	31	—30·7	25	14·1	—5·0	...	...	...	...	1·50	9	4·8
Victoria, B.C.	53·1	25	32·2	2	44·9	37·1	37·8	89	...	...	6·23	18	8·3
Dawson	29·0	14	—51·0	22	-16·7	—28·2	...	...	...	...	·80	4	5·3

a—and 23.

MALTA.—Mean temp. of air 55°·2, or 1°·1, below; mean hourly velocity of wind 12·2, or 1·1 above averages. Mean temp. of sea 63°·9. TSS on 3 days. J. F. DOBSON.

LAGOS.—The Harmattan prevailed during the latter half of month. A. CLEMINSON.

Mauritius.—Mean temp. of air 0°·1, dew point 2°·8, and R 4·92 in., above averages, and mean hourly velocity of wind 0·4 miles below average. T. F. CLAXTON.

MADRAS.—Rainfall about 75 per cent. above average. R. D. JONES.

KODAIKANAL.—Bright sunshine 124·9 hours. Mean temp. of air 54°·1. Mean velocity of wind 317 miles per day. C. P. BUTLER.

COLOMBO.—Mean temp. of air 79°·5, or 0°·4 above, of dew point 1°·0 above, and R ·17 in. above, averages. Mean hourly velocity of wind 7·8 miles. H. O. BARNARD.

HONGKONG.—Mean temp. of air 64°·6 or 2°·2 above, R 1·96 in. above, averages. Sunshine 71·9 hours, or 117·8 below, average. Mean hourly velocity of wind 11·2 miles; prevailing direction E.N.E. F. G. FIGG.

Adelaide.—Mean temp. 1°·9 below, and R 1·75 in. above, averages. C. TODD, F.R.S.

Sydney.—Mean temp. 1°·8 above, humidity 0°·8 below. and R ·29 in. above, averages. H. C. RUSSELL, F.R.S

Wellington.—Mean temp. 1°·8 below, and R ·75 in. below, averages. A. H. GORE.

Auckland.—Mean temp. nearly two degrees below average, R half an inch above average. T. F. CHEESEMAN.

TRINIDAD.—R 1·91 in. below the 40 years' average. J. H. HART.

SYMONS'S

METEOROLOGICAL MAGAZINE.

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THE RAINFALL OF JUNE, 1903.

THE month of June, 1902, exhibited a peculiarity of rainfall, the wettest part of the British Isles having been the south of England and the driest part the north of Ireland and Scotland (see this Magazine for July, 1902, p. 88). The month of June, 1903, exhibits the same peculiarity in a more intense and, we believe, an unprecedented degree, and we therefore deal with the distribution in more detail on this occasion, and illustrate it by a map on a larger scale than that given last year.

To a certain extent the rainfall tends towards a more uniform distribution in June than in other months, for in the wet western and north-western districts it is usually the driest month of the year, while in the dry southern and south-eastern parts of the country the greater frequency of thunderstorms often makes it a wet month. The wetness of a wet June is usually due to torrential rain affecting small and scattered areas and falling only for a few hours; it is usually accompanied by great heat. Both in 1902 and 1903 the wetness of June in the south of England has been due to long-continued steady rain lasting for many hours at a time, not accompanied by thunder except on rare occasions, but associated with exceptionally low temperature. The rain was, in fact, rather of an autumnal than a midsummer type.

We have prepared the accompanying map from data supplied by more than 400 observers, to many of whom special requests were addressed so that the area of the heaviest fall could be determined as accurately as possible. We are particularly grateful to Mr. F. Campbell Bayard and Mr. W. Marriott for the number of records they supplied. Some parts of Scotland, Ireland and Mid-Wales, were sketched in from infrequent data; but the whole of the south of England was well represented, and so far as its scale admits the map may be accepted as substantially correct.

Where less than two inches of rain fell in the month the map is left unshaded, while lines are drawn for every inch of rainfall, the shading above two inches being made darker in proportion to the fall. It will be seen that the north and north-west of Ireland and some of the islands of the Outer Hebrides had less than one inch of rain, about one-third or one-quarter of the average amount, and a narrow belt from Stafford to Lincoln was equally dry. The north and east

THE BRITISH ISLES

THE RAINFALL OF JUNE, 1903.

of Scotland and the centre of the north of England, together with the greater part of Ireland, had less than two inches.

The Lake District contained a very small area over three inches, a larger area with a fall of equal amount occurred near the coast in the north-east of England, while a comparatively large region in the west of Scotland had a rainfall very slightly exceeding three inches, but in no place greater than the average fall for the month, and in very few approaching it. A fairly large area in the middle of Wales also slightly exceeded three inches, and probably falls of four inches or over occurred in some part of the Principality. In the south of Ireland the amount of rainfall increased towards the south coast, the whole of which had more than four inches, and in the south-east more than five inches of rain.

The most interesting distribution, however, is that over England. A broad dry belt in which the fall scarcely anywhere reached two inches (and nowhere reached the average for the month), stretched from North Wales and the Mersey to the Humber and the Wash, separating a slightly higher rainfall on the north from an excessively high rainfall on the south. The wet zone stretched from west to east across the country. Along the axis of it, from Swindon to Southend, for a distance of 110 miles, the rainfall exceeded 6 inches (or more than three times the average amount), the greatest breadth of the belt with a rainfall nowhere less than 6 inches was 40 miles between Hertford and Red Hill. This extremely heavy fall prevailed over the greater part of the valley of the Thames and Lea, and in the south, especially in the neighbourhood of Croydon, it exceeded 7 inches and in one case reached the unprecedented figure of 8·91 inches. The total area on which the fall exceeded 6 inches may be estimated at 2240 square miles, of which about 90 square miles had over 7 inches. Surrounding this very wet area was a belt from 5 to 20 miles wide, with over 5 inches of rain, covering 3300 square miles, and outside that a belt from 4 to 15 miles wide, in which the rainfall exceeded 4 inches, an area of 3700 square miles.

Assigning to each of these areas the average rainfall indicated by a large scale map, on which all the figures were plotted, we get the following table :—

	Area (sq. miles).	Rainfall (in.)	Volume of water (square mil.x in).
More than 7 in.	90	7·3	657
Between 6 in. and 7 in.	2150	6·3	13545
Between 5 in. and 6 in.	3300	5·6	18480
Between 4 in. and 5 in.	3700	4·5	16650
Above 4 in.	9240		49332

This gives an average rainfall over the 9240 square miles of 5·3 inches. One inch of rain over one square mile of area is equal to about 64,660 tons of water, or 14,483,000 gallons. As the area of heaviest fall was central over the middle and lower Thames, and as the whole of the Upper Thames basin lay within the area on

which more than 4 inches of rain fell, it is, of course, understating the average rainfall of the Thames valley if we put it at 5·3 inches. It will be an understatement, we believe, to put it at 5·5 inches for the month of June, 1903; but it may be conveniently taken at that figure for the purpose of calculation. The total drainage areas of the Thames and Lea above Teddington and Feilde's Weir, respectively, is approximately 4200 square miles, so that for the month of June, or rather for the ten days between June 8th and 19th, during which all the rain fell, the amount of water deposited on the drainage area of the two rivers was 1494 million tons, or 334,560 million gallons.

Taking the mean rainfall over the county of London at 6·3 inches, which is a reasonable estimate, though probably too low, the amount of water which fell on the 117 square miles of the metropolitan county amounted to nearly 48 million tons, or 10,675 million gallons. At Camden Square the rain fell during 110 hours, and on the assumption that this rate held good for the whole county, the amount of water deposited in London during the period when it was falling, averaged 433,000 tons, or 97,000,000 gallons per hour.

The usual tables published in this number give the rainfall for June at about 150 stations, and we have not space to print all the additional records. The extremes, however, are so interesting that we give below a statement of the 30 highest and the 14 lowest falls that have been reported to us. It is enough to say that the former are all in a region where the June fall is normally about two inches, the latter are mainly in districts where the June fall usually considerably exceeds three inches.

Thirty Wettest Stations in June, 1903.

		in.
Carshalton Sewage Works	*Surrey*	8·91
Brimstone Barn, Croydon	,,	8·10
Park Farm, Addington	,,	8·04
Waddon New Road, Croydon	,,	7·76
Ashburton Road, ,,	,,	7·62
Park Hill Rise, ,,	,,	7·51
Hayes	*Kent*	7·39
Pyrford Croft	*Surrey*	7·38
Duppas House, Croydon	,,	7·20
Wallington, ,,	,,	7·09
Beddington, ,,	,,	7·03
Burgh Heath, Banstead	,,	7·00
The Hemnalls, Epping	*Essex*	6·96
Avondale Road, Croydon	*Surrey*	6·95
Addington	,,	6·92
Sanderstead	,,	6·92
Bickley	*Kent*	6·92
D'Abernon Chase, Ashtead	*Surrey*	6·91
South Norwood	,,	6·91
Lindisaye, Horsell	,,	6·90
Worcester Park	,,	6·84
Beckenham	*Kent*	6·84
Letcombe Regis	*Berkshire*	6·84

		in.
Broxbourne	*Hertfordshire*	6·84
Bromley	*Kent*	6·81
Belle Vue, Staines	*Middlesex*	6·81
Banstead	*Surrey*	6·77
Benhilton	,,	6·76
Warlingham	,,	6·76
Horsley Towers	,,	6·76

Fourteen Driest Stations in June, 1903.

		in.
Markree Observatory, Collooney	*Sligo*	·70
Dunderave, Bushmills	*Antrim*	·72
St. Helen's, Westport	*Mayo*	·79
Murrisk Abbey, ,,	,,	·83
The Heath House, Cheadle	*Staffordshire*	·85
Creggan Reservoir	*Londonderry*	·87
Bucknall, Horncastle	*Lincolnshire*	·88
Horn Head	*Donegal*	·89
Letterkenny	,,	·90
Watten	*Caithness*	·91
Lincoln	*Lincolnshire*	·91
Duffield	*Derbyshire*	·93
Enniscoe	*Mayo*	·94
Eallabus, Islay	*Argyll*	·94

So far we have spoken of the total rainfall, we now have to examine the way in which it was distributed throughout the month. For this purpose the dates of days with rain for 150 well-distributed stations were written out and compared. The smallest number of rainy days occurred in Norfolk, where two stations showed respectively five and six days; the largest number occurred in parts of the east coast of Great Britain, 18 rainy days having been experienced at Cawdor in Nairnshire and 16 or 17 days in parts of the East Riding of Yorkshire, Forfarshire, Aberdeenshire, and also in Co. Donegal. The number of days bore no relation to the amount of fall. Over the whole country the average number of rainy days was 10·2, and in the area of heaviest fall the number of rainy days was almost without exception either 9 or 10. In that area also the total fall for the month occurred between the 8th and the 19th in two wet spells, one from the 8th to the 11th, the other from the 13th to the 19th; but in the second spell either the 17th or the 18th was usually dry. The first rainy spell did not extend to the extreme east of England, thus accounting for the small number of rainy days in that locality. In the west of England the first rainy spell consisted of only two days, the 8th and 9th, and brought little rain. The latter part of the second rainy spell, about the 19th, was very wet, and a third rainy spell occurred between the 23rd and 25th. In the north of England, Scotland and Ireland, the rains of the month were more frequent but much less intense. The days were not so clearly grouped into spells as in the south and west, indeed only the third spell, which occurred in the last week of the month, was a well defined wet period.

London lay in the very centre of intensity of the mid-June deluge, and although the neighbourhood of Croydon had fully an inch more rain than the north of London, the Camden Square record represents very nearly the average amount for the lower Thames valley, and may thus be taken as typical of the whole of the very wet area. Rain to the depth of 6·43 in. fell on ten days, giving a fall of ·64 in. per rainy day, whereas the average fall (for 45 years) per rainy day in June is only ·19 in. On three of the ten rainfall days the fall exceeded one inch, and on two other days it exceeded half-an-inch. The record of the self-recording gauge shows that there were only eleven showers during the ten rainy days, the word *shower* being used to denote a period of continuous rain. Of these, three showers had a duration of only half-an-hour each, and one lasted for an hour and a quarter; the other seven each exceeded four hours. The following is an exact statement of the duration, amount and average intensity of the rain at Camden Square. The dates refer to the civil day.

Shower.	Rain commenced.	Rain ceased.	Duration of shower.	Amount of rain.	Intensity per hour.
i.	June 9th, 2.45 a.m.	7.30 a.m.	4 h. 45 m.	·51 in.	·107 in.
ii.	,, 10th, 2.15 a.m.	7.30 a.m.	5 h. 15 m.	·43 ,,	·082 ,,
iii.	,, 10th, 10.45 a.m.	6.15 p.m.	7 h. 30 m.	·09 ,,	·012 ,,
iv.	,, 10th, 11.15 p.m.	3.30 a.m. on 11th	4 h. 15 m.	·08 ,,	·019 ,,
v.	,, 11th, 1.15 p.m.	8.15 p.m.	7 h. 0 m.	·19 ,,	·027 ,,
vi.	,, 13th, 1.0 p.m.	11.30 p.m. on 15th	58 h. 30 m.	3·44 ,,	·059 ,,
vii.	,, 16th, 5.15 p.m.	5.45 p.m.	0 h. 30 m.	·21 ,,	·420 ,,
viii.	,, 16th, 7.45 p.m.	8.15 p.m.	0 h. 30 m.	·17 ,,	·340 ,,
ix.	,, 17th, 5.15 a.m.	5.45 a.m.	0 h. 30 m.	·02 ,,	·040 ,,
x.	,, 17th, 5.15 p.m.	6.30 p.m.	1 h. 15 m.	·15 ,,	·120 ,,
xi.	,, 19th, 9.15 a.m.	5.15 a.m. on 20th	20 h. 0 m.	1·14 ,,	·057 ,,
			110 h. 0 m.	6·43 in.	·058 in.

The only really heavy rain shown in the table is that which fell in the two short showers on the 16th, although portions of the longer showers showed individual half-hours of equal intensity. But attention is arrested by the extraordinary duration of steady uninterrupted rain from 1.0 p.m. on Saturday, the 13th, all that day, all Sunday, and all Monday until half-an-hour before midnight, when it stopped. These 58½ hours contributed more than half the month's fall; but it must be remembered that in the only wetter June at Camden Square of which records exist 3·28 in. fell in 56 minutes, from 1.32 p.m. to 2.12 p.m. and from 2.46 p.m. to 3.2 p.m., during a terrific thunderstorm on the 23rd of June, 1878. It was only in the shorter showers and once or twice for a short time during the longer falls that anything approaching the typical summer "thunder plump" was observed, and electrical disturbances were recorded from comparatively few places during the month.

The problem which this remarkable distribution of rain suggests to the meteorologist is a very puzzling one. It is to find the reason for a great wet area developing itself symmetrically along the valley of the lower Thames. The fact that the amount of rain bears little

relation to the configuration of the ground, and that where any relation is traceable it suggests a lower fall on the higher land, may be accepted as proof that it is the distribution of pressure in the air which must provide an explanation. The daily isobaric charts of the Weather Reports show that there was a distinct sympathy between rain and barometric pressure. From June 1st to 7th an anticyclone lay over the British Isles, the wind was steadily from north and north-east, and the weather generally dry. On the night of the 8th a low pressure area moved northward from France and continued over the south of England for four days, during which the first wet spell in the south took place. On the 12th the Atlantic anticyclone spread over the British Isles from the west bringing a dry day; on the 13th the pressure fell in the south, but again rose on the 18th, when a small low pressure area appeared over Scotland and inverted the gradient. On the 19th a well marked depression occupied the English Channel, and the rainfall over the extreme south of England was general and heavy while the north was dry. Next day the Atlantic anticyclone reasserted itself from the west and a period of absolute drought commenced in the south, which lasted at Camden Square unbroken for twenty-two days, a duration which has only been exceeded on eight occasions in the last forty-five years. Meanwhile the pressure in the north gave way about the 24th, and was relatively low until the end of the month, coinciding with the third wet spell, which did not extend to southern stations except in the west.

The difficulty is of course not removed, but merely shifted a step backward, by tracing the fluctuations of rainfall to variations in pressure, and there remains a reason to seek for the prolonged and steady rain which accompanied comparatively slight diminutions of pressure with very moderate gradients and little wind.

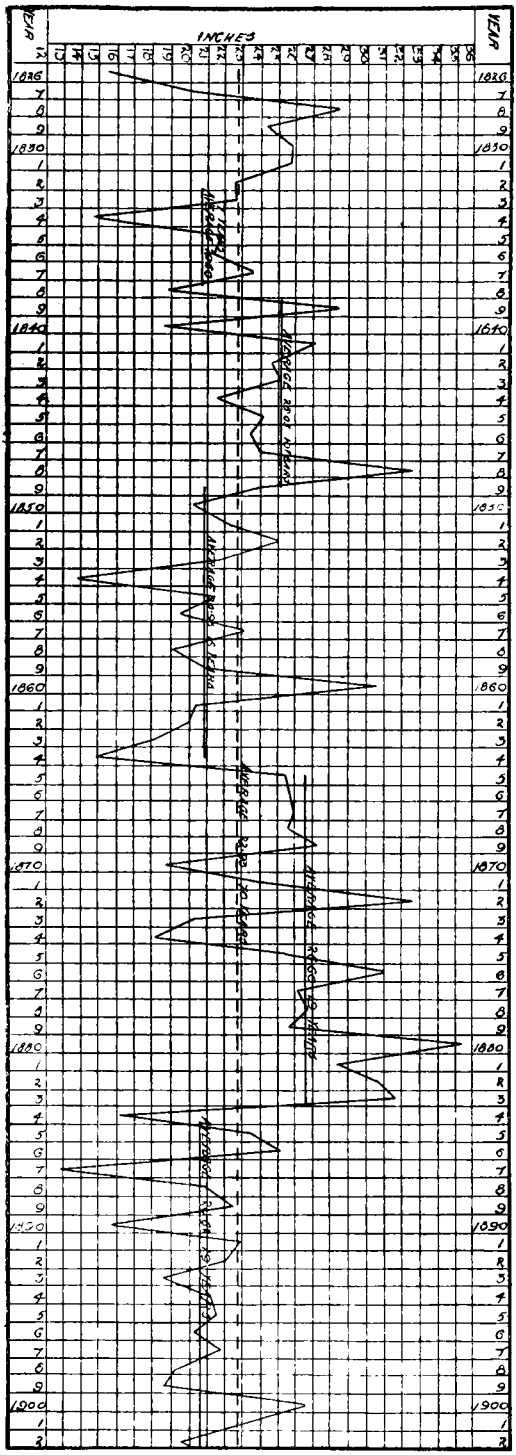
If space were available we should gladly print a selection of the numerous interesting letters we have received on the June rains, but we must ask the indulgence of our correspondents in this matter. For the same reason we must withhold a description of the floods in the Thames valley and in the rivers radiating from its southern watershed, for a long list of damage and loss would be necessary to do justice to the consequences of the ten days' deluge in the south, and —though in a less degree—to the troubles caused by drought in the north.

Correspondence.

RAINFALL IN THE LINCOLNSHIRE FENS, FROM RECORDS KEPT AT BOSTON.

To the Editor of Symons's Meteorological Magazine.

IN a paper on the "Shortage of Water," reported in your Magazine for April last, Dr. H. R. Mill pointed out that the rainfall statistics did not bear out the theory of a secular diminution of rainfall in the British Isles, but that the deficiency in the central parts of England had been very great, reaching 16 or 17 per cent. for the ten years 1890-99.



Bearing on this the accompanying statistics and diagram of rainfall recorded by me at Boston, the centre of the Lincolnshire Fen district, may be of interest.

With the year ending December, 1902, there were completed two cycles of 19 years, one being a wet and the other a dry period.

For the 19 years 1865-1883 the average annual rainfall amounted to 26·60 inches.

For the 19 years 1884-1902 the average was 20·62 inches.

The mean annual rainfall of the 70 years 1830-1899 was 22·93 inches.

The surplus above this average for the wet period 1865-1883 was 69·73 inches, and the deficiency for the dry period 1884-1902 was 43·94 inches.

During the first period there were 3 years when the average was not reached; and during the second period 3 years when it was exceeded.

The greatest annual rainfall during these two cycles was 35·53 inches and the least 12·94 inches.

The accompanying diagram shows the periods of wet and dry years during the last 70 years.

W. H. WHEELER,
M. Inst. C.E.

Boston, Lincolnshire,
April 24th, 1903.

W. H. Wheeler. M. Inst. C.E.

CLOUD ESTIMATION.

To the Editor of Symons's Meteorological Magazine.

THE practice of estimating the amount of cloud on the scale of 0 to 10 may have its imperfections from the circumstance that at any given place of observation the portion of sky at lower altitudes has not the same relation to the place itself as the portion overhead. In our country, and in others also, the tendency of the sky is usually to a cloudy or nearly cloudy state, or to a clear or nearly clear state, represented in the former case by estimations of say from 8 to 10, and in the latter case by estimations of say from 0 to 3, in both of which extremes the estimations are probably not much affected by the cause mentioned, which perhaps applies more to the transition state, as represented by the estimations 4 to 7, in which the cloud may be so situated as to refer more to the surrounding neighbourhood than to the place of observation. This transition state is, however, the exceptional condition. Lately I was induced to examine how far or to what extent it is really exceptional. For this purpose I selected at random from the Greenwich Observations for 1843 eight periods of five consecutive days each, two in each for the months of March, June, September and December, and as the observations were made every two hours, their number was in all 480. The results are as follows :—

Group	I. (0-3)	II. (4-7)	III. (8-10)	Mean Amount of Cloud.
Number of Observations	144	49	287	
Percentage.....	30	10	60	6·6

Thus, as was expected, the percentage of observations falling in Group No. II. is small ; only 10 per cent. of the whole.

I further discussed the observations at two places very different in position—Hawes and Strathfield Turgiss—employing the daily records at these places at 9 a.m. and 9 p.m. throughout the years 1875 to 1877, as given in Volumes III. and IV. of the *Quarterly Journal of the Royal Meteorological Society*. The number of observations in each of the years 1875 and 1877 was 730, and in 1876 was 732 ; in all, 2192 :—

Group	I. (0-3)	II. (4-7)	III. (8-10)	Mean Amount of Cloud.
Hawes—				
Number of Observations ...	430	242	1520	
Percentage	20	11	69	7·6
Strathfield Turgiss—				
Number of Observations ...	673	260	1259	
Percentage	31	12	57	6·4

The mean cloud at Strathfield Turgiss, 6·4, being much less than at Hawes, 7·6, the percentage in Group I. at Strathfield Turgiss is correspondingly greater, and in Group III. correspondingly less. But the percentages in Group II. are again small and nearly similar : 12 at Strathfield Turgiss and 11 at Hawes ; at Greenwich it was 10.

It seemed interesting to examine this point further. I therefore separated the observations of the 36 months at each place into three

divisions according to magnitude of the monthly amount of cloud. The results for the two places are given together, adding also that for Greenwich, the number of observations being here omitted and percentage only given :—

Group	I. (0-3)	II. (4-7)	III. (8-10)	Mean Amount of Cloud.
Strathfield Turgiss	46	11	43	5·0
Hawes	31	14	55	6·3
Strathfield Turgiss	29	14	57	6·5
Greenwich	30	10	60	6·6
Hawes	19	10	71	7·7
Strathfield Turgiss	17	10	73	7·8
Hawes	9	9	82	8·7

Thus whilst the percentage of 46 in Group I., with mean cloud 5·0, becomes reduced to 9 with mean cloud 8·7, the percentage of 43 in Group III. is increased to 82. But the percentages in Group II. vary only from 9 to 14. If the sky at any place were always clear, the percentage in Group I. would become 100, with nothing in Groups II. and III. ; if always cloudy, the percentage in Group III. would become 100, with nothing in Groups I. and II. But in the range of ordinary observations it would appear that increased percentage in Group I. is accompanied by decreased percentage in Group III., with little change in Group II.

WILLIAM ELLIS.

June, 1903.

GRASS AND SHADE MINIMA ON A HILL AND IN A VALLEY.

To the Editor of Symons's Meteorological Magazine.

I HAVE for some years noticed that the difference between the grass and shade minima is much greater in a valley than on a hill-top. The following comparison well illustrates my point.

	At Beddington,* 120 ft. above sea, on Wandle Brook.				On Top of Wimbledon Hill,† about 270 ft. above sea.		
	Shade Min.	Grass Min.	Diff.		Shade Min.	Grass Min.	Diff.
	°	°	°		°	°	°
April 13.....	30	21	9	...	32	28	4
,, 14.....	28	20	8	...	31	27	4
,, 15.....	37	28	9	...	38	35	3
,, 16.....	25	16·9	8·1	...	28	23	5
,, 17.....	25	17	8	...	29	26	3
,, 18.....	26	17·6	8·4	...	29	26	3
,, 19.....	25	19	6	...	30	26	4
,, 20.....	26·8	20·2	6·6	...	31	27	4
,, 21.....	34·9	29·2	5·7	...	39	35	4
,, 22.....	35	32	3	...	36	33	3
,, 23.....	26·7	20	6·7	...	31	27	4
,, 24.....	34	29·8	4·2	...	35	32	3
,, 25.....	25	16·7	8·3	...	30	24	6

* A difference of 12°—15° has sometimes been noted here. Average difference about 7°. Soil, gravel on chalk.

† An average difference of about 4°. Soil, clay.

STANLEY SINGLE

Park View, Wimbledon Park.

ROYAL METEOROLOGICAL SOCIETY.

THE concluding meeting of the present session was held on Wednesday afternoon, June 17th, at the Society's Rooms, 70, Victoria Street, Westminster, Capt. D. Wilson-Barker, F.R.S.E., President, in the chair.

Capt. C. Barron, Mr. G. Burt, Assoc. Inst. C.E., Mr. R. A. Coates, Mr. J. W. Gallagher, and Mr. A. Krawehl, were elected Fellows.

Dr. W. N. Shaw, F.R.S., read a paper on "The Meteorological Aspects of the Storm of February 26–27, 1903," in the preparation of which he had been assisted by Mr. F. J. Brodie and Mr. R. C. K. Lempfert. Between sunset on the 26th and noon on the 27th of February the British Isles were visited by a storm of unusual severity. Its most impressive characteristic was the amount of damage done to trees and buildings by gales from the south or south-west, particularly in the neighbourhood of Dublin, where very large numbers of trees were uprooted, and in Lancashire. Gales or strong winds were also experienced in many other parts of the British Isles. [See *Symons's Met. Mag.*, March and April, 1903].

After exhibiting some lantern slides showing the path of the barometric minimum and the area over which the destruction extended, Dr. Shaw proceeded to put forward some general conclusions about barometric depressions and storms, dealing more especially with the distribution of winds and the velocity of travel. He said:—

"There is possibly some misapprehension as to what motion of air may be expected to take place in a travelling storm of normal and permanent type. I will therefore devote a few lines to the consideration of that question. The accepted representation of the instantaneous motion of air in the neighbourhood of a low-pressure centre is a combination of rotation and radial motion represented by spirals with a certain incurvature. The maps suggest that the air approaches the centre by essentially similar paths from all sides. This suggestion appears to me to be apt to lead to very serious misapprehension. The apparent spiral motion is a merely instantaneous representation of the state of motion of a number of bodies. The actual motion of the air in a travelling storm is not a symmetrical spiral motion of air masses towards a centre, but a complicated kind of dance figure, in which the dancers group themselves at any instant in such a way that they can be sorted into spirals; but the path of any individual dancer may, and generally does, make no real approach to the spiral form. The spiral motion only becomes complete if the storm centre becomes stationary, and the conventional diagram represents the true paths in that case; but when the incurvature is small and the velocity of travel great, the general resemblance to symmetrical spiral motion is lost. To simplify the preliminary consideration of the question on this occasion, I propose to neglect the incurvature and regard the instantaneous motion of the travelling storm as purely rotational. I wish to consider the actual motion of the component air under the circumstances indicated—in other words, the actual geographical path of a balloon floating in the air within the influence of the cyclonic disturbance. For ease of distinction I shall call the actual path of the air a 'trajectory,' reserving the use of the word path for the motion of

the storm centre. If the centre of the storm were stationary the balloon would be carried round in a circle, but if the storm centre moves the trajectory is not a circle but something entirely different.

"I suppose, further, as a special case, that the velocity of the wind is uniform over the area covered by the circular storm, and that the velocity of travel of the storm centre happens to be the same as the velocity of the wind. The trajectories will be of different shape according to the original positions of the points under consideration with regard to the centre and its path. A point in front of the approaching centre will start at right angles to the path, but will be overtaken by the advancing storm and have its direction of motion reversed before it has made a half circle, and in the rear of the storm it will find itself in the region of nearly parallel isobars and travel away from the line of the path. Its trajectory will be a curious hook-shaped curve. A point behind the centre will get into the region of the isobars approaching more and more nearly to parallel straight lines inclined to the direction of motion of the storm. Its trajectory will not differ much from a straight line inclined to the path. A point in the transverse line through the centre on the left of the path will gradually approach and cross the path in the rear and come into the concluding condition of the previous cases, while a corresponding point on the right of the centre will not have its direction of motion affected but will travel along always keeping the storm centre on its left. Its trajectory will be a straight line parallel to the path. No point moves in a circle or in anything approaching to it. The apparent simplicity of motion as represented on an isobaric map becomes therefore very misleading when we deal with the actual motion of air. The trajectories in any real case depend upon the velocity of the centre and the incurvature as well as the original position of the points, and hence they are a series of exceedingly complicated lines always combining to show a comparatively simple and symmetrical arrangement of velocities at any instant.

"For any particular case, assuming a certain distribution of winds and a velocity of travel, it is easy to construct a diagram showing the trajectories for a series of particles which at any particular instant take their places on a circular isobar. Such trajectories are of course, to a certain extent, hypothetical, but at least they approximate to the motion of air in a real cyclonic depression. We may distinguish two extreme types—first, Type A, the stationary storm with symmetrical incurvature, drawing its air equally from all sides; and secondly, Type B, the storm made up of winds of uniform velocity but varying direction which travels with the same velocity as one of its component winds."

Dr. Shaw was of opinion that the storm of February 26th-27th must be classed as belonging to the Type B.

A long and interesting discussion followed the reading of this paper, in which the President, Dr. A. Buchan, Mr. R. T. Omond, Col. H. E. Rawson, Mr. W. Ellis, Mr. F. J. Brodie, Mr. W. H. Dines, Dr. H. R. Mill, Mr. C. Harding, Capt. A. Carpenter, and Mr. W. Marriott took part, and Dr. W. N. Shaw replied.

The other paper communicated to the meeting was "The Dines-Baxendell Anemograph and the Dial-pattern Non-oscillating Pressure-Plate Anemometer," by Mr. J. Baxendell, F.R.Met.Soc. The Dines

Pressure-Tube Anemometer is now the accepted standard instrument for recording wind movement, but it does not record the direction of the wind. Mr. Baxendell has endeavoured to overcome this drawback, and in this paper he gave a description of the combined velocity and direction anemometer which he has designed for the Fernley Observatory at Southport. In addition, he has designed a non-oscillating pressure-plate for showing on a dial the maximum pressure of the wind. By using a combined "head" or vane for the Dines anemometer Mr. Baxendell has been able to arrange for the new instrument to record—(1) the velocity, (2) the direction, and (3) the maximum pressure of the wind.

THE SIX MONTHS' RAINFALL OF 1903.

Aggregate Rainfall for January—June, 1903.

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	+7·22	175	Arncliffe	+11·93	145	Braemar	+8·95	163
Tenterden	+2·74	125	Hull	+1·66	116	Aberdeen	+2·53	119
Hartley Wintney	+7·78	173	Newcastle	+1·41	113	Cawdor	+4·77	139
Hitchin	+8·49	188	Seathwaite	+19·91	134	Glencarron	+14·05	135
Winslow	+6·90	170	Cardiff	+5·47	134	Dunrobin	+1·78	113
Westley	+1·64	116	Haverfordwest	+6·31	136	Darrynane	+3·50	116
Brundall	+·16	102	Gogerddan	+4·49	125	Waterford	+6·91	141
Alderbury	+6·18	153	Llandudno	+4·27	136	Broadford	+5·31	137
Ashburton	+5·90	127	Dumfries	+10·29	154	Carlow	+7·20	149
Polapit Tamar	+5·30	135	Lilliesleaf	+6·65	152	Dublin	+3·34	129
Stroud	+7·72	167	Colmonell	+3·65	119	Mullingar	+5·78	136
Woolstaston	+6·52	152	Glasgow	+13·63	188	Ballinasloe	+5·33	134
Boston	+2·75	132	Inveraray	+10·70	134	Clifden	+2·29	107
Hesley Hall	+1·62	118	Islay	+4·57	124	Crossmolina	+5·91	126
Derby	+2·97	130	Mull	+6·23	126	Seaforde	+5·15	132
Bolton	+2·77	117	Loch Leven	+11·19	173	Londonderry	+1·46	108
Wetherby	+5·97	158	Dundee	+2·23	119	Omagh	+7·53	145

The rainfall of the first six months of 1903 is above the average in all parts of the British Isles, and almost everywhere to a very substantial extent. Two extensive areas are particularly worthy of notice: the larger occupies the centre and south of Scotland and the north of England; the smaller occupies the central part of the south of England. In both the excess exceeds 50 per cent. of the average fall, and in both the excesses have the same maximum, both Hitchin and Glasgow having an excess of 88 per cent. The abnormal wetness of the winter months accounts for the condition of the northern area, that of the southern area is due mainly to the unprecedented character of June. Coast stations, both east and west, show the smallest excess of rainfall above the average.

REVIEWS.

The Cloud World, its features and significance, being a popular account of forms and phenomena, with an extended Glossary. By SAMUEL BARBER. London: Elliot Stock, 1903. Size $9\frac{1}{2} \times 6\frac{1}{2}$. Pp. xii. + 140. Illustrations.

THE author deals with clouds much in the same way as the field-naturalist deals with plants and animals. He describes their forms and what we may call their habits, dwelling upon the value of these characteristics as prognostics of coming weather. The scientific student of clouds or of air-movements, though he cannot fail to be interested in the observations which are detailed, will not be greatly helped, for the book was not written for him. The observer who loves observing for its own sake will find much to stimulate his interest in a fascinating avocation.

We cordially commend Mr. Barber's observations of the behaviour of clouds in exceptional circumstances to the attention of meteorologists. It would be well for the general reader to consult recent books on Meteorology to compare the impressions likely to be made by the portions of the text which border on theory with the views of other authors.

The pictures of clouds, most of them reproduced from *Knowledge* and many from the skilled camera of Captain Wilson-Barker, are a most attractive feature of the book.

U.S. Department of Agriculture. Report of the Chief of the Weather Bureau. 1900-1901. Size (vol. i.) 12 × 9. Pp. 318. Washington: 1901.

Ditto. 1901-02. Size 12 × 9. Pp. xxvi. + 342. Washington: 1902.

IN these reports only a few pages are devoted to the administration of the meteorological system; the bulk of the work is a discussion of the climatology of the United States for the year in question, mainly in the form of tables supplemented by explanatory statements.

With regard to the administration of the Weather Bureau, special attention is called to the efforts made to improve forecasts, and to secure the distribution of forecasts as widely and expeditiously as possible. Since the beginning of 1901 a new system of forecasts of Atlantic weather has been in use, whereby steamers leaving Europe are warned of the weather they are likely to meet in mid-Atlantic, and considerable success is claimed. A special caution is given to farmers who might be inclined to waste money by bombarding the sky in the hope of dissipating hail clouds; but, on the other hand, instances are cited in which damage from frost has been avoided by the timely use of smoke-producing combustibles in the fields on nights when a freezing temperature was predicted.

BOOKS RECEIVED.

The Meteorology of Edinburgh. By R. C. Mossman. [Trans. Roy. Soc. Edin., Vol. XL., Part III.] Edinburgh, 1903. Size 12 × 9½. Pp 41, one plate.

Survey Atlas of England and Wales. Part II. By J. G. Bartholomew. Edinburgh, 1903. Size 18½ × 12½. Five maps.

On the Similarity of the Short-period Pressure Variation over Large Areas. By Sir Norman Lockyer and W. J. S. Lockyer. [From Proc. Roy. Soc., Vol. 71.] Size 8½ × 5½. Pp. 2 and one plate.

Essai de Chronologie des Variations Glaciaires. Par M. C. Rabot. [Ex. du Bulletin de géographie historique et descriptive, No. 2.] Paris, 1902. Size 9½ × 6½. Pp. 47.

Researches with the Heliometer. Determination of the Parallax of the Ten First Magnitude Stars in the Northern Hemisphere. By W. L. Elkin. [Trans. Astronomical Obsy. of Yale Univ.] Size 12 × 9½. Pp. 72.

Meteorologisch Jaarboek voor 1900 & 1902. Utrecht, 1902. Size 12½ × 10. Pp. xxxvi + 262 and xxv + 242.

Meteorologiska Jakttagelser i Sverige. Vol. 39, 1897; vol. 40, 1898 and vol. 41, 1899. Stockholm, 1902. Size 12 × 10. Pp. viii + 157 and x + 155.

METEOROLOGICAL NEWS AND NOTES.

THE INTERNATIONAL KITE COMPETITION, held on the Sussex Downs, on June 25th, under the auspices of the Aëronautical Society of Great Britain, took place in fine weather but with a wind too light to enable the kites to rise 3000 feet, the minimum height for which the medal could be awarded. The kites, which were all worked by hand gear, were six in number. Each was loaded with a weight of 2 lbs. to represent a meteorograph and the greatest heights attained, as calculated from trigonometrical observations, were for Mr. Brogden's Burmese kite, 1816 feet; Mr. L. Cody's bird-shaped kite, 1476 feet; Mr S. F. Cody's similar machine, 1407 feet and Mr. S. H. R. Salmon's rhomboidal kite, 1250 feet.

WEATHER FORECASTS ARE UNNECESSARY in the opinion of a daily paper, published in a sea-side resort, which observes—whether in fun or in earnest we cannot say—

"For the pleasure-seeker, who can provide himself with a waterproof coat and umbrella, these reports are superfluous, and may be detrimental. The dwellers in our rough sea-girt island should never be influenced by considerations of weather. Townspeople when they want fresh air should take it without any attention to warnings. If it is mixed with *more hydrogen* than they desire they should suffer it patiently. It will be a bad day for England when a man or woman hesitates about going to the sea-side on account of the weather."

Some sea-side places seem, from the reference to hydrogen, to possess an explosive atmosphere.

THE THAMES FLOODS of last month caused a riverside resident to complain in the newspapers that he had taken his house because the river was at the bottom of his garden, but now he found that his garden was at the bottom of the river.

RAINFALL AND TEMPERATURE, JUNE, 1903.

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) ...	6·43	+ 4·53	1·48	14	10	85·9	28	39·7	13	0	0
II.		Tenterden	3·56	+ 1·37	·79	10	10	83·5	28	37·5	13	0	1
,,		Hartley Wintney	5·55	+ 3·60	1·02	15	9	83·0	28*b*	36·0	22	1	0
III.		Hitchin	6·40	+ 4·62	1·75	14	8	84·0	29	38·0	14	0	...
,,		Winslow (Addington)	5·17	+ 3·32	1·60	14	10	83·0	27	34·0	21	0	1
IV.		Bury St. Edmunds (Westley)	3·11	+ 1·07	·75	13	6	86·0	28	36·0	13	0	...
,,		Norwich (Brundall)	2·45	+ ·43	·68	15	10	86·0	28	34·8	13	0	1
V.		Winterborne Steepleton	1·75	...	·58	19	11	77·6	1	33·5	22	0	2
,,		Torquay	1·88	...	·54	19	14	76·2	1	43·5	22	0	0
,,		Polapit Tamar [Launceston]..	1·80	— ·59	·68	9	11	73·1	27	36·8	22	0	0
VI.		Stroud (Upfield)	4·12	+ 2·12	1·35	14	13	83·0	27	42·0	20	0	...
,,		Church Stretton (Woolstaston)	3·16	+ 1·02	·96	14*a*	13	75·5	27	37·0	14*a*	0	...
,,		Worcester (Diglis Lock)	2·90	+ 1·28	·83	10	15	...	...	...	...	...	...
VII.		Boston	1·59	— ·09	·50	13	8	85·0	27	37·0	21	0	...
,,		Hesley Hall [Tickhill].....	1·42	— ·25	·93	13	9	83·0	27	35·0	21	0	...
,,		Derby (Midland Railway).....	1·26	— ·79	·45	13	8	81·0	27	37·0	20	0	...
VIII.		Bolton (The Park).....	2·34	— 1·26	·65	26	9	71·5	27	35·1	21	0	1
IX.		Wetherby (Ribston Hall) ...	2·48	+ ·39	·78	13	10	...	...	...	...	...	...
,,		Arncliffe Vicarage.....	2·34	— 1·39	·83	26	11	...	...	...	...	...	...
,,		Hull (Pearson Park).	1·74	— ·23	·99	13	8	81·0	28	39·0	21	0	...
X.		Newcastle (Town Moor)	3·06	+ 1·18	·95	15	10	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	3·96	— 3·14	1·70	26	12	73·5	6	31·3	20	1	...
XI.	WALES.	Cardiff (Ely).....	2·09	— ·24	·62	14	12	...	...	...	...	...	...
,,		Haverfordwest	2·13	— ·20	·77	25	10	68·7	8,27	35·9	21	0	4
,,		Aberystwith (Gogerddan) ...	2·26	— ·38	1·05	10	8	77·0	27	28·0	19	3	...
,,		Llandudno.....	1·11	— ·86	·38	15	10	70·0	23*c*	42·5	21	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	1·84	— ·88	·43	27	9	74·0	4	35·0	12	0	...
XIII.		Edinburgh (Royal Observatory)	1·09	...	·37	4	11	74·2	4	39·7	18	0	1
XIV.		Colmonell	1·99	— ·68	·59	27	9	77·0	8	34·0	20	0	...
XV.		Tighnabruaich	2·60	...	·93	30	11	71·0	7, 10	38·0	19	0	...
,,		Mull (Quinish).....	2·34	— 1·09	·69	30	10	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·87	+ ·49	1·23	28	9	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	2·20	+ ·37	·55	27	17	79·0	4	36·3	14	0	..
XVII.		Braemar	1·42	— ·91	·40	27	12	73·0	8	27·8	20	3	7
,,		Aberdeen (Cranford)	1·59	— ·55	·42	27	12	73·0	28	30·0	18*d*	2	...
,,		Cawdor (Budgate)	2·38	+ ·06	·52	4	18	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	1·19	— 2·32	.61	25	...	...	...	...	...	...	...
,,		Glencarron Lodge.....	3·90	— 1·84	1·19	30	13	76·4	7, 8	30·9	20	1	...
XIX.		Dunrobin	1·36	— ·68	·27	24	12	69·0	4	34·0	20	0	...
,,		S. Ronaldshay (Roeberry) ...	...	...	...	...	...	...	...	...	...	...	...
XX.	IRELAND.	Darrynane Abbey.....	4·12	+ 1·02	1·70	23	11	...	...	44·0	14	0	...
,,		Waterford (Brook Lodge) ...	5·31	+ 2·70	1·89	25	10	73·0	5	35·0	21	0	...
,,		Broadford (Hurdlestown) ...	1·33	— 1·08	·36	25	11	70·0	5, 27	38·0	13	0	...
XXI.		Carlow (Browne's Hill)	3·15	+ ·88	·86	25	10	...	...	...	...	...	...
,,		Dublin (Fitz William Square)	2·49	+ ·57	·84	22	13	72·7	28	41·0	14	0	0
XXII.		Ballinasloe	2·04	— ·61	1·02	24	13	73·0	7	35·0	20	0	...
,,		Clifden (Kylemore)	2·32	— 3·11	·63	23	7	...	...	...	...	...	...
XXIII		Seaforde.....	2·97	+ ·41	1·34	22	12	86·0	28	35·0	18*e*	0	1
,,		Londonderry (Creggan Res.).	·87	— 2·27	·19	22	9	...	...	...	...	...	...
,,		Omagh (Edenfel)	1·95	— 1·06	·96	22	12	76·0	7	38·0	19	0	...

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

a and 15. *b* and 29. *c* and 28. *d* and 19. *e* and 20.

SUPPLEMENTARY RAINFALL, JUNE, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	5·41	XI.	Llandefaelog-fach.....	...
II.	Dorking, Abinger Hall .	5·19	,,	New Radnor, Ednol.....	3·69
,,	Sheppey, Leysdown	4·75	,,	Rhayader, Nantgwillt...	3·30
,,	Hailsham	2·44	,,	Lake Vyrnwy	1·30
,,	Crowborough.....	4·17	,,	Ruthin, Plâs Drâw	1·68
,,	Ryde, Beldornie Tower..	2·17	,,	Criccieth, Talarvor	1·34
,,	Bournemouth, Kempsey	2·47	,,	I. of Anglesey, Lligwy..	1·78
,,	Emsworth, Redlands ...	2·22	,,	Douglas, Woodville.....	2·58
,,	Alton, Ashdell	4·06	XII.	Stoneykirk, Ardwell Ho.	2·92
,,	Newbury, Welford Park	6·00	,,	Dalry, Old Garroch	3·10
III.	Oxford, Magdalen Coll..	5·66	,,	Moniaive, Maxwelton Ho.	2·44
,,	Banbury, Bloxham	3·85	,,	Lilliesleaf, Riddell	1·48
,,	Pitsford, Sedgebrook ...	3·06	XIII.	N. Esk Res. [Penicuick]	2·00
,,	Huntingdon, Brampton.	3·60	XIV.	Dalry, Blair	3·21
,,	Wisbech, Bank House...	2·02	,,	Glasgow, Queen's Park..	1·74
IV.	Southend	5·87	XV.	Inveraray, Newtown ...	2·96
,,	Colchester, Lexden	3·16	,,	Ballachulish, Ardsheal...	3·87
,,	Saffron Waldon, Newport	5·71	,,	Campbeltown, Redknowe	1·55
,,	Rendlesham Hall	3·41	,,	Islay, Eallabus.....	·94
,,	Swaffham	2·37	XVI.	Dollar.....	2·76
V.	Salisbury, Alderbury ...	3·28	,,	Balquhidder, Stronvar...	3·38
,,	Bishop's Cannings	4·85	,,	Coupar Angus Station...	2·30
,,	Ashburton, Druid House	2·70	,,	Blair Atholl	2·25
,,	Okehampton, Oaklands.	2·66	,,	Montrose, Sunnyside ...	2·14
,,	Hartland Abbey	1·59	XVII.	Alford, Lynturk Manse..	1·86
,,	Lynmouth, Rock House	3·03	,,	Keith H.R.S.....	1·89
,,	Probus, Lamellyn	1·34	XVIII.	Fearn, Lower Pitkerrie..	1·51
,,	Wellington, The Avenue	2·81	,,	S. Uist, Askernish	1·54
,,	North Cadbury Rectory	3·03	,,	Invergarry.....	2·37
VI.	Clifton, Pembroke Road	3·74	,,	Aviemore, Alvie Manse.	2·10
,,	Ross, The Graig	2·81	,,	Loch Ness, Drumnadrochit	1·93
,,	Shifnal, Hatton Grange	1·31	XIX.	Invershin	1·45
,,	Wem Rectory	1·13	,,	Bettyhill	1·79
,,	Cheadle, The Heath Ho.	·85	,,	Watten H.R.S.....	·91
,,	Coventry, Kingswood ...	2·89	XX.	Cork, Wellesley Terrace	3·94
VII.	Market Overton	1·69	,,	Killarney, District Asyl.	2·27
,,	Grantham, Stainby	1·68	,,	Glenam [Clonmel]	2·92
,,	Horncastle, Bucknall ...	·88	,,	Ballingarry, Hazelfort...	2·05
,,	Worksop, Hodsck Priory	1·29	,,	Miltown Malbay	1·01
VIII.	Neston, Hinderton	1·34	XXI.	Gorey, Courtown House	4·06
,,	Southport, Hesketh Park	2·22	,,	Moynalty, Westland ...	1·46
,,	Chatburn, Middlewood.	2·32	,,	Athlone, Twyford	1·75
,,	Duddon Val., Seathwaite Vic.	2·96	,,	Mullingar, Belvedere ...	1·20
IX.	Langsett Moor, Up. Midhope	1·84	XXII.	Woodlawn	1·36
,,	Baldersby	1·71	,,	Westport, Murrisk Abbey	·83
,,	Scalby, Silverdale	1·75	,,	Crossmolina, Enniscoe ..	·94
,,	Ingleby Greenhow Vic..	4·14	,,	Collooney, Markree Obs.	·70
,,	Middleton, Mickleton ...	1·50	XXIII.	Enniskillen, Portora ...	2·35
X.	Beltingham	1·66	,,	Warrenpoint.....	2·02
,,	Bamburgh	2·35	,,	Banbridge, Milltown ...	1·23
,,	Keswick, The Bank.....	1·59	,,	Belfast, Springfield	2·05
,,	Melmerby Rectory	1·33	,,	Bushmills, Dundarave..	·72
XI.	Llanfrechfa Grange	2·68	,,	Stewartstown	1·64
,,	Treherbert, Tyn-y-waun	...	,,	Killybegs	1·35
,,	Castle Malgwyn	1·90	,,	Horn Head	·89

METEOROLOGICAL NOTES ON JUNE, 1903.

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 brilliant day on the 1st, the temp. suddenly fell and no further warm weather was experienced until almost the end. A period of extraordinary wetness set in on the morning of the 9th, lasting till the night of the 19th, during which time 6·43 in., the whole of the month's R fell. This total has only been exceeded in June, 1878, with 6·71 in., and only on one other occasion in any month—namely, in August, 1878, with 6·72 in. On 13th, 14th, and 15th, the fall exceeded 1·00 in. in 24 hours. The mean temp. was 57°·6, or 2°·8 below the average, and the lowest in 46 years, except 56°·4 in 1860 and 56°·5 in 1871. The shade max. on 19th, 50°·8, was 2°·7 lower than the previous lowest value in June. T, L and H on 16th.

ABINGER HALL.—Fine till 8th and then extremely wet. Several frosts. TS on 16th.

TENTERDEN.—The first week was dry. From 8th to 19th was generally very wet. Cold, except for the first day and the last week, which were dry and hot. Duration of sunshine 195 hours.

CROWBOROUGH.—After the 1st, which was unusually warm, it was cool till 19th, and afterwards warm and dry. In 10 days, from 8th to 19th, 4·17 in. of R fell. On the night of 28th the min. temp. was 62°·9.

HARTLEY WINTNEY.—The greatest R ever recorded in any month, except October, 1891, when 7·07 in. fell. The first fortnight was cold, dull and cloudy; the second hot, dry and sunny.

WINSLOW, ADDINGTON.—The greatest June R ever registered at this station.

NORWICH, BRUNDALL.—A month of extremes. The 28th gave the highest June temp. in 21 years, and the 13th the lowest in the same period. The first 12 and the last 10 days were almost rainless, and nearly the whole month's fall occurred on the 8 days, 13th to 20th. The mean temp. was 2°·4 below the average of 20 years, and lower than any since 1886. L on 16th and 17th.

WINTERBORNE STEEPLETON.—Unusually cold. Mean temp. 53°·6, or 3°·0 below the average of 10 years. The excessive R of London and the Thames Valley did not extend to this part, and the R was less than the average.

TORQUAY, CARY GREEN.—R ·34 in. below the average. Duration of sunshine 215·9 hours, or 15·8 hours below the average. Mean temp. 56°·6, being 2°·2 below the average. Mean amount of ozone, 5·0; max. 8·0 on 22nd with S.E. wind, min. 3·0 on 5th with S.S.E. wind.

WELLINGTON.—Fine and warm at first. Weather changed on 8th, becoming very wet and at times abnormally cold till the 20th, when it improved. R about ·75 in. above the normal.

NORTH CADBURY RECTORY.—The first week and the last 10 days were fine and dry. From 8th to 20th was very gloomy with much R, though little compared with what fell round London. The 14th was the coldest June day by 8° in 7 years, and less warm than April 13th when there was S. Big H stones on 17th.

CLIFTON, PEMBROKE ROAD.—The first week was fine and warm, with high bar. and E. winds; from 8th to 16th very wet and cold, with R all day on 14th and 15th, the coldest days in June for 50 years. The last week was fine and warm with rising bar. R 1·40 in. above the average. TSS on 9th and 13th.

BOLTON, THE PARK.—During the first 20 days there were 19 on which the wind was E. or N.; this kept the temp. below its normal value, the lowest temp. in the screen being 35° and on grass 27°. Very little R fell until 24th and the three following days. The mean temp. was 53°·5, or 2°·5 below the average. Duration of sunshine 133 hrs. 20 mins.

SEATHWAITE VICARAGE.—A dry month, with persistently low night temp. and bright sunny days.

HULL, PEARSON PARK.—The earlier days were frequently cold, with N.E. wind and low night temp. Heavy R on 13th, 15th and 17th. T and H on 25th.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE.—Cold and ungenial after a hot week at the end of May. Fruit was much blighted by cold wind; the hay crop was very short and vegetation much retarded.

HAVERFORDWEST.—Unusually cold and inclement, with strong and persistent N. and E. winds throughout, reaching the force of a gale on the 1st and 2nd. Crops very backward and hay crop thin. Duration of sunshine 147·6 hours; three sunless days.

ABERYSTWITH, GOGERDDAN.—Very ungenial throughout, with heavy R and cold winds. Good weather in the last week, but too cold at night.

SCOTLAND.

CARGEN [DUMFRIES].—The dry weather of the first three weeks, accompanied by E. winds, most adversely affected the hay, corn and turnip crops.

INVERARAY, NEWTOWN.—Very fine and dry for the greater part of the month, but not warm, except for a few days at the beginning.

ISLAY, EALLABUS.—R only about one-third of the average.

MULL, QUINISH.—Absolute drought for 17 days from 5th to 21st, with brilliant sunshine. The first week of the drought was very hot and calm, but afterwards wind went to N. and E., with very cold nights. Sharp frost on 19th and 20th did much damage. This was the first frost in June since observations started 30 years ago. T and L on 29th.

COUPAR ANGUS.—The mean temp., 54°·7, was practically the average, but the extremes of 82° on 4th and 29° on 14th were unusual, and potatoes and the young leafage of the beech suffered much. Ground frosts occurred on 3 nights. R ·58 in. in excess of the average.

ALFORD, LYNTURK MANSE.—Notable for continuance of drought, the R being little felt till 19th and the ground fairly moistened only on 27th.

IRELAND.

CORK, WELLESLEY TERRACE.—R 1·15 in. over the average, and for the first 6 months of the year 7·50 in. over the average. The coldest June for 21 years except 1902; min. temp. on 14th, 34°·5, the lowest in June for 21 years.

DARRYNANE ABBEY.—Very dry to 20th, the fall being only ·11 in. on 3 days, followed by 3·72 in. on 5 days.

WATERFORD, BROOK LODGE.—The wettest June since 1879. T on 24th.

BROADFORD, HURDLESTOWN.—From May 17th to June 16th only 1·02 in. of R fell on 8 days, ·83 in. falling in a TS on May 29th, during which ·80 in. fell in 20 minutes.

MILTOWN MALBAY.—Cold and very dry. From May 22nd until June 21st there was only ·11 in. of R, falling mostly in amounts of ·01 in. The June frosts did serious damage to the potato crop in low-lying bogs and bottoms, the cold black drought wilting and stunting all vegetation. All crag and stony lands were burned brown and water running scarce.

DUBLIN, FITZWILLIAM SQUARE.—Between 8th and 19th, rendered memorable by the torrential R in the south of England, only ·33 in. fell in Dublin, whilst in the week ending on 27th the fall amounted to 2·16 in. As in June, 1902, winds from Polar quarters prevailed throughout the greater part, but during the last 10 days S. winds were observed. Duration of sunshine 167·5 hours. Mean temp. 56°·4, or 1°·6 below the average. High winds were noted on 6 days, never reaching the force of a gale. L on 28th, and TSS on 14th, 24th and 28th.

BALLINASLOE.—Potatoes were damaged by frost on 20th. During a TS on 24th ·90 in. of R fell in an hour.

MARKREE OBSERVATORY.—Very fine and dry almost throughout. Severe frost on the night of the 20th. TS on 24th.

OMAGH, EDENFEL.—A favourable month, more than redressing the ill effects of the earlier months. During the first three weeks the weather was almost continuously fine, with occasional high temperatures, so that the heavy R of the last eight days was needed and welcome.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1903.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute.				Average.				Absolute.		TotalRain.		Aver.
	Maximum.		Minimum.										
	Temp.	Date.	Temp.	Date.	Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	53·8	5	22·1	16	45·2	36·0	38·1	90	78·7	17·3	2·15	17	6·0
Malta	66·2	12	45·3	31	59·7	49·9	49·9	80	111·1	39·2	4·14	7	5·1
Lagos, W. Africa	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape Town	91·7	7	51·1	26	76·0	59·0	55·0	64	...	...	1·81	8	3·0
Durban, Natal	95·0	28	61·4	15	86·5	69·0	...	...	152·3	...	2·44	18	6·2
Mauritius	89·0	10	66·6	1	86·0	73·4	72·3	80	160·0	63·4	9·26	18	7·1
Calcutta	84·1	26	48·9	1	77·9	57·7	56·8	69	135·1	42·7	·21	1	3·5
Bombay	86·6	7	61·5	27	81·7	67·8	63·2	69	133·5	52·7	·00	0	2·4
Madras	87·3	2	66·9	1	84·2	69·9	69·8	82	136·0	63·8	4·53	3	3·3
Kodaikanal	71·1	18	43·5	25	64·0	47·6	44·4	71	130·5	28·7	1·25	3	3·8
Colombo, Ceylon	92·8	24	73·0	7	89·2	74·1	72·3	80	155·0	71·0	4·16	9	5·3
Hongkong	73·8	26	46·2	10	63·0	54·2	48·0	68	123·5	...	1·37	8	7·3
Melbourne	105·0	31	48·8	22	77·3	55·5	50·9	63	162·0	40·2	·94	4	4·7
Adelaide	102·3	31	51·9	14	84·1	60·6	50·8	47	159·0	47·0	·87	5	3·0
Coolgardie	113·4	27	49·2	21	96·2	64·4	48·5	33	173·6	47·0	·24	3	1·9
Sydney	89·1	6	57·3	15	77·3	64·6	59·6	65	132·7	49·9	2·28	14	4·4
Wellington	78·5	25	42·0	30	66·7	52·5	48·7	66	132·0	32·0	3·86	18	5·7
Auckland	76·5	7	52·0	30	68·9	57·2	50·3	63	145·0	50·0	7·13	19	5·4
Jamaica, Negril Point	87·9	13	62·2	18	84·0	69·5	69·2	78	...	...	1·13	5	...
Trinidad	90·0	19	61·0	16	86·9	67·5	69·8	78	160·0	60·0	1·51	3	...
Grenada	86·2	9	70·2	26	82·3	72·5	68·7	72	151·0	...	5·09	21	2·8
Toronto	43·9	30	—4·9	9	29·8	16·3	21·4	84	54·0	—9·1	2·70	18	7·8
Fredericton, N.B.	45·9	22	19·5	11	26·8	3·7	4·7	61	...	...	3·96	10	6·0
Winnipeg	35·0	25	—28·7	30	13·6	—9·1	...	...	...	...	·28	3	5·5
Victoria, B.C.	54·0	3	30·3	28	45·2	38·6	...	...	...	...	3·94	20	8·3
Dawson	14·2	13	—60·8	26	-19·6	—33·5	...	...	...	...	·50	2	4·5

MALTA.—Mean temp. of air 54°·3, or 1°·1, above average. Mean hourly velocity of wind 8·4 miles, or 2·9 below average. Mean temp. of sea 60°·2.

Mauritius.—Mean dew point 2°·0 above, and R 2·03 in., above average. Mean hourly velocity of wind 8·4 miles, or 2·7 below average; prevailing direction E. by S.

MADRAS.—Bright sunshine 185·2 hours, or 52·4 per cent. of the possible maximum.

KODAIKANAL.—Mean temp. of air 54°·0. Mean daily velocity of wind 287 miles. Bright sunshine 203·0 hours.

COLOMBO.—Mean temp. of air 80°·7, or 1°·6 above, of dew point 2°·4 above, and R ·65 in. above, averages. Mean hourly velocity of wind 7·9 miles.

HONGKONG.—Mean temp. of air 58°·3. Bright sunshine 107·3 hours. Mean hourly velocity of wind 11·8 miles; prevailing direction E.N.E.

Adelaide.—Mean temp. of air 72°·4, or 1°·7 above average.

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

Auckland.—Unprecedentedly cool and wet, R being the largest yet recorded for the month, and nearly three times the average. Mean temp. 4° below average.

TRINIDAD.—R 1·45 in. below the 40 years' average.

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCLI.] AUGUST, 1903. VOL. XXXVIII.

HEAVY FALLS OF RAIN IN JULY, 1903.

A REMARKABLY wet July following a remarkably wet June has made it quite clear that the year 1903 is to have a rainfall much above the average in the south of England at least. As in June so in July, the heavy rain has not been accompanied by thunderstorms of remarkable severity, though electrical disturbances have not been absent. The most striking features of the July rainfall have perhaps been the very high falls which occurred in the north of Kent on Thursday, the 23rd, and the heavy rain in London on the early morning of Sunday, the 26th, when several of the newspaper offices were flooded and the printing of the Sunday papers stopped.

The monthly falls, with the difference from the average as well as the aggregate excesses of rainfall for the year, will be found set forth in detail in the Tables. We may mention that at Camden Square there were five days with a rainfall exceeding one inch between June 13th and July 23rd, and in only one previous year, in 1878, has so great a number of rainfall days with falls of one inch or over been recorded. Between June 13th and July 25th there were no less than seven days with a rainfall exceeding three-quarters of an inch, and by July 31st the rainfall from January 1st amounted to 22·04 in., whereas in 1902 the total fall for the year was 20·84 in., and the average yearly fall for the ten years, 1890-99, was 22·78 in. Since the Camden record commenced in 1858 there has been no previous instance of two consecutive months with over 5 inches of rain each, nor of so great a fall as 11·63 in. in any two consecutive months.

As regards the exceptionally heavy falls, we cannot do better than let our correspondents speak for themselves. The first of the following letters refers to the 19th; all the others to the 23rd.

To the Editor of Symons's Meteorological Magazine.

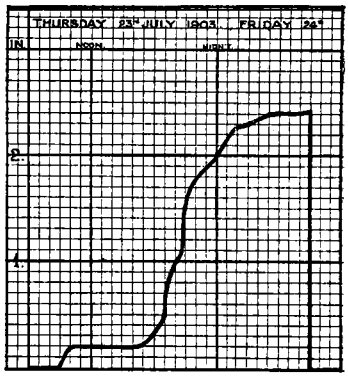
As a regular yearly correspondent of yours in the matter of rainfall, I think it will be of interest to you if I send a report of the most remarkable storm I ever witnessed in England. Dense masses of clouds appeared to come from all sides at 4.30 p.m. on July 19th. The storm began, the lightning was almost continuous, and in 30 minutes, when there was a lull in the storm, I measured 1·68 in. of rain; within a quarter of an hour it began again, and in a little over

half-an-hour a further fall of 1·53 in. The storm then passed away towards the S.E. Altogether **3·21** inches of rain fell in about one hour and a half. Several trees were struck, and I had two heifers killed and one injured by the lightning not far from my house; they were under a tree that was struck.

J. G. WOOD.

Shaldon Manor, Alton, Hants,
20th July, 1903.

The heaviest rainfall which has occurred on the summit of Crowborough Hill since the commencement of my residence there at the end of the year 1889 is recorded on the enclosed copy of my rain gauge diagram. The fall commenced at 9 o'clock on Thursday morning, 23rd July, when two-tenths of an inch fell in one hour; then there was a cessation from 10 o'clock a.m. till 5 o'clock p.m., when the rain recommenced, and fell continuously till 5 o'clock a.m. on Friday, the 24th, by which time 2·25 inches additional rain had fallen, thus showing that **2·45** inches had fallen in 14 hours.



Each vertical line represents one hour, each horizontal line ·10 in.

ISAAC ROBERTS.

Starfield, Crowborough,
27th July.

On the morning of the 24th my gauge measured **2·48** in., 13½ hours rain. We had neither thunder nor wind; the heavy black clouds seemed to pass from east to west. This is a record for

J. MASSON.

Tottingworth Park, Heathfield, Sussex,
July 26th, 1903.

I registered no less than **2·79** in. this morning, which fell in 17 hours. So far as I know, this is unprecedented for this locality.

C. E. JONES.

9, Manor Terrace, Lea Bridge Road, Leyton, E.
July 24th, 1903.

The rainfall here for 24 hours ending 10 a.m. July 24th, has been **2·85** in., the result of heavy showers in the morning and 15 hours continuous rain, from 4.30 p.m. July 23rd to 7.30 a.m. July 24th. I thought the amount sufficiently remarkable to notify to you.

M. BOARDMAN.

Glen Andred, Groombridge, Sussex,
July 24th.

I registered this morning at 9 a.m. **2·89** in. Rain began about 4 p.m., and at 7 p.m. 0·25 in. had fallen. A tropical rain fell from about 7.30 to 9.30, and heavy rain till daylight. Rain ceased about 8.30 a.m.

FREDERICK WILKIN.

Lower Cousley Wood, Sussex, 24th July, 1903.

The rainfall, as measured by myself here, for 24 hours ending 9 a.m., 24th inst., was **3·02** in. Rain started at 6.45 p.m., 23rd, but only fell in any quantity after 7.15 p.m.

Measurements were at

23rd	7.15 p.m.	.....	·01 in.
	8.15 p.m.	.....	·53 ,,
	9.15 p.m.	.....	1·04 ,,
	10.15 p.m.	.....	1·49 ,,
24th	9 a.m.	.....	3·02 ,,

The rain ceased practically on the stroke of 9 a.m.

F. W. FREIR.

Bylock Hall, Ponders End, Middlesex, July 25th, 1903.

I have to inform you that the rainfall for 24 hours ending 9 a.m. this day, amounted to no less than **3·11** in. The rain overflowed the receiver (which holds 2·90 in.) into the large cylinder. The rain occurred from 10 a.m. till noon, and from 5 p.m. to 6.30 a.m. on 24th.

I. C. STENNING.

Steel Cross House, Tunbridge Wells, 24th July, 1903.

I registered **3·38** in. of rain here for the period 5.40 p.m. on 23rd to 8 a.m. on 24th. As a rule our rainfall is small on board the ship. On this occasion it came down in torrents. I had been in town and coming back, just on this side of Dartford, the embankment had washed down and blocked the lines; they managed, however, to clear one line, over which all trains, up and down, had to pass slowly.

D. WILSON-BARKER.

H.M.S. Worcester, off Greenhithe, Kent, July 24th, 1903.

The amount of rain measured at 9 a.m. to-day (July 24th) for the preceding 24 hours totalled **3·42** inches. This amount is almost unprecedented so far as London and its neighbourhood are concerned, the nearest approach, as far as I have been able to ascertain, being 3·28 in. at Camden Square on 23rd June, 1878. The fall of rain was heaviest from 6.30 to 10.30 p.m. on July 23rd, during which time the amount was 2·31 inches.—At Greenwich Observatory (distant $\frac{3}{4}$ mile W.N.W.) the total fall was **3·15** inches. There was some thunder and lightning between 7.15 and 7.45 p.m. on the 23rd.

H. K. G. ROGERS.

13, Eastcombe Villas, Blackheath, S.E., 24th July, 1903.

We are surprised to see so little in the papers about the heavy rainfall we measured in this district on Thursday. You may be interested to know that we had **3·28** in. My brother, living three miles off (nearer Gravesend) measured **3·75** in., and a friend at Thorney, near Gravesend, **3·84** in. In our own case, ·53 in. fell between 11 a.m. and 1.30 p.m. We had a fine afternoon, but it began to rain again at 6 p.m. and kept up a continual downpour until about 9 a.m. on Friday. We only measured ·02 in. for Friday. I believe they had between 2 and 3 inches at Frindsbury. Thunder was heard on Thursday morning, but very distant.

FRANCES PYE.

Knight's Place, Rochester,
July 25th, 1903.

This morning at 9 o'clock I measured the exceptional amount of **3·94** inches of rain, being the quantity for previous 24 hours. The greater portion fell between 6.30 and 9 p.m., but I believe that it rained all night and was raining slightly at 9 o'clock this morning. There was a little thunder last evening. I may say that I measured *most* carefully (twice), taking all precautions to avoid error. My gauge holds $4\frac{1}{2}$ inches.

LIONEL BURRELL.

Westley, Sidcup,
July 24th, 1903.

[Dr. Burrell is to be congratulated on his prudence in having a gauge large enough to contain so exceptional a fall. Another observer at Sidcup spoiled his record for the year and lost the satisfaction of noting a great fall, by having so small a receiver that his gauge overflowed with 2·50 in., an amount which any summer thunderstorm might deposit in an hour.]—Ed. *S.M.M.*

SCOTTISH METEOROLOGICAL SOCIETY.

THE Half-yearly General Meeting of the Society was held in the Hall of the Royal Scottish Society of Arts, 117, George Street, Edinburgh, on July 18th, Lord MacLaren, Vice-President, in the chair.

The report of the Council, which indicated that the affairs of the Society were in a satisfactory condition, was adopted.

Dr. Buchan read a paper on "The Rainfall of Scotland in relation to Sunspots." A set of eleven maps was exhibited, showing the variations for each of 144 Scottish stations most of which had practically continuous records from 1855 to 1898, that is for four eleven-year sunspot periods. The amounts for each station for the years 1855, '66, '77, '88 were grouped together, those for 1856, '67, '78, '89, and so on. Each of these eleven groups of four years was averaged, and the deviations of each from the 44-years' mean were entered as percentages on the corresponding maps. The broad results were of

a striking character, the year following that of sunspot maximum being a year of decided rainfall excess, whilst there was a tendency to a secondary maximum about the time of sunspot minimum. The different stations all over the country confirmed one another in a remarkable manner, but this variation was more pronounced for places on the west coast than for places on the east. Combining and averaging the results for all the stations dealt with, the following curve for "all Scotland" was obtained :—

Year of cycle	i.	ii. (*min.*)	iii.	iv.	v.	vi. (*max.*)	vii.	viii.	ix.	x.	xi.
Per centage under or above average of 42·6 inches ...	−3	−2	−5	−4	−3	+4	+7	+7	+1	−1	—

The time of rainfall maximum corresponded to a period of excess of winds with a westerly component.

The results presented referred to Scotland only. An examination, for instance, of the rainfall of the south-eastern counties of England showed that there the curve was inverted, the principal maximum occurring at the time at which the secondary maximum occurred in Scotland. The curves for the different countries of the world must be studied in relation to the varying meteorological conditions of different regions.

Lord MacLaren made some remarks on the nature of sunspots. The double maximum suggested that two influences were in operation. Perhaps there was a double variation, one of rainfall intensity and one of rainfall frequency. Sir John Murray emphasized the cumulative effect of the causes at work by which the year of rainfall maximum was deferred till the year following that of maximum sunspots.

Mr. R. T. Omond, the hon. secretary, followed with a paper on "The Location of Rainfall Stations in Scotland." From the scientific point of view it was desirable to know with equal accuracy the amount of rain that fell on each small portion of the country ; but a map on which were entered all places from which records were available showed lamentable blanks in most of the mountainous or thinly populated districts. The Council, therefore, appealed to members to aid them in an endeavour to secure additional rainfall observers, especially in the Southern Uplands, the Western Highlands and the extreme North.

OBSERVING THE FALL OF A METEORITE.

REFERRING to a note in our February number, stating that meteoric stones had been seen to fall only four times in the British Isles, the Rev. W. C. Plenderleath, of Mamhead Rectory, writes stating that he had heard of another case, and sending an account of it written by the lady who saw the phenomenon. In the absence of a mineral-

ogical examination of the stone it is impossible to say positively that it was a meteorite and not a piece of ironstone struck by the flash of lightning which fused the sand. The description runs :—

"With pleasure I write all I remember of the incident referred to in Mr. Plenderleath's letter, and I will make it as clear as I can. In 1887 (I think early in August) there was a very heavy thunderstorm at Harrogate, and in the surrounding districts. We were then living at Starbeck, a hamlet between Harrogate and Knaresborough. I was watching the storm from the drawing-room window, when suddenly (simultaneously with a sharp, cracking clap of thunder, immediately overhead) I saw a bright white light fall, in a flash of lightning. As it touched the earth I heard a loud fizz—like an enormous match being struck. When the rain ceased I went to the spot where it fell, in a meadow, at the bottom of the garden, about 50 yards distant. I saw a disturbance in the ground, and on digging at a little below the surface, I found a hard, heavy substance, about the size of a guinea-fowl's egg, surrounded by pieces of light grey and white substance, like slate. I collected it all and sent it to Professor Tyndal; by return of post I had a kind note from Mrs. Tyndal, saying that the Professor was from home, but that she had notified him. In a few days I heard from Professor Tyndal, thanking me for the specimen, and saying that it was 'ironstone,' and the fragments 'fusion of sand by the lightning.' Dr. Tyndal did not return the specimens, and I do not know what became of them. My husband's health was very bad, and we left for the east, and Japan, immediately afterwards, and the meteorite passed from my mind, interesting though it was. I was seven years absent from England. It is a long time ago now, nearly sixteen years, and so much has happened since—but I always remember the interesting circumstance, and feel rather proud to have seen and found it. I wish I could tell what became of it."

Abraham Follett Osler.

1808—1903.

THE death of Mr. James Glaisher, at the advanced age of 93, has been quickly followed by that of his still more patriarchal contemporary, Mr. A. F. Osler, F.R.S., who, although less known to the public, was a notable figure in the meteorological world of the first half of the last century. Mr. Osler devised the self-recording pressure-plate anemometer and rain-gauge with which his name is associated, in the year 1837, and, although for purposes of exact measurement the instrument in its original form has been superseded by Mr. Dines's pressure-tube anemometer, it exercised a very important influence on the growth of our knowledge of the force of the wind. These anemometers were used at the temporary observatories at St. Helena, Toronto and the Cape of Good Hope during Ross's Antarctic expedition of 1839-43. Mr. Osler was engaged in business in Birmingham, and the first of his anemometers to be constructed has, we believe, been at work in the observatory of the Birmingham and Midland Institute for sixty-six years.

Correspondence.

HEAVY FALLS OF RAIN IN SHORT PERIODS.

To the Editor of Symons's Meteorological Magazine.

ON page 78 of your Magazine for June I note that Mr. F. Campbell Bayard records some phenomenal short period rainfalls, of which the most remarkable is that of Beddington Corner—3·50 in. in less than an hour.

The greatest fall I have ever registered was during a thunderstorm in North Sussex on June 7th, 1889, when 2¼ inches fell in 1½ hours. This is at the rate of 1·50 in. per hour, or considerably less than half that recorded by Mr. Campbell Bayard. In *British Rainfall*, 1886, p. 117, I see there are three remarkable falls within the last 30 years of half an hour and less, viz. :

2·12	inch at	Canterbury	in 20 minutes.
2·34	,, at	Camden Square	in 30 ,,
2·90	,, at	Glamorgan	in 30 ,,

But I fail to find any record to equal 3½ inches in less than an hour, and shall be glad to know whether this is a record for Surrey.

Yours faithfully,

ARTHUR F. PARBURY.

Jesses, Haslemere, Surrey, 17th June.

[The measurement of the rate of rainfall is of great importance, but it has been much neglected, and until self-recording rain gauges are much more frequently used than at present we must remain with very imperfect information. Although very heavy falls of rain in short periods have rarely been measured, it is not safe to conclude that they rarely occur, for their apparent rarity may be due merely to the small number of observers who are on the watch for them.

So far as we can ascertain by consulting the volumes of *British Rainfall*, the fall of 3·50 in. of rain in one hour at Beddington Corner, on May 30th, 1903, is the greatest amount ever recorded in one hour in the British Isles with one exception, 3·63 in. having fallen in one hour at Maidenhead in 1901. In 1889 a fall of 3·64 in. in 1 hr. 5 min. (at the rate of 3·36 in. per hour) took place at Henley-in-Arden ; in 1901 a fall of 3·25 in. in 55 minutes (at the rate of 3·55 in. per hour) was reported from Wadhurst, and in 1900 a fall of 3·75 in. occurred at Ilkley in 1 hr. 15 min. (at the rate of three inches per hour). We have found no other case of a continuous rain for more than 55 minutes at an average rate of 3 in. per hour. For shorter periods, of course, far greater intensities are on record. Thus, in 1893, a fall of 1·25 in. took place in five minutes at Preston, the rate being 15·00 in. per hour. The diagram published annually in *British Rainfall* shows that in order to be exceptional an hour's rain must exceed 1·75 in., a half-hour's 1·25 in, a quarter-hour's ·80 in., and five minutes' fall ·30 in. ; these values corresponding respectively

to 1·75 in., 2·50 in., 3·20 in., and 3·60 in. per hour. We trust that the attention called to this matter by Mr. Parbury may induce many observers to observe the duration of exceptionally heavy showers, and read their gauges as soon as the shower is over.—ED., *S.M.M.*]

PREVALENCE OF MACKEREL SKIES IN THE LATTER PART OF JUNE.

To the Editor of Symons's Meteorological Magazine.

I WAS much struck by the prevalence, during the latter part of June, of what Abercromby, in his treatise on Weather, calls one of the rarest skies seen, viz., mackerel. From June 25th to 30th a distinct mackerel sky was visible during some period of the day. At 7.30 a.m. on the 27th, a really beautiful mackerel sky was visible of a pearly white colour at the zenith; when first observed it was of a minute cumuli-form appearance, it gradually changed between 7.30 and 7.45 a.m., first into wavelets and then into flecks, and by 8 a.m. it had assumed the appearance of an almost perfect scale cloud. A still more beautiful instance was seen on the 28th at 8.30 p.m.; this cloud was of a dark minute cumuli-form appearance, tinged a glowing golden red, set in a golden yellow background, the contrast being very fine. On the same evening, towards 9.30 p.m., cirro-stratus was visible in the W.N.W.; it appeared to hang in the sky like a pall of smoke on a calm day, and was tinged a peculiar brick-dust tint round the edges.

S. C. RUSSELL.

"*Dunrobin*," *Cedar Road, Sutton, Surrey,*
July 3rd, 1903.

REVIEWS.

Report of the Meteorological Council for the year ending 31st March, 1902, to the President and Council of the Royal Society. London. Printed for H. M. Stationery Office, 1902. Size 9½ × 6. Pp. 164. Price 1s. 2d.

THIS report, though dated on the cover 1902, was not in the hands of the public in that year. Of the new work taken up by the Council, we may notice the preparation of the meteorological reports for the Registrar-General, a work which had for many years been carried out by the late Mr. Glaisher. The Council supplied meteorological instruments to the Antarctic Expedition on board the *Discovery*, and opened a new statistical department in the largest and most accessible room in the Meteorological Office, where the public may consult the records preserved there. Other desirable extensions of the work of the Office are referred to, and regret expressed, which will meet with general sympathy, that they are at present impracticable, on account of the full occupation of the staff in other duties which cannot be set aside.

The weather forecasts for the year were rather more successful than usual, 58 per cent. of complete and 26 per cent. of partial successes being claimed, as compared with an average of 55 and 27. The special storm warnings were as usual rather better, 62 per cent. being completely, and 26 per cent. partially justified.

The report on the Climatological stations shows a satisfactory increase in the number of sunshine records. Appendix V. contains a summary of the conspicuous meteorological occurrences of 1901, and maps are given of the distribution of rainfall during the heavy falls of November 11th and 12th, showing the relation of the rainfall to barometric pressure and wind.

This report seems to exhale a spirit of hopefulness, and we trust that facilities may be afforded the Meteorological Office to carry out the new work hinted at or already begun.

Theory of Observations. By T. N. THIELE, Director of the Copenhagen Observatory. London: C. and E. Layton, 1903. Size $10\frac{1}{2} \times 8\frac{1}{2}$. Pp. 144. Plate. Price 12s. net.

THIS is a discussion of the theory of observations, dealing in a comprehensive way with the laws of error and probability. The treatment of every collection of statistics necessarily involves the application of these laws either designedly or implicitly, but it would be impossible in this place to follow Mr. Thiele's systematic development of the subject which is treated in a purely general way with much mathematical detail. We must congratulate the author on his admirable command of the English language, his clear and graceful use of which makes the memoir pleasant to read and the reasoning easy to follow.

Quarterly Return of Births, Marriages and Deaths for England and Wales. Published by the Authority of the Registrar General. London: April 28th, 1903. Price 9d.

WE notice this well-known official publication, because the first quarter of 1903 contains the first issue of the meteorological tables compiled by the Meteorological Office. These are preceded by remarks on the weather, extracted from the Monthly Weather Reports, and the tables themselves contain data from sixty-one stations in England, Wales and the English Channel. The stations are grouped into eight districts, and are selected so as to represent the various meteorological conditions of each district with regard to distance from the sea, height above sea level, and relation to aggregation of population as well as to uniformity of geographical distribution. With so small a number of stations scattered over so large an area the attempt to take account of all the factors specified is a bold one, but it is an attempt in the right direction, and we are not rash enough to say that we could improve upon it. Unfortunately

uniformity in recording has not yet been attained. Some stations only give the readings once daily at 9 a.m., some are taken at 8 a.m. and 6 p.m., others at 9 a.m. and 3 p.m., but these are distinguished by the use of special type from the majority of the stations, which have readings for 9 a.m. and 9 p.m., and the latter alone are used for estimating the mean values for the eight districts. The scientific value and practical utility of the tables have been distinctly increased by the changes which have been made.

The National Physical Laboratory. Report for the Year 1902. London: Harrison and Sons. 1903. Size $10\frac{1}{2} \times 7$. Pp. 52.

A PROMPT report of work done, including as an appendix a record of the magnetic and meteorological observations at Kew Observatory. As showing the value of the Kew verifications and the excellence of the work of leading opticians, we note that out of 2733 meteorological thermometers tested in 1902, only 55 were rejected on account of excessive error or for other reasons; thus 98 per cent. of the thermometers submitted were of high accuracy.

Rapport sur les Observations Internationales des Nuages au Comité International Météorologique, par H. HILDEBRAND HILDEBRANDSSON. I. Historique: Circulation Générale de l'Atmosphere. Upsala, 1903. Size $10\frac{1}{2} \times 7\frac{1}{2}$. Pp. 44 and 22 plates.

PROFESSOR HILDEBRANDSSON of Upsala first describes the steps by which the International Meteorological Committee were induced to organize systematic observations of clouds in all parts of the world. One result of this was the adoption of an international nomenclature for clouds and the preparation of the well-known international cloud atlas. Another result was the observation of cloud movement, especially the movement of the upper clouds, at a number of stations in all parts of the world.

The second and larger part of the report is devoted to the discussion of the observations which have been collected, and this is illustrated by plates showing the average cloud-directions at each station for each month in the year. The conclusions arrived at are so important that we translate them in full.

"We have proved *by direct observations* the following results:—

"1. Above the thermal equator and the equatorial calms an air-current prevails from the east all the year round and at great heights it appears to have a high velocity.

"2. Above the trade winds there prevail anti-trades blowing from S.W. in the northern hemisphere, and from N.W. in the southern.

"3. These upper anti-trades do not blow beyond the limits of the surface trade winds, but are deviated more and more to the right in the northern hemisphere and to the left in the southern, until they become westerly winds above the tropical high pressure belts, where they descend to supply the surface trades.

"4. The regions situated near the equatorial limits of the trade winds lie according to season in the trades or in the equatorial calms, and consequently above them there is an upper monsoon, consisting of the anti-trade in winter and the equatorial current in summer.

"5. From the tropical high pressure belts the pressure of the air diminishes regularly, on the average, towards the poles or at least to within the polar circles. Thus the air of each temperate zone is drawn into a great polar whirl, turning from west to east. The circulatory movement seems to be of the same nature as that of an ordinary cyclone; the air of the lower layers approaches the centre and that of the upper retires from it more and more as the height increases up to the highest regions in which we have cloud observations.

"6. The upper layers of air of the temperate zones extend over the tropical high-pressure belts in order to descend there.

"7. The irregularities found at the surface, especially in the region of the Asiatic monsoons, in general disappear at the height of the lower or intermediate clouds.

"8. It is necessary to abandon the idea of a vertical circulation of air between the tropics and the poles hitherto admitted according to Ferrel and James Thomson."

These results are a statement of observed facts as to cloud movement and are in no way theoretical. The author points out in addition that the direction of the upper air-currents seems to coincide with the average paths of barometrical depressions which may originate as satellites in the great atmospheric currents.

THE SEVEN MONTHS' RAINFALL OF 1903.

Aggregate Rainfall for January—July, 1903.

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	+10·17	186	Arncliffe ...	+11·94	138	Braemar	+9·60	156
Tenterden	+3·81	128	Hull	+2·02	116	Aberdeen	+5·17	132
Hartley Wintney	+8·82	168	Newcastle.....	+3·45	126	Cawdor	+4·98	131
Hitchin	+10·24	185	Seathwaite	+20·75	131	Glencarron	+13·96	130
Winslow	+7·90	164	Cardiff	+6·81	136	Dunrobin	...	...
Westley.....	+2·55	119	Haverfordwest	+6·72	132	Darrynane ...	+4·13	116
Brundall.....	+2·66	120	Gogerddan ...	+5·96	128	Waterford ...	+7·16	135
Alderbury	+6·59	147	Llandudno ...	+4·25	129	Broadford.. ...	+6·92	140
Ashburton	+7·79	131	Dumfries ...	+11·96	154	Carlow	+8·83	150
Polapit Tamar ...	+5·82	132	Lilliesleaf	+8·09	152	Dublin	+4·78	133
Stroud	+9·00	164	Colmonell	+3·94	118	Mullingar.....	+7·94	141
Woolstaston	+7·32	149	Glasgow ...	+14·33	178	Ballinasloe ...	+6·64	135
Boston	+3·16	130	Inveraray ...	+10·29	128	Clifden	+2·27	106
Hesley Hall	+1·88	117	Islay	+4·91	122	Crossmolina ...	+7·28	128
Derby.....	+2·86	123	Mull	+7·12	125	Seaforde	+6·88	136
Bolton	+2·44	112	Loch Leven	+13·53	174	Londonderry..	+2·64	113
Wetherby	+6·92	155	Dundee	+4·27	130	Omagh	+8·34	141

RAINFALL AND TEMPERATURE, JULY, 1903.

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) ...	5·20	+ 2·95	1·33	17	13	87·2	10	45·2	8	0	0
II.		Tenterden	3·67	+ 1·07	1·17	23	16	83·4	11	40·5	8	0	0
,,		Hartley Wintney	3·40	+ 1·04	·70	23	15	85·0	10	44·0	28*b*	0	0
III.		Hitchin	4·16	+ 1·75	1·36	23	15	82·0	10	41·0	7	0	...
,,		Winslow (Addington)	3·47	+ 1·00	·80	23	14	86·0	10	41·0	8	0	0
IV.		Bury St. Edmunds (Westley)	3·82	+ ·91	1·47	23	15	86·8	10	40·0	8	0	...
,,		Norwich (Brundall)	5·37	+ 2·50	2·28	23	19	83·2	10	40·4	21	0	0
V.		Winterborne Steepleton	4·52	...	1·80	25	15	79·1	10	39·5	14	0	0
,,		Torquay	3·62	...	·80	25	15	76·2	10	48·3	14	0	0
,,		Polapit Tamar [Launceston]..	3·54	+ ·52	·68	16	16	78·1	11	39·1	14	0	0
VI.		Stroud (Upfield)	3·89	+ 1·28	1·31	21	16	79·0	2	47·0	7	0	...
,,		Church Stretton (Woolstaston)	3·13	+ ·80	·90	19	19	78·0	10	47·0	8, 9	0	...
,,		Worcester (Diglis Lock)	3·35	+ 1·59	·92	18	19	...	...	...	...	...	...
VII.		Boston	2·53	+ ·41	·60	23	14	90·0	10	40·0	8	0	...
,,		Hesley Hall [Tickhill].....	2·23	+ ·26	·41	11	14	86·0	10	40·0	8	0	...
,,		Derby (Midland Railway).....	2·20	— ·11	·52	25	15	86·0	10	42·0	7	0	...
VIII.		Bolton (The Park).....	3·77	— ·33	·77	14*a*	17	77·0	2	43·9	8	0	0
IX.		Wetherby (Ribston Hall) ...	3·24	+ ·95	·85	11	18	...	...	...	...	...	...
,,		Arncliffe Vicarage.....	5·04	+ ·01	·92	14	18	...	...	...	...	...	...
,,		Hull (Pearson Park).	2·68	+ ·36	·58	14	16	86·0	10	41·0	8	0	0
X.		Newcastle (Town Moor)	4·73	+ 2·04	·80	14	16	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	10·25	+ ·84	2·32	6	18	75·8	2	44·4	7, 8	0	...
XI.	WALES.	Cardiff (Ely).....	4·58	+ 1·34	1·09	29	18	...	...	...	...	...	...
,,		Haverfordwest	3·75	+ ·41	1·02	21	18	75·6	10	45·4	13	0	...
,,		Aberystwith (Gogerddan) ...	5·09	+ 1·47	1·28	21	15	80·0	9	...	...	...	...
,,		Llandudno.....	2·56	— ·02	·41	14	17	80·0	2	49·0	2, 7	0	...
XII.		Cargen [Dumfries]	5·01	+ 1·67	1·74	14	14	76·0	2	40·0	7*c*	0	...
XIII.		Edinburgh (Royal Observatory)	3·82	...	1·00	16	14	74·6	2	42·5	7	0	0
XIV.		Colmonell	3·49	+ ·29	1·02	14	15	78·0	9	41·0	5, 23	0	...
XV.		Tighnabruaich	5·08	...	1·42	4	18	70·0	18	43·0	6, 13	0	...
,,		Mull (Quinish).....	5·00	+ ·89	1·46	4	22	...	...	...	...	...	...
XVI.	SCOTLAND.	Loch Leven Sluices	5·41	+ 2·34	1·62	6	18	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	4·40	+ 2·04	1·55	16	19	77·0	10	39·2	19	0	...
XVII.		Braemar	3·42	+ ·65	·86	26	20	68·5	2	35·0	8, 19	0	5
,,		Aberdeen (Cranford)	5·27	+ 2·64	1·40	16	21	80·0	9	37·0	7	0	...
,,		Cawdor (Budgate)	3·63	+ ·21	1·15	5	20	..	...	...	...	...	...
XVIII		Strathconan [Beauly]	5·17	+ ·51	1·62	6	11	...	...	...	...	...	...
,,		Glencarron Lodge.....	6·81	— ·09	1·52	3	22	71·1	25	36·6	14	0	...
XIX.		Dunrobin	...	...	...	...	...	...	...	...	...	...	...
,,		S. Ronaldshay (Roeberry) ...	...	...	...	...	...	...	...	...	...	...	...
XX.		Darrynane Abbey.....	4·35	+ ·63	·88	14	24	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	3·63	+ ·25	·57	14	18	75·0	8	43·0	7*d*	0	...
,,		Broadford (Hurdlestown) ...	4·59	+ 1·61	·71	14	24	74·0	9	47·0	22	0	...
XXI.		Carlow (Browne's Hill)	4·58	+ 1·63	·52	26	19	...	...	...	...	...	...
,,		Dublin (Fitz William Square)	4·02	+ 1·44	·52	14	23	79·0	9	44·1	7	0	0
XXII.	IRELAND.	Ballinasloe	4·58	+ 1·31	·80	14	19	73·0	9	42·0	12	0	...
,,		Clifden (Kylemore)	6·57	— ·02	1·38	14	21	...	...	...	...	...	...
XXIII		Seaforde.....	4·92	+ 1·73	1·19	14	21	88·0	9	40·0	6	0	0
,,		Londonderry (Creggan Res.).	4·88	+ 1·18	1·50	14	23	...	...	...	...	...	...
,,		Omagh (Edenfel)	4·36	+ ·81	1·20	14	23	75·0	9	44·0	11*e*	0	0

+ Shows that the fall was above the average ; — that it was below it.
a and 27. *b* and 29. *c* and 8, 20. *d* and 24, 26. *e* and 19, 23.

SUPPLEMENTARY RAINFALL, JULY, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	3·77	XI.	Llandefaelog-fach.....	...
II.	Dorking, Abinger Hall .	4·45	,,	New Radnor, Ednol.....	3·58
,,	Sheppey, Leysdown	5·22	,,	Rhayader, Nantgwillt ...	...
,,	Hailsham	5·58	,,	Lake Vyrnwy	4·56
,,	Crowborough.....	5·06	,,	Ruthin, Plâs Dráw	5·17
,,	Ryde, Beldornie Tower..	1·95	,,	Criccieth, Talarvor	4·36
,,	Bournemouth, Kempsey	3·59	,,	I. of Anglesey, Lligwy..	2·90
,,	Emsworth, Redlands ...	3·15	,,	Douglas, Woodville.....	4·77
,,	Alton, Ashdell	3·71	XII.	Stoneykirk, Ardwell Ho.	3·34
,,	Newbury, Welford Park	2·83	,,	Dalry, Old Garroch	4·52
III.	Oxford, Magdalen Coll..	3·17	,,	Monaive, Maxwelton Ho.	4·19
,,	Banbury, Bloxham	5·11	,,	Lilliesleaf, Riddell	4·36
,,	Pitsford, Sedgebrook ...	3·10	XIII.	N. Esk Res. [Penicuick]	...
,,	Huntingdon, Brampton.	3·39	XIV.	Dalry, Blair	4·70
,,	Wisbech, Bank House...	4·19	,,	Glasgow, Queen's Park..	3·74
IV.	Southend	4·86	XV.	Inveraray, Newtown ...	4·63
,,	Colchester, Lexden	3·90	,,	Ballachulish, Ardsheal...	7·18
,,	Saffron Waldon, Newport	4·36	,,	Campbeltown, Redknowe	4·33
,,	Rendlesham Hall	5·59	,,	Islay, Eallabus..... ...	3·59
,,	Swaffham	2·67	XVI.	Dollar.....	5·64
V.	Salisbury, Alderbury ...	2·73	,,	Balquhidder, Stronvar...	...
,,	Bishop's Cannings	2·85	,,	Coupar Angus Station...	4·12
,,	Ashburton, Druid House	5·02	,,	Blair Atholl	3·42
,,	Okehampton, Oaklands.	3·02	,,	Montrose, Sunnyside ...	5·46
,,	Hartland Abbey	3·41	XVII.	Alford, Lynturk Manse..	6·59
,,	Lynmouth, Rock House	2·57	,,	Keith H.R.S.....	6·34
,,	Probus, Lamellyn	4·47	XVIII.	Fearn, Lower Pitkerrie..	3·21
,,	Wellington, The Avenue	2·51	,,	S. Uist, Askernish	3·06
,,	North Cadbury Rectory	3·00	,,	Invergarry.....	5·90
VI.	Clifton, Pembroke Road	1·75	,,	Aviemore, Alvie Manse.	...
,,	Ross, The Graig	2·52	,,	Loch Ness, Drumnadrochit	4·28
,,	Shifnal, Hatton Grange	2·09	XIX.	Invershin	2·77
,,	Wem Rectory	2·53	,,	Bettyhill	3·35
,,	Cheadle, The Heath Ho.	3·32	,,	Watten H.R.S.....	3·73
,,	Coventry, Kingswood ...	...	XX.	Cork, Wellesley Terrace	6·42
VII.	Market Overton	2·27	,,	Killarney, District Asyl.	3·91
,,	Grantham, Stainby	1·72	,,	Glenam [Clonmel]	5·89
,,	Horncastle, Bucknall ...	2·35	,,	Ballingarry, Hazelfort...	4·69
,,	Worksop, Hodsck Priory	2·20	,,	Miltown Malbay	4·70
VIII.	Neston, Hinderton	4·99	XXI.	Gorey, Courtown House	4·17
,,	Southport, Hesketh Park	2·51	,,	Moynalty, Westland ...	3·82
,,	Chatburn, Middlewood.	4·48	,,	Athlone, Twyford	4·32
,,	Duddon Val., Seathwaite Vic.	7·54	,,	Mullingar, Belvedere ...	5·53
IX.	Langsett Moor, Up. Midhope	3·29	XXII.	Woodlawn	4·88
,,	Baldersby	3·44	,,	Westport, Murrisk Abbey	5·00
,,	Scalby, Silverdale	3·73	,,	Crossmolina, Enniscoe ..	5·12
,,	Ingleby Greenhow Vic..	4·14	,,	Collooney, Markree Obs.	5·19
,,	Middleton, Mickleton ...	3·51	XXIII.	Enniskillen, Portora ...	4·88
X.	Beltingham	4·99	,,	Warrenpoint.....	7·38
,,	Bamburgh	5·27	,,	Banbridge, Milltown ...	5·95
,,	Keswick, The Bank	4·37	,,	Belfast, Springfield	4·91
,,	Melmerby Rectory	4·93	,,	Bushmills, Dundarave..	4·54
XI.	Llanfrechfa Grange	2·98	,,	Stewartstown	4·63
,,	Treherbert, Tyn-y-waun	4·92	,,	Killybegs	6·84
,,	Castle Malgwyn	4·47	,,	Horn Head	4·61

METEOROLOGICAL NOTES ON JULY, 1903.

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.—The first half was fine, dry and generally warm, the only R of the first 15 days being ·01 in. on 12th, which terminated an absolute drought of 22 days' duration. A TS early on the 18th, with heavy R, commenced an exceedingly wet period with lower temp., which prevailed till the 29th; during this time 5·07 in. fell. The wettest July in 45 years. Mean temp. 63°·2, or 0°·1 below the average.

ABINGER HALL.—The first half dry, then very wet. In about 20 minutes on the morning of the 18th ·50 in. of R fell. Much bush fruit spoiled by R. Low night temp., with frosts.

TENTERDEN.—The first half dry and warm, the last half very wet, with several TSS. Absolute drought for 15 days ended on 4th, and partial drought for 30 days, with ·20 in. of R, ended on 19th.

CROWBOROUGH.—With the exception of ·02 in. on 5th, no R fell till the 15th, the weather being a continuation of the drought which began on June 20th. After the 15th there was very heavy and continuous R, 2·51 in. falling on 23rd. The first half warm, but during the wet period unseasonably cold. Mean temp. 60°·0.

HARTLEY WINTNEY.—Absolute drought for 23 days ended on the 12th, after which the weather was exceedingly unsettled, with heavy R almost daily until the end. TSS on 18th, 19th and 30th. Temp. very low and weather dull and cloudy.

WINSLOW, ADDINGTON.—In the 24 days ended on 14th only ·01 in. of R was registered, but from the 16th to the end wet weather prevailed. Very heavy TS on 19th.

COLCHESTER, LEXDEN.—Absolute drought for 23 days ended on the 13th. Hot till about the 10th; vegetation very much dried up. The last half very wet and cold.

BURY ST. EDMUNDS, WESTLEY.—No R fell from June 19th to July 12th. Very wet from the 23rd to the end. Corn much laid. T on 23rd, 26th, 29th and 30th.

NORWICH, BRUNDALL.—Like last year during this month the ther. only once reached 80°. The R was the greatest recorded in the neighbourhood in July since 1879, and nearly all fell in the second half, the first half being nearly rainless.

WINTERBORNE STEEPLETON.—The early part was dry, but the latter part very wet; it being the wettest July since 1894. TSS on 26th and 29th.

TORQUAY, CARY GREEN.—R 1·27 in. above the average. Duration of sunshine 237 hours, being 1·5 above the average. Mean temp. 61°·3, or 0°·4 below the average. Mean amount of ozone 4·5; max., 9·0 on 6th with N.W. wind, min., 1·0 on 19th with N.N.W. wind.

WELLINGTON.—The month opened fine and warm, but after the 14th hardly a day touched the average max temp., and R was frequent, although the normal was only exceeded by about ·25 in.

NORTH CADBURY RECTORY.—The coolest, cloudiest, windiest and wettest July in at least 8 years. Very dry till 15th, then very rainy and rather cool. The R was largely exceeded in the immediate neighbourhood to E. and N., owing to the way in which TSS always work away from here. The aggregate R for the 7 months was 1·56 in. more than the previous highest in 7 years.

CLIFTON, PEMBROKE ROAD.—Mostly fine, with several very hot days in the first fortnight, but a few slight showers. Unsettled and showery in the third week, with some T, the remainder cool, with R on most days, and fresh westerly winds. Comparatively little sunshine. R 1·33 in. below the average.

WEM, THE RECTORY.—Dull, and at times very cold. Little sunshine. Some hay still lying in fields at the end.

HULL, PEARSON PARK.—Very unsettled, dull and cloudy. TSS on 11th and 29th. Stormy and cold on 6th and 7th. Sunshine recorded 106 hours.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE.—Very unsettled; an unusual amount of T and L, but not near. Hay harvest interfered with, though some was secured well in the first fortnight.

HAVERFORDWEST.—Very unsettled, with some low night temps. Hot and summerlike from the 8th to the 14th, followed by some very oppressive days; no TSS, but persistent, strong, and often cold winds following R. Hay crops much damaged by wet. Potatoes good, but fruit scarce. Duration of sunshine 188·8 hours.

DOUGLAS, WOODVILLE.—Cold and ungenial with N. to N.W. winds, while only 4 wetter Julys have occurred in 30 years. A violent N.W. gale sprang up on the 5th, lasting some 30 hours.

SCOTLAND.

CARGEN [DUMFRIES].—Dull, cheerless, and full of sudden variations in temp. and other conditions. Hay work much interfered with, and turnip crop likely to be the worst for years.

RIDDELL.—R 1·51 in. above the average. Cold and rainy, with much wind, especially from the E.

BALLACHULISH, ARDSHEAL.—The wettest July ever recorded at this station. R 2·15 in. above the average.

COUPAR ANGUS.—R nearly twice the average, and the total from January 1st 6·71 in. above the average. Mean temp. 57°·1; slightly below the average. No lengthened period of summer weather.

BETTYHILL.—The R fell mostly in the earlier half, the fall on the 5th, 1·72 in., being unusually heavy. A number of fine days, chiefly towards the end.

WATTEN, H.R.S.—Cloudy, cold, and with little sunshine. Frost on several nights about the middle. A notable R storm on 5th.

IRELAND.

DARRYNANE ABBEY.—R nearly 20 per cent. over the average. Much blight showing in potatoes.

BROADFORD, HURDLESTOWN.—Very wet. Hay cut during the month is quite ruined, and blight has appeared on the potatoes.

MILTOWN MALBAY.—Rather cool, with much T, and only a few dry days. Bad for hay making in this district. Blight appearing generally on the potato crop.

DUBLIN, FITZWILLIAM SQUARE.—Though an average month as to temp. it was in other respects unfavourable, the weather being for the most part unsettled, and R both frequent and heavy. Mean temp. 60°·1, or 0°·2 below the average. Duration of sunshine 169·3 hours.

MARKREE OBSERVATORY.—Very wet, with frequent TSS, and temp. very low throughout. A small amount of sunshine, the days generally cloudy and gloomy, but the nights fine and bright. A few fogs.

BELFAST, SPRINGFIELD.—R an inch above the average. T and L very prevalent. Very disappointing for farmers.

OMAGH, EDENFEL.—Up to the 12th the weather was better than the record would indicate. The temp. was about normal, what R there was fell at night, and for those who took advantage of it an abundant hay harvest was well saved. The remainder of the month was of the character too frequently typical of these parts in July, deluging, but not continuous rains, dull skies and mostly stagnant atmosphere, but no damage that a few fine days would not repair.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1903.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute.				Average.				Absolute.		Total Rain		Aver.
	Maximum.		Minimum.										
	Temp.	Date.	Temp.	Date.	Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	59·0	20	48·1	18	50·8	40·0	40·5	85	86·0	19·5	·83	10	6·6
Malta	63·2	24	42·5	4, 19	59·6	47·9	45·6	78	111·6	37·1	1·52	7	6·2
Lagos, W. Africa	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape Town	92·1	11	53·7	18	76·9	60·0	56·4	67	...	...	·22	3	3·2
Durban, Natal	92·9	28	63·6	25	84·7	68·0	...	...	149·1	...	2·40	13	5·2
Mauritius	87·8	11*a*	68·8	22	85·8	73·1	72·4	81	154·4	63·5	6·00	16	6·6
Calcutta	89·1	27	49·8	5	82·0	59·8	56·4	63	144·0	41·9	·64	1	2·4
Bombay	89·2	8	61·7	7	82·7	67·0	62·1	67	137·8	52·9	·00	0	0·1
Madras	91·4	15*b*	67·2	8	87·0	71·9	70·4	78	141·9	63·0	2·17	3	2·8
Kodaikanal	72·9	28	45·6	9, 22	66·2	48·6	45·4	70	136·6	33·2	1·00	3	3·9
Colombo, Ceylon	93·9	23	68·5	1, 3	90·4	73·6	71·6	77	152·0	62·2	3·95	5	4·0
Hongkong	72·8	25	41·9	3	62·7	55·1	50·2	73	127·6	...	·21	3	7·8
Melbourne	104·4	9	42·7	25	76·3	56·8	50·5	61	165·3	36·3	1·36	8	5·3
Adelaide	105·6	9	49·6	15	81·5	58·9	50·9	52	161·9	45·0	1·00	5	4·2
Coolgardie	106·6	19	51·0	15	89·3	60·8	53·0	47	172·0	47·2	·38	3	3·2
Sydney	98·1	3	59·3	12	81·0	65·9	60·5	67	139·5	52·6	1·02	8	5·3
Wellington	78·0	24	43·0	3	68·3	54·4	53·5	77	138·0	32·0	1·38	12	6·5
Auckland	78·0	15	50·0	2	71·8	58·9	53·3	65	142·0	49·0	2·08	9	4·7
Jamaica, Negril Point	89·9	14	66·5	4	85·8	69·5	68·1	73	...	...	1·22	1	...
Trinidad	90·0	19*c*	64·0	13*d*	88·0	67·0	69·5	77	164·0	60·0	·68	6	...
Grenada	86·2	19	70·6	26	83·0	72·8	69·3	73	150·0	...	2·27	13	3·0
Toronto	45·5	28	—5·7	17	32·1	19·4	22·6	79	56·2	—8·8	2·80	16	7·1
Fredericton, N.B.	49·8	28	20·5	19	28·5	8·2	6·5	58	...	...	4·36	9	5·5
Winnipeg	36·0	27	—36·7	15	14·5	—8·6	...	...	...	...	·10	2	2·2
Victoria, B.C.	53·3	22	27·2	12	44·6	35·0	...	...	...	...	1·31	9	6·2
Dawson	21·6	28	—53·1	11	—0·6	—17·8	...	...	...	...	1·35	6	4·3

a—and 19, 24. *b*—and 27. *c*—and 23. *d*—and 25.

MALTA.—Mean temp. of air 52°·7, or 1°·5, below; mean hourly velocity of wind 9·4 miles, or 2·4 below averages. Mean temp. of sea 60°·0.

Mauritius.—Mean temp. of air 0°·3 above, dew point 2°·1 above, and R 1·01 in., below averages. Mean hourly velocity of wind 3·6 below average, extremes 23·5 on 8th, and 0·0 on 2nd, 4th, and 16th; prevailing direction E. by S.

KODAIKANAL.—Mean temp. of air 55°·3. Mean velocity of wind 293 miles per day. Bright sunshine 203·1 hours.

COLOMBO.—Mean temp. of air 80°·9, or 0°·5 above, of dew point 3°·1 above, and R 1·66 in. above, averages. Mean hourly velocity of wind 7·1 miles, prevailing direction N.E. to S.W.

HONGKONG.—Mean temp. of air 58°·4. R 1·10 in. below average. Sunshine 77·2 hours. Mean hourly velocity of wind 12·6 miles; prevailing direction E. by N.

Adelaide.—Mean temp. of air 70°·2, has only once been lower in February during previous 46 years. R ·39 in. above average. Good rains over agricultural settlements.

Sydney.—Mean temp. 2°·4 above, humidity 6·0 below, and R 3·88 inches below averages.

Wellington.—Mean temp. 1°·2 below, and R 1·66 in. below, averages.

Auckland.—Mean temp. 2°, and R 1½ in., below averages.

TRINIDAD.—R ·77 in. below the 40 years' average.

SYMONS'S

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THE BRITISH RAINFALL ORGANIZATION.

THE RETIREMENT OF MR. SOWERBY WALLIS.

To the Editor of Symons's Meteorological Magazine.

I HAVE received so many letters expressing regret for my ill health and appreciation of the great work founded by the late G. J. Symons in which we have been associated during the last few years, that it is impossible to answer all in writing.

I shall therefore be glad, if you will allow me in the pages of the *Meteorological Magazine*, to express my most hearty thanks for all the kind references to myself and my grateful acknowledgment of the testimony to the value of the British Rainfall Organization.

H. SOWERBY WALLIS.

6, Hilldrop Road, Camden Road, London, N.
5th September, 1903.

ON August 31st, Mr. Sowerby Wallis retired from the charge of the British Rainfall Organization, after a connexion with the work extending over more than thirty years, and Dr. H. R. Mill, who had during the last three years shared Mr. Wallis's labours, has succeeded to the sole responsibility. The occasion is one which justifies a few lines of retrospect and anticipation.

Early in 1859 George James Symons, then a youth of twenty, began collecting records of rainfall, having realized, thus early, the importance of obtaining very numerous data in order to study the distribution of rain. In the following year he joined the staff of the Meteorological Office, then a department of the Board of Trade, and his interest in the subject did not diminish, though it did not form part of his official work. From the hunt for old records he went on to the collection of actual observations. Towards the end of 1860 Mr. Symons sent out to all observers of whom he knew in England, a circular commencing with an almost prophetic forecast of the work he set before him—

"Observations of rainfall have been made in various parts of the British Isles for upwards of a century, yet no one has, I believe, attempted the somewhat herculean labour of collecting the published and unpublished results . . . . . This investigation I have commenced."

The result was the publication of a four-page quarto pamphlet, entitled "English Rainfall, 1860," in which 168 stations were included. In the few lines of introduction Mr. Symons said that he had "commenced an extensive investigation," though how extensive it was ultimately to prove he could then have had little idea. Next year the publication referred to both 1860 and 1861, and took the style and title it has since retained—"British Rainfall." It included 360 records from England, 11 from Wales, 115 from Scotland, and 21 from Ireland, a total of 507, and the little volume was published on February 15th, 1862.

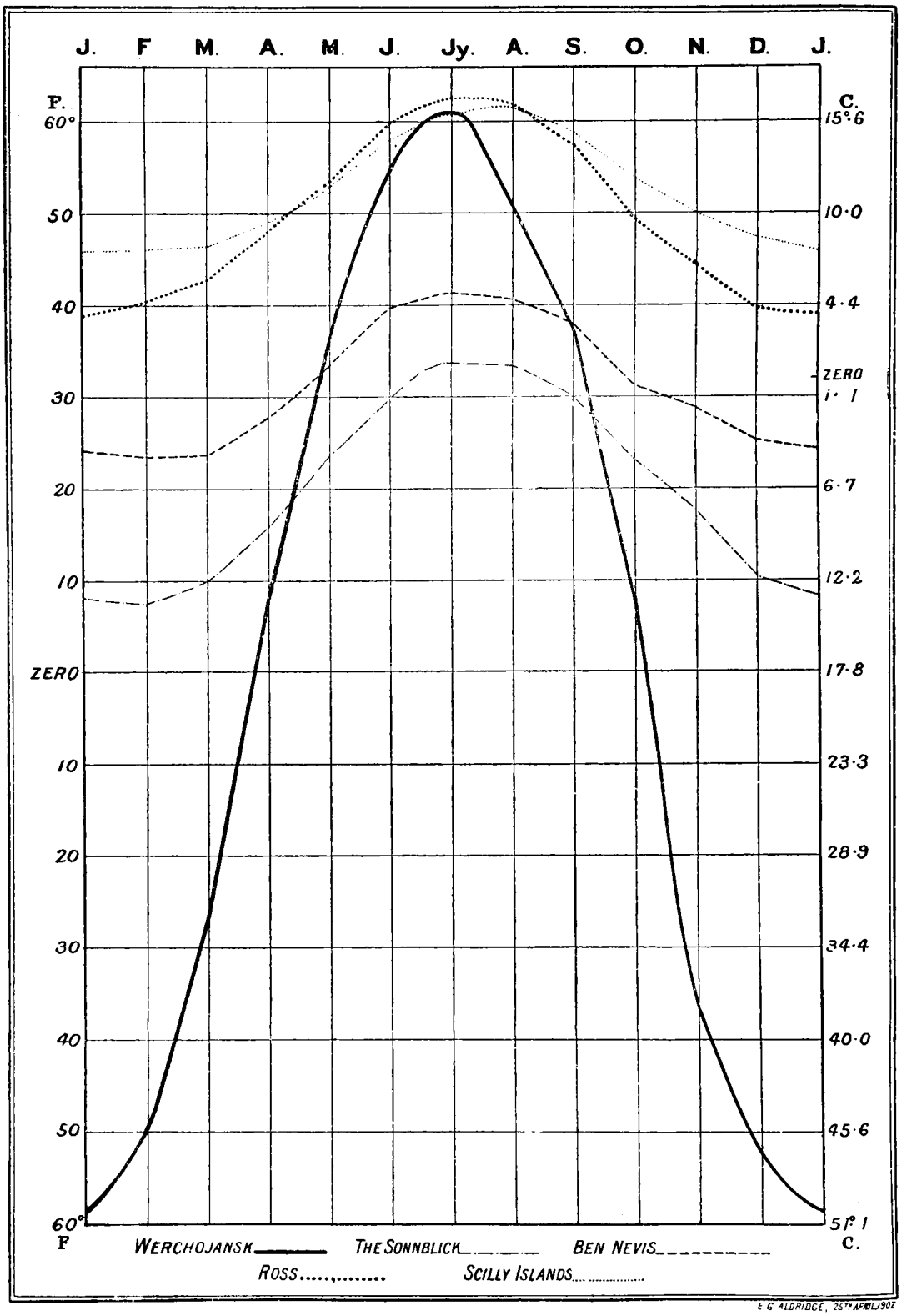
By 1863 the hobby of his leisure had grown to such dimensions that Symons left the Meteorological Office and deliberately set himself to the collection and discussion of rainfall statistics as his serious life work. As the number of observers grew under the enthusiastic care of the organizer, the expense of collection and publication grew also, and although at first he himself bore it all, later, and by degrees, a greater and greater proportion of the ever growing amount was contributed by observers and friends of meteorological science. Thus in ten years the annual volume of statistics demanded not the leisure which a government clerk could find after office hours in six weeks, but the whole time of an experienced man of uncommonly quick and accurate eye and hand, working for five months without intermission. The work had assumed national proportions, and observations from 1500 stations were being published annually. Although national in scope and purpose, Mr. Symons felt that unless the support of the State could be given without any hampering conditions, he could develop the work best as an organization under private direction, the results of which were presented to the public as fully as the funds supplied by the public permitted.

A serious illness in 1871 brought home to Mr. Symons's mind the necessity of making some provision for the future of the enterprise which he had brought so far. In the annual circular, at the end of 1871, he said :—

"I thankfully acknowledge the assistance whereby I have been enabled to raise the system of rainfall observation to its present unequalled position, but I should very much prefer that its maintenance did not depend on the frail thread of one man's life. To secure this a successor must be trained."

A remarkable gift which Mr. Symons possessed, in a perfection rarely seen, was the power of initiation in a form so complete that subsequent development rarely or never required any alteration. For example the page of *British Rainfall* in 1860 hardly differed in

TYPICAL TEMPERATURE CURVES.



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arrangement from that at the present day. An equally remarkable gift was his power of appreciating character. He set out to train a successor, and Mr. Sowerby Wallis, then a very young man, was his choice.

Mr. Wallis began work as Mr. Symons's assistant at Camden Square in 1872, the wettest year which ever rained over the British Isles so far as our records can tell. He adapted himself so quickly and completely to his duties that he soon became indispensable to Mr. Symons, and so far as his rainfall work was concerned practically inseparable from him. Few indeed could tell, after a few years had elapsed, from which of the two pens an unsigned article came.

By 1890 the number of stations dealt with in the annual volume reached 3,000, and it was impossible to issue it before the beginning of July—a year earlier, by the way, than similar publications are usually issued by Government offices. In the preface to *British Rainfall*, 1890, Mr. Symons says :—

"I am glad to acknowledge how much I owe to Mr. Sowerby Wallis, who has now been helping me for nearly twenty years, working as those only do whose hearts are in their work, until he is as familiar with the details and routine as I am. And that is why in this, my thirtieth annual issue, I have asked him to let me put his name along with mine on the title page."

From that time onward the name of Mr. Sowerby Wallis has appeared on the annual volume, in the preparation of which he took an increasing part. The sudden death of Mr. Symons in March, 1900, threw upon Mr. Wallis an amount of work which would have overwhelmed most men. He grappled with the task, and the punctual appearance of the annual and monthly publications was never interrupted, or even delayed, although at the same time there was a vast amount to be done (and it was all done) in the removal of Mr. Symons's unique library from Camden Square to the Royal Meteorological Society, in winding up all the affairs of a man of the most multifarious interests, and in adapting the Rainfall Organization to its new conditions. The great task was accomplished, but at a price. Mr. Wallis's health suffered severely from successive attacks of influenza, and the rest necessary for complete recovery was never taken. Though for nearly three years the work of the Organization was shared with his successor, Mr. Wallis could never stop working, nor could he work except with all his might. At length repeated warnings decided him that the time had come when he must be free from the responsibilities which he had never shirked during the many years he bore them, and we are sure that all our readers will join us in the confident hope that the leisure thus secured before it is too late, will enable Mr. Wallis to re-establish his health, and that a long and useful life still lies before him.

Dr. H. R. Mill has acquired the historic rainfall house, 62, Camden Square, London, N.W., and the rainfall records and instruments which have been accumulated there. If the lapse of time has made

some changes in detail desirable, these changes will no doubt be made, but in all essentials the Rainfall Organization will continue to move in the straight course which its founder impressed upon it. The three assistants trained by Mr. Symons and Mr. Wallis remain to give the Organization the benefit of their valued experience.

The time seems now to have come when a critical comparison of the rainfall of the British Isles from year to year may be commenced with reasonable certainty of success. For this it is necessary to arrive at some standard for comparison, so that one year may be studied in relation to another more fully and systematically than is possible when working with the short average that must be used in the annual volume. The work would be a heavy one, and if it extended to the preparation of a complete series of monthly as well as of annual rainfall maps, it would be almost too great to attack, still it seems that the study of maps on which all the results for individual years, or shorter periods, are plotted is the most promising field for rainfall research at the present moment. Hence it is more than ever necessary to secure new observers in the desert places of our islands where gauges are most thinly scattered. In scientific work there is no standing still; when research in one direction is systematized into routine, a new field is always opening in which experiment and new forms of observation are required. We hope that our readers will continue to help us in the future as in the past by their suggestions, for even when advice cannot be adopted completely, it is often of immense value in suggesting practicable improvements. We feel strongly that this Magazine could be made more useful than it is, and we know that it can be made much fuller and more interesting if only the number of readers were increased two or threefold. We are not justified in attempting any permanent enlargement until it becomes clear that the Magazine will not be a burden on the resources of the Rainfall Organization; it ought instead to be a source of strength.

In entering on the new arrangement we hope to retain the cordial co-operation of the great volunteer army of observers whose work has in the past produced such fine results, and on our part we will keep before us the steady purpose of helping all observers to the utmost of our ability, and of maintaining the great traditions established by the founders of the Organization; though they have left little room for improvement, there is abundant scope for advance.

BOOKS RECEIVED.

Quarterly Record of the Royal Botanic Society of London. No. 92. Vol. VIII. London. Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. 16.

The Weather of 1902 at Hodsock Priory, Worksop. By H. Mellish. Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. 5 and one table.

Hull Corporation Waterworks. Sixth Annual Report of the Water and Gas Engineer. By F. G. Bancroft. 1903. Size $9\frac{1}{2} \times 6$. Pp. 12, one plate and one table.

THE RAINFALL OF THE SUMMER OF 1903.

LONDON is the journalistic as well as the political capital of the British Isles, and consequently occurrences in and around London are apt to acquire an importance all over the country out of proportion to their real magnitude. It is so with the rainfall of the summer of 1903, which was so exceptionally severe in the lower Thames Valley as to create a general impression that the condition was widespread. The accompanying Table, giving the rainfall at 51 well-distributed stations for June, July and August, shows that in North Wales, Lancashire, and the extreme west of Ireland, the summer was actually rather drier than the average, and by far the greater part of the British Isles showed a total rainfall for the three months less than 25 per cent. in excess of the average. The centre of Ireland showed an excess of a little over 30 per cent.; the middle of Scotland had an excess of from 40 to 50 per cent., while the Highlands and the Southern Uplands had scarcely more than the average fall. Indeed, were it not for the curious state of matters in the south east of England, the rainfall of the summer of 1903 would hardly call for remark. Eastward from the borders of Cornwall and Wales to the North Sea the excess of rainfall much exceeded 50 per cent., and within a roughly circular area with a radius of about 40 miles from London the excess was greater than 100 per cent., in other words, more than twice the normal amount. June was the wettest and August the least wet of the three months as a rule. The most striking cases, reduced to percentages, are as follows: Camden Square, average fall for three summer months, 6·25 in.; actual fall, 15·87 in., or if the average rainfall is taken as 100, that for last summer was no less than 254, or two-and-a-half times as great; at Hitchin the ratio was 222, at Winslow 194, and at Hartley Wintney 180.

The high rainfall in this particular district was accompanied, as our recent numbers have shown, by an exceptional number of heavy falls on rainfall days, without, however, many violent thunderstorms. Up till 1903, the only year in which so many as five days had a rainfall each exceeding one inch at Camden Square was 1878; but up to September 4th, 1903, there had been seven days with falls exceeding one inch, and more than a quarter of the year has still to run.

The table of aggregate rainfall for the eight months, January to August inclusive, taking account of the wet spring in Scotland and the north of England, shows a fairly uniform excess of rainfall for the year so far as it has gone. The average excess is about 40 per cent., the greatest being 88 per cent. in London, the least 9 per cent. at Clifden, in the west of Ireland, but no other station is nearly so low.

August was everywhere a rainy month, even the two instances in which the total fall was slightly below the average for the month, had an unusually large number of rainy days.

Three Months' Summer Rainfall, June—August, 1903.

STATIONS.	June.	July.	August.	Total of 3 Months, 1903.	Total of 3 Months' Average.	Difference.
	in.	in.	in.	in.	in.	in.
London	6·43	5·20	4·24	15·87	6·25	+9·62
Tenterden	3·56	3·67	3·63	10·86	7·23	+3·63
Hartley Wintney	5·55	3·40	2 98	11·93	6·66	+5·27
Hitchin	6·40	4·16	3·46	14·02	6·32	+7·70
Winslow	5·17	3·47	3·85	12·49	6·45	+6 04
Westley	3·11	3·82	3·78	10·71	7·35	+3·36
Brundall	2·45	5·37	2·72	10·54	7·26	+3·28
Alderbury	3·28	2·73	3·70	9·71	6·50	+3·21
Ashburton	2·70	5·02	5·19	12·91	9·39	+3·52
Polapit Tamar	1·80	3·54	4·55	9·89	8·75	+1·14
Stroud	4·12	3·89	3·83	11·84	7·15	+4·69
Woolstaston	3·16	3·13	5·23	11·52	7·31	+4·21
Boston	1·59	2·53	4·57	8·69	5·75	+2·94
Hesley Hall	1·42	2·23	3·69	7·34	5·85	+1·49
Derby	1·26	2·20	4·86	8·32	6·48	+1·84
Bolton	2·34	3·77	5·67	11·78	12·18	— ·40
Wetherby	2·48	3·24	2·42	8·14	6·65	+1·49
Arncliffe	2·34	5·04	8·63	16·01	14·25	+1·76
Hull	1·74	2·68	3·19	7·61	6·91	+ ·70
Newcastle	3·06	4·73	2·24	10·03	7·48	+2·55
Seathwaite	3·96	10·25	21·14	35·35	27·91	+7·44
Cardiff	2·09	4·58	6·00	12·67	9·74	+2·93
Haverfordwest	2·13	3·75	5·66	11·54	9·33	+2·21
Gogerddan	2·26	5·09	6·61	13·96	10·21	+3·75
Llandudno	1·11	2·56	3·51	7·18	7·35	— ·17
Dumfries	1·84	5·01	5·02	11·87	10·20	+1·67
Lilliesleaf	1·48	4·36	3·53	9·37	8·16	+1·21
Colmonell	1·99	3·49	4·72	10·20	9·86	+ ·34
Glasgow	1·74	3·74	6·28	11·76	9·19	+2·57
Inveraray	2·96	4·63	10·95	18·54	15·28	+3·26
Islay	·94	3·59	7·13	11·66	10·11	+1·55
Mull	2·34	5·00	8·08	15·42	12·66	+2·76
Loch Leven	2·87	5·41	4·78	13·06	9·11	+3·95
Dundee	2·20	4·40	5·30	11·90	7·00	+4·90
Braemar	1·42	3·42	4·31	9·15	8·77	+ ·38
Aberdeen	1·59	5·27	4·29	11·15	8·07	+3·08
Cawdor	2·38	3·63	3·03	9·04	8·89	+ ·15
Glencarron	3·90	6·81	12·31	23·02	21·18	+1·84
Dunrobin	1·36	5·23	3·94	10·53	7·29	+3·24
Darrynane	4·12	4·35	5·88	14·35	11·31	+3·04
Waterford	5·31	3·63	4·62	13·56	9·92	+3·64
Broadford	1·33	4·59	5·21	11·13	8·97	+2·16
Carlow	3·15	4·58	5·06	12·79	8·65	+4·14
Dublin	2·49	4·02	2·80	9·31	7·46	+1·85
Mullingar	1·20	5·53	6·68	13·41	10·37	+3·04
Ballinasloe	2·04	4·58	6·69	13·31	9·85	+3·46
Clifden	2 32	6·57	10·11	19·00	19·92	— ·92
Crossmolina	·94	5·12	7·68	13·74	11·57	+2·17
Seaforde	2·97	4·92	4·26	12·15	9·05	+3·10
Londonderry	·87	4·88	6·93	12·68	11·26	+1·42
Omagh	1·95	4·36	7·92	14·23	10·80	+3·43

THE INTERNATIONAL METEOROLOGICAL COMMITTEE.

THE members of the International Meteorological Committee, which held its meeting at Southport simultaneously with the British Association, gathered in London on September 7th, and on that evening they were entertained to dinner in the Trocadero Restaurant by Dr. W. N. Shaw, F.R.S., who invited a number of meteorologists and representatives of allied sciences to meet the foreign guests. The following were present:—

Mr. F. Campbell Bayard, Sec. R. Met. Soc.
Dr. von Bebber, Hamburg.
M. Teisserenc de Bort, Paris.
Mr. C. V. Boys, F.R.S.
Dr. C. Chree, F.R.S., Kew.
Mr. F. W. Dyson, Greenwich.
Dr. R. T. Glazebrook, F.R.S.
Prof. G. Hellmann, Berlin.
Captain Campbell Hepworth, C.B.
Prof. H. Hergesell, Strasburg.
Prof. H. Hildebrandsson, Upsala.
Prof. J. Larmor, Sec. R.S.
Mr. R. G. K. Lempfert.
Sir Norman Lockyer, K.C.B., F.R.S.
Dr. W. J. S. Lockyer.
M. Mascart, Paris.
Mr. E. Mawley.
Dr. H. R. Mill.
Prof. H. Mohn, Christiania.
Prof. Willis Moore, Washington.
Prof. A. F. W. Paulsen, Copenhagen.
Prof. J. M. Pernter, Vienna.
Mr. A. Laurence Rotch, Blue Hill Observatory.
Prof. Rykatcheff, St. Petersburg.
Prof. A. Schuster, F.R.S, Manchester.
Dr. R. H. Scott, F.R.S.
Dr. W. N. SHAW, F.R.S., the host.
Prof. M. Snellen, Utrecht.
Captain Tizard, R.N., F.R.S.
Prof. H. H. Turner, F.R.S., Oxford.
Dr. Theodore Williams.
Mr. C. T. R. Wilson, Cambridge.

In welcoming the guests after dinner, Dr. W. N. Shaw said that in any other country any such international committee as that about to meet at Southport would be formally welcomed by a Grand Duke or at least a Minister of State; but here science was not held in such esteem in government circles, and scientific men were left to greet their scientific colleagues. On behalf of the leading scientific institutions of this country he could bid the members of the Committee welcome, and he expressed regret that some of the number were unable to be present, naming especially Professor Palazzo, of Rome, and Dr. Billwiller, of Berne. The Chairman then proposed the toast of the Foreign Members of the International Committee, coupled with the names of M. Mascart and Professor Willis Moore, who replied. Professor Pernter proposed the toast of the old masters of Meteorology, former members of the Committee; and to this Dr. R. H. Scott responded, remarking that only Hann, von Neumeyer, Buchan and himself now survived of those who met at Leipzig in 1872. Sir Norman Lockyer and Dr. Larmor welcomed the visitors on the part of the British Association and the Royal Society respectively. Professor Willis Moore, in replying, spoke of the admirable work done by the Meteorological Office on an utterly inadequate grant of public money, observing that as much was spent on the local weather services of Boston and New York alone as on the whole British system.

There was opportunity for much general conversation, and an excellent foundation was laid for the serious work of the Committee at Southport.

Correspondence.

THE STUDY OF SUNSPOT CYCLES.

To the Editor of Symons's Meteorological Magazine.

MUCH attention is now being given to meteorological correlations with the sun-spot cycle of eleven years' mean.

To ensure absolute comparisons it is plainly important that all who are working in this field should give the same value to the same years. Since the actual cycles vary so greatly (14 years to 10 years from min. to min.; 3 to 6 from min. to max.; 11 to 3 years from max. to min.), it is absolutely necessary to "doctor" the years to compare cycle with cycle on the basis of mean values (11 years min. to min.; 5 years min. to max.; 6 years max. to min.)

Is not the most logical way to treat the years of each cycle as if printed on an elastic ribbon, fixed at years 1 and 12 for minima and 6 for the maximum? If, then, the intervening years are more or less than the normal 4 between min. and max. and 5 between max. and min., the years will be puckered or stretched out respectively over the intervening space.

The appended table represents one that I have been using, so far as the last century is concerned.* The letters C, D, E, &c., and Roman numerals I., II., III., &c., afford means of easy reference. It will be noted as a necessary, but important, consequence of the system that the years next each critical date remain undoctored.

Could some such scale be generally accepted it would surely be an important gain.

Year Plan for Reduction of Years to Mean Sunspot Cycle Curve.

Cycle.		Min. I.	II.	III.	IV.	V.	Max. VI.	VII.	VIII.	IX.	X.	XI.	Min. I.
1798·3—1810·6	C	98	9	0	1-2	3	04	5	6	7	8	9	10
1810·6— 23·3	D	10	1	2-3	3-4	5	16	7	8	9-10	1	2	23
23·3— 33·9	E	23	4	5-6	7-8	9	30	1	1	1-2	2	2	33
33·9— 43·5	F	33	4	4-5	5-6	6	37	8	9	0	1	2	43
43·5— 56·0	G	43	4	4-5	5-6	6	47	8	9-0	1	2-3	4	55
56·0— 67·2	H	55	6	6-7	7-8	8	59	0	1-2	3	4-5	6	67
67·2— 78·9	K	67	8	8-9	8-9	9	70	1	2-3	4	5-6	7	78
78·9— 89·6	L	78	9	0	1	2	83	4	5	5-6	6-7	8	89
89·6—(?)01·5	M	89	0	1	1-2	2	93	4	5-6	7	8-9	0	01
	N	01	2										

J. EDMUND CLARK.

Lile Garth, Ashburton Road, Croydon, Sept. 3rd, 1903.

[We should be glad to hear the opinion of our readers on the foregoing suggestion.—ED. *S.M.M.*]

* As the investigation was confined to the three months August to September, a careful comparison with Wolf's and Wolfer's unreduced sunspot values caused the adoption of 1799 and 1888 as years for minima.

HEAVY RAINFALL ON JULY 23RD.

To the Editor of Symons's Meteorological Magazine.

A SHOWER of rain fell about midday on Thursday, the 23rd July, to the extent of ·20 of an inch. After that rain fell as shown below, the readings being cumulative :—

Hour.	Gauge reading. in.	Amount. in.
		·20
6.40 p.m.	Zero	—
7.5	·23	·23 in 25 min.
7.15	·58	·35 ,, 10 ,,
7.23	·83	·25 ,, 8 ,,
7.35	1·03	·20 ,, 12 ,,
7.50	1·34	·31 ,, 15 ,,
8.5	1·80	·46 ,, 15 ,,
8.50	1·97	·17 ,, 45 ,,
10.0	2·55	·58 ,, 70 ,,
11.30	3·02	·47 ,, 90 ,,
12.30 (midnight)	3·29	·27 ,, 60 ,,
12.45 a.m.	3·37	·08 ,, 15 ,,
5	3·89	·52
7	4·01	·12
8	4·05	·04

The total rainfall in the 24 hours being **4·25** ins.

W. B. BRYAN.

Lea Bridge, Clapton, N.E., 24th August, 1903.

THE WET SUMMER.

To the Editor of Symons's Meteorological Magazine.

THE local rainfall for the past month of August, measured this day at 9 a.m., amounts to **4·42** ins. It was 3·32 in. for August, 1902, 1·65 in. for August, 1901, and 3·36 in. for August, 1900. The total rainfall for the three months, June, July and August, amounts to 18·14 in., and for eight months, January to August, 26·31 in., all recorded under the same conditions.

Comparisons.

Periods.	1903. in.	1902. in.	1901. in.	1900. in.
January to May	8·17	6·38	6·40	7·88
June to August	18·14	7·38	5·47	7·87
Eight months	26·31	13·76	11·87	15·75
September to December		4·70	7·31	6·26
Twelve months		18·46	19·18	22·01

A. J. WILMSHURST.

6, Albany Road, Manor Park, E., 1st Sept., 1903.

EXCESSIVE RAINFALL IN SHORT PERIODS.

To the Editor of Symons's Meteorological Magazine.

IN your Magazine for August you draw attention to the necessity of measuring quickly after a heavy fall of rain has occurred, with the view of discovering whether the amount be exceptional or no.

Bearing this in mind, after a recent series of heavy downpours, I measured directly after the cessation of each fall, with the following results:—On the 24th of August heavy rain commenced at 3 p.m., and continued till 5 p.m., during which period 0·81 in. fell, but between 8.25 and 8.35 the same evening a veritable torrent deposited 0.57 in. in the gauge in the 10 minutes, causing much flooding in this neighbourhood.

I may add that the rainfall for the three summer months, June, July and August, has amounted at this station to 16·90 inches, with *five* occasions in the period on which an inch or more was precipitated in less than 24 hours.

D. W. HORNER.

Clapham Park, S. W., Sept. 2nd, 1903.

P.S.—Since the above was written, yet another fall of over one inch has occurred in a space of less than 24 hours, viz, 1·24 in., measured at 9 a.m. September 5th.—D.W.H.

To the Editor of Symons's Meteorological Magazine.

REFERRING to the records of rainfall on or about the 23rd and 24th ult., in your number for August, I venture to send you the enclosed from my sister, Mrs. Eliot Howard, of Ardmore, Buckhurst Hill, Essex (on the border of Epping Forest), as the figures she mentions appear to exceed any of those named by your correspondents. She is a careful observer, and has worked with a gauge for many years.

F. F. TUCKETT.

Frenchay, near Bristol, August 18th, 1903.

"I wonder whether your rain record is like ours. We had **4·35** between 6.30 p.m. on Thursday, July 23rd, and 7 and 8 on Friday, 24th, morning—say 13 hours; then again last night (Saturday, 25th July) ·95 in."

AUGUST RAINFALL—AN EXCEPTIONAL CASE.

To the Editor of Symons's Meteorological Magazine.

A PARAGRAPH in *The Times* states "The rainfall during August was nearly double that in the same month last year."

This was doubtless the case in many places, but not here, where the total fall was 3·49 in. against 4·29 in. last year, or less by ·80 in. I may add that there was no thunderstorm this year, and only one last year, which gauged ·69 in.

CHARLES S. PRINGLE.

Whitekirk, Southbourne, Hants.

AUGUST RAINFALL IN IRELAND.

To the Editor of Symons's Meteorological Magazine.

YOU may like to compare the rainfall at Cloondrah, Longford, for other wet months with that for August, 1903, which was the heaviest since the commencement of records in May, 1892.

1892, August.....	5·78 in.	1896, July	5·82 in.
1895, July	5·01 ,,	1903, July	5·08 ,,
,, August.....	5·05 ,,	,, August.....	6·32 ,,

These are the only instances during 11 years in which the monthly fall was 5 inches or over.

F. DUDLEY FLETCHER.

Shannon Navigation Office, Limerick, 1st Sept., 1903.

CURVES OF MONTHLY MEAN TEMPERATURES FOR VERKHOYANSK (SIBERIA), THE SONNBLICK (AUSTRIAN ALPS), BEN NEVIS, ROSS, AND THE SCILLY ISLES.

By EDWARD G. ALDRIDGE, F.R.Met.Soc., F.G.S.

VERKHOYANSK.

THE Verkhoyansk* curve has been laid down from the means of 13 to 15 years, the observations there being often interrupted. The values have been supplied by Professor Woeikof. They were calculated in 1897; are derived from observations taken daily at 7 a.m., 1 p.m., and 9 p.m.; and have been reduced to the level of the sea by adding 1°·3 for a somewhat doubtful altitude of 470 ft. (Dr. Hann's ratio). It will be understood that the *actual* values are 1°·3 less than those given by the curve. The mean annual temperature, reduced to the sea-level, is 2°·7 (—16°·3 C.). It may be noticed that the mean temperature of April exceeds that of October, while June is considerably warmer than August. Probably the explanation of these very un-English results is to be found in the fact that in April and June the length of the day is greater than in October and August respectively. At Verkhoyansk there is little or no marine influence. The temperature has several times reached 96°, but not in the period stated. Frost in July is slight. The "jumps" of the monthly mean temperatures are truly marvellous, and, if I may coin a word, "kangaruvine." The fall (43°·6) of mean temperature between October and November is nearly twice and thrice that from the warmest month to January at Ross and in the Scilly

* The Russian alphabet is transliterated phonetically in different languages, thus in German *w* has the sound of the English *v*, *ch* has the sound of the Scottish *ch* in loch, the nearest English equivalent of which is *kh*, and *j* has the sound of *y*; hence, a German copies the sound of the Russian name by Werchojansk, while an Englishman gives exactly the same sound by Verkhoyansk. Neither spelling is wrong, although one is given on the diagram, another in the text.—ED. *S.M.M.*

Islands respectively. If the mean annual range (119½°) of monthly mean temperature at Verkhoyansk be represented by 100, that of the Scilly Isles is only about 13. The lat. and long. of Verkhoyansk are 67° 34′ N. and 133° 51′ E.

The Sonnblick.

The curve for the Sonnblick (Sun-glimpse) has been prepared from the means of the period from October, 1886, to December, 1900. The values are contained in a printed report entitled *Neunter Jahresbericht des Sonnblick-Vereines für das Jahr 1900*, and this has been sent to me from Vienna. The means are obtained from observations taken daily at 7 a.m., 2 p.m. and 9 p.m., the last reading being used twice. They have not been reduced to the sea-level. The mean annual temperature at an elevation of 3,112 metres (10,210 ft.) is 20°·3 (—6°·5 C.). The Sonnblick is believed to have the highest regular observatory in Europe. It may be seen that, notwithstanding the great altitude of the mountain, the continentality of its climate in respect of mean temperature, as compared with that of Ben Nevis, is well maintained. Absolute extremes = 55°·4 in July, 1894, and —30°·3 in March, 1890.

Ben Nevis.

The Ben Nevis curve has been drawn from the means of the period from 1884 to 1901. They have been sent to me by Mr. R. T. Omond, Honorary Secretary of the Scottish Meteorological Society, and are derived from twenty-four hourly observations daily. They have not been reduced to the level of the sea. The mean annual temperature at an altitude of 1,343 metres (4,406 ft.) is 31°·5 (−0°·3 C.). The absolute minimum temperature (0°·7 on the 6th January, 1894) is 1°·7 higher than that experienced at Mobile, Alabama, in February, 1899, when enormous damage was done to the orange-groves of Florida. This mininum of —1° is 13° below the previous lowest. It is safe to say, I think, that this temperature is the minimum during the Ben Nevis period of 18 years. Mobile is in N. lat. 30° 41′; the elevation of the thermometers may be about 100 ft. A report from Jacksonville, Florida, mentions that the minimum over the western district of the State was as low as —4°. The absolute maximum on the Inverness-shire mountain is 66°·2 on the 24th June, 1887. The mean of May is about the same as that of August on the Sonnblick; the mean of September corresponds fairly well with that of January at Ross. The annual mean is perhaps equivalent to that of the autumnal equinox at Verkhoyansk.

Ross.

The Ross (Herefordshire) curve has been sketched in from the means of the period from 1875 to 1901. They are obtained by dividing by 2 the sum of the mean daily maximum and the mean daily minimum temperature. They have been reduced to the sea-level by

adding 0°·7 for a height of 217 ft. (Herschel's ratio). The mean annual temperature at the sea-level is practically 50° (10° C.). Ross, in N. lat. 51° 55′ and in W. long. 2° 35′, has been selected to represent a thoroughly rural and agricultural district of England. The values have been supplied by Mr. H. Southall of that town. Absolute extremes = 95°·0 on the 16th July, 1876, and 2°·9 on the 21st January, 1881. At Greenwich the mean temperature of October considerably surpasses, I believe, that of the year: at Ross October is 0°·7 colder than the year. The Greenwich warmth at this season may be due to the influence of a tidal river.

The Scilly Isles.

The curve for these islands has been obtained from the means of the period from 1871 to 1900. These have been worked out from values given in the publications of the Meteorological Office, and are derived in the same manner as those of Ross. They have been reduced to the sea-level by adding $\frac{1}{4}$° for 75 ft. (Herschel's ratio). The mean annual temperature at the sea-level is 52°·5 (11°·4 C.). The islands have been chosen as affording the warmest climate, and one of the most equable, in the United Kingdom. Absolute extremes = 75° in July, 1886, June and August, 1893, and August, 1899; and 25° in January, 1894. The temperature during the period has never fallen below 30° in March and December. November is 1° warmer than April, October 1° warmer than May, and September about 1° warmer than June. The mean of May is about the same as that of the whole year. March is but little warmer than January. In December the mean daily minimum is nearly equivalent to the mean daily maximum at Ross.

Temperature Table.

Months	Verkhoyansk.			Sonnblick.	Ben Nevis.	Ross.			Scilly Isles.		
	Absolute Max.	Absolute Min.	Mean (unreduced).	Mean.	Mean.	Mean Daily Max.	Mean Daily Min.	Mean.	Mean Daily Max.	Mean Daily Min.	Mean.
	°	°	°	°	°	°	°	°	°	°	°
Jan....	—8·9	—90·0	—59·8	8·1	24·1	43·3	33·0	38·2	48·8	42·5	45·7
Feb....	14·2	—93·6	—51·0	7·5	23·7	45·7	33·8	39·8	49·0	42·5	45·8
Mar...	37·6	—77·4	—27·6	10·0	23·9	49·7	34·5	42·1	49·7	42·3	46·0
April.	48·0	—46·5	7·5	16·0	27·8	56·1	38·5	47·3	52·6	45·0	48·8
May...	68·0	—29·6	35·2	23·9	33·3	62·6	43·1	52·8	56·6	48·4	52·5
June..	88·7	18·9	53·6	29·8	39·8	69·0	49·4	59·2	61·8	53·4	57·6
July ..	92·7	29·7	59·7	33·6	41·3	71·4	52·6	62·0	64·9	56·5	60·7
Aug...	86·2	19·8	49·3	33·4	40·7	70·4	52·1	61·2	65·3	57·1	61·2
Sept...	69·1	4·1	36·0	30·0	38·0	65·3	48·1	56·7	62·4	54·9	58·6
Oct....	48·4	—38·6	5·9	23·0	31·3	55·7	41·6	48·6	56·9	50·1	53·5
Nov...	20·5	—72·4	—37·7	17·8	28·9	49·2	38·1	43·7	53·0	46·6	49·8
Dec....	—3·5	—82·8	—53·7	10·4	25·2	44·4	33·9	39·2	50·3	43·8	47·0

For Curves see diagram facing p. 129

REVIEWS.

Regenkarte der Provinzen . . . . (Sachsen, Schleswig-Holstein und Hannover, Hessen Nassau und Rheinland, Westfalen u.s.w.) mit erläuterndem Text und Tabellen. In amtlichen Auftrage bearbeitet von PROFESSOR DR. G. HELLMANN. [Four numbers]. Berlin, Dietrich Reimer (Ernst Vohsen), 1902 and 1903. Size $10\frac{1}{2} \times 6\frac{1}{2}$. Pp. 32, 44, 56, 30. *Maps.*

WE have to notice together four new parts of Professor Hellmann's series of rainfall maps of the provinces of Prussia, referring respectively to Saxony and the Thuringian States, Schleswig-Holstein and Hanover, Hesse-Nassau and the Rhineland and to Westphalia with some small neighbouring principalities. Each map represents the mean rainfall for ten years, but not for exactly the same ten years in each case. Between 1890 and 1892 the number of rain observing stations in Prussia was greatly extended, and more than ten years' records from a large number of stations being now available the results are set forth in a form likely to prove practically useful to the residents in each province.

We have only space to touch on one of the many points of interest in these admirable little memoirs and we select the maximum falls in a rainfall day (for Prussia the 24 hours ending at 7 a.m.). There were 22 instances noted (in the four memoirs under review) of falls exceeding 4 in. (101 mm.) in a day, particulars for those over 4·50 in. being :—

Harzburg, *Brunswick*	3rd Aug., 1896	156 mm.	or	6·25 in.
Schlanstedt, *Saxony*	16th May, 1889	153 ,,	,,	6·00 ,,
Schmücke, *Saxe-Coburg Gotha*	24th Nov., 1890	137 ,,	,,	5·40 ,,
Oberhof, ,, ,, ,,	,, ,,	127 ,,	,,	5·00 ,,
Lautenthal, *Harz Mts.*	11th July, 1898	122 ,,	,,	4·85 ,,
Mücheln, *Saxony*	7th June, 1896	120 ,,	,,	4·75 ,,
Scharfenstein, *Harz Mts.*	11th July, 1898	119 ,,	,,	4·70 ,,
Ahlden	25th July, 1901	117 ,,	,,	4·60 ,,
Zweifallshammer, *Rhine Prov.*	11th June, 1898	115 ,,	,,	4·50 ,,

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Is it going to rain? Popular weather prognostics, selected and reliable, with notes by EDWARD VERNON, M.A. Edinburgh : Macniven and Wallace. 1903. Size $6\frac{1}{2} \times 4\frac{1}{2}$. Pp. 106. Price 1s. net.

A DAINTILY got up little book in paper covers, bearing the design of a sceptical old gentleman looking at a barometer. The prognostics of rain dealt with are few, but carefully selected, and the explanations of them have a tendency to be rather more "cock-sure" than a meteorologist could altogether approve. It is not easy to find anything new to say of weather prognostics, but the author has managed to clothe his remarks with grace and a touch of humour. This is just the sort of book to send to an intelligent young friend in the country ; it will bore no one and may stimulate the cultivation of observant habits.

Ergebnisse der Arbeiten am Aëronautischen Observatorium (Results of the work at the Aeronautical Observatory) in den Jahren 1900 *und* 1901 *von* RICHARD ASSMANN *und* ARTHUR BERSON. Berlin: A. Asher & Co., 1892. Size 13 × 10. Pp. 280. Price 15 m.

Bericht über die Erforschung der freien Atmosphäre mit Hilfe von Drachen. (Report on the exploration of the free atmosphere by means of kites.) Von Prof. Dr. W. KÖPPEN, *Aus dem Archiv der Deutschen Seewarte.* Hamburg: 1902. Size 11½ × 9. Pp. 104. Plates.

DR. KÖPPEN gives a brief history of the kite as an aid to meteorological research, and describes in much detail the theory and practice of kite-flying as specially employed by the German Marine Observatory at Hamburg.

Messrs. Assman and Berson produce an even more exhaustive report also touching on the history and theory of kite-flying; but mainly concerned with a most interesting account of the Aeronautical Observatory of the Royal Prussian Meteorological Institute in Berlin. It describes the Observatory, its equipment of kites, kite-balloons, and unmanned balloons, and gives an account of the researches carried on by means of these appliances during the first year of work.

THE EIGHT MONTHS' RAINFALL OF 1903.

Aggregate Rainfall for January—August, 1903.

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 .....+	12·31	188	Arncliffe ...+	15·08	140	Braemar ...+	10·24	149
Tenterden	+5·00	131	Hull	+2·59	117	Aberdeen	+6·16	132
Hartley Wintney	+9·45	162	Newcastle.....	+2·78	117	Cawdor	+4·86	126
Hitchin .....+	11·57	182	Seathwaite +	30·49	139	Glencarron +	17·73	132
Winslow	+9·62	167	Cardiff	+8·64	137	Dunrobin	+5·70	131
Westley.....	+3.93	125	Haverfordwest	+8·72	135	Darrynane ...	+5·52	119
Brundall.....	+3·01	120	Gogerddan ...	+8·62	134	Waterford ...	+7·85	133
Alderbury	+8·08	150	Llandudno ...	+4·96	129	Broadford.. ...	+8·55	141
Ashburton	+9·38	133	Dumfries ...+	12·84	149	Carlow .....+	10·46	150
Polapit Tamar ...	+7·03	133	Lilliesleaf	+8·57	146	Dublin	+4·62	127
Stroud .....+	10·29	162	Colmonell	+4·67	118	Mullingar...+	10·52	145
Woolstaston	+9·71	155	Glasgow ...+	16·98	177	Ballinasloe ...	+9·40	141
Boston	+5·78	146	Inveraray ...+	15·19	136	Clifden	+4·48	109
Hesley Hall	+3·36	126	Islay	+8·02	130	Crossmolina +	10·21	133
Derby.....	+5·60	139	Mull .....+	10·08	130	Seaforde	+7·84	135
Bolton	+6·16	114	Loch Leven +	14·65	166	Londonderry..	+5·15	120
Wetherby	+7·07	148	Dundee	+6·76	140	Omagh .....+	12·02	149

RAINFALL AND TEMPERATURE, AUGUST, 1903.

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) ...	4·24	+ 2·14	1·17	24	18	80·6	8	45·4	11	0	0
II.		Tenterden	3·63	+ 1·19	·90	14	15	75·7	8	42·0	23	0	0
,,		Hartley Wintney	2·98	+ ·63	·76	11	21	75·0	8	40·0	23*b*	0	0
III.		Hitchin	3·46	+ 1·33	·94	11	19	74·0	8	43·0	21	0	...
,,		Winslow (Addington)	3·85	+ 1·72	·70	24	19	76·0	8	39·0	22	0	0
IV.		Bury St. Edmunds (Westley)	3·78	+ 1·38	·92	11	14	72·0	13*a*	44·0	18*c*	0	...
,,		Norwich (Brundall)	2·72	+ ·35	·65	11	17	74·0	13	44·4	22	0	0
V.		Winterborne Steepleton	5·51	...	1·03	11	16	70·0	8	38·0	22	0	0
,,		Torquay	3·41	...	·82	13	14	70·1	8	47·5	22	0	0
,,		Polapit Tamar [Launceston]..	4·55	+ 1·21	1·06	23	20	69·8	8	38·0	22	0	0
VI.		Stroud (Upfield)	3·83	+ 1·29	·69	23	21	76·0	8	46·0	25	0	...
,,		Church Stretton (Woolstaston)	5·23	+ 2·39	·90	24	23	71·5	8	45·5	22	0	...
,,		Worcester (Diglis Lock)	3·49	+ 1·34	·51	23	20	...	...	...	...	...	...
VII.		Boston	4·57	+ 2·62	1·54	18	15	72·0	4	44·0	22	0	...
,,		Hesley Hall [Tickhill].....	3·69	+ 1·48	1·07	18	12	75·0	8	40·0	23	0	...
,,		Derby (Midland Railway).....	4·86	+ 2·74	1·20	24	15	75·0	1	40·0	21	0	...
VIII.		Bolton (The Park).....	5·67	+ 1·19	·75	2	24	69·1	8	43·6	22	0	0
IX.		Wetherby (Ribston Hall) ...	2·42	+ ·15	·65	17	20	...	...	...	...	...	...
,,		Arncliffe Vicarage.....	8·63	+ 3·14	1·12	15	24	...	...	...	...	...	...
,,		Hull (Pearson Park).	3·19	+ ·57	·82	24	15	73·0	8	46·0	17*d*	0	0
X.		Newcastle (Town Moor)	2·24	— ·67	·38	30	25	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	21·14	+ 9·74	3·95	27	28	67·8	25	41·4	12	0	...
XI.	WALES.	Cardiff (Ely).....	6·00	+ 1·83	·68	23	21	...	...	...	...	...	...
,,		Haverfordwest	5·66	+ 2·00	·62	17	21	68·6	8	43·0	12	0	0
,,		Aberystwith (Gogerddan) ...	6·61	+ 2·66	·91	19	18	76·0	8	35·0	11	0	...
,,		Llandudno.....	3·51	+ ·71	·71	17	20	71·0	8	48·0	12	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	5·02	+ ·88	·83	26	18	70·0	1	39·0	22	0	...
XIII.		Edinburgh (Royal Observatory)	2·56	...	·73	1	22	64·8	27	44·4	30	0	0
XIV.		Colmonell	4·72	+ ·73	·66	14	25	71·0	18	37·0	21	0	...
XV.		Tighnabruaich	9·45	...	1·15	14	24	63·0	2	42·0	21	0	...
,,		Mull (Quinish).....	8·08	+ 2·96	1·23	26	28	...	...	...	...	...	...
XVI.		Loch Leven Sluices	4·78	+ 1·12	·95	31	18	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	5·30	+ 2·49	·95	30	20	70·6	12	39·6	25*e*	0	...
XVII.		Braemar	4·31	+ ·64	·60	14	27	63·2	2	35·4	30	0	4
,,		Aberdeen (Cranford)	4·29	+ ·99	·66	14	26	70·0	27	36·0	22	0	...
,,		Cawdor (Budgate)	3·03	— ·12	·44	30	24	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	6·76	+ 2·36	·85	15	15	...	...	...	...	...	...
,,		Glencarron Lodge.....	12·31	+ 3·77	1·22	26	29	66·0	8	41·3	13	0	...
XIX.		Dunrobin	3·94	+ 1·39	·88	30	16	65·0	9	40·0	30	0	...
,,		S. Ronaldshay (Roeberry) ...	...	...	...	...	...	...	...	...	...	...	...
XX.	IRELAND.	Darrynane Abbey.....	5·88	+ 1·39	1·05	13	28	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	4·62	+ ·69	·90	16	22	69·0	4	39·0	22	0	...
,,		Broadford (Hurdlestown) ...	5·21	+ 1·63	·81	26	27	66·0	8, 30	43·0	23	0	...
XXI.		Carlow (Browne's Hill)	5·06	+ 1·63	·74	23	25	...	...	..	...	...	...
,,		Dublin (FitzWilliam Square)	2·80	— ·16	·47	13	26	70·9	30	46·1	21	0	0
XXII.		Ballinasloe	6·69	+ 2·76	·89	2	31	66·0	8, 30	40·0	7, 22	0	...
,,		Clifden (Kylemore)	10·11	+ 2·21	1·70	14	23	...	...	...	...	...	...
XXIII		Seaforde.....	4·26	+ ·96	·46	14	27	74·0	5, 11	39·0	11	0	0
,,		Londonderry (Creggan Res.).	6·93	+ 2·51	·86	9	29	...	...	...	...	...	...
,,		Omagh (Edenfel)	7·92	+ 3·68	·95	30	28	66·0	8	38·0	21	0	0

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

a and 27. *b* and 26. *c* and 25. *d* and 19, 24. *e* and 30.

SUPPLEMENTARY RAINFALL, AUGUST, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	...	XI.	Llandefaelog-fach.....	5·15
II.	Dorking, Abinger Hall .	5·97	,,	New Radnor, Ednol.....	6·38
,,	Sheppey, Leysdown	2·25	,,	Rhayader, Nantgwillt...	8·55
,,	Hailsham	4·04	,,	Lake Vyrnwy	7·51
,,	Crowborough.....	4·76	,,	Ruthin, Plâs Drâw	3·71
,,	Ryde, Beldornie Tower..	3·71	,,	Criccieth, Talarvor	5·69
,,	Bournemouth, Kempsey	3·65	,,	I. of Anglesey, Lligwy..	3·87
,,	Emsworth, Redlands ...	5·59	,,	Douglas, Woodville.....	3·95
,,	Alton, Ashdell	3·76	XII.	Stoneykirk, Ardwell Ho.	4·13
,,	Newbury, Welford Park	3·90	,,	Dalry, Old Garroch	8·95
III.	Oxford, Magdalen Coll..	3·78	,,	Moniaive, Maxwelton Ho.	7·66
,,	Banbury, Bloxham	3·51	,,	Lilliesleaf, Riddell	3·53
,,	Pitsford, Sedgebrook ...	3·56	XIII.	N. Esk Res. [Penicuick]	4·85
,,	Huntingdon, Brampton.	3·05	XIV.	Dalry, Blair	9·38
,,	Wisbech, Bank House...	3·47	,,	Glasgow, Queen's Park..	6·28
IV.	Southend	2·60	XV.	Inveraray, Newtown ...	10·95
,,	Colchester, Lexden	3·87	,,	Ballachulish, Ardsheal...	11·94
,,	Saffron Waldon, Newport	3·08	,,	Campbeltown, Redknowe	6·69
,,	Rendlesham Hall	3·70	,,	Islay, Eallabus.....	7·13
,,	Swaffham	3·32	XVI.	Dollar.....	5·49
V.	Salisbury, Alderbury ...	3·70	,,	Balquhidder, Stronvar...	10·69
,,	Bishop's Cannings	3·47	,,	Coupar Angus Station...	4·19
,,	Ashburton, Druid House	5·19	,,	Blair Atholl	5·32
,,	Okehampton, Oaklands.	4·94	,,	Montrose, Sunnyside ...	4·46
,,	Hartland Abbey	5·38	XVII.	Alford, Lynturk Manse..	3·80
,,	Lynmouth, Rock House	4·63	,,	Keith H.R.S.....	4·72
,,	Probus, Lamellyn	4·08	XVIII.	Fearn, Lower Pitkerrie..	3·34
,,	Wellington, The Avenue	2·92	,,	S. Uist, Askernish	5·38
,,	North Cadbury Rectory	3·27	,,	Invergarry.....	9·19
VI.	Clifton, Pembroke Road	4·39	,,	Aviemore, Alvie Manse.	4·03
,,	Ross, The Graig	3·53	,,	Loch Ness, Drumnadrochit	3·29
,,	Shifnal, Hatton Grange	4·82	XIX.	Invershin	5·96
,,	Wem Rectory	4·43	,,	Bettyhill	5·75
,,	Cheadle, The Heath Ho.	5·43	,,	Watten H.R.S.....	5·57
,,	Coventry, Kingswood ...	3·67	XX.	Cork, Wellesley Terrace	4·46
VII.	Market Overton	5·00	,,	Killarney, District Asyl.	4·64
,,	Grantham, Stainby	4·89	,,	Glenam [Clonmel]	4·76
,,	Horncastle, Bucknall ...	4·28	,,	Ballingarry, Hazelfort...	4·59
,,	Worksop, Hodsck Priory	5·01	,,	Miltown Malbay	6·76
VIII.	Neston, Hinderton	3·11	XXI.	Gorey, Courtown House	4·22
,,	Southport, Hesketh Park	4·18	,,	Moynalty, Westland ...	6·05
,,	Chatburn, Middlewood.	...	,,	Athlone, Twyford	6·46
,,	Duddon Val., Seathwaite Vic.	10·36	,,	Mullingar, Belvedere ...	6·68
IX.	Langsett Moor, Up. Midhope	5·10	XXII.	Woodlawn	8·07
,,	Baldersby	2·09	,,	Westport, Murrisk Abbey	9·24
,,	Scalby, Silverdale	2·39	,,	Crossmolina, Enniscoe ..	7·68
,,	Ingleby Greenhow Vic..	2·10	,,	Collooney, Markree Obs.	7·58
,,	Middleton, Mickleton ...	3·80	XXIII.	Enniskillen, Portora ...	5·13
X.	Beltingham	3·66	,,	Warrenpoint.....	4·81
,,	Bamburgh	3·37	,,	Banbridge, Milltown ...	5·08
,,	Keswick, The Bank	8·10	,,	Belfast, Springfield	...
,,	Melmerby Rectory	4·43	,,	Bushmills, Dundarave..	5·28
XI.	Llanfrechfa Grange	5·89	,,	Stewartstown	5·96
,,	Treherbert, Tyn-y-waun	13·45	,,	Killybegs	11·68
,,	Castle Malgwyn	5·48	,,	Horn Head	6·56

METEOROLOGICAL NOTES ON AUGUST, 1903.

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.—Another wet and cool month, for the greater part stormy and inclement. Thundery weather prevailed on the 9th and 10th, and exceptionally heavy R occurred on 11th and 24th. Mean temp. 60°·7, or 1°·4 above the average.

ABINGER HALL.—A very remarkable month, with a record fall of 1·98 in. on 24th, 1·62 in. falling from 9 a.m. to 5 p.m. Harvest operations were much hindered and corn discoloured.

TENTERDEN.—The first week was fine and the rest mostly wet and very bad for harvest. A great deal of wind at times. TSS on 10th.

SHEPPEY, LEYSDOWN.—Altogether cheerless and sunless. Fine during the first week, then rainy and unsettled.

CROWBOROUGH.—Heavy R, high winds and storms, doing damage to crops. Sharp gale on 20th. Mean temp. 57°·7, or 2°.3 below the average.

EMSWORTH, REDLANDS.—R 3·13 in. in excess of the average of 19 years. On 24th 1·02 in. of R fell in 55 minutes. Continuous gales.

HARTLEY WINTNEY.—Cold and wet, with R almost daily and rough S.W winds. TS on 11th. This month completes the average total R for the year.

BURY ST. EDMUNDS, WESTLEY.—Most unfavourable for harvest work. Corn was not so much damaged as last year, the month being cold and windy.

NORWICH, BRUNDALL.—Mean temp. 1°·8 below the average. Although it was a cool and unsettled month, the mean temp. was 0°·8 higher than in August, 1902, and the R ·65 in. less.

SWAFFHAM.—On the 1st ·33 in. of R fell in about 15 minutes.

WINTERBOURNE STEEPLETON.—The R was the highest and the mean. temp. the lowest during eleven years' observations. The weather was nearly as bad for the harvest as in 1902, when 4·39 in. of R fell in August.

TORQUAY, CARY GREEN.—R ·77 in. above the average. Duration of sunshine 196·3 hours, or 10·0 hours below the average. Mean temp. 59°·9, or 1°·7 below the average. Mean amount of ozone 4·9; max. 7·0 on 15th with W. wind and on 27th with S.W. wind; min. 2·0 on 2nd with N.W. wind.

OKEHAMPTON, OAKLANDS.—Very wet and unseasonable, with low temp. Most unfavourable for harvest work.

WELLINGTON, THE AVENUE.—Very stormy and unsettled almost throughout, the wind at times being very violent. Only on four days did the temp. rise to 70°. R, although very frequent, only ·25 in. above the normal.

NORTH CADBURY RECTORY.—Most miserable. A rainy and cloudy month. The max. temp. was below 70° on 14 days, and there were many cool nights. The amount of wind was very great.

ROSS, THE GRAIG.—Till the 12th fine and pleasant, only ·14 in. of R falling in a fortnight. The next 12 days were just the contrary, with great R, blackness and gloom, and disastrous for corn harvest.

WEM, THE RECTORY.—A very melancholy month; cold, damp and almost sunless.

BOLTON, THE PARK.—Changeable, with frequent R and low temp. Mean temp. 54°·8, or 2°·5 below the average. Bright sunshine on 24 days, the total being 133 hours 50 mins., or 4 hours 50 mins. below the average. Severe TS with vivid L on 14th.

HULL, PEARSON PARK.—Mild and genial early in the month, but from 14th very unsettled with frequent R and much wind. Very cloudy throughout.

BAMBURGH.—Very unsettled. High N.W. winds and few warm days.

WALES AND THE ISLANDS.

HAVERFORDWEST.—Remarkable for the number of wet days, absence of sunshine and low temp., which not once reached 70° and seldom exceeded 63°.

One of the wettest Augusts of recent years. Crops much damaged. Duration of sunshine 154 hours.

DOUGLAS, WOODVILLE.—Probably the worst month of a generally disastrous summer. Cold, wet and unsettled, with remarkably low bar. R fell on 24 days, but the total was not excessive. Gales were unusually frequent, doing much damage. L on 14th and T on 24th.

SCOTLAND.

CARGEN [DUMFRIES].—Cold, wet and changeable. Harvest prospects poor. T and L on 14th and 23rd and T on 6th.

TIGHNABRUAICH.—The clouds were highly charged with electricity and sheet lightning was a common phenomenon. The R exceeded all records for a summer month.

BALLACHULISH, ARDSHEAL.—The wettest August recorded at this station. R 5·11 in. above the average.

STRONVAR.—Only one dry day and everything in the way of crops is far backward.

COUPAR ANGUS.—August, generally the wettest month, has been no exception this year. TSS were numerous and in some cases severe. Mean temp. 54°·0, or 3°·5 below the average; the lowest since 1888.

ABERDEEN, CRANFORD.—Wet, with little sunshine. T and L almost every day.

DRUMNADROCHIT.—R 1·10 in. above the average, while the number of rainy days beats the record for the month.

BETTYHILL.—With the exception of a few days and an occasional half-day of sunshine, this was a very wet month.

IRELAND.

CORK, WELLESLEY TERRACE.—Critically speaking, we had no summer, the mean temp. having been little over that of autumn. Owing to the excessive R and low temp. the harvest prospects are very unfavourable. R ·97 in. above the average.

DARRYNANE ABBEY.—Very wet and harvest very backward. Hay and oats still in the fields and much damaged.

MILTOWN MALBAY.—More or less R every day, a visitation almost unexampled. Harvest business in a deplorable state.

DUBLIN, FITZWILLIAM SQUARE.—Unsettled, cool, rainy and windy. The R was remarkable for frequency rather than quantity, and the force of the wind was unusual for the time of year. Severe TS on 24th, with T and L of exceptional violence. Mean temp. 58°·4, or 1°·3 below the average. The shade temp. rose above 70° on one day only. High winds were noted on 18 days, reaching the force of a gale on 5.

BALLINASLOE.—This was the first time in 32 years that R fell on every day of the month.

MARKREE OBSERVATORY.—Very wet; at times very heavy R fell with frequent TSS. Some high wind, reaching the force of a gale on 5 or 6 days.

KILLYBEGS.—The R has only been exceeded since 1886 by that of November, 1890, when 12·36 in. fell.

HORN HEAD.—On the 8th ·32 in. of R fell in 15 minutes. accompanied by T.

OMAGH, EDENFEL.—The R of the past month, 7·92 in., was the heaviest ever registered in the same period, and brought the R of the 8 months to 36·39 in., almost exactly the full average fall for a whole year. Every other characteristic of the weather was equally unsettled and unfavourable; in fact, August, 1903, will be remembered as the most unsummerlike summer month ever recorded here.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1903.

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	67·9	25	29·9	11*a*	53·9	39·5	39·7	78	102·9	23·5	2·30	18	5·3
Malta	67·9	26	45·0	10	61·8	51·0	48·4	79	119·6	39·3	·88	8	3·3
Lagos, W. Africa	93·0	8	70·0	19	90·3	78·4	76·9	78	143·0	70·0	1·86	3	...
Cape Town	88·0	15	50·0	7, 20	74·7	57·6	53·0	66	...	...	1·34	6	3·3
Durban, Natal	90·7	1, 30	55·6	21	82·7	64·4	...	...	146·3	...	4·13	12	4·1
Mauritius	87·6	5, 6	70·8	31	84·7	74·5	73·3	83	155·5	65·6	7·49	22	6·7
Calcutta	99·9	30	62·1	10	91·1	70·0	64·9	61	151·1	55·9	·77	2	2·3
Bombay	87·7	29	64·3	9	83·8	70·6	66·9	73	133·0	55·3	·17	1	0·6
Madras	98·6	31	67·2	4	89·9	72·6	72·1	78	141·9	63·3	·00	0	1·2
Kodaikanal	74·5	23	46·9	2	70·6	51·4	41·6	53	144·8	32·2	·29	1	2·7
Colombo, Ceylon	94·0	14	72·8	9	82·4	75·6	73·3	75	152·4	70·8	2·53	5	1·9
Hongkong	79·8	11	56·2	1	70·1	63·0	63·1	89	130·7	...	2·66	14	8·8
Melbourne	99·8	2	43·2	24	77·1	55·4	53·0	66	155·0	33·1	2·93	9	5·8
Adelaide	97·5	1	46·9	25	79·2	59·0	50·7	52	153·3	40·9	2·20	8	4·4
Coolgardie	100·3	2	43·2	8	84·5	56·0	47·0	44	166·2	37·2	·00	0	1·9
Sydney	94·1	23	59·4	15	78·2	66·6	63·8	78	135·0	53·0	3·78	18	5·9
Wellington	74·0	6	43·0	22	65·6	52·6	49·5	71	126·0	29·0	1·95	12	5·4
Auckland	76·5	11	49·0	13	69·9	56·3	51·3	65	150·0	44·0	1·38	8	3·6
Jamaica, Negril Point	89·4	1	61·9	16	85·1	68·9	68·6	75	...	...	·57	3	...
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	87·8	31	69·6	13	84·3	73·0	69·2	73	157·2	...	2·48	12	2·5
Toronto	68·4	19	15·9	1	46·5	32·7	33·9	80	80·0	13·7	1·83	11	7·2
Fredericton, N.B.	58·2	14	—4·4	3	43·8	22·8	22·0	59	...	...	6·07	12	5·8
Winnipeg	41·1	11	—10·3	14	27·9	7·7	...	...	...	...	1·08	10	5·9
Victoria, B.C.	55·7	23	26·4	12	47·0	35·5	...	...	...	...	2·71	13	5·6
Dawson	34·8	18	—31·8	9	16·9	—4·5	...	...	...	...	·60	4	4·1

a—and 12.

Lagos	January...	92·0	20,22, 25,31	68·0	1	88·9	77·2	...	...	142·0	...	·00	0	...
	February.	92·0	14	69·0	1	87·2	74·7	74·0	78	137·0	...	3·41	3	...

MALTA.—Mean temp. of air 55°·4, or 0°·5 below and mean hourly velocity of wind 10·9 or 0·2 below, averages. Mean temp. of sea 61°·6.

Mauritius.—Mean temp. of air 1°·5 and dew point 2°·5 above, and R ·71 in. below, averages. Mean hourly velocity of wind 10·2 miles, or 0·3 below average; extremes 24·7 on 10th and 1·6 on 31st; prevailing direction E.

KODAIKANAL.—Mean temp. of air 59°·0. Mean velocity of wind 275 miles per day. Bright sunshine 250·9 hours.

COLOMBO.—Mean temp. of air 83°·8, or 1°·8 above, of dew point 0°·1 above, and R 2·29 in. below, averages. Mean hourly velocity of wind 5·7 miles, mean direction S.W.

HONGKONG.—Mean temp. of air 66°·3 or 4°·1 above, R 0·60 in. below, averages. Sunshine 64·3 hours. Mean hourly velocity of wind 15·0 miles; prevailing direction E.

Adelaide.—Mean temp. of air 1°·2 below, R 1·14 in. above, 46 years' average. Cool, with good agricultural rains during the first week.

Sydney.—Mean temp. of air 3°·1 above and R 1·31 in. below, averages.

Wellington.—Mean temp. of air 3°·0 below, and R 1·59 in. below, averages.

SYMONS'S

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THE SOUTHPORT MEETING OF THE BRITISH ASSOCIATION.

THE 1903 meeting of the British Association for the Advancement of Science stands out from the seventy-two that have gone before it on account of the remarkable prominence given to Meteorology. This was largely due to the happy inspiration of holding the meeting of the International Meteorological Committee at the same time and place, and thereby securing the presence of official representatives of Meteorology from almost all civilised countries.

Southport proved a most attractive meeting place. Although the gale and torrential rain of the night of September 10th will not soon be forgotten by those exposed to them, the porous, sandy soil on which the town is built speedily absorbed all traces of the deluge.

The Fernley Observatory has been known by reputation to British meteorologists for many years, but the completeness and perfection of the meteorological equipment came as a surprise to most of the visitors. The utmost credit is due to Mr. Baxendell and his able assistant Mr. Halliwell for the sound scientific plan on which the observations are made and published, and many observers both private and official carried away valuable lessons as to what was possible and feasible. We hope to have a full account of this model observatory in an early number.

The town itself was bright and cheerful, shaded by trees in the day-time, the pavements of the principal streets sheltered from rain by glass arcades, and at night it was illuminated by innumerable coloured electric lights fitted up among the branches. The meeting rooms were commodious and conveniently arranged, and the meteorological exhibition occupied a prominent place.

In the descriptions of British Association meetings in these pages it has been usual to give as complete a list as possible of the meteorologists and observers present, but we have not space this year to print such a list in full. It must suffice to place on record those who took part in the Meteorologists' Breakfast, a gathering of early birds which on this occasion reached the unprecedented (though familiar) number of **62**. The Breakfast was held in the Queen's Hotel on Tuesday, September 15th, at the appropriate hour of 9 a.m.

All the members of the International Meteorological Committee then in Southport and the President of the Association, Sir Norman Lockyer, were present as guests. The following is a complete list, members of the International Committee being distinguished by small capitals:—

Ackroyd, W. T. (Halifax)
Amery, P. Fabyan S. (Ashburton)
Archibald, Douglas (London)
Aspland, W. G. (Newton Abbot)
Biggs, J. H. W. (Liverpool)
Black, Surg.-Maj. W.G. (Edinburgh)
Bolton, John (London)
Boltzmann, Prof. L. (Vienna)
Brodie, F. J. (London)
Buchan, Dr. A., F.R.S. (Edinburgh)
Creak, Capt. E. W., R.N., F.R.S. (London)
Crowley, F. (Ashdell, Alton)
Dines, W. H. (Oxshott)
Edmonds, F. B. (London)
Fream, Prof. W. (Salisbury)
Glazebrook, Dr. R. T., F.R.S. (Teddington)
Halliwell, F. L. (Southport)
Harmer, F. W. (Norwich)
Hardman, S. (Southport)
HELLMANN, PROF. G. (Berlin)
Herbertson, Dr. A. J. (Oxford)
HERGESELL, PROF. H. (Strasburg)
HILDEBRANDSSON, PROF. H. H. (Upsala)
Hinks, A. R. (Cambridge)
Hopkinson, John (Watford)
Hoyle, W. E. (Manchester)
Kitto, E. (Falmouth)
Larmor, Prof. J., F.R.S. (Cambridge)
Lempfert, R. G. K. (London)
Lockyer, Sir Norman, K.C.B., F.R.S. (London)
Lockyer, Dr. W. J. S. (London)
Lodge, Sir Oliver, F.R.S. (Birmingham)
Mackinder, H. J. (Oxford)
Marriott, W. (London)
MASCART, PROF. E. (Paris)
Mill, Dr. H. R. (London)
MOHN, PROF. H. (Christiania)
MOORE, PROF. WILLIS L. (Washington)
Morrison, G. J. (London)
Parker, Rev. Dr. Dunne (Stevenage)
PAULSEN, DR. A. (Copenhagen)
PERNTER, PROF. M. (Vienna)
Pircher, Dr. J. (Vienna)
Rotch, Dr. A. L. (Blue Hill Observatory, Massachusetts).
Russell, The Hon. Rollo (Haslemere)
RYKATCHEFF, GENERAL (St. Petersburg)
Sampson, R. A. (Durham)
Schuster, Prof., F.R.S. (Manchester)
SHAW, DR. W. N., F.R.S. (London)
Simpson, Dr. J. Y. (Edinburgh)
Smith, J. (Crathes)
Smyth, John (Banbridge)
SNELLEN, DR. M. (Utrecht)
Sopp, E. J. B. (Southport)
Southall, H. (Ross)
TEISSERENC DE BORT, M. L. (Paris)
Turner, Prof. H. H., F.R.S. (Oxford)
VAN BEBBER, DR. (Hamburg)
Warner, A. (Croydon)
Watts, Prof. W. W. (Birmingham)
Wilson, C. T. R. (Cambridge)
Whipple, R. S. (Cambridge)

Before the meal commenced, Dr. H. R. Mill explained that there was no chairman and no formality, for this was merely a spontaneous social gathering of students of the weather, but on this occasion the unofficial meteorologists of the British Isles were happy to have the opportunity of welcoming as guests the official meteorologists of the world. M. Mascart, of Paris, Chairman of the International Meteorological Committee, and Professor Willis Moore of the United States Weather Bureau expressed their appreciation of the courtesy done them, and Dr. W. N. Shaw, as the British representative on the International Committee, also said a few words. Mr. Marriott expressed the regret of Captain D. Wilson-Barker, President of the Royal Meteorological Society, and of Mr. Joseph Baxendell of the Fernley Observatory, at their inability to be present. A successful photograph of the party was taken while breakfast was in progress,

and by the kindness of the photographer, Mr. J. A. Kay, of Southport, we hope to publish a reduction of it in an early issue.

A novel exhibition was given on the esplanade on two successive evenings by Professor Pernter of Vienna, who brought with him one of the great funnel-shaped cannons used in Austria and Italy for the purpose of discharging large vortex rings into the air with the expectation of averting hail. Professor Pernter did not exhibit the apparatus as a hail-preventer, but merely in order to show the production of large vortex rings. Unfortunately the only powder which could be procured did not produce enough smoke to make the rings clearly visible; but though not seen well they were heard very distinctly as they hurtled through the air, the gun being fired in a horizontal position.

We hope in our next number to give some account of the Meteorological Exhibition, and also an epitome of the meteorological papers read at the meeting. Meanwhile we have pleasure in reproducing the greater part of Dr. W. N. Shaw's admirable address as Chairman of the Sub-section of Section A devoted to Astronomy and Meteorology.

METHODS OF METEOROLOGICAL INVESTIGATION.

By W. N. Shaw, Sc.D., F.R.S.

In opening the proceedings of the Sub-section devoted to Cosmical Physics, which we may take to be the application of the methods and results of Mathematics and Physics to problems suggested by observations of the Earth, the air, or the sky, I desire permission to call your attention to some points of general interest in connection with that department which deals with the air. . . . .

But this is not the first occasion upon which the Address from the Chair of the Sub-section has been devoted to Meteorology. Many of you will recollect the trenchant manner in which a university professor, himself a meteorologist, an astronomer, a physicist, and a mathematician, dealt candidly with the present position of Meteorology. After that Address I am conscious that I have no claim to be called a meteorologist according to the scientific standard of Section A. Professor Schuster has explained—and I cannot deny it—that the responsible duty of an office from which I cannot dissociate myself is signing weather reports; and I could wish that the duty of making the next Address had been entrusted to one of my colleagues from across the sea. But as Professor Schuster has set forth the aspect of official meteorology as seen from the academic standpoint with a frankness and candour which I think worthy of imitation, I shall endeavour to put before you the aspect which the relation between Meteorology and academic science wears from the point of view of an official meteorologist whose experience is not long enough to have hardened into that most comfortable of all states of mind, a pessimistic contentment.

Meteorology occupies a peculiar position in this country. From the point of view of Mathematics and Physics, the problems which the subject presents are not devoid of interest, nor are they free from that difficulty which should stimulate scientific effort in academic minds. They afford a most ample field for the display of trained intellect, and even of genius, in devising and apply-

ing theoretical and experimental methods. And can we say that the work is unimportant? Look where you will over the countries which the British Association may be supposed to represent, either directly or indirectly, and say where a more satisfactory knowledge of the laws governing the weather would be unimportant from any point of view. Will you take the British Isles on the eastern shores of the Atlantic, the great meteorological laboratory of the world, with the far-reaching interests of their carrying trade; or India, where the phenomena of the monsoon show most conspicuously the effects of the irregular distribution of land, the second great meteorological cause, and where recurring famines still overstrain the resources of administration. Take the Australasian Colonies and the Cape, which, with the Argentine Republic, where Mr. Davis is developing so admirably the methods of the Weather Bureau, constitute the only land projections into the great southern ocean, the region of "planetary meteorology;" Australia, with its periods of paralysing drought; the Cape, where the adjustment of the crops to climate is a question of the hour; or take Canada, which owns at the same time a granary of enormous dimensions and a large portion of the Arctic Circle; or take the scattered islets of the Atlantic and Pacific, or the shipping that goes wherever ships can go. The merest glance will show that we stand to gain more by scientific knowledge, and lose more by unscientific ignorance of the weather, than any other country. The annual loss on account of the weather would work out at no inconsiderable sum per head of the population, and the merest fraction of success in the prevention of what science must regard as preventable loss would compensate for half a century of expenditure on meteorological offices. Or take a less selfish view and consider for a moment our responsibilities to the general community of nations, the advantages we possess as occupying the most important posts of observation. If the meteorology of the world were placed, as perhaps it ought to be, in the hands of an International Commission, it can be no exaggeration to say that a considerable majority of the selected sites for stations of observation would be on British soil or British ships. We cannot help being the most important agency for promoting or for obstructing the extension of meteorological science. I say this bluntly and perhaps crudely because I feel sure that ideas not dissimilar from these must occasionally suggest themselves to every meteorologist, British or foreign; and if they are to be expressed—and I think you will agree me that they ought to be—a British meteorologist ought to take the responsibility of expressing them.

And how does our academic organisation help us in this matter of more than parochial or even national importance? There was a time when Meteorology was a recognised member of the large physical family and shared the paternal affection of all professors of Physics; but when the poor nestling began to grow up and develop some individuality electricity developed simultaneously with the speed of a young cuckoo. The professors of Physics soon recognised that the nest was not large enough for both, and with a unanimity which is the more remarkable because in some of these academic circles utilitarianism is not a condition of existence, and pure science, not market value, might be the dominant consideration—with singular unanimity the science which bears in its left hand, if not in its right, sources of wealth beyond the dreams of avarice was recognised as a veritable Isaac, and the science wherein the fruits of discovery must be free for all the world, and in which there is not even the most distant prospect of making a fortune—that science was ejected as an Ishmael.

Electrical engineering has an abundance of academic representatives; brewing has its professorship and its corps of students, but the specialised physics of the atmosphere has ceased to share the academic hospitality. So far as I know the British universities are unanimous in dissembling their love for Meteorology as a science, and if they do not actually kick it downstairs they are at least content that it has no encouragement to go up. In none is there a professorship, a lectureship, or even a scholarship, to help to form the nucleus of that corps of students which may be regarded as the primary condition of scientific development.

Having cut the knot of their difficulties in this very human but not very humane method, the universities are, I think, disposed to adopt a method of justification which is not unusual in such cases; indications are not wanting which disclose an opinion that Meteorology is, after all, not a science. There are, I am aware, some notable exceptions; but do I exaggerate if I say that when university professors are kind enough to take an interest in the labours of meteorologists, who are doing their best amid many discouragements, it is generally to point out that their work is on the wrong lines; that they had better give it up and do something else? And the interest which the universities display in a general way is a good-humoured jest about the futility of weather prophecy, and the kindly suggestion that the improvement in the prediction of the next twenty-four hours' weather is a natural limit to the orbit of an Ishmaelite's ambition. . . . . It is quite possible that the unformulated opinion of the vast majority of people in this country who are only too familiar with the meteorological vagaries of the British Isles is that the weather does just as it pleases; that any day of the year may give you an August storm or a January summer's day; that there are no laws to be discovered, and that the further prosecution of so unsatisfactory a study is not worth the time and money already spent upon it. They forget that there are countries where, to judge by their languages, the weather has so nearly the regularity of "old time" that one word is sufficient to do duty for both ideas. They forget that our interests extend to many climates, and that the characteristics of the eastern shores of the North Atlantic are not appropriate to, say, western Tropical Africa. That may be a sufficient explanation of the attitude of the man in the street, but as regards the British universities dare I offer the difficulty of the subject as a reason for any want of encouragement? Or shall I say that the general ignorance on the part of the public of the scientific aspirations and aims of meteorologists and of the results already obtained is a reason for the universities to keep silence on the subject? With all respect I may say that the aspect which the matter presents to official meteorologists is that the universities are somewhat oblivious of their responsibilities and their opportunities.

I have no doubt that it will at once be said that Meteorology is supported by Government funds, and that alma mater must keep her maternal affection and her exiguous income for subjects that do not enjoy State support. I do not wish just now to discuss the complexities of alma mater's housekeeping. I know she does not adopt the same attitude with regard to astronomy, physics, geology, mineralogy, zoology, or botany, but let that pass. From the point of view of the advancement of science I should like to protest against the idea that the care of certain branches of science by the State and by the universities can be regarded as alternative. The advancement of science

demands the co-operation of both in their appropriate ways. As regards Meteorology, in my experience, which I acknowledge is limited, the general attitude towards the department seems to be dictated by the consideration that it must be left severely alone in order to avoid the vicious precedent of doing what is, or perhaps what is thought to be, Government work without getting Government pay, and the result is an almost monastic isolation.

There is too much isolation of scientific agencies in this country. You have recently established a National Physical Laboratory the breath of whose life is its association with the working world of physics and engineering, and you have put it—where? At Cambridge, or anywhere else where young physicists and engineers are being trained? No; but in the peaceful seclusion of a palace in the country, almost equidistant from Cambridge, Oxford, London, and everywhere else. You have established a Meteorological Office, and you have put it in the academic seclusion of Victoria Street. What monastic isolation is good for I do not know. I am perfectly certain it is not good for the scientific progress of Meteorology. How can one hope for effective scientific development without some intimate association with the institutions of the country, which stand for intellectual development and the progress of science?

I could imagine an organisation which by association of the universities with a central office would enable this country, with its colonies and dependencies, to build up a system of meteorological investigation worthy of its unexampled opportunities. But the co-operation must be real and not one-sided. Meteorology, which depends upon the combination of observations of various kinds from all parts of the world, must be international, and a Government department in some form or other is indispensable. No university could do the work. But whatever form Government service takes it will always have some of those characteristics which, from the point of view of research, may be called bondage. On the other hand, research, to be productive, must be free with an academic freedom, free to succeed or fail, free to be remunerative or unremunerative, without regard to Government audits or House of Commons control. Research looks to the judgment of posterity with a faith which is not unworthy of the Churches, and which is not among those excellent moral qualities embodied in the Controller and Auditor General. *Die academische Freiheit* is not the characteristic of a Government department. The opportunity which gave to the world the "Philosophiæ Naturalis Principia" was not due to the State subvention of the Deputy Mastership of the Mint, but to the modest provision of a professorship by one Henry Lucas, of whose pious benefaction Cambridge has made such wonderful use in her Lucasian professors.

The future of Meteorology lies, I believe, in the association of the universities with a central department. I could imagine that Liverpool or Glasgow might take a special interest in the meteorology of the sea; they might even find the means of maintaining a floating observatory; and when I say that we know practically nothing of the distribution of rainfall over the sea, and we want to know everything about the air above the sea, you will agree with me that there is room for such an enterprise. Edinburgh might, from its association with Ben Nevis, be desirous of developing the investigation of the upper air over our land; in Cambridge might be found the author of a book, on the principles of atmospheric physics, worthy of its Latin predecessor: and for London I can assign no limited possibilities.

If such an association were established I should not need to reply to Professor Schuster's suggestion for the suppression of observations. The real requirement of the time is not fewer observations, but more men and women to interpret them. I have no doubt that the first expression of such an organisation would be one of recognition and acknowledgment of the patience, the care, the skill, and the public spirit—all of them sound scientific characteristics—which furnish at their own expense those multitudes of observations. The accumulated readings appal by their volume, it is true, but they are, and must be, the foundation upon which the scientific structure will be built. . . .

Yet with all these achievements it must be confessed that the progress made with the problems of general or dynamical Meteorology in the last thirty years has been disappointing. When we compare the position of the subject with that of other branches of Physics it must be allowed that it still lacks what astronomy found in Newton, sound in Newton and Chladni, light in Young or Fresnel, heat in Joule, Kelvin, Clausius, and Helmholtz, and electricity in Faraday and Maxwell. Above all, it lacks its Kepler. Let me make this clear. Kepler's contribution to physical astronomy was to formulate laws which no heavenly body actually obeys, but which enabled Newton to deduce the law of gravitation. The first great step in the development of any physical science is to substitute for the indescribably complex reality of nature an ideal system that is an effective equivalent for the purposes of theoretical computation. . . . . When we look round the sciences each has its own peculiar ideals and its own physical quantities: astronomy has its orbits and its momentum, sound its longitudinal vibration, light its transverse vibration, heat its energy and entropy, electricity its "quantity" and its wave, but meteorology has not yet found a satisfactory ideal problem to substitute for the complexity of nature. I wish to consider the aspect of the science from this point of view and to recall some of the attempts made to arrive at a satisfactory modification of reality. I do not wish to refer to such special applications of physical reasoning as may be involved in the formation of cloud, the thermodynamics of a mixture of air and water vapour, the explanation of optical or electrical phenomena, nor even Helmholtz's application of the theory of gravitational waves to superposed layers of air of different density. These require only conventions which belong already to physics, and though they may furnish suggestions they do not themselves constitute a general meteorological theory.

The most direct efforts to create a general theory of atmospheric circulation are those which attempt to apply Newtonian dynamics, with its more recent developments on the lines of hydrodynamics and thermodynamics. Attempts have been made, mathematical or otherwise, to determine the general circulation of the atmosphere by the application of some form of calculation, assuming only the sun and a rotating earth, with an atmosphere, as the data of the problem. I confess that these attempts, interesting and ingenious as they are, seem to me to be somewhat premature. The "problem" is not sufficiently formulated. When Newton set to work to connect the motions of the heavenly bodies with their causes, he knew what the motions of the heavenly bodies were. Mathematics is an excellent engine for explaining and confirming what you know. It is very rarely a substitute for observation, and before we rely upon it for telling us what the nature of the general circulation of the atmosphere really is, it would be desirable to find out by observation or

experiment what dynamical and elastic properties must be attributed to an extremely thin sheet of compressible fluid rotating about an axis with a velocity reaching 1000 miles an hour, and subject to periodic heating and cooling of a very complicated character. It would be more in consonance with the practice of other sciences to find out by observation what the general circulation is before using mathematics to explain it. What strikes one most about the mathematical treatises on the general circulation of the atmosphere is that what is true about the conclusions is what was previously known from observation. It is, I think, clear that that method has not given us the working ideal upon which to base our theory.

Consider next the attempts to regard atmospheric phenomena as periodic. Let me include with this the correlation of groups of atmospheric phenomena with each other or with those of the sun, when the periodicity is not necessarily regular, and the scientific process consists in identifying corresponding changes. This method has given some remarkable results by the comparison of the sequence of changes in the meteorological elements in the hands of Petterson and Meinardus, and by the comparison of the variation of pressure in different parts of the globe by Sir Norman Lockyer and Dr. W. J. S. Lockyer; as regards the Earth and the sun the subject has reached the stage of productive discussion.

For the purpose of dealing with periodicity in any form we substitute for nature an ideal system obtained by using mean values instead of individual values, and leaving out what, from this point of view, are called accidental elements. The simplification is perfectly legitimate. Passing on to the consideration of periodicity in the stricter sense the process which has been so effective in dealing with tides, the motions of the liquid layer, is very attractive as a means of attacking the problems of the atmosphere, because, in accordance with a principle in dynamics, to every periodic cause there must correspond an effect of the same period, although the relation of the magnitude of the effect to the cause is governed by the approximation of the natural period of the body to that of the cause.

There are two forms of the strict periodic method. One is to examine the generalised observations for periodicities of known length, whether it be that of the lunar rotations or of sunspot frequency, or of some longer or shorter period. In this connexion let me acknowledge a further obligation to Professor Schuster for tacking on to his Address of last year a development of his work on the detection of hidden periodicities by giving us a means of estimating numerically what I may call the reality of the periodicity. The other method is by harmonic analysis of a series of observations with the view of finding causes for the several harmonic components. I may say that the Meteorological Office, supported by the strong opinion of Lord Kelvin, has favoured that plan, and on that account has for many years issued the hourly results for its observatories in the form of five-day means as representing the smallest interval for which the harmonic analysis could be satisfactorily employed. Sir Richard Strachey has given some examples of its application, and the capabilities of the method are by no means exhausted, but as regards the general problem of dynamic meteorology harmonic analysis has not as yet led to the disclosure of the required generalisation.

I ought to mention here that Professor Karl Pearson, with the assistance of Miss Cave, has been making a most vigorous attempt to estimate the numerical

value of the relationship, direct or inverse, between the barometric readings at different places on the earth's surface. The attempt is a most interesting one as an entirely new departure in the direction of reducing the complexity of atmospheric phenomena. If it were possible to find co-ordinates which showed a satisfactory correlation it might be possible to reduce the number of independent variables and refer the atmospheric changes to the variations of definite centres of action in a way that has already been approached by Hildebrandsson from the meteorological side.

Years ago, when Buys Ballot laid down as a first law of atmospheric motion that the direction of the wind was transverse to the barometric gradient and the force largely dependent upon the gradient, and when the examination of synchronous charts showed that the motion of air could be classified into cyclonic and anticyclonic rotation, it appeared that the meteorological Kepler was at hand, and the first step towards the identification of a working meteorological unit had been taken—the phenomena of weather might be accounted for by the motion and action of the cyclonic depression, the position of the ascending current, the barometric minimum. The individual readings over the area of the depression could be represented by a single symbol. By attributing certain weather conditions to certain parts of the cyclonic area and supposing that the depression travelled with more or less unchanged characteristics, the vagaries of weather changes can be accounted for. For thirty years or more the depression has been closely watched, and thousands of successful forecasts have been based upon a knowledge of its habits. But unfortunately the travelling depression cannot be said to preserve its identity in any sense to which quantitative reasoning can be applied. As long as we confine ourselves to a comparatively small region of the earth's surface the travelling depression is a real entity, but when we widen our area it is subject to such variations of path, of speed, of intensity, and of area, that its use as a meteorological unit is seriously impaired, and when we attempt to trace it to its source or follow it to its end it eludes us. Its origin, its behaviour, and its end are almost as capricious as the weather itself.

Nor if we examine other cases in which a veritable entity is transmitted can we expect that the simple barometric distribution should be free from inexplicable variations. We are familiar with ordinary motion, or, as I will call it, astronomical motion, wave motion, and vortex motion. Astronomical motion is the motion of matter, wave motion the motion of energy, vortex motion the motion of matter with energy, but the motion of a depression is merely the transmission of the locus of transformation of energy; neither the matter nor the energy need accompany the depression in its motion. If other kinds of motion are subject to the laws of conservation of matter and conservation of energy, the motion of the depression must have regard also to the law of dissipation of energy. An atmospheric disturbance, with the production of rainfall and other thermal phenomena, must comply in some way with the condition of maximum entropy, and we cannot expect to account for its behaviour until we can have proper regard to the variations of entropy. But the conditions are not yet in a form suitable for mathematical calculation, and we have no simple rules to guide us. So far as Meteorology is concerned, Willard Gibbs unfortunately left his work unfinished.

When the cyclonic depression was reluctantly recognised as too unstable a creature to carry the structure of a general theory, Mr. Galton's anticyclones,

the areas of high pressure and descending currents, claimed consideration as being more permanent. Professor Köppen and Dr. van Bebber have watched their behaviour with the utmost assiduity and sought to find therein a unit by which the atmospheric changes can be classified; but I am afraid that even Dr. van Bebber must allow that his success is statistical and not dynamical. "High pressures" follow laws on the average, and the quantity we seek is not an average but an individual.

The question arises, whether the knowledge of the sequence of weather changes must elude us altogether, or will yield to further search. Is the man in the street right after all? But consider how limited our real knowledge of the facts of atmospheric phenomena really is. It may very well be that observations on the surface will never tell us enough to establish a meteorological entity that will be subject to mathematical treatment; it may be that we can only acquire a knowledge of the general circulation of the atmosphere by the study of the upper air, and must wait until Professor Hergesell has carried his international organisation so far that we can form some working idea therefrom of general meteorological processes. But let us consider whether we have even attempted for surface meteorology what the patience of astronomers from Copernicus to Kepler did for astronomy.

Do we yet fully comprehend the kinematics of the travelling depression; and if not, are we in a satisfactory position for dealing with its dynamics? I have lately examined minutely the kinematics of a travelling storm, and the results have certainly surprised me and have made it clear that the travelling depressions are not all of one kinematical type. We are at present hampered by the want of really satisfactory self-recording instruments. I have sometimes thought of appealing to my friends the professors of physics who have laboratories where the reading of the barometer to the thousandth of an inch belongs to the work of the "elementary class," and of asking them to arrange for an occasional orgy of simultaneous readings of the barometer all over the country with corresponding weather observations for twenty-four consecutive hours, so that we might really know the relation between pressure, rainfall, and temperature of the travelling depressions; but I fear the area covered would even then hardly be large enough, and we must improve our self-recording instruments.

Then, again, have we arrived at the extremity of our knowledge of the surface circulation of the atmosphere? We know a great deal about the average monthly distribution, but we know little about the instantaneous distribution. It may be that by taking averages we are hiding the very points which we want to disclose.

Let me remind you again that the thickness of the atmosphere in proportion to the Earth's surface is not unsatisfactorily represented by a sheet of paper. Now it is obvious that currents of air in such a thin layer must react upon each other horizontally, and therefore we cannot *à priori* regard one part of the area of the Earth's surface as meteorologically independent of any other part. We have daily synoptic charts for various small parts of the globe, and the Weather Bureau extended these over the northern hemisphere for the years 1875 to 1879; but who can say that the meteorology of the northern hemisphere is independent of that of the southern? To settle that primary question we want a synchronous chart for the globe. As long as we are unable to watch the changes in the globe we are to a certain extent groping in the dark,

A great part of the world is already mapped every day, and the time has now arrived when it is worth while to consider what contributions we can make towards identifying the distribution of pressure over the globe. We may idealise a little by disregarding the local peculiarities without sacrificing the general application. I have put in the exhibition a series of maps showing what approximation can be made to an isochronous chart of the globe without special effort. We are gradually extending the possibility of acquiring a knowledge of the facts in that as in other directions. With a little additional enterprise a serviceable map could be compiled; and when that has been reached, and when we have added to that what the clouds can tell us, and when the work of the Aëronautical Committee has so far progressed that we can connect the motion of the upper atmosphere with the conditions at the surface, when we know the real kinematics of the vertical and horizontal motion of the various parts of a travelling storm, we shall, if the universities will help us, be able to give some rational explanation of those periodic relations which our solar physics friends are identifying for us, and to classify our phenomena in a way that the inheritors of Kepler's achievements associated with us in this Section may be not unwilling to recognise as scientific.

Correspondence.

SUN PILLAR.

To the Editor of Symons's Meteorological Magazine.

IT may interest your readers to know that I saw a sun pillar on Thursday, the 17th instant, at 6.20 p.m., when travelling by train between Waterloo and Wimbledon. The sky was nearly covered with high stratus cloud. The sun itself was not visible, but the pillar was seen as a vertical shaft of light of a pale pink colour through a gap in the cloud just above the sun. The phenomenon lasted about fifteen minutes.

FRANCIS DRUCE.

65, Cadogan Square, S. W., 28th September, 1903.

THE GALE OF SEPTEMBER 10TH.

To the Editor of Symons's Meteorological Magazine.

IN case you should be collecting any particulars with respect to the recent severe gale, I write to say that judging from the amount of rain I recorded here at 9 a.m. on 11th inst., the centre of the disturbance must have passed almost directly over the north-west coast of Anglesey. The amount in question was 2·07 in., as against 1·56 in. recorded at Holyhead, which is the maximum fall I have seen returned. No less than ·82 in. fell here between 5 and 7 p.m. on 10th, at which latter hour the barometer stood at 28·83 in., and at 8 p.m., when a rise had commenced, the direction of the wind, which blew with almost hurricane force, was about N.N.E.

BOSTON.

Lligwy, Moelfre, Anglesey, 13th September, 1903.

To the Editor of Symons's Meteorological Magazine.

THOUGH the force of the gale on Thursday, September 10th, was only moderate in this district, the fall of the barometer was extremely rapid, and is worthy of note :—

From 4 p.m. to 10 p.m., Sept. 10th, the fall was 0·645 in.

The most rapid portions of this fall were :—

From 4 to 5 p.m.....	0·185 in.
From 7.55 to 8.5 p.m.	0·065 ,,
From 9.30 to 10 p.m.....	0·150 ,,

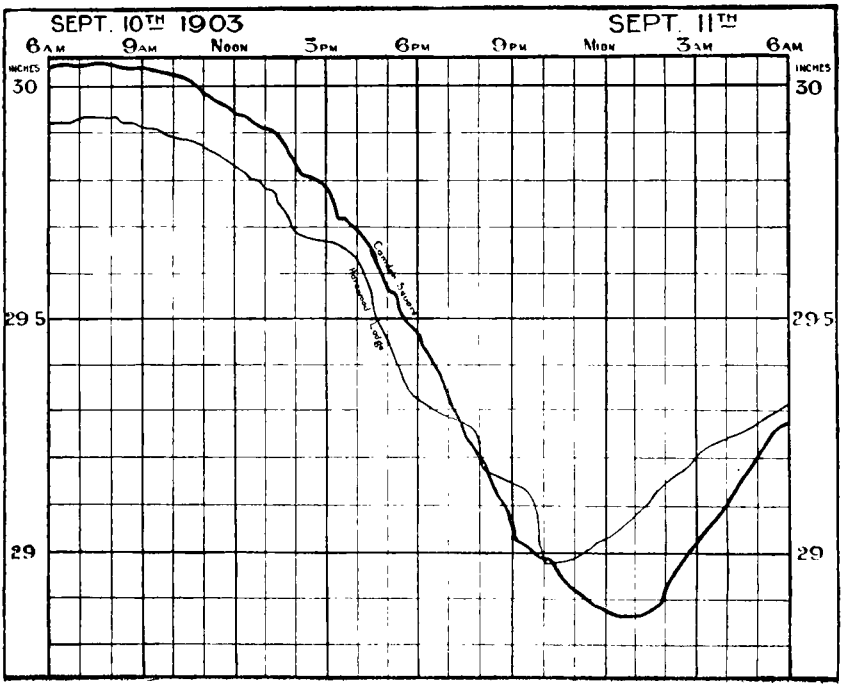
I have nothing which approaches these rates in a nearly complete twelve-year record, 1890-1901, from my Redier barograph. The nearest I can find are :—

1891, October 13th, 2 to 3 p.m., a fall of 0·155 in.
1896, September 25th, in five hours ..... 0·510 ,,

I send you a copy of the trace of my Redier barograph for September 10th, 1903. The lowest point shown on diagram, 28·980, is probably not quite low enough, as the barograph is rather sluggish, but the actual fall cannot have been less rapid, and may have been a little more rapid.

C. L. BROOK.

Harewood Lodge, Meltham, September 12th, 1903.



[To Mr. Brook's tracing of the movements of his Redier barograph at Meltham we add a copy of the curve given by the Redier barograph at Camden Square for the same period. It will be noticed that the range of pressure was greater and the minimum occurred later in London than in Yorkshire. The fall at Camden Square was from 30·008 in. at 9 a.m. on September 10th to 28·830 in. at 1 a.m. on the 11th, a fall of no less than 1·178 in. in sixteen hours. The recovery of pressure was somewhat more rapid than at Meltham. The storm was a peculiarly violent one, and yielded heavy falls of rain over a large part of England.—ED. *S.M.M.*]

To the Editor of Symons's Meteorological Magazine.

YOU will have plenty of reports of Thursday night's gale, but it may be of interest to note the effect on trees and hedges and almost all vegetation in this district. Everything is scorched brown; even the nettles and brambles are blackened, and the foliage of the large trees (what remains to them) is curled and shrivelled up, and this even at Studland and places on the lee side of the downs.

The wind was from S.W., and I hardly thought salt spray could have been carried so far across the land, and so much rain fell too in the night. It was very cold, and if it had been a hard frost there could hardly have been more havoc. In the lanes one is ankle-deep in green leaves torn off. I think I never saw such wholesale destruction in so short a time—trees, of course, and large branches down everywhere.

LOUISA M. S. PASLEY.

The Chestnuts, Swanage, 9th September, 1903.

[Mr. D. W. Horner sends us specimens of oak leaves from near Ilfracombe which were blasted by the same storm, the effects of which upon vegetation reached, he says, as far inland as Exeter. Other observers have described similar devastation extending inland from Weston-super-Mare to beyond Cheddar; and it would appear that the force of the gale on the night of September 10th was very exceptional all over the Devon-Cornwall peninsula.—ED. *S.M.M.*]

HEAVY FALL OF RAIN.

To the Editor of Symons's Meteorological Magazine.

DURING a violent thunderstorm here this afternoon, though we were apparently on the western edge, I measured ·82 in. in 19 minutes, from 3.48 to 4.7; the total fall was 1·07 in. in about 1½ hour.

CHARLES P. HOOKER.

Dollarward, Cirencester, September 24th, 1903.

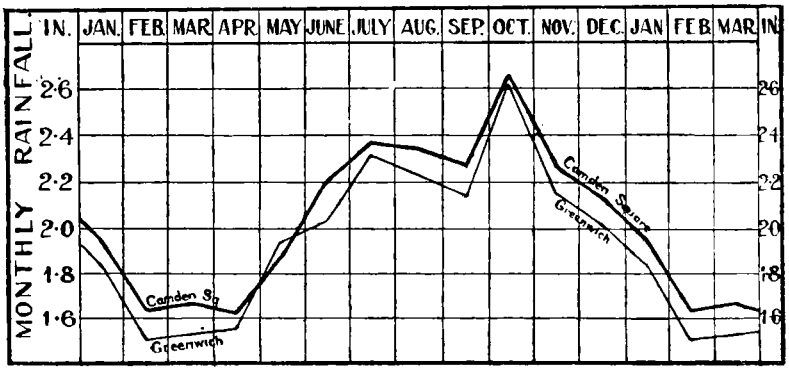
MEAN RAINFALL.

To the Editor of Symons's Meteorological Magazine.

IN an interesting paper appearing in the annual volume of *British Rainfall*, 1902, Mr. Sowerby Wallis has collected some long-period records of rainfall, the mean monthly values of which are also graphically represented in curves. One record is that for Camden Square for the 45 years 1858 to 1902; another is that for Greenwich for the 60 years 1840 to 1899. Considering that 42 out of the 45 years at Camden Square are included in, and indeed form the greater part of, the Greenwich period, the resulting annual curves (given in *British Rainfall*, but scarcely necessary here to repeat) show for these places differences greater than might have been expected. I was thus induced to form mean monthly values at Greenwich for the shorter period 1858 to 1902, and make a more direct comparison. The new Greenwich values for each month of the year are respectively—

1·84 1·50 1·52 1·56 1·92 2·02 2·30 2·23 2·13 2·62 2·17 2·02 in.

Reproducing here Mr. Wallis's 45 years' curve for Camden Square, and adding thereto the curve for the similar period at Greenwich, it is seen that the two curves are not dissimilar, but, on the contrary, in very fair agreement. It seemed to me to be of interest thus to point out how an apparent discrepancy disappears when the period compared is at both places the same.



Again, I have the Greenwich results collected for the 62 years 1841 to 1902. Dividing these into two groups of 31 years each, I find great differences in the annual distribution of rainfall, the mean monthly values in the two series differing in each of the months of January, May, September and December by more than 0·25 in. It is thus difficult to say how long a period is really sufficient to obtain satisfactory mean values.

WILLIAM ELLIS.

September, 1903.

THE NINE MONTHS' RAINFALL OF 1903.

Aggregate Rainfall for January—September, 1903.

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 .....+	12·88	180	Arncliffe ...+	16·34	138	Braemar	+9·77	141
Tenterden	+4·98	127	Hull	+3·49	120	Aberdeen	+6·90	131
Hartley Wintney	+9·52	154	Newcastle.....	+2·95	116	Cawdor	+3·72	117
Hitchin .....+	11·46	170	Seathwaite +	28·42	131	Glencarron +	14·59	123
Winslow	+9·09	155	Cardiff	+9·23	134	Dunrobin	+5·42	126
Westley.....	+4·75	126	Haverfordwest	+9·79	134	Darrynane ...	+4·83	143
Brundall.....	+4·25	124	Gogerddan +	10·28	135	Waterford ...	+8·08	130
Alderbury	+7·56	141	Llandudno ...	+6·16	130	Broadford.. ...	+9·45	140
Ashburton .....+	11·28	135	Dumfries ...+	12·89	143	Carlow .....+	11·18	147
Polapit Tamar ...	+8·16	133	Lilliesleaf	+9·06	143	Dublin	+5·90	130
Stroud .....+	10·43	155	Colmonell	+4·14	114	Mullingar...+	11·92	145
Woolstaston ...+	11·28	156	Glasgow ...+	17·01	167	Ballinasloe +	10·56	141
Boston	+6·83	147	Inveraray ...+	13·23	127	Clifden	+7·76	114
Hesley Hall	+4·49	130	Islay	+7·39	124	Crossmolina +	11·66	133
Derby.....	+6·29	138	Mull	+8·18	121	Seaforde	+9·17	136
Bolton	+5·28	118	Loch Leven +	14·78	159	Londonderry..	+4·13	114
Wetherby	+8·86	152	Dundee	+6·83	136	Omagh .....+	12·20	143

September has proved the driest month of the year, except February, though most stations record a fall considerably in excess of the average, and the falls for the nine months vary from 14 to 80 per cent. in excess, the average for the British Isles being probably about 37 per cent. or fully one-third more than the normal fall.

REVIEW.

Instructions to Observers of the Indian Meteorological Department. By J. ELIOT, M.A., F.R.S., &c. Second edition. Calcutta, 1902. Size 10 × 6. Pp. iv. + 120.

THESE instructions apply to the special circumstance of meteorological observers in India, and they bear evidence of being based on experience. The use of a minimum wet-bulb thermometer is recommended, and this is an instance of different conditions making it possible to use an instrument which could not be satisfactorily employed in this country, at least not in winter. The one point which we are inclined to criticise is the recommendation to set the rain gauge, which is provided with a wide foot, in a bed of cement. It would serve the purpose better to use a plain cylindrical gauge which could readily be lifted out of a hollow in a cement block so as to empty the outer can in case of overflow. The method recommended is to break out the wide-based gauge from its cement bed, and reset it when emptied. A simpler plan still would be to use a metal inner can, as in the Snowdon gauge, which could readily be withdrawn in case of the bottle overflowing, but the arrangement is perhaps designed to discourage thieves.

RAINFALL AND TEMPERATURE, SEPTEMBER, 1903.

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) ...	2·64	+ ·57	1·06	4	13	83·7	2	38·1	17	0	0
II.		Tenterden	2·37	— ·02	·50	10	17	81·5	2	38·0	12	0	1
,,		Hartley Wintney	2·27	+ ·07	·59	10	11	80·0	1, 2	35·0	11*e*	0	2
III.		Hitchin	2·02	— ·11	·60	10	16	80·0	2	38·0	12	0	..
,,		Winslow (Addington)	1·73	— ·53	·52	10	13	77·0	1	35·0	13*e*	0	2
IV.		Bury St. Edmunds (Westley)	3·31	+ ·82	1·12	10	17	83·0	2	38·0	12	0	...
,,		Norwich (Brundall)	3·69	+ 1·24	1·95	10	20	83·0	2	38·2	18	0	0
V.		Winterborne Steepleton	3·99	...	1·05	28	15	73·6	1	34·5	13	0	6
,,		Torquay	3·28	...	·60	24	14	71·9	1	42·2	15	0	0
,,		Polapit Tamar [Launceston]..	4·43	+ 1·13	·90	1	20	69·5	1	29·9	15	1	1
VI.		Stroud (Upfield)	2·58	+ ·14	·60	28	16	71·0	1*a*	39·0	14*f*	0	...
,,		Church Stretton (Woolstaston)	3·98	+ 1·57	·83	10	24	69·0	1	38·5	15	0	...
,,		Worcester (Diglis Lock)	2·95	+ 1·13	·52	29	20	...	...	...	...	...	...
VII.		Boston	3·03	+ 1·05	·95	10	13	77·0	2	39·0	16	0	...
,,		Hesley Hall [Tickhill].....	3·02	+ 1·13	1·25	10	16	72·0	1	36·0	13*g*	0	...
,,		Derby (Midland Railway).....	2·70	+ ·69	·90	10	17	75·0	1	35·0	16	0	...
VIII.		Bolton (The Park).....	5·81	+ 1·65	1·67	10	20	68·5	23	36·1	16	0	5
IX.		Wetherby (Ribston Hall) ...	4·01	+ 1·79	1·20	10	22	...	...	...	...	...	...
,,		Arncliffe Vicarage.....	6·44	+ 1·26	1·91	8	18	...	...	...	...	...	...
,,		Hull (Pearson Park).	3·13	+ ·90	1·26	10	16	73·0	1	32·0	18	1	5
X.		Newcastle (Town Moor)	2·35	+ ·17	·84	2	16	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	10·81	— 2·07	3·16	9	19	...	...	31·3	16	2	...
XI.	WALES.	Cardiff (Ely).....	4·34	+ ·59	·83	24	18	...	...	...	...	...	...
,,		Haverfordwest	4·87	+ 1·07	·80	1	19	69·3	20	34·0	15	0	2
,,		Aberystwith (Gogerddan) ...	5·73	+ 1·66	1·26	8	15	75·0	24	28·0	14	4	...
,,		Llandudno.....	4·07	+ 1·20	1·14	10	17	69·0	21*a*	39·0	15	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·80	+ ·05	·93	2	15	67·0	18*a*	30·0	15	2	...
XIII.		Edinburgh (Royal Observatory)	2·03	...	·77	2	14	66·2	1	37·1	14	0	4
XIV.		Colmonell	3·46	— ·53	·76	4	14	69·0	21	32·0	12*h*	2	...
XV.		Tighnabruaich	4·05	...	·81	7	15	62·0	18	36·0	13	0	...
,,		Mull (Quinish).....	3·22	— 1·90	·52	4	16	...	...	...	...	...	...
XVI.		Loch Leven Sluices	3·04	+ ·13	·72	3	15	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	2·30	+ ·07	·75	2	20	66·0	26	34·0	15	0	...
XVII.		Braemar	2·65	— ·47	·53	2	16	65·7	23	27·0	15	2	4
,,		Aberdeen (Cranford)	3·47	+ ·74	·94	2	23	67·0	26	28·0	14	2	...
,,		Cawdor (Budgate)	1·95	— 1·14	·48	8	15	...	..	...	...	...	...
XVIII		Strathconan [Beauly]	2·78	— 1·70	·53	8	9	...	...	...	...	...	...
,,		Glencarron Lodge.....	5·39	— 3·14	·73	11	16	68·5	24	33·0	14	0	...
XIX.		Dunrobin	2·31	— ·28	·50	11	13	61·5	6	32·0	14	1	...
,,		Castletown	2·72	...	·56	12	21	67·0	25	35·0	15	0	1
XX.	IRELAND.	Darrynane Abbey.....	3·48	— ·69	·42	17	22	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	3·36	+ ·23	·66	29	16	67·0	1	36·0	15*g*	0	...
,,		Broadford (Hurdlestown) ...	3·77	+ ·90	·58	10	21	62·0	6*b*	36·0	13	0	...
XXI.		Carlow (Browne's Hill)	3·45	+ ·72	·90	10	18	...	...	...	..	...	...
,,		Dublin (Fitz William Square)	3·40	+ 1·28	·97	10	17	67·2	1	37·8	15	0	0
XXII.		Ballinasloe	4·30	+ 1·16	1·69	10	23	65·0	22*c*	32·0	14	1	...
,,		Clifden (Kylemore)	10·12	+ 3·28	2·10	10	21	...	...	...	...	...	...
XXIII		Seaforde.....	4·48	+ 1·33	1·33	10	20	68·0	1	33·0	14*f*	0	2
,,		Londonderry (Creggan Res.).	2·85	— 1·02	·74	10	16	...	...	...	...	...	...
,,		Omagh (Edenfel)	3·89	+ ·18	1·10	10	17	65·0	20*d*	36·0	14	0	...

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

a and 23. *b* and 18, 20, 24. *c* and 25. *d* and 23, 25. *e* and 17. *f* and 15. *g* and 16. *h* and 13.

SUPPLEMENTARY RAINFALL, SEPTEMBER, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	...	XI.	Llandefaelog-fach.....	4·74
II.	Dorking, Abinger Hall .	3·97	,,	New Radnor, Ednol.....	4·70
,,	Sheppey, Leysdown	2·46	,,	Rhayader, Nantgwillt...	6·52
,,	Hailsham	2·87	,,	Lake Vyrnwy	7·62
,,	Crowborough.....	2·62	,,	Ruthin, Plâs Dráw	4·85
,,	Ryde, Beldornie Tower..	...	,,	Criccieth, Talarvor	5·57
,,	Bournemouth, Kempsey	2·25	,,	I. of Anglesey, Lligwy..	5·71
,,	Emsworth, Redlands ...	3·94	,,	Douglas, Woodville.....	6·17
,,	Alton, Ashdell.....	2·84	XII.	Stoneykirk, Ardwell Ho.	3·19
,,	Newbury, Welford Park	2·27	,,	Dalry, Old Garroch	6·24
III.	Oxford, Magdalen Coll..	1·60	,,	Monaive, Maxwelton Ho.	5·01
,,	Banbury, Bloxham	2·07	,,	Lilliesleaf, Riddell	3·07
,,	Pitsford, Sedgebrook ...	2·73	XIII.	N. Esk Res. [Penicuick]	2·70
,,	Huntingdon, Brampton.	1·68	XIV.	Dalry, Blair	4·12
,,	Wisbech, Bank House...	2·93	,,	Glasgow, Queen's Park..	3·32
IV.	Southend	1·52	XV.	Inveraray, Newtown ...	4·61
,,	Colchester, Lexden	2·04	,,	Ballachulish, Ardsheal...	6·09
,,	Saffron Waldon, Newport	3·14	,,	Campbeltown, Redknowe	2·86
,,	Rendlesham Hall	2·23	,,	Islay, Eallabus.....	3·98
,,	Swaffham	4·23	XVI.	Dollar.....	4·11
V.	Salisbury, Alderbury ...	1·87	,,	Balquhidder, Stronvar...	5·44
,,	Bishop's Cannings	2·50	,,	Coupar Angus Station...	2·57
,,	Ashburton, Druid House	5·70	,,	Blair Atholl	2·98
,,	Okehampton, Oaklands.	5·04	,,	Montrose, Sunnyside ...	2·89
,,	Hartland Abbey	3·54	XVII.	Alford, Lynturk Manse..	2·44
,,	Lynmouth, Rock House	4·03	,,	Keith H.R.S.....	2·74
,,	Probus, Lamellyn	3·42	XVIII.	Fearn, Lower Pitkerrie..	1·32
,,	Wellington, The Avenue	3·68	,,	S. Uist, Askernish	2·19
,,	North Cadbury Rectory	2·39	,,	Invergarry.....	4·61
VI.	Clifton, Pembroke Road	3·33	,,	Aviemore, Alvie Manse.	2·88
,,	Ross, The Graig	3·04	,,	Loch Ness, Drumnadrochit	2·85
,,	Shifnal, Hatton Grange	3·68	XIX.	Invershin	2·30
,,	Wem Rectory	3·85	,,	Bettyhill	2·03
,,	Cheadle, The Heath Ho.	6·08	,,	Watten H.R.S.....	2·72
,,	Coventry, Kingswood ...	1·97	XX.	Cork, Wellesley Terrace	4·07
VII.	Market Overton	3·30	,,	Killarney, District Asyl.	5·62
,,	Grantham, Stainby	3·21	,,	Glenam [Clonmel]	3·94
,,	Horncastle, Bucknall ...	2·73	,,	Ballingarry, Hazelfort...	3·00
,,	Worksop, Hodsck Priory	2·84	,,	Miltown Malbay	5·52
VIII.	Neston, Hinderton	4·07	XXI.	Gorey, Courtown House	2·32
,,	Southport, Hesketh Park	5·26	,,	Moynalty, Westland ...	4·43
,,	Chatburn, Middlewood.	6·47	,,	Athlone, Twyford	3·93
,,	Duddon Val., Seathwaite Vic.	9·27	,,	Mullingar, Belvedere ...	4·50
IX.	Langsett Moor, Up. Midhope	5·62	XXII.	Woodlawn	4·32
,,	Baldersby	3·51	,,	Westport, Murrisk Abbey	7·10
,,	Scalby, Silverdale	3·27	,,	Crossmolina, Enniscoe ..	5·74
,,	Ingleby Greenhow Vic..	3·50	,,	Collooney, Markree Obs.	4·70
,,	Middleton, Mickleton ...	4·47	XXIII.	Enniskillen, Portora ...	3·60
X.	Beltingham	3·33	,,	Warrenpoint.....	4·04
,,	Bamburgh	2·53	,,	Banbridge, Milltown ...	3·89
,,	Keswick, The Bank.....	5·74	,,	Belfast, Springfield	3·69
,,	Melmerby Rectory	4·33	,,	Bushmills, Dundarave..	2·14
XI.	Llanfrechfa Grange	4·02	,,	Stewartstown	3·79
,,	Treherbert, Tyn-y-waun	8·89	,,	Killybegs	3·35
,,	Castle Malgwyn	5·86	,,	Horn Head	2·51

METEOROLOGICAL NOTES ON SEPTEMBER, 1903.

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.—On the whole finer than any of the summer months, and there was no persistently wet or cold weather. A TS of considerable severity occurred on the evening of the 4th, lasting for over 3 hours, with T, L and R. There was a little fog in the last week. Mean temp. 58°·4, or 0°·7 above the average.

ABINGER HALL.—A month of sharp contrasts, with a remarkably heavy fall on 4th. All green crops were growing more than in August. Two severe frosts.

TENTERDEN.—There were two hot days to begin with, then showery with TSS on 2nd and 4th, and a violent gale on the night of the 10th. Duration of sunshine 177 hours.

SHEPPEY, LEYSDOWN.—Unsettled and showery. During a TS on 4th ·92 in. of R fell in about an hour. Terrific gale on the night of the 10th.

CROWBOROUGH.—Warm and not unpleasant, with a mean temp. of 56°·3. Gale on 8th and a severe one on 10th. R ·60 in. below the average of 27 years.

EMSWORTH, REDLANDS.—R 1·65 in. in excess of the average of 19 years. TSS on 4th and 2·21 in. of R, the heaviest fall in 24 hours ever recorded here.

HARTLEY WINTNEY.—The first month of the year with R below the average. Mild throughout. A terrific S.W. gale on the night of the 10th, doing damage to trees only. Ozone on 9 days with a mean of 2·2. TS on 4th.

BURY ST. EDMUNDS, WESTLEY.—Very wet for harvest, with ten wet days in succession. Cold in the middle, very mild at the beginning and end. TS on 4th.

TORQUAY, CARY GREEN.—R ·89 in. above the average. Duration of sunshine 155·2 hours, being 9·1 hours below the average. Mean amount of ozone 4·5; max. 7·5 on 20th with S.E. wind, min. 1·5 on 2nd with E.S.E. wind and on 25th with W. wind.

HARTLAND ABBEY.—On 10th there was a very severe storm from S.W., W. and N.W., and all vegetation was very much scorched. The general opinion was that the wind was very strongly charged with salt, as it was seen on the windows on the morning of the 11th. Many trees were blown down.

LYNMOUTH, ROCK HOUSE.—A warm month, excepting a cold spell between 9th and 16th, but there were no extremely hot days. A mock moon was seen at 9.5 p.m. on 6th. Violent S.W. to N.W. gale on 10th.

NORTH CADBURY RECTORY.—Much nearer to normal conditions than any of the summer months. It was rather wet and very damp. The last 11 nights were most abnormally warm. The great gale of the 10th did much damage. Every road was blocked with limbs or trunks of trees. The fury of the gale began about 4 p.m. from S. and was worst from 5 to 6 p.m. and from 10 p.m. to 1 a.m. Hedges and trees were browned on the windward side.

CLIFTON, PEMBROKE ROAD.—Unsettled and rainy till 12th and from 23rd to the end. A dry period intervened with N. and E. winds, cold at first and warm after. The gale of the 10th was one of the most violent ever known here and caused enormous damage to the "sea defences" of the upper part of the Bristol Channel, and the destruction of a great number of trees.

ROSS, THE GRAIG.—Rather more than the average amount of R on about the usual number of days. It was warm on 1st and from 20th to the end, the remainder being very cold for the season. The gale of the 10th was very severe, many trees being blown down.

BOLTON, THE PARK.—Unsettled until 12th, 1·20 in. of R falling on 8th and 1·67 in. on 10th, the total to the 12th being 5·01 in. Floods occurred on the evening of the 10th, but very slight damage was done. This was succeeded by anticyclonic conditions with warm and humid atmosphere till near the close, affording farmers an opportunity of harvesting. Bright sunshine was recorded on 25 days, amounting to 91 hrs. 10 mins.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE.—Very wet. The harvest was much hindered and damaged by the storm on 10th, during which many trees were blown down.

HAVERFORDWEST.—The first 13 days were wet; on 10th a heavy storm occurred, the bar. falling an inch between 4 a.m. and 6.40 p.m. The force of the wind was tremendous and roofs were stripped and trees snapped off or uprooted. Foliage except evergreens was blasted as if by fire in a way never seen before. Sharp TS on the night of the 26th. Duration of sunshine 133·7 hours.

ABERYSTWITH, GOGERDDAN.—Another bad month. Much R till 11th, and a fearful storm of wind on 9th and 10th, uprooting trees. From 12th to 23rd was ideal weather with a little frost. The remainder was wet and cold.

DOUGLAS, WOODVILLE.—Only twice (since 1873), in 1883 and 1891, has the R of September exceeded this month's fall of 6·17 in., of which 4·41 in. fell in the first 12 days. From 12th to 21st was fine and dry, with strong, cold N.E. winds; afterwards very mild, with daily R to the end. Violent W.N.W. gale on 9th, and S.E. gale on 21st, when all steamers had to leave Douglas Harbour for shelter elsewhere.

SCOTLAND.

CARGEN [DUMFRIES].—Most unfortunate for harvest operations. A dry spell from 12th to 21st allowed of finishing the work in earlier districts, but the greater part of the oats was still in the fields at the end and suffered much from the wet, "muggy" weather. Frost on 15th did much damage in gardens.

LILLIESLEAF, RIDDELL.—September was very much like its predecessors, but with less wind. It was thus difficult to get in the corn which in the high ground was all out on the last day of the month.

TIGHNABRUAICH.—The R was not excessive and its effect on the cut grain was minimised by the high wind.

BALLACHULISH, ARDSHEAL.—The almost constant R of August continued till September 11th, followed by 10 dry days, which in turn was succeeded by slight daily showers till 29th, when heavy R began again.

STRONVAR.—The most backward September for 31 years. A considerable amount of hay was still out at the end and corn was not all cut. On 7th 1·08 in. of R fell in 8 hours and on 23rd 1·43 in. in 8 hours.

COUPAR ANGUS.—The noteworthy features were—the excess of wet days rather than heavy falls, and the high night temp. of the last 10 days.

ALFORD, LYNTURK MANSE.—Cold and wet to 20th, like the summer since the end of May; afterwards it was dry with slight exceptions, the 7 successive days from 20th to 26th being the longest dry period since the end of May. The night frosts were dangerous for oat crops, which were not yet ripened.

WATTEN.—The first half was wet, dull and cold; the second, mild, dry and fine, with slight frosts, heavy fogs and some T.

IRELAND.

CORK, WELLESLEY TERRACE.—R 1·37 in. above the average. The mean temp. was the lowest in September for 21 years. The storm on 10th was most disastrous and was accompanied by a fall of bar. of ·76 in. in 7 hours.

MILTOWN MALBAY.—Boisterous winds from S.E. to S.W., often approaching the force of a gale, prevailed throughout, with a hurricane on 10th, which lasted with damaging force for a quarter of an hour. All crops were damaged and much hay left uncut.

DUBLIN, FITZWILLIAM SQUARE.—A fitting sequel to the summer months of 1903. A cold spell followed a disastrous storm on 10th, and lasted until the 16th inclusive. Subsequently the temp. recovered under the influence of S. winds and remained high to the end, and the mean temp. (56°) was 0°·1 above the average. A redeeming feature was the amount of bright sunshine, the duration of which was 166 hours, or 44 per cent. of the possible duration.

OMAGH, EDENFEL.—Up to the 12th the weather was no improvement on that of August, but from 13th to 26th a comparatively fine period went some way in redressing the effects of that disastrous month. There was, however, at the end much grain and even hay still in the fields. The temp. of the last fortnight was over 5° above the average.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1903.

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	61·1	29	27·8	18	53·6	37·1	46·4	74	108·4	21·2	2·14	13	5·6
Malta	76·2	30	47·4	25	64·2	52·7	49·2	75	126·5	40·9	·98	6	3·8
Lagos, W. Africa	92·0	3	70·0	20	89·3	78·6	76·8	79	142·0	...	7·39	8	...
Cape Town	86·8	4, 5	41·1	24	70·0	53·9	51·4	70	...	...	2·18	6	4·8
Durban, Natal	86·2	19	55·8	29	78·7	62·8	...	...	141·8	...	5·97	18	5·3
Mauritius	84·6	10	62·8	7	81·6	70·4	69·8	83	147·5	54·6	6·18	22	5·9
Calcutta	107·6	29	68·0	6	98·6	75·1	69·4	60	159·0	63·8	1·71	2	1·3
Bombay	93·3	23	68·6	2	88·5	76·1	71·9	72	136·7	59·3	·00	0	1·4
Madras	98·0	1	72·6	16	93·0	76·7	74·0	75	142·8	69·0	·00	0	2·2
Kodaikanal	74·3	22	50·5	8	69·3	53·4	46·8	63	145·8	41·2	4·07	5	4·4
Colombo, Ceylon	93·0	22	72·8	11	90·8	76·3	77·0	84	148·8	72·0	7·62	18	5·1
Hongkong	83·5	22	62·0	4	76·8	68·7	66·7	83	135·7	...	4·73	10	7·7
Melbourne	88·5	10	44·4	16	67·0	51·3	48·5	72	141·8	33·0	3·76	16	7·3
Adelaide	92·9	9	45·8	13	71·3	54·9	50·2	65	142·4	41·8	2·78	14	6·2
Coolgardie	93·8	8	37·8	25	72·6	51·3	47·5	59	156·2	26·3	1·03	3	5·2
Sydney	85·9	5	51·3	27	71·5	58·8	54·0	75	118·3	44·0	1·73	17	5·3
Wellington	70·0	14	40·0	26	61·9	48·8	47·2	75	118·0	30 0	4·51	12	6·5
Auckland	71·5	13	47·0	26	63·6	53·4	50·2	74	135·0	45·0	2·66	15	4·6
Jamaica, Negril Point	90·1	28	66·8	21	85·8	71·2	69·6	72	...	...	·64	4	...
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	92·4	30	71·2	5	86·5	74·6	68·6	69	150·6	...	·65	7	2·1
Toronto	76·2	29	14·4	5	52·7	35·0	33·1	67	91·2	18·0	3·74	...	5·6
Fredericton, N.B.	73·8	29	12·2	6	51·2	28·8	25·5	52	...	...	2·82	10	6·4
Winnipeg	71·3	26	15·0	29	52·6	27·4	...	...	...	...	·54	8	4·4
Victoria, B.C.	61·3	28	31·2	11	52·7	40·3	...	...	...	...	1·39	14	7·6
Dawson	52·8	30	—18·4	9	36·1	11·8	...	...	...	...	·60	3	3·5

MALTA.—Mean temp. of air 57°·4, or 2°·3 below; mean hourly velocity of wind 12·9 or 1·4 above, averages. Mean temp. of sea 63°·0. TS on 1st.

Mauritius.—Mean temp. of air equal to, dew point 1°·0, and R ·98 in. above averages. Mean hourly velocity of wind 0·2 miles below average; extremes 23·3 on 22nd, and 1·7 on 10th; prevailing direction E.S.E. L on 2 days; L and T on 5 days.

MADRAS.—Bright sunshine 235·5 hours.

KODAIKANAL.—Mean temp. of air 59°·7. Mean velocity of wind 317 miles per day. Bright sunshine 208 hours.

COLOMBO.—Mean temp. of air 83°·2, or 0°·7 above, of dew point 2°·5 above, and R 3·62 in. below, averages. Mean hourly velocity of wind 5·2 miles, prevailing direction S.W. TS8 on 13 days, L on 12 other days.

HONGKONG.—Mean temp. of air 72°·4 or 2°·5 above average. Sunshine 87 hours. Mean hourly velocity of wind 13·2 miles; prevailing direction E. by S.

Adelaide.—Mean temp. of air 63°·1, or 0°·9 below average. Splendid rains.

Sydney.—Mean temp. of air 0°·6 above, humidity 3°·4 below, and R 3·74 in. below, averages.

Wellington.—Mean temp. of air 3°·3 above, and R ·98 in. above, averages.

Auckland.—Mean temp. of air 3° below, and R one inch below averages.

SYMONS'S

METEOROLOGICAL MAGAZINE.

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THE RAINFALL OF OCTOBER, 1903.

THE remarkable abundance of the rainfall of the present year has, we hope, convinced the public that the British Isles are not drying up. Up to last year there was some reason for the suspicion, if only a short series of years was considered. For instance, an observer who commenced to record rainfall in the seventies might find, on examining his records, that each successive period of ten years (though perhaps not each successive period of five years) was drier than the one before. He had no personal knowledge of the fact that dry spells came before the wet spell as well as after it, and so might fail to see the reasonableness of expecting a wet spell to follow. A year that bids fair to compete successfully for the title of unprecedented in wetness has now come upon us, teaching a wholesome lesson to those who were inclined to generalize from short views, though unfortunately causing much damage and distress in many parts of the country.

October is recognised as the wettest month of the year over all parts of our islands except the west and north-west, and heavy rain in October rarely attracts special notice; but the exceptional nature of the month just passed compels rather than induces us in allocating the space of the present number to give up to rainfall what was meant for all meteorology. The Table of Rainfall on p. 184 shows that all the stations for which an average is published were wetter than the average, and in about half the instances quoted the fall was more than double that of a normal October. The Supplementary Table on p. 185 shows at least 22 falls exceeding 10 inches, and only three less than 4 inches.

Coming after so long a succession of wet months, October 1903, has in many, if not in most, parts of the country brought the total rainfall for the year up to the highest figure previously recorded for any complete year. Considering the ten months alone, our table on p. 183 shows that the excess this year over the average of the ten years 1890—99 (which, however, was a somewhat dry decade) amounts to from 17 per cent. at Clifden, in the west of Ireland, to 88 per cent. at Camden Square; the average excess for the whole country is probably very close to 45 per cent., or we may say nearly


RAINFALL, OCTOBER 1903.
English Miles
0 50 100
Shetland Is
Fair I.
Orkney Is
John o'Groats
C. Wrath
Butt of Lewis
The Minch
Hebrides
St Kilda
Skye
Barra Hd
Mull
Islay
Moray Firth
R. Spey
Buchan Ness
R. Don
Aberdeen
R. Dee
Dundee
Firth of Forth
R. Tweed
NORTH SEA
ATLANTIC OCEAN
Foyle R.
Belfast
L. Neagh
Erris Hd
Solway Firth
I. of Man
Newcastle
R. Tyne
R. Tees
Scarborough
Flamborough Hd
Hull
R. Humber
The Wash
IRISH SEA
Ribble R.
Liverpool
Holyhead
Dublin
R. Trent
Norwich
R. Ouse
R. Shannon
St George's Channel
Waterford
Cork
C. Clear
Milford
Bristol Channel
LONDON
R. Thames
Dover
Beachy Hd
I. of Wight
Portland
Start Pt
Lands End
Scilly Is
English Channel
10
8
6
4
2
0
60
58
56
54
52
50

half as much again as the average. The actual fall for the month was very nearly twice the average amount, when the country is considered as a whole, and it is remarkable that scarcely any stations have recorded less than 4 inches, whereas in a normal October scarcely any stations record more than that amount. The distribution of the rainfall over the surface is so interesting that we have prepared a map from data supplied by about 400 stations, and reproduce it on a scale large enough to make the general features clear. A comparison with the similar map published for June (p. 94) will show that, although June was wetter than October in London, it was really a dry month compared with October.

No part of the British Isles could be called even moderately dry in October, and rain fell nearly every day. Several stations recorded 31 days with rain, a large number had 30, and very few indeed less than 25. Only a few stations on the coast of Kent, Essex, Suffolk and Nairn had less than 4 inches to report; but a considerable area in the middle of Ireland, from the east coast westward to the Shannon, had a lower fall. So far as we can ascertain, Dublin was the only place where less than 3 inches were measured, and there the fall had the unique distinction of being nearly half-an-inch below the average. The greater part of Ireland, the north-east and south-east of Scotland, the east of England and the valley of the Trent had less than six inches; all the rest of the country had more. It is curious to observe how closely the distribution resembles that of an average year; in fact, if the figures attached to each of the lines were multiplied by 5, the map would be a very fair representation of the average distribution of annual rainfall.

The wettest districts, with over 10 inches of rain, were a very small patch in the extreme west of Co. Galway, the Western Highlands, a portion of the Southern Uplands of Scotland, the Lake district (where the gauge at The Stye registered the enormous amount of over 32 inches in the single month), a small portion of the south of the Pennine chain, the whole of inland Wales, the Devon and Cornwall moors, and a narrow strip (mainly in Hampshire) running from Salisbury to Guildford. Over all these areas more than 1000 tons of water fell on every acre of land during the month.

Within the line of 10 inches it has only been possible to indicate on the map two zones of greater rainfall; these are bounded by the lines of 15 and 20 inches. It will be seen that in both South Wales and North Wales a very considerable amount of country was subjected to more than 15 inches in the month, or more than 1400 tons of water per acre.

Enormous damage has been done to crops, and it was pitiable to see corn and even hay standing in the sodden fields in the last week of October, ruined beyond all hope of saving. So wet a month has not been seen before in the present generation, and it is doubtful if so remarkable a series of wet months as this year has brought was ever previously experience in this country.

There are only two previous Octobers in the long annals of British Rainfall which can bear comparison with the month just passed. Of these the more recent was October, 1891, when a very large proportion of the fall of a dry year took place in the one month, but many stations had less than the average amount of rain and a large part of the north of England, Scotland and Ireland received less than 4 inches. That month, although extremely wet, has now been far surpassed. The second case of a very wet October was in 1865, a year of average rainfall, when the one month following an almost rainless September, yielded about 30 per cent. of the yearly total. In 1865 October was considerably wetter than in 1903 in the south of England, but rather drier in the north. On the average the months probably differed little; but in the short time elapsing between the arrival of the monthly returns, which revealed the widespread wetness of last October, and the publication of this Magazine it has been impossible to examine the records for 1865 minutely enough to decide which ought to be placed first in order of the amount of rain. It is, however, certain that, with the possible exception of 1865, October, 1903, has been the wettest since *British Rainfall* was founded in 1860, and a rapid examination of the records back to 1800 has failed to show any other year except 1855 which might claim to be a second exception. It may be that October, 1903, was not the wettest month of the name at individual stations but was yet the wettest for the country as a whole, the wetter months in different places having occurred sporadically in different years.

We give a list of the largest and smallest falls for the month that have been reported to us, and as a supplement we have selected from the great mass of correspondence we have received some representative communications which throw light on the abnormal conditions. We wish to thank very heartily those correspondents whose letters we do not print as well as those whose names appear below, and we would like it to be understood that we are always glad to hear of any phenomenon which strikes an observer as unusual or of special interest. With so much original matter we feel that we may be excused from reprinting or epitomising the records of floods and damage from the daily press, remarkable although these records are. To do justice to the matter we should require the whole space of several numbers.

This article is a mere record of fact; it does not attempt to explain the cause of the conditions which it chronicles, though beyond doubt a cause exists and should be ascertainable. A vast amount of rubbish has been printed on the subject; we advise our readers to pay attention only to the signed utterances of scientific men.

List of the Wettest and Driest Stations in October, 1903, which have been reported up to November 8th.

Div.		inches.
X.	The Stye (gauge B)	32·50
,,	Sprinkling Tarn	27·60
,,	Stye Head Tarn	27·40
,,	Mickleden	26·72
,,	Dungeon Ghyll	25·62
,,	Seathwaite (monthly g.)	25·10
,,	Little Langdale, Fell Foot	23·35
,,	Grasmere, High Close	22·77
,,	Wythburn	22·00
XI.	Rhiwbryfdir	21·45
X.	Grasmere, Pavement End	20·89
,,	Buttermere, Hassness	20·82
,,	Rosthwaite	20·70
XI.	Treherbert, Tyn-y-waun	20·56
VIII.	Skelwith Bridge [Ambleside]	20·22

Sixty-two stations reported falls exceeding 12 inches in the month; the above are all those exceeding 20 inches.

XXI.	Dublin, Fitzwilliam Square	2·61
II.	Minster, Gas Works	3·03
XXI.	Castledermot	3·29
IV.	Burgh Castle Rectory	3·73
XXI.	Athlone, Twyford	3·81
,,	Ballybrack, Streamville	3·85
,,	Carlow, Browne's Hill	3·92
,,	Gorey, Courtown House	3·93
II.	Sheppey, Leysdown	3·96
,,	Ramsgate, West Cliff Villas	3·97
VI.	Great Barrington	4·10
XVII.	Cawdor, Budgate...	4·11

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE rainfall measured here in October came to the exceptional figure of 7·88 inches, and I am interested to know if any of your other correspondents in this district have measured so large an amount. Rain fell on 28 days in the month, and on two days the amounts exceeded an inch, viz., on the 11th of the month 1·62 in., and on the 27th 1·08 in. The rainfall from the beginning of the year up to the end of October is 37·28 in.

MORRIS BIRKBECK.

Dippen Hall Cottage, Farnham, Surrey, Nov. 2nd, 1903.

I SEND you the result of my records for this rainy season. From the 23rd of September to the 31st of October, there was only one day during the period of thirty-nine days on which I did not register rain, and that was Saturday, the 17th of October. In the last eight days of September the total was ·85 in. In thirty days of October the total was 8·17 in., making a total for the period of 9·02 in. My average of 25 years is 3·14 in. for October. So this year's record for October is far more than double, as it exceeds the average by

5·03 in., and it exceeds the heaviest fall which I have registered in October (*i.e.*, 6·83 in. in October, 1891) by 1·34 in. The rainfall for the ten months of the year, at this station, is 30·64 in., whereas my average is 21·54 in. The excess, therefore, for the year up to this date is 9·10 in. T. W. SIDEBOTHAM.

The Bourne Vicarage, Farnham, Surrey, Nov. 2nd, 1903.

I AM sending you my returns of rainfall up to date that you may see that even in a wet year we keep up our reputation for a lower rainfall than other parts of England.

Jan.	Feb.	Mar.	April.	May	June.	July.	Aug.	Sept.	Oct.
2·49	1·47	1·93	2·56	2·25	3·97	3·94	3·09	1·78	4·12

The total for 10 months is 27·60 in. October, usually our finest month, had more rain than any other month.

H. C. V. SNOWDEN.

Hildersham House, St. Peter's, Kent, Nov. 1*st,* 1903.

I WISH to inform you as to the very abnormal fall of October here. Rain fell on 28 days, and total measured 10·30 in. The total fall for 10 months ending October has reached 40·07 in.

WILLIAM ESDAILE.

Park View, Burley Manor, Ringwood, Nov. 7th, 1903.

AS you may like to use this report of excessive rainfall, I send it in advance of my yearly account. The total for October is 10·63 in., falling on 30 days. Every month so far has exceeded the average.

G. NORSWORTHY.

Elderfield, Otterbourne, Winchester, Nov. 1*st,* 1903.

THE following comparison of rainfall for the 10 months, January—October, of the present year, with previous wet years, at six of our older stations, may be of interest at the present time. The station Nash Mills (now Apsley Mills) is near Hemel Hempstead; Rothamsted is near Harpenden; and Bayfordbury is in the neighbourhood of Hertford, in a very central position.

	1903. 10 mths. in.	Diff. from average. 1840-99. in.	1879. 12 mths. in.	1852. 12 mths. in.
Nash Mills or Apsley Mills	34·46	+12·24	34·23	41·54
Hitchin	33·51	+13·38	29·13	34·11
Royston	30·86	+11·74	29·99	36·08
Rothamsted	34·07	+11·12	36·02	...
Berkhamsted	32·93	+ 9·47	34·90	...
Bayfordbury	31·82	+11·46	29·94	...
Average	32·94	+11·57	32·27	(36·08)

It will thus be seen that the fall for the past 10 months has exceeded the fall for the whole of 1879 by about half-an-inch, and is within about 3 inches of the fall of 1852. C. WIGAN HARVEY.

Throcking Rectory, Buntingford.

WITH all these portentous returns of rain in to-day's *Times* it seems absurd for me to write about our pigmy rainfall, now *circa* 34 inches, but the fact of only two days in the month being without a record of rain is unprecedented. In 1896 March had only three days without a record, and that is the only case at all similar since 1849, when our record began. W. LUCAS.

Hitchin, November 3rd, 1903.

THIS is the first morning since the 27th of September that my rain gauge has not contained some measurable rain, 37 days giving a total of 7·23 inches. WILLIAM HALL.

Swerford, Oxford, November 5th, 1903.

I WISH to call attention to the parallel between 1891 and 1903. It is really very close for a great part of the year, and especially for October. The question suggests itself, will there now be a ten days anti-cyclone as there was then? H. A. BOYS.

North Cadbury Rectory, November 2nd, 1903.

[Mr. Boys is something of a prophet. The question he propounded has been answered by the barometer, for the anti-cyclonic condition which was fully established on November 4th, lasted, with one slight break, until the 13th, when we send this sheet to press.—ED. *S.M.M.*]

As you are aware, I have a rain record of over 30 years. My 30-years' average (1871—1900) is 26·965 in. I have already measured this year, for the ten months, 29·96 in.

During the near 33 years I have eight times measured 5 inches in a month, and three times upwards of 6 inches, including last month, which may be said to have had 31 wet days, for though under ordinary circumstances I should have returned Wednesday 21st as blank, I hesitated whether I should read it ·005 in. and put it down as ·01 in., so I have put it down ·004 in. The following are the eight wettest months.

	in.		in.
1876, December.....	6·48	1881, August	5·20
1878, August	5·09	1892, October.....	5·59
1879, October.....	5·60	1900, February	5·36
1880, July	6·51	1903, October	6·82

July, August and September, 1903, (the three preceding months) had each 19 wet days), January 23, and March 21. October, then, is a record, and this September and October beat any two consecutive months.

1876-7.	in.	1880.	in.	1903.	in.
Dec., 1876...	6·48	Sept....	4·57	Sept....	3·58
Jan., 1877...	3·85	Oct. ...	5·60	Oct. ...	6·82
	10·33		10·17		10·40

Again, the average (30 years) for the six summer months, May to October, is 14·87 in.; the actual this year 21·75 in., or 146 per cent., or 142 per cent. for the 10 months.

I have never known fruit such an utter failure.

ROBT. ELMHIRST.

Farnham Lodge, nr. Knaresborough, 2nd November, 1903.

I ENCLOSE report of our rainfall for October just ended, the total being 8·50 in., falling on 27 days. The average fall for October for 20 years is 3·25 in. The ten months' rainfall of 1903 has been 36·08 in., the 20 years' average being 23·60 in.

There is no record of such a precipitation hereabouts at any previous time. The centres of so many of the depressions have travelled over us lately, that one is not surprised at the result.

G. PAUL,

Harrogate, 1st November, 1903. *Borough Meteorologist.*

THE following may interest you:—Comparison of rainfall in 1903 at Aysgarth Vicarage with that of previous years, beginning with 1876. 1903, total rainfall to October 31st, 48·96 in. Average (1876—1900) for whole year 39·01 in. Wettest year, 1877, 52·03 in. Least rain, 1902, 27·18 in. (1887, 28·97 in.) 1903 rainfall in October, 9·74 in. Wettest October previously, 1892, 8·46 in. (of which, however, more than 5 inches fell in 46 hours). Average for October, 4·07 in.

I hear that at Hawes Junction the rainfall this year, up to date, is about 80 inches, of which, I think, about 35 inches fell in first three months; also, that at Eastgate, Durham, Rev. J. G. B. Knight has measured nearly 12 inches in October. The rainfall at Eastgate is about the same as at Aysgarth generally; it is in Weardale, similar hilly country to this, and about 800 ft. above sea. The wettest months previously were:—1888, November, with 9·44 in.; 1876, December, with 9·28 in.; 1894, February, with 8·74 in.; 1892, October, with 8·46 in.; 1884, January, with 8·27 in.; 1877, November, with 7·86 in.; 1895, July, with 7·74 in. (3 in. fell on 25th); 1903, March, with 7·70 in.

FENWICK W. STOW.

The Vicarage, Aysgarth, Yorks, R.S.O., Nov. 2nd, 1903.

THE rainfall in October has amounted to 8·16 in., which is the largest for any month in my record of 44 years; the previous largest amount being 7·10 in. in November, 1878. The rainfall for the first ten months of this year is 29·21 in., which has been exceeded only in 1900, with a fall of 30·61 in. Two days only during October were quite rainless, ·005 in. having been reached on every day except the 30th. The amount measured on the 8th was 2·59 in., and is the heaviest fall I have recorded in a day in 44 years, with the exception of 26th October, 1900, when the fall was 3·28 in.

T. W. BACKHOUSE.

West Hendon House, Sunderland, November 2nd, 1903.

THE rainfall here in October, viz., 6·88 in., is the largest total recorded here in *any one month* since January 1st, 1868, when observations were begun at this place. The nearest approach that I can find in my registers is 6·76 in. in May, 1886; the next in amount being October, 1872, with 6·65 in.

B. T. GRIFFITH-BOSCAWEN.

Trevalyn Hall, Rossett, S.O., Denbighshire, Nov. 2nd, 1903.

THE rainfall at Dolaucothy, Carmarthenshire, during the month of October, 1903, and throughout the year to date has been as follows :—

	in.	
January..	7·65	five days over half-inch ; heaviest ·95 in.
February	6·13	four days over half-inch ; heaviest 1·49 in.
March ...	9·30	twice over 1 inch ; 4 times over half-inch ; heaviest 1·35 in.
April	2·82	once over half-inch, ·82 in.
May	5·50	three times over half-inch ; heaviest ·78 in.
June	1·76	once over half-inch, ·98 in.
July	3·84	twice over half-inch ; heaviest ·85 in.
August ...	8·03	once over 1 inch, 1·90 in. ; 4 times over half-inch.
September	7·46	twice over 1 in. ; 4 times over half-inch ; heaviest 1·80 in.
October ...	16·68	five times over 1 inch ; 7 times over half-inch ; heaviest 1·95 in.
	69·17	

Dolaucothy, 1st Nov., 1903. J. H.-J.

METEOROLOGICAL NEWS AND NOTES.

DR. JULIUS HANN, of Vienna, has been designated by the Council of the Royal Meteorological Society as the recipient of the Symons' Gold Medal, in recognition of the valuable work which he has done in connection with meteorological science. This medal, which is awarded biennially, was founded in memory of the late Mr. G. J. Symons, and the only previous recipient has been Dr. A. Buchan. The medal will be presented at the annual meeting of the society, on January 20th, 1904.

A KITE AS THE MOTIVE POWER for a boat has recently been tested by Colonel S. F. Cody, who crossed from Calais to Dover on Saturday, 7th November, in a small collapsible boat, which was towed by a kite kept flying at the height of about a quarter of a mile. The voyage was made by night, with a favourable wind, and occupied about ten hours. It may be remembered that Benjamin Franklin, as a boy, amused himself when bathing by being drawn across a pond by means of a kite, and from time to time the proposal has been made to use kites instead of sails for ships.

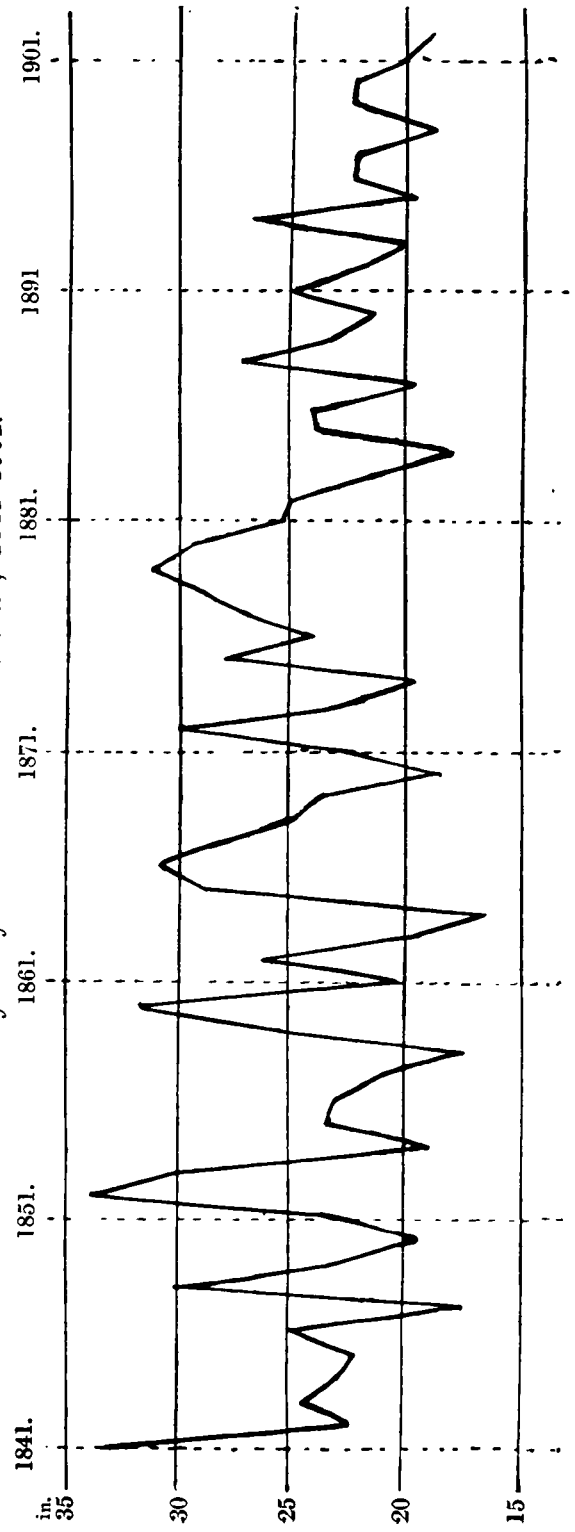
GREENWICH RAINFALL, 1841–1902.

THE long record of rainfall at Greenwich Observatory is so frequently referred to that we have pleasure in reproducing the following article from our contemporary *The Observatory*, to the Editors of which, and to the author of the paper, we express our indebtedness.

GREENWICH RAINFALL, 1841–1902.

The abnormal rainfall of the present year approximating closely in ten months to the heaviest annual fall on record, has caused so much attention to be directed to the rainfalls in previous years that it has been considered desirable to print a complete table of the falls at Greenwich, and to exhibit the annual fluctuations graphically. It might have been expected that this curve would serve to indicate the coincidence which is alleged to exist between the well-established period of sunspots and the rainfall, but this does not appear to be borne out. The revised table of Wolf's sunspot numbers has already been printed in this journal (*Observatory*, vol. xxv. p. 397), and will need only to be referred to. The sunspot epochs derived from this table are:-

Maximum.
1848, 1860, 1870, 1883, 1893.
Minimum.
1843, 1856, 1867, 1878, 1889, 1901.



The rainfall aggregates for three years at these periods are :--

Sun-spot Maximum.	in.		in.	Sun-spot Minimum.	in.		in.
1847–1849	71·29	Mean	23·76	1842–1844	70·24	Mean	23·41
1859–1861	78·18	,,	26·06	1855–1857	68·02	,,	22·67
1869–1871	64·87	,,	21·62	1866–1868	84·33	,,	28·11
1882–1884	65·14	,,	21·71	1877–1879	87·62	,,	29·21
1892–1894	69·32	,,	23·11	1888–1890	72·65	,,	24·22
				1900–1902	61·94	,,	20·65
Mean			23·25	Mean			24.71

Showing a slight excess at the minimum sun-spot period.

Dr. Meldrum (Proc. Meteorological Society of Mauritius, February, 1873) considered, from the discussion of the results of observations at a number of stations, that the rainfall on the whole was greater at the maximum sun-spot periods that at the minimum periods, but many results in Dr. Meldrum's paper were found to be contradictory.

Table of Annual Rainfall at Greenwich, 1841–1902.

	in.		in.		in.		in.
1841	33·26	1857	21·16	1873	23·36	1888	27·51
1842	22·57	1858	17·70	1874	19·95	1889	23·28
1843	24·47	1859	25·83	1875	27·97	1890	21·86
1844	23·20	1860	31·90	1876	24·10	1891	25·04
1845	22·34	1861	20·45	1877	27·28	1892	22·31
1846	25·29	1862	26·32	1878	28·98	1893	20·12
1847	17·61	1863	19·66	1879	31·36	1894	26·89
1848	30·10	1864	16·38	1880	29·68	1895	19·73
1849	23·58	1865	28·70	1881	25·72	1896	22·42
1850	19·53	1866	30·72	1882	25·18	1897	22·13
1851	23·53	1867	28·46	1883	21·91	1898	18·85
1852	34·01	1868	25·15	1884	18·05	1899	22·33
1853	29·99	1869	24·02	1885	24·00	1900	22·31
1854	19·01	1870	18·55	1886	24·21	1901	20·29
1855	23·59	1871	22·30	1887	19·86	1902	19·34
1856	23·27	1872	30·02				

The average for the 60 years 1841–1900 = 24·15 inches.

W.C.N.

THE UNEXAMPLED LONDON RAINFALL OF 1903.

THE following letter appeared in *The Times* of October 29th. It may be remarked that the total rainfall for the month at Camden Square was 6·03 in., falling on 26 days; making the total from January 1st to October 31st, 34·94 in.

To the Editor of The Times.

SIR,—You will, I hope, permit me to follow the custom of my predecessors in laying before your readers the facts concerning an interesting point in the history of British rainfall records. This is the certainty, now established, that 1903 is to prove the wettest year since Mr. Symons established his first rain gauge in Camden Town in 1858. During the period of 46 years there

were six complete years in which the rainfall exceeded 30 in., and of these the wettest was 1878, with 34·08 in. The rainfall for the portion of 1903, from January 1 to October 27, amounts to 34·61 in., so that, to use a phrase which seems to carry much significance to the general mind, the record is broken.

Table I. shows concisely the relation which each of the six wet years bears to the average, and also to the driest year of the series, 1864. The first column gives the total fall for the first ten months, the second that for the last two months, the third the total for the year, and the fourth the ratio which the total for the year bears to the average expressed as 100.

TABLE I.

Comparison of Wet Years at Camden Square.

	Ten months, January—October.	Two months, November—December.	Year.	Year, per cent. of Average.
Average 1858-1902.....	20·59	4·40	24·99	100
Driest year, 1864	14·08	2·85	16·93	68
Wet year, 1860	27·01	5·23	32·24	129
Wet year, 1866	27·24	4·36	31·60	126
Wet year, 1872	25·53	8·33	33·86	135
Wet year, 1878	29·67	4·41	34·08	136
Wet year, 1879	32·23	1·59	33·82	135
Wet year, 1880	25·26	5·02	30·28	121
Wettest year, 1903* ...	34·61	?	?	?

* To October 27th.

It is interesting to notice that the three years 1872, 1878, and 1879, were almost equally wet, that the total fall was about one-third more than the average, and almost exactly double the fall of the driest year. It will be observed, further, that, while in 1872 the rainfall of the last two months was twice the average, in 1866 and 1878 it was as close to the average as possible, and in 1879 it was only one-third of the average; less, in fact, than in the driest year on record. The moral of this is a warning to prophets. It is impossible to predict what the rainfall of the next two months may be; it may raise the yearly total to little over 36 in., it may cause it to surpass 40, but in either case it will be unprecedented so far as Camden Square is concerned, and for the first time London will have had more than a yard of rain.

Table II. accentuates the variability of the distribution of rain throughout the months, and brings out the fact that in 1903 three months have already had a rainfall exceeding 5 in. each—no earlier year has had more than two.

TABLE II.

Monthly Rainfall of the Wettest Years at Camden Square, compared with the Average.

	Jan.	Feb.	March.	April.	May.	June.	July.
Average.....	1·96	1·64	1·67	1·63	1·88	2·19	2·36
1878	1·31	1·49	1·12	4·97	3·89	6·71	·64
1879	2·87	3·77	·91	2·72	3·46	4·76	4·17
1903	2·15	·83	2·30	2·14	2·99	6·43	5·20

	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Average	2·35	2·27	2·64	2·27	2·13	24·99
1878	6·72	·82	1·99	2·95	1·47	34·08
1879	5·11	3·67	·79	·73	·86	33·82
1903 to October 27th	4·24	2·64	5·69	?	?	?

It may be mentioned that on no previous occasion have more than five days each with over one inch of rain occurred in any one year; but 1903 has already had seven such days. The greatest number of rainy days in October hitherto has been 23; that number has already been surpassed this year.

So far I have confined myself solely to Camden Square and its record since 1858; but I must now venture into the less certain fields of London and all time. There is little doubt that for the British Isles as a whole the wettest year of the 19th century was 1872, and that 1852 followed hard after it, and I think that 1903 will be found at the close of the year to have outstripped both. It so happened that 1878 and 1879 were wetter than 1872 in London, but that is a local incident and not of capital importance.

The rainfall of London before 1840 is largely a matter of speculation, but fragmentary records exist as far back as 1729, and these are capable of furnishing some information. A careful search through them fails to provide proof of any year before 1820 having a rainfall approaching 34 inches. The records exceeding that figure for parts of London within 300 feet of sea level are given in Table III. so far as I can ascertain them. If any other cases exist within the limits stated, I should be glad to be informed.

TABLE III.

Annual Rainfall in London exceeding 34 in.

Year.	Place.	Amount.
1821	Greenwich Observatory	34·5*
1824	Greenwich Observatory	36·3*
1852	Greenwich Observatory	34·01
1852	St. John's Wood	35·10
1860	St. John's Wood	34·60
1872	Dorset Square	35·11*
1878	Camden Square	34·08
1878	Stoke Newington.....	35·06
1879	St. John's Wood	34·13
1879	Regent's Park	34·29

* Doubtful records.

Even including doubtful records we may say that so much as 36½ inches of rain in one year has never been measured in London. If satisfactory records only are considered, the highest fall at any station was 35·10 in. at St. John's Wood in 1852.

In conclusion, I may be allowed to point out that this is the season for planting rain-gauges, so that new observers may have time to become accustomed to their work before commencing a new year. And I may also say that it is eminently desirable that trustworthy rain gauges should be set up in open spaces in London, by public authorities, as a safeguard against the records being broken, in the unfortunate sense of that term, by the mortality of solitary enthusiasts.

I am, your obedient servant,

HUGH ROBERT MILL.

62, Camden Square, N. W., October 28th.

ON THE RATE OF FALL OF RAIN AT SEATHWAITE.

By HUGH ROBERT MILL, D.Sc., LL.D.

Abstract of paper read at the British Association, Southport Meeting.

A recording rain gauge on Negretti and Zambra's pattern was established at Seathwaite in Cumberland in the wettest part of the Lake District in July, 1899, by the late Mr. Symons, and records were obtained up to the end of December, 1900. Ordinary observations of rainfall are available for many years at the same place, and as the result of 38 years (1865-1902) the average rate of fall is ·614 inch per rainy day, a rainy day being one on which more than ·005 in. falls, and on the result there are 216 such days in the year, the total mean annual rainfall being 132·53 in. The total number of rainfall days for the eighteen months (July, 1899—December, 1900) was 350; the total rainfall by the recording gauge 182·91 in., or at the rate of ·523 in. per rainy day. The average duration of rainfall was $4\frac{3}{4}$ hours per rainy day, or nearly double the duration in London. During the period in question rain fell during 1695 hours, or at an average rate, when raining, of ·108 in. per hour.

Taking account of continuous falls of 6 hours' duration or longer, there were 91 occasions with a total length of 822 hours, a total fall of 99·99 in., and an average rate of ·122 in. per hour.

Taking account of falls exceeding ·50 in. in amount, there were 86 occasions with a total duration of $703\frac{1}{2}$ hours, a total fall of 109·47 in., and an average rate of ·156 in. per hour.

The maximum rate at which half-an-inch or more rain fell during the eighteen months in question was ·56 in. per hour, a total of 1·40 in. falling in $2\frac{1}{2}$ hours from 8 to 10.30 p.m. on September 21st, 1899. This is a trifling rate compared with the fall of from 2 to 3 inches in an hour which may occur in a thunderstorm in any of the drier parts of the country, and even if attention is confined to falls of one hour only, no instance occurred of a rate equal to ·75 in. per hour. The peculiarity of the Seathwaite rainfall seems to be its long duration and comparatively small rate of fall. The longest and heaviest shower in the period considered was $19\frac{1}{4}$ hours, during which 3·59 in. of rain fell, at an average rate of ·186 in. per hour.

The duration of rainfall during daylight (sunrise to sunset) and during darkness (sunset to sunrise) was calculated for the year 1900, with the result :—

	No. of hours Rain.	Amount of Rain. in.	Rate. in. per hour.	No. of Days.
Daylight	595	61·28	·103	197
Darkness	$596\frac{1}{2}$	64·66	·108	172

This shows that the duration of rainfall in daylight and darkness was practically identical, but that there was a very slightly greater intensity in the night than during the day.

It is very desirable to extend the use of recording rain gauges, and to be of much value the scale should be open enough to give exact readings, preferably giving a separate record strip for each day.

BOOKS RECEIVED.

Isforholdene i de Arktiske Have, 1902. [The state of the ice in the Arctic Seas, 1902.] Published by the Danish Met. Inst. Size $12 \times 9\frac{1}{2}$. Pp. 22 and six plates.

Annual Report of the Director of the Royal Alfred Observatory, Mauritius, for 1901. By T. F. Claxton. Size $13\frac{1}{2} \times 8\frac{1}{2}$. Pp. 24.

THE TEN MONTHS' RAINFALL OF 1903.

Aggregate Rainfall for January—October, 1903.

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 .....+	16·32	188	Arncliffe ...+	24·47	150	Braemar ...+	11·28	141
Tenterden	+6·75	131	Hull	+6·29	130	Aberdeen	+8·40	133
Hartl'yW'ntn'y+	14·12	169	Newcastle.....	+9·47	145	Cawdor	+4·89	120
Hitchin .....+	14·62	177	Seathwaite +	38·64	137	Glencarron +	18·73	125
Winslow .....+	12·70	166	Cardiff .....+	16·17	151	Dunrobin	+6·77	128
Westley.....	+7·39	136	Haverf'dwest+	14·88	144	Darrynane ...	+7·93	120
Brundall.....	+5·84	129	Gogerddan +	16·80	148	Waterford +	10·74	134
Alderbury .....+	13·33	161	Llandudno ...	+7·59	131	Broadford.. +	12·08	145
Ashburton .....+	18·32	148	Dumfries ...+	18·86	154	Carlow .....+	11·70	143
Polapit Tamar +	14·89	151	Lilliesleaf ...+	14·15	158	Dublin	+5·48	124
Stroud .....+	14·74	167	Colmonell.....	+8·81	126	Mullingar...+	13·54	146
Woolstaston ...+	14·56	162	Glasgow ...+	21·35	175	Ballinasloe +	11·75	140
Boston .....+	10·19	161	Inveraray ...+	19·04	134	Clifden .. ...+	11·07	117
Hesley Hall	+7·14	141	Islay .....+	11·86	133	Crossmolina +	14·54	136
Derby.....	+9·13	148	Mull .....+	14·12	132	Seaforde ...+	13·01	145
Bolton .....+	10·44	131	Loch Leven +	18·76	166	Londonderry..+	6·87	121
Wetherby .....+	14·67	174	Dundee	+9·37	143	Omagh .....+	15·57	149

REVIEW.

Les Variations Passagères de la Température, causes ou effets des tourbillons atmosphériques. P. MARC DECHEVRENS, S.J. Estratto dalle Memorie della Pontificia Accademia Romana dei Nuovi Lincei, vol. XIX. (1902).

WE are pleased to call the attention of readers interested in the theory of cyclones, to the above publication. The author concludes from observations made at Pike's Peak, Colorado, and various other high level stations, that, at an altitude of about 4000 metres, the temperature of the air in a cyclonic disturbance is much below the average, just as it is much above at sea level. He then proceeds to show that cyclones, at all events those of Europe, cannot be satisfactorily explained by the convection theory, which ascribes their origin to the ascent of masses of heated air, maintaining, on the contrary, that the abnormal development of heat in the lower atmosphere of a disturbance, as well as of cold in the elevated regions, is the product and not the cause of cyclone action, the excess of temperature below being due to a concentration of the particles of air and the deficit above to a radial dispersion or rarefaction of them. Father Dechevrens' pamphlet contains an impartial exposition of facts together with the results of original investigation.

RAINFALL AND TEMPERATURE, OCTOBER, 1903.

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) ...	6·03	+ 3·44	·94	11	26	67·4	1	36·0	24	0	2
II.		Tenterden	4·76	+ 1·77	·62	11	26	66·4	3	35·0	31	0	2
,,		Hartley Wintney	7·49	+ 4·60	1·24	11	31	65·0	1*b*	33·0	24*d*	0	2
III.		Hitchin	5·73	+ 3·16	·90	11	29	65·0	1	37·0	23*e*	0	..
,,		Winslow (Addington)	6·30	+ 3·61	·83	27	27	66·0	3	33·0	21	0	3
IV.		Bury St. Edmunds (Westley)	5·30	+ 2·64	·83	11	25	68·0	3	35·0	10*f*	0	...
,,		Norwich (Brundall)	4·21	+ 1·59	·74	11	27	67·0	3	35·4	24	0	1
V.		Winterborne Steepleton	8·32	...	·87	19	30	65·3	1	31·2	31	1	3
,,		Torquay	6·95	...	·69	14	28	63·8	3	40·9	29	0	0
,,		Polapit Tamar [Launceston]..	11·27	+ 6·73	1·30	27	30	65·4	2	35·1	29	0	0
VI.		Stroud (Upfield)	7·09	+ 4·31	1·15	11	29	65·0	1	33·0	30	0	...
,,		Church Stretton (Woolstaston)	6·78	+ 3·28	1·10	27	31	62·0	1	37·5	24	0	...
,,		Worcester (Diglis Lock)	5·16	+ 2·51	·80	11	28	...	...	...	...	...	...
VII.		Boston	5·63	+ 3·36	·95	11	21	65·0	1	35·0	24	0	...
,,		Hesley Hall [Tickhill].....	5·22	+ 2·65	·60	14	23	66·0	1	35·0	24	0	0
,,		Derby (Midland Railway).....	5·38	+ 2·84	·76	6	30	66·0	1	34·0	9	0	...
VIII.		Bolton (The Park).....	9·72	+ 5·16	1·35	27	30	60·0	6	36·5	10	0	2
IX.		Wetherby (Ribston Hall) ...	8·61	+ 5·81	1·55	8	29	...	...	...	...	...	...
,,		Arncliffe Vicarage.....	14·77	+ 8·13	1·33	8	30	...	...	...	...	...	...
,,		Hull (Pearson Park).	5·84	+ 2·80	·72	11	26	66·0	1	30·0	24	3	4
X.		Newcastle (Town Moor)	9·24	+ 6·52	3·68	8	29	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	23·64	+10·22	2·35	26	30	63·5	5	31·8	10	1	...
XI.	WALES.	Cardiff (Ely).....	11·37	+ 6·94	2·19	14	29	...	...	...	...	...	...
,,		Haverfordwest	10·17	+ 5·09	1·02	14	29	61·6	4, 7	35·2	28	0	5
,,		Aberystwith (Gogerddan) ...	12·08	+ 6·52	1·21	19*a*	29	64·0	11	32·0	23	1	...
,,		Llandudno.....	5·43	+ 1·43	·92	27	29	62·0	6	40·5	27	0	...
XII.		Cargen [Dumfries]	10·40	+ 5·97	1·36	27	29	62·0	1	28·0	10	1	...
XIII.		Edinburgh (Royal Observatory)	5·72	...	1·06	8	30	62·1	1	35·6	10	0	2
XIV.		Colmonell	9·01	+ 4·67	·85	6	28	65·0	24	32·0	9	1	..
XV.		Tighnabruaich	10·61	...	·88	4	29	57·0	3	34·0	9	0	...
,,		Mull (Quinish).....	11·51	+ 5·94	1·16	4	27	...	...	...	...	...	...
XVI.		Loch Leven Sluices	7·55	+ 3·88	·97	7	29	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	5·30	+ 2·54	·70	6	27	62·6	2	32·6	24	0	...
XVII.		Braemar	5·39	+ 1·51	·82	27	29	57·0	1	29·2	10	1	13
,,		Aberdeen (Cranford)	4·86	+ 1·50	·71	27	26	63·0	2	33·0	23	0	...
,,		Cawdor (Budgate)	4·11	+ 1·17	·63	3	29	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	9·96	+ 4·31	2·49	16	17	...	...	...	...	...	...
,,		Glencarron Lodge.....	13·43	+ 4·14	2·61	15	29	61·0	1	29·2	10	2	...
XIX.		Dunrobin	4·63	+ 1·35	·65	24	22	64·0	2	33·0	7*f*	0	...
,,		Castletown.....	6·18	...	1·07	5	30	60·0	1	27·0	8	2	...
XX.	IRELAND.	Darrynane Abbey.....	8·31	+ 3·10	1·00	10	29	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	6·56	+ 2·66	1·36	28	26	61·0	1, 3	26·0	28	2	...
,,		Broadford (Hurdlestown) ...	5·73	+ 2·63	1·03	28	28	62·0	1	28·0	27	3	...
XXI.		Carlow (Browne's Hill)	3·92	+ ·52	·46	27	27	...	...	...	...	...	...
,,		Dublin (Fitz William Square)	2·61	— ·42	·32	6	22	64·9	6	33·6	28	0	2
XXII.		Ballinasloe	4·59	+ 1·19	·62	28	30	66·0	6	22·0	28	4	...
,,		Clifden (Kylemore)	11·25	+ 3·31	50	28	29	...	...	...	...	...	...
XXIII		Seaforde.....	7·43	+ 3·84	1·31	25	28	60·0	2*c*	32·0	26	1	3
,,		Londonderry (Creggan Res.).	6·82	+ 2·74	·93	6	31	...	...	...	...	...	...
,,		Omagh (Edenfel)	7·28	+ 3·37	1·09	6	29	60·0	1, 4	32·0	26*a*	2	4

+ Shows that the fall was above the average ; — that it was below it.
a and 27. *b* and 2, 3. *c* and 3, 4. *d* and 31. *e* and 30. *f* and 24.

SUPPLEMENTARY RAINFALL, OCTOBER, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Harrow Weald	7·30	XI.	Llandefaelog-fach.....	10·29
II.	Dorking, Abinger Hall .	8·93	,,	New Radnor, Ednol.....	10·50
,,	Sheppey, Leysdown	3·96	,,	Rhayader, Nantgwillt...	15·06
,,	Hailsham	7·01	,,	Lake Vyrnwy	13·59
,,	Crowborough.....	9·28	,,	Ruthin, Plâs Drâw	7·86
,,	Ryde, Beldornie Tower..	6·57	,,	Criccieth, Talarvor	8·71
,,	Bournemouth, Kempsey	9·38	,,	I. of Anglesey, Lligwy..	7·45
,,	Emsworth, Redlands ...	8·78	,,	Douglas, Woodville.....	8·95
,,	Alton, Ashdell	10·07	XII.	Stoneykirk, Ardwell Ho.	9·46
,,	Newbury, Welford Park	8·35	,,	Dalry, Old Garroch	12·34
III.	Oxford, Magdalen Coll..	6·30	,,	Moniaive, Maxwelton Ho.	11·63
,,	Banbury, Bloxham	6·21	,,	Lilliesleaf, Riddell	8·21
,,	Pitsford, Sedgebrook ...	6·22	XIII.	N. Esk Res. [Penicuick]	7·90
,,	Huntingdon, Brampton.	5·35	XIV.	Dalry, Blair	9·30
,,	Wisbech, Bank House...	4·87	,,	Glasgow, Queen's Park..	7·47
IV.	Southend	4·55	XV.	Inveraray, Newtown ...	13·08
,,	Colchester, Lexden	5·01	,,	Ballachulish, Ardsheal...	15·68
,,	Saffron Waldon, Newport	4·95	,,	Campbeltown, Redknowe	11·27
,,	Rendlesham Hall	4·18	,,	Islay, Eallabus..... ...	9·59
,,	Swaffham	6·19	XVI.	Dollar.....	8·64
V.	Salisbury, Alderbury ...	8·97	,,	Balquhidder, Stronvar...	15·58
,,	Bishop's Cannings	6·97	,,	Coupar Angus Station...	4·81
,,	Ashburton, Druid House	12·98	,,	Blair Atholl	6·45
,,	Okehampton, Oaklands.	10·17	,,	Montrose, Sunnyside ...	4·79
,,	Hartland Abbey	11·43	XVII.	Alford, Lynturk Manse..	5·59
,,	Lynmouth, Rock House	12·75	,,	Keith H.R.S.....	4·98
,,	Probus, Lamellyn	9·42	XVIII.	Fearn, Lower Pitkerrie..	5·00
,,	Wellington, The Avenue	6·69	,,	S. Uist, Askernish	8·77
,,	North Cadbury Rectory	6·40	,,	Invergarry.....	10·29
VI.	Clifton, Pembroke Road	8·03	,,	Aviemore, Alvie Manse.	4·38
,,	Ross, The Graig	7·40	,,	Loch Ness, Drumnadrochit	5·72
,,	Shifnal, Hatton Grange	5·40	XIX.	Invershin	5·76
,,	Wem Rectory	5·76	,,	Bettyhill	4·96
,,	Cheadle, The Heath Ho.	5·79	,,	Watten H.R.S.....	4·72
,,	Coventry, Kingswood ...	6·58	XX.	Cork, Wellesley Terrace	5·82
VII.	Market Overton	6·37	,,	Killarney, District Asyl.	8·59
,,	Grantham, Stainby	6·06	,,	Glenam [Clonmel]	5·32
,,	Horncastle, Bucknall ...	5·59	,,	Ballingarry, Hazelfort...	4·27
,,	Worksop, Hodsck Priory	4·88	,,	Miltown Malbay	7·30
VIII.	Neston, Hinderton	7·30	XXI.	Gorey, Courtown House	3·93
,,	Southport, Hesketh Park	6·98	,,	Moynalty, Westland ...	4·34
,,	Chatburn, Middlewood.	...	,,	Athlone, Twyford	3·81
,,	Duddon Val., Seathwaite Vic.	15·76	,,	Mullingar, Belvedere ...	4·67
IX.	Langsett Moor, Up. Midhope	10·43	XXII.	Woodlawn	5·61
,,	Baldersby	7·17	,,	Westport, Murrisk Abbey	9·19
,,	Scalby, Silverdale	7·61	,,	Crossmolina, Enniscoe ..	8·13
,,	Ingleby Greenhow Vic..	8·23	,,	Collooney, Markree Obs.	6·81
,,	Middleton, Mickleton ...	9·54	XXIII.	Enniskillen, Portora ...	6·10
X.	Beltingham	9·23	,,	Warrenpoint.....	4·56
,,	Bamburgh	6·64	,,	Banbridge, Milltown ...	4·63
,,	Keswick, The Bank.....	11·90	,,	Belfast, Springfield	7·30
,,	Melmerby Rectory	8·85	,,	Bushmills, Dundarave..	7·13
XI.	Llanfrechfa Grange	11·43	,,	Stewartstown	5·53
,,	Treherbert, Tyn-y-waun	20·37	,,	Killybegs	7·44
,,	Castle Malgwyn	10·78	,,	Horn Head	7·83

METEOROLOGICAL NOTES ON OCTOBER, 1903.

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.—Exceedingly wet and very mild, the mean temp. being 53°·1, or 3°·3 above the average, and the highest with three exceptions in 46 years. Measurable R fell on 29 days, but of these only 26 rank as days with rain.—See p. 180.

ABINGER HALL.—Mild and open weather, with extraordinary R, beating all records since 1879, and bringing the total since January 1st to 42·94 in., which is in excess of all yearly records. In this neighbourhood the great fall was welcome, as all wells were low and some had had to be deepened.

CROWBOROUGH.—R exactly the same as in October, 1891, and has not been exceeded since 1870, while the number of rainy days (28) forms a record for the month. Mean temp. 50°·7.

EMSWORTH, REDLANDS.—Continuous gales. The largest R ever recorded at this station in any month and 5·48 in. above the October average of 19 years.

HARTLEY WINTNEY.—R fell every day and exceeded in amount that of any month recorded at this station. Slight TSS on 22nd and 25th and L on 6 days. Ozone on 8 days with a mean of 4·6. Oaks still in luxuriant autumn foliage.

WINSLOW, ADDINGTON.—With the exception of 1891 the greatest R recorded in October. Meadows have been under water many times during the month.

PITSFORD, SEDGEBROOK.—A month of constant R, wind and gloom. Heavy floods in the last week.

COLCHESTER, LEXDEN.—Continuously mild, overcast and very wet, save from 28th to 30th, when it was colder, with a few hours' sunshine.

WINTERBOURNE STEEPLETON.—Remarkable for the number of rainy days. More than 26 has never been recorded in 11 years. Mean temp. 51°·9.

TORQUAY, CARY GREEN.—R 3·01 in. above the average. Mean temp. 54°·2, or 2°·4 above the average. Duration of sunshine 101·3 hours, being 13·5 hours below the average. Mean amount of ozone 5·6; max. 8·5 on 14th with S.S.W. wind; min. 3·0 on 8th with S.W. wind, and on 21st with W. wind.

POLAPIT TAMAR [LAUNCESTON].—Gloomy and extraordinarily wet. Much damage was caused on 28th by the highest floods remembered. The R was by far the greatest in one month for 23 years.

OKEHAMPTON, OAKLANDS.—A record wet month; only two days without R.

WELLINGTON, THE AVENUE.—The largest R, about double the average, and number of rainy days recorded in about 12 years. R on 29 years.

NORTH CADBURY RECTORY.—A month of one character throughout. Temp. high and very equable. Only one day wholly without R and 28 with a measurable quantity. The pond, strange to say, has often been seen higher.

CLIFTON, PEMBROKE ROAD.—R more than double the average. Frequent strong winds and gales from S.E. to S.W. The wettest October in 48 years with the single exception of 1891, when 8·71 in. of R fell.

ROSS, THE GRAIG.—The R beat the record for any October for which observations were made since 1818, both for total amount and number of days. It rained every day. Round Ross most of the farmers succeeded in harvesting their corn, but in the later districts in Herefordshire many fields were uncut.

CHURCH STRETTON, WOOLSTASTON.—Exceedingly wet. Hurricane on 25th and violent gale on 27th with heavy R. Much harvest still out at the end.

BOLTON, THE PARK.—Without precedent for number of wet days and amount of R, surpassing the fall of 9·14 in. in September, 1896. Mean temp. 48°·6, or 1°·7 above the average.

SEATHWAITE VICARAGE.—The wettest October for the last generation.

ARNCLIFFE VICARAGE.—The wettest month on record in this district.

NEWCASTLE, TOWN MOOR.—The greatest monthly fall, the greatest number of rainy days and the greatest fall in 24 hours since 1868.

WALES AND THE ISLANDS.

HAVERFORDWEST.—The greatest R in October during 55 years. Great quantities of R fell in short periods, including 1·02 in. on 15th. It was mild from beginning to end.

BRECON.—TS on evening of 25th.

ABERYSTWITH, GOGERDDAN.—R a record for the month and more than any of the inhabitants can remember, but little damage was done.

DOUGLAS, WOODVILLE.—The R exceeded that of any previous October and, with two exceptions, that of any month in at least 30 years. Gales of unusual violence blew on 13 days. TS on 25th March. R and the worst of the gales occurred at night and there were at least 15 days fine.

SCOTLAND.

CARGEN [DUMFRIES].—The R has only twice been exceeded in a single month since observations were commenced in 1860. In December, 1897, 11·24 in. were registered, and in October, 1874, 10·72 in. Neither of these months, however, had nearly so many rainy days. No harvest work was possible and most of the grain crop was absolutely valueless.

LILLIESLEAF, RIDDELL.—In 39 years record no month has equalled this, the highest previous fall being 7·72 in. in July, 1877, and the highest in October 5·85 in. in 1896. In the whole month there were only four fine days, and it was practically impossible to get any corn in dry. For mild and warm weather the month has probably never been equalled.

BALLACHULISH, ARDSHEAL.—R 9·34 in. above the average. The second wettest month during 11 years.

MULL, QUINISH.—The R of the month has only twice been exceeded—12·49 in. on 30 days in Nov., 1877, and 11·57 in. on 26 days in Sept., 1879.

COUPAR ANGUS.—The most persistent R in a quarter of a century, not so much for total fall as for number of wet days and continually saturated atmosphere. In many cases the harvest was unfinished, the sheaves being half covered with water, so that farmers despaired of saving more. The most disastrous harvest on record. Mean temp. 46°·3.

BLAIR ATHOLL.—Very late harvest. Fully two-thirds of the crop of oats was still in stooks at the end of the month and in a bad condition.

DRUMNADROCHIT.—R 2·26 in. above the average of 17 years. The fall from January 1st exceeds that of any previous whole year for 17 years.

CASTLETOWN, THE CLETT.—Cold and damp, with overcast skies and abnormal R. Harvesting operations were carried on under most disheartening conditions and at the end of the month great parts of the crop were still uncut, and where cut the corn remains wet in the fields.

IRELAND.

CORK, WELLESLEY TERRACE.—Remarkable for excessive R and low temp., the R being 2·52 in. in excess of the average, and for the 10 months 16·77 in. over the average. The mean temp. was 3°·3 in. below the average, and that of 28th the lowest in October for 21 years.

MILTOWN MALBAY.—R every day but one. Mild throughout and vegetation on dry rich lands was vigorous. Owing to the unceasing R, gales and high winds, it is proving a most disastrous year for agriculturists.

DUBLIN, FITZWILLIAM SQUARE.—Frequent but not very heavy R; comparatively high temp.; S.W., W. and N.W. winds; and a high percentage of sunshine. Mean temp. 51°·4, or 2°·0 above the average. High winds on 14 days, reaching the force of a gale on 5. Duration of sunshine 132·75 hours.

COLLOONEY, MARKREE OBSERVATORY.—Very wet and stormy, reaching the force of a gale at times. H showers on 13th, 15th and 17th, and frost on 27th and 28th. The nights were generally cloudy.

BANBRIDGE, MILTOWN.—The R of the last 10 months was 33·97 in., the greatest for 42 years except 1872, which was 36·8 in.

OMAGH, EDENFEL.—The third month this year with R over 7 inches, bringing the total to 47·56 in., over 10 inches above the average for the whole year. A great deal of the grain and late hay was either entirely lost or hopelessly damaged. The only set off was the abnormal mildness, which kept the trees in leaf to the end, accompanied by a magnificent display of autumn tints.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1903.

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	80·9	30	34·9	13	65·1	45·8	47·6	81	122·8	30·1	2·99	17	5·2
Malta	81·2	21	50·2	18	73·4	58·7	56·5	76	132·7	42·9	·00	0	3·5
Lagos, W. Africa	90·0	*a*	73·0	21	88·7	78·2	76·4	77	140·0	...	3·00	7	...
Cape Town	78·8	4	42·8	21	63·4	50·8	50·8	80	...	...	5·16	14	6·0
Durban, Natal	86·7	24	51·3	31	78·4	58·6	...	...	139·1	...	·91	6	3·2
Mauritius	81·8	2 *b*	58·5	13	80·1	65·7	72·2	76	145·2	49·4	1·00	11	4·5
Calcutta	106·2	22*c*	73·2	9	98·6	78·8	73·5	64	164·0	71·0	1·53	3	3·8
Bombay	93·7	22	74·0	26	89·5	79·1	75·8	77	136·8	71·8	7·79	6	3·7
Madras	101·1	16	74·8	19	94·5	78·9	75·6	77	146·0	73·4	5·32	4	4·0
Kodaikanal	71·0	5, 7	49·4	20	67·3	54·3	52·7	79	143·6	42·7	6·00	11	5·8
Colombo, Ceylon	92·2	5	69·6	18	88·5	76·7	76·6	90	146·2	69·1	20·76	25	7·1
Hongkong	87·0	20	66·3	2	79·5	72·2	71·2	87	139·1	...	13·96	16	8·5
Melbourne	71·2	6	33·4	28	58·9	45·6	46·2	83	129·1	24·2	1·94	12	7·1
Adelaide	76·6	7	38·7	31	64·4	47·7	45·9	71	133·5	33·1	1·70	11	...
Coolgardie	76·6	15	34·8	30	64·5	46·7	45·2	70	139·6	29·3	1·91	7	5·6
Sydney	73·0	8	44·7	29	63·9	52·6	48·4	78	103·8	36·0	3·23	24	5·6
Wellington	65·5	3	36·5	24	56·4	46·3	44·9	80	108·0	28·0	8·95	19	6·7
Auckland	64·5	14	44·0	23	60·5	51·5	48·8	77	122·0	42·0	6·09	20	5·1
Jamaica, Negril Point	89·4	21	68·2	4	86 6	73·8	71·5	73	...	...	4·40	12	...
Trinidad	95·0	*a*	61·0	24*e*	93·3	68·6	71·4	71	167·0	61·0	·95	7	...
Grenada	90·2	1	73·0	22	86·6	75·6	69·5	70	149·2	...	1·42	15	3·4
Toronto	83·2	19*d*	28·6	1	66·6	45·2	45·3	67	104·0	25·0	1·80	8	4·1
St. John's, N.B.	72·0	18	28·3	2	55·9	41·9	...	...	...	...	3·13	6	4·4
Winnipeg	84·1	15	17·0	2	67·8	40·6	...	...	...	...	3·40	9	5·0
Victoria, B.C.	64·6	11	38·6	21	57·9	45·3	...	...	...	...	·79	12	6·2
Dawson	65·5	19	18·4	5	53·9	33·0	...	...	...	...	·39	2	3·5
Trinidad March..	93·0	29	61·0	26	89·9	66·6	64·9	65	162·0	60·0	1·74	...	...
Trinidad April...	94·0	28,29	61·0	29	91·3	65·5	71·0	75	170·0	75·0	2·17	6	...

a several. *b* and 3, 5, 10. *c* and 24. *d* and 20. *e* and 25, 26, 29.

MALTA.—Mean temp. of air 64°·5 or 0°·5 above, mean hourly velocity of wind 11·1 or 1·0 above, averages. Mean temp. of sea 65°·7.

Mauritius.—Mean temp. of air 0°·1 above, dew point 0°·9, and R 3·02 in., below, averages. Mean hourly velocity of wind 9·2 miles, or 1·0 below average.

MADRAS.—Bright sunshine 156·7 hours, or 39·9 per cent. of possible.

KODAIKANAL.—Mean temp. of air 59°·5. Mean velocity of wind 282 miles per day. Bright sunshine 174·6 hours.

COLOMBO.—Mean temp. of air 80°·4 or 2°·1 below, of dew point 1°·4 above, and R 8·90 in. above, averages. Mean hourly velocity of wind 5·5 miles, prevailing direction S.W.

HONGKONG.—Mean temp. of air 75°·4. R 1·42 in. above average. Bright sunshine 82·5 hours, or 70 hours below average. Mean hourly velocity of wind 13·8 miles.

Adelaide.—Mean temp. of air 56°·0 or 1°·6 below, R 1·06 in. below, 46 years' average.

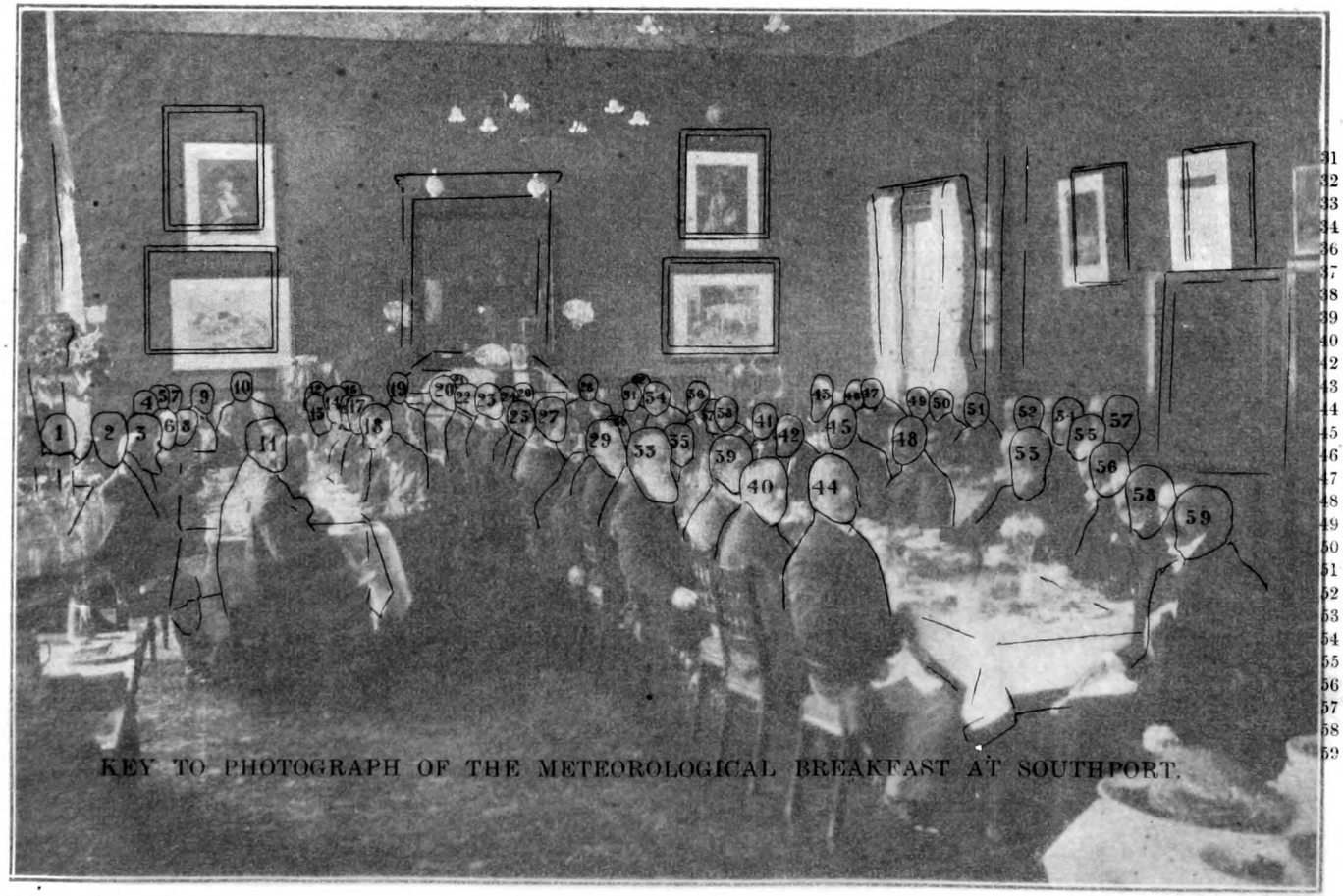
Wellington.—Mean temp. of air 0°·6 below, and R 4·06 in. above, averages.

TRINIDAD.—R 2·98 in. below the 40 years' average.

Frontispiece.]

THE SOUTHPORT METEOROLOGICAL BREAKFAST.

[*Photograph by J. A. Kay, Southport.*



KEY TO PHOTOGRAPH OF THE METEOROLOGICAL BREAKFAST AT SOUTHPORT.

1 Prof. J. Larmor.
3 Prof. L. Boltzmann.
4 W. E. Hoyle.
5 Dr. A. J. Herbertson.
6 Dr. W. J. S. Lockyer.
7 L. Teisserenc de Bort.
8 Prof. H. Hergesell.
9 A. Lawrence Rotch.
10 Dr. A. Paulsen.
11 Capt. E. W. Creak.
13 Dr. W. G. Black.
14 P. Fabyan Amery.
15 Prof. W. W. Watts.
17 John Bolton.
18 J. H. W. Biggs.
19 W. H. Dines.
20 Sir Oliver Lodge.
21 Sir Norman Lockyer.
22 Dr. W. N. Shaw.
23 S. Hardman.
24 Dr. R. T. Glazebrook.
25 Dr. J. Y. Simpson.
26 Prof. E. Mascart.
27 A. R. Hinks.
28 Prof. Willis Moore.
29 H. Southall.

31 Hon. Rollo Russell.
32 H. J. Mackinder.
33 F. Crowley.
34 Prof. Hildebrandsson
36 E. Douglas Archibal
37 J. Smyth.
38 E. J. B. Sopp.
39 A. Warner.
40 J. Hopkinson.
42 Prof. A. Schuster.
43 Dr. A. Buchan.
44 Dr. G. Hellmann.
45 J. Smith.
46 General Rykatcheff.
47 Prof. H. H. Turner.
48 R. G. K. Lempfert.
49 R. S. Whipple.
50 E. Kitto.
51 F. J. Brodie.
52 Dr. Van Bebber.
53 Rev. Dr. Parker.
54 F. W. Harmer.
55 W. Marriott.
56 W. T. Ackroyd.
57 Dr. M. Snellen.
58 Prof. H. Mohn.
59 Dr. H. R. Mill.

Frontispiece.] THE SOUTHPORT METEOROLOGICAL BREAKFAST. [*Photograph by J. A. Kay, Southport.*

SYMONS'S

METEOROLOGICAL MAGAZINE.

No. CCCCLV.] DECEMBER, 1903. VOL. XXXVIII.

THE GOVERNMENT AND METEOROLOGY.

IT is exactly a year since the appointment of a Treasury Committee "to inquire and report as to the administration by the Meteorological Council of the existing Parliamentary grant," and rumours have recently been heard to the effect that the Committee had agreed upon a report recommending certain changes. It is somewhat disappointing to find that this is not the case, and that we have still to wait several months before the result of the deliberations of the Committee can be known. Sir Herbert Maxwell has sent the following letter to *The Times*, where it was published on Dec. 11th :—

To the Editor of The Times.

SIR,—As I have received numerous inquiries as to when the report of the Committee on the Meteorological Grant will be presented, and some complaints on the ground of delay, perhaps you will allow me to explain the circumstances.

The evidence was closed in July; the committee reassembled in October to consider report, and made considerable progress; but the serious illness of one member and the absence of another on the Continent have obliged us to defer the final meetings till February.

I am, Sir, your obedient servant,

HERBERT MAXWELL, *Chairman.*

Monreith, Dec. 9th.

METEOROLOGY AT THE BRITISH ASSOCIATION.

SECOND ARTICLE.

THE number of meteorological papers read at the Southport meeting of the British Association was greater than usual, and the interest shown in Meteorology was more apparent than at any meeting during the last nineteen years. As frequently happens at great gatherings, however, the informal intercourse of persons interested in a special subject proved more stimulating and helpful than the regular meetings for the reading and discussion of papers. The formal meetings attracted good audiences as a rule, and we give some account of such of the papers as could be obtained in abstract or were sufficiently interesting to be reported in the daily press.

It must be confessed, however, that the local newspapers, on which one usually relies to supplement the data obtained at the meetings which it was impossible to attend personally, preferred to put on record the debates on such subjects as the Fiscal Question and Education, near enough the borderland of science to catch some reflected warmth from the forbidden fires of politics; indeed, one reporter said in his haste, "Nobody cares for meteorology."

The following are the titles of papers of meteorological interest:—

Read on Thursday, 10th September.

IN SECTION E. (Geography.)

Presidential Address, by Captain Ettrick W. Creak, C.B., F.R.S., dealing comprehensively with Terrestrial Magnetism.

Read on Friday, 11th September.

IN SECTION A. (Mathematical and Physical Science.)

"Methods of Meteorological Investigation," by Dr. W. N. Shaw, F.R.S. [See this Magazine for October, pp. 151—159].

"On Simultaneous Solar and Terrestrial Changes," by Sir Norman Lockyer, K.C.B., F.R.S.

"On the Relation of the Rainfall of Scotland to the Sun-spot Periods 1855—98," by Dr. A. Buchan, F.R.S.—[An abstract of Dr. Buchan's results appeared in this Magazine for August, pp. 116-117].

"On Barometric Depressions," by M. Teisserenc de Bort.

"On the Origin and Forms of Hoar Frost," with lantern illustrations, by Dr. K. Grossman and Mr. J. Lomas.

IN SECTION E.

"The Influence of Ice-melting on Oceanic Circulation," by Professor Otto Pettersson.

"An Experiment on the Melting of Ice in Salt Water," by Mr. J. W. Sandstrom.

"Afforestation of Waterworks Catchment Areas, with special reference to the case of Liverpool," by Mr. J. Parry, C.E.

On Monday, 14th September.

IN SECTION A.

"On the Employment of the Hair Hygrometer in place of the Psychrometer," by Professor J. M. Pernter.

"On the General Circulation of the Atmosphere," by Professor H. H. Hildebrandsson.—[The results of the work were noticed in this Magazine for August, pp. 122-123].

"Report of the Kite Committee," by Mr. W. H. Dines [see below].

"Kite Observations at Blue Hill, 1900—02," by Mr. A. L. Rotch.

"Work of the International Aeronautical Committee," by Professor H. Hergesell.

"Phenomena accompanying the Volcanic Eruptions in the West Indies," by Mr. D. Burns.

On Tuesday, 15th September.

IN SECTION A.

"Report of the Seismological Committee," by Professor J. Milne, F.R.S.

"Radiation from a Foggy Atmosphere," by Professor A. Schuster, F.R.S. [An abstract will be published in an early number].

"Solar Prominences and Terrestrial Magnetism," by Rev. A. L. Cortie.

"Comparison of the Spectrum of Nitrogen and of the Aurora," by Dr. A. Paulsen.

"Diurnal Variation of Temperature in the Levant and its relation to Radiation," by Dr. A. Buchan, F.R.S.

"Progress of the Magnetic Survey of the United States," by Mr. L. A. Bauer.

IN SECTION G. (Engineering.)

"Water Supply in South-West Lancashire," by Mr. J. Parry, C.E.

"Rainfall on the River Bann, Co. Down," by Mr. J. Smyth, C.E.—[The paper is printed in full on pp. 198-201].

"Rate of Fall of Rain at Seathwaite," by Dr. H. R. Mill.

[See this Magazine for November, p. 182].

On Wednesday, 16th September.

IN SECTION A.

"Report of the Ben Nevis Committee," by Dr. A. Buchan, F.R.S.—[We regret that we have not yet received a copy of this report, which was read from MS.]

"Self-recording Instruments," by Professor H. L. Callendar, F.R.S.

"A Study of Audibility as affected by Meteorological Conditions at Blue Hill during 1901," by Mr. A. L. Rotch.

"On some Rainfall Problems," by Dr. H. R. Mill.

Altogether an embarrassment of meteorological riches, and it is with real regret that we have to limit our notice in most cases to titles, which can only tantalize the reader who desires full information.

Investigation of the Upper Atmosphere by Means of Kites in co-operation with a Committee of the Royal Meteorological Society.—Second Report of the Committee, consisting of DR. W. N. SHAW (*Chairman*), MR. W. H. DINES (*Secretary*), MR. D. ARCHIBALD, MR. C. VERNON BOYS, DR. A. BUCHAN, DR. R. T. GLAZEBROOK, DR. H. R. MILL *and* PROFESSOR A. SCHUSTER. *Drawn up by the Secretary.*

The results of last year's work have been published; a description of the apparatus and methods employed being given in the *Quarterly Journal of the Royal Meteorological Society*, Vol. XXIX., No. 126, p. 65; and a discussion of the results obtained in a paper by Dr. Shaw and myself, which appears in the *Transactions of the Royal Society*, Series A, vol. 202, p. 123.

The apparatus used at Crinan last year was erected at Oxshott in the autumn, and it was hoped that to a limited extent the observations might be continued there; but before the end of October the wire was accidentally dropped across the main road leading from Esher to Leatherhead. Fortunately the wire rested on trees on both sides of the road; but before it could be removed many carriages and bicyclists had passed under it. This accident convinced me that it would be unwise to continue the work at Oxshott, excepting for winds between south and north-west, and the winter has been devoted to an endeavour to improve the apparatus.

This I hope has been accomplished: a new winding-gear has been constructed, which so far has given every satisfaction; and the details of the construction of the kites have been altered, so that they exert a more uniform pull and seem

to be more reliable. The apparatus was brought to Crinan at the beginning of August, and in view of the uncertainty about obtaining a vessel, was erected on the same island as last year. The apparatus in the possession of the Committee now consists of—

I. Engine, boiler, and winding-gear used last year.
II. New winding-gear.
III. About 14 miles of wire, six of which have been purchased this year.
IV. Ten kites 7 ft. 6 in. high; three kites 9 ft. high; materials of a kite 12 ft. high.
V. Two self-recording instruments made by M. Teisserenc de Bort.
VI. Spare bamboo sticks, &c., for repairs.

The old winding-gear is hardly reliable, but many of the parts will be available for making another.

Application was made to the Government Grant Committee of the Royal Society for a grant of £250 for the hire of a vessel. On the suggestion of this Committee the Admiralty were asked to lend a vessel for the purpose, and they had kindly consented to do so; but unfortunately the vessel they proposed to place at the disposal of the Kite Committee met with an accident and became unavailable. The Royal Society, however, made a grant of £200, but great difficulty was experienced in obtaining a suitable vessel owing to the lateness of the time at which inquiries about one were instituted, and to the fact that July and August are the yachting season. A steam tug, the "Renown," has been hired for a month, and reached Crinan on August 13th. The apparatus was fitted on board by the evening of the 14th, and since then daily ascents have been made. No great height (over 6,000 feet) has been reached, for the weather has been of the most unfavourable description for kite flying; but one very interesting trace has been obtained, namely, that of August 20th, when the kite was drawn in from a height of 4,500 feet during a sudden and unexpected thunderstorm which was accompanied by extremely violent rain and hail.

Mr. Dines stated when reading his report that the kite 12 feet high was constructed and used successfully on calm days. Although strong winds and wretched weather prevailed, he succeeded in getting 38 ascents, from 20 of which good records were obtained. This year there were only seven really good days for kite-flying during the stay at Crinan, but on that very account the contrast with the records obtained during the fine weather of last year promises to be interesting.

THE SOUTHPORT METEOROLOGICAL BREAKFAST.

By the courtesy of Mr. J. A. Kay, 211, Lord Street, Southport, we this month present our readers with a reduction of the photograph of the Meteorological Breakfast at Southport (see p. 149), to which we have added a key giving the names of those whom we are able to identify. Of the sixty-two who were at the breakfast, two at least do not appear in the photograph, either because they arrived late or were concealed from the camera by their neighbours. We understand that Mr. Kay is prepared to supply copies of the original photograph (size when mounted, 13 in. × 11 in., or unmounted 11 in. × 8 in.) at a moderate price.

THE METEOROLOGICAL EXHIBITION AT SOUTHPORT.

THE "Exhibition of Instruments, &c.," arranged in connection with the visit of the International Meteorological Committee to Southport was more elaborate and interesting than its official designation implies. The greatest novelty consisted of a complete weather-forecast office at work. The telegrams on which the Daily Weather Reports of the Meteorological Office are based were repeated to Southport each morning, a map was drawn on the spot, forecasts prepared, and a separate Daily Weather Report printed and published in Southport, independent of the London Report, though of course made from the same data. The close similarity of the two simultaneous reports proved at least that different forecasters could come to the same conclusions, and the result must be looked on as satisfactory.

The greater part of the Exhibition consisted of instruments and records, which might be divided into two classes:—*historical*, associated with the beginnings of modern meteorology; and *improved*, which will, we trust, be associated with fresh advances. There was a pleasing absence of instruments such as may be seen in any first-class instrument-maker's shop, or in most meteorological observatories. The value of these has been established and is fully recognised. Thanks to the general insistence on having certificates of accuracy with all instruments purchased and the firm rules of the leading meteorological institutions, it is no longer necessary to teach observers that good instruments are better than bad.

The catalogue contained 191 entries, but in order to gain space for the consideration of most of the more strictly meteorological, we have to pass over a number of very interesting exhibits bearing on terrestrial magnetism and other allied branches of cosmical physics.

Amongst the historic instruments which did good service in their day were Whewell's anemometer and Crossley's self-registering rain gauge, dating from 1841, aud exhibited by the Astronomer Royal, who also showed one of the wooden bowls used in Campbell's first pattern of sunshine recorder with a year's sunshine burnt into its surface. Later patterns were also exhibited, showing how the principle of this beautiful instrument remained unaltered while the details of construction were being improved, until Mr. R. H. Curtis's adjustable stand (exhibited by Mr. J. J. Hicks) brought the whole into its present efficient form. The Royal Meteorological Society showed the instruments used by the late Mr. Glaisher in his balloon ascents.

Amongst the less familiar instruments, the nephoscopes, or cloud mirrors, claim somewhat special notice, for there is, perhaps, no meteorological observation so unsatisfactorily made as a rule as the estimation of the amount and direction of motion of clouds. Three different patterns were shown by the Meteorological Office and Dr. W. N. Shaw. Perhaps the most interesting was Besson's portcullis nephoscope, in which a horizontal line of vertical spikes is

turned so that it coincides with the direction of motion of a cloud. This direction can then be read off on a graduated circular disc, and the angular velocity of the cloud's movement may also be measured by noting the time intervals as it passes from spike to spike.

The Kew Observatory sent the McLeod Sunshine Recorder, and Mr. A. Lander, of Canterbury, showed a new pattern of photographic sunshine recorder made of aluminium and provided with a revolving slit actuated by clockwork, instead of a lens, through which the light is thrown on the sensitive paper, giving a very sharp trace. The trouble with all photographic recorders which have to measure intensity of light is of course the difficulty of ensuring equal sensitiveness in successive batches of paper.

Mr. J. Baxendell, the director of the Fernley Observatory at Southport, whose absence from the meeting through illness was much regretted, showed several of his ingenious improvements and inventions. The most interesting was his self-recording anemoscope, both by itself for recording the direction of the wind and in combination with the Dines' pressure-tube anemometer. A neat little contrivance by which the annular space below the funnel of a 5-inch Snowdon rain gauge is converted into a hot water chamber, by which snow collected in the funnel may be melted, struck us as of considerable practical utility.

Mr. F. L. Halliwell showed the daily and weekly patterns of his beautiful recording rain gauge, the traces of which for the deluge that greeted the British Association on its opening day, attracted much attention on account of the sharpness with which the variations in intensity of fall were brought out by the curve.

Mr. R. W. Munro exhibited the latest patterns of Dines' anemometers adapted for obtaining automatic records either with the pressure-plate or the pressure-tube vane head.

The Cambridge Scientific Instrument Company brought forward several modifications of the Calendar platinum resistance thermometers adapted for giving automatic records of meteorological phenomena. The principle of all is the same: the change of resistance in a coil of platinum wire due to change of temperature upsets the balance of a Wheatstone bridge, and an automatic slider moves along a slide wire in the other arm of the bridge until the balance is restored; a pen attached to the slider records the changes upon a revolving drum. The principle is very simple, but the details present several points of great ingenuity, and the recorder, which is a large and solidly constructed instrument, is likely to be useful mainly in observatories where a trained staff is available. The thermometer is adapted for use as a sunshine recorder (or rather as a black-bulb solar radiation thermometer) by taking account of the difference in resistance of two coils, one of plain platinum wire, the other exactly similar but embedded in a thin layer of black enamel. For observing air temperature the change of resistance is measured in a fine copper wire wound on a light mica frame and enclosed in a

brass tube. This company also showed a novel device called the Blakesley Portable Barometer, the practical working of which it would be interesting to test. It consists of a straight tube closed at one end, open at the other and with a bore of about one-twentieth of an inch. The tube contains air shut in by a column of mercury about eight inches long. The length of this air space is read with the tube vertical, first with the closed end uppermost, then with the open end uppermost, and the barometric height is equal to the sum of the two readings divided by the difference of the two readings and multiplied by the length of the thread of mercury at 32° F. No temperature correction is required.

Messrs. Newton & Co. showed an altimeter designed for measuring the height of kites or balloons; and Mr. A. L. Rotch an instrument for showing the true direction and velocity of the wind at sea when its apparent direction and the speed of the ship are known. Mr. Dines exhibited his kites and winding gear; and Mr. P. Y. Alexander showed some of the unmanned balloons with which he has made interesting experiments at Bath.

Dr. W. N. Shaw exhibited the anemoidograph, a new instrument for tracing air trajectories of the kind described in this Magazine for July, p. 103; and also his thermopsychrophorus, the interesting performances of which before it had attained the dignity of so expressive a title were touched upon in this Magazine for April, 1902, p. 39.

Many interesting maps of meteorological and magnetic conditions were exhibited; we have space only to mention those showing the distribution of the stations of the Meteorological Office, and the Royal Meteorological Society, and of the 3636 rain gauges whose records appeared in "British Rainfall, 1902." Some interesting early synoptic charts, many records of special phenomena, and not a few striking photographs added to the interest of an exhibition which was much appreciated by the members of the British Association and reflected credit on its organizers, presided over by Dr. Shaw, and on Mr. R. G. K. Lempfert and Mr. Marriott in particular, to whose efforts the arrangement of the collection and the prompt publication of the catalogue were largely due.

Correspondence.

THE OCTOBER RAINFALL.

To the Editor of Symons's Meteorological Magazine.

THE Rainfall measured here in October was 8·88 in. and not 7·88 in. as given in my letter to you dated 2nd November.

I am, Sir, your obedient servant,

MORRIS BIRKBECK.

Dippen Hall Cottage, Farnham, Surrey, 9th Dec., 1903.

USE OF THE RAIN GAUGE ON SHIPBOARD.

To the Editor of Symons's Meteorological Magazine.

ACCORDING to Dr. W. N. Shaw, F.R.S., "we know practically nothing of the distribution of rainfall over the sea." This desideratum ought to be supplied. There is a form of rain gauge for use at sea. Is there no means of using it? Meteorologists would do well to give attention to this requirement now that it has become desirable to know the precipitation in various parts of the ocean, this being an important factor in the genesis and maintenance of cyclonic and electrical storms, as well as of oceanic currents; and without this knowledge the physics of the atmosphere over the oceans must be defective. Some knowledge of the frequency of rain over the oceans has been obtained from the log books of ships; but these documents give no account of the quantity of the rain. A rain gauge mounted on gimbals is made suitable for use on shipboard, but hitherto it has not been much employed. There are some difficulties in using it. When the most appropriate position is selected for its exposure, the water which it collects is not always, indeed seldom, entirely due to rain. There is always the liability of sea water being mixed with the rain water, for the sea comes on the ship often as spray, sometimes as topping waves. The problem is to find how much of the contents of the gauge at any time is due to rain and how much should be eliminated as sea water. A rule may be proposed for the purpose which apparently admits of sufficient accuracy.

The water collected by the gauge should be tested by an accurate glass hydrometer, such as is now very generally used on shipboard for observing the specific gravity of the surface water of the sea. Let the specific gravity of the collected water be s; that of the surface water must also be observed in the usual way; let it be S. The temperature must be noted at the same time, as usual. If the temperature is at or about 62°, the specific gravity of rain, that is of pure water is 1. The contents of the gauge should be examined regularly every day, or preferably at shorter intervals, say every four hours, commonly the observing interval at sea for meteorological conditions. Let the quantity of water be represented by Q; the part due to rain by x; then Q—x will be the amount of sea water to be deducted. The observations s, S, Q yield the equation

$$x f + (Q - x)\,S = Q\,s\,;\ \text{whence}$$

$$x = \frac{Q\,(S - s)}{S - f}$$

Here f is the specific gravity of water, taken as 1 at the temperature of 62°, which becomes 1·0015 at 42°, 0·9976 at 82°, and for any other temperature may be known by interpolation near enough. The equation expresses the Rule: Multiply the quantity of water by the difference between its specific gravity and that of the sea water; divide the product by the difference between the specific gravity of

the sea water and that of fresh water at the same temperature; the result is the amount of rain.

Example:—Q = ·87 inch, s = 1·0095, S = 1·0267, temperature 51°.

Here $f = (1{\cdot}0015-1)\frac{11}{20} + 1 = 1{\cdot}0008$, and the equation becomes

$$x = {\cdot}87\ \frac{1{\cdot}0267-1{\cdot}0095}{1{\cdot}0267-1{\cdot}0008} = 0{\cdot}58 \text{ inch.}$$

Of course it would save the calculation if the gauge were unaffected by sea spray, having regard to good exposure to rain. The record should supply Time, Latitude, Longitude, Quantity collected, its specific gravity and that of the sea water, Temperature, Value of f used, Rain deduced. The last two items might be systematicaliy neglected, to be afterwards worked out by a computer. A table might be calculated for a more expeditious mode of reducing the observations.

RICHARD STRACHAN.

[For water of such low salinity as rain mixed with sea-spray in a ship's rain gauge, a hydrometer of very great delicacy would have to be employed. It would probably be found easier and more accurate to estimate the salinity by determning the chlorine chemically.—ED. *S.M.M.*]

SEASONAL RAINFALL OF 1902—3.

To the Editor of Symons's Meteorological Magazine.

WITH the month of November I bring to an end another year of *Seasonal* Rainfall, and a heavy record it proves, owing to the excess during the summer and autumn. Comparing the actual fall with the average of 1880—99, we get the following values:—

	1903.	1880—99.	Diff. 1903.
Winter (December—February)...	4·45 in.	5·14 in.	—0·69 in.
Spring (March—May).....	7·42 in.	4·81 in.	+2·61 in.
Summer (June—August)	13·74 in.	6·56 in.	+7·18 in.
Autumn (September—November)	10·20 in.	7·65 in.	+2·55 in.
Dec. 1902—Nov. 1903.....	35·81 in.	24·16 in.	+11·65 in.

These values show that, roughly speaking, we had the average fall for the whole year during the summer and autumn, when 67 per cent. of the total fall was recorded; and the excess of 1903 above the average during the winter and spring. The total number of wet days was 196, giving an average fall of ·18 inch per wet day—the largest average I have yet observed. I have gauged one fall of 2 inches, and four exceeding 1 inch. Snow has been almost conspicuous by its absence, only a total of ·13 inch being gauged on four days.

C. WIGAN HARVEY.

Throcking Rectory, Herts.

RAINFALL ON THE RIVER BANN, CO. DOWN, IRELAND, AT BANBRIDGE AND LOUGH ISLAND REAVY RESERVOIR, FOR 40 YEARS, FROM 1862 TO 1901.

By JOHN SMYTH, M.A., M.Inst.C.E.I., F.R.Met.Soc.

IN the year 1857, as engineer of the Bann Reservoir Company, I was engaged in an arbitration between that company and the riparian proprietors or occupiers of the lands adjoining the River Muddock, which were alleged to be flooded by an excessive amount of water sent down from the reservoir through that river (an affluent of the Bann) to supply the mills on the River Bann. In trying to show the arbitrators that the damage done was principally due to heavy rainfalls, too great for the capacity of the several streams passing through the lands, I was met by the difficulty of making calculations of the amount of water to be provided for, when I found no rain gauges had been kept in that neighbourhood or even near it. I, therefore, in the meantime having thoroughly studied the subject, commenced in the year 1861 to take rainfall observations. Amongst others, I established the gauges at Milltown, Banbridge and Lough Island Reavy, and now proceed to give an account of the observations taken by means of these gauges and the results obtained from them.

Milltown, Banbridge.

I have prepared a summary of the 40 years' observations to accompany this paper, giving the total rainfall for each year, and for each month of the year. The mean values of all these are given for periods of 10, 20, 30 and 40 years, so that by comparing these results with any year or portion of a year it will be seen whether the rainfall is below or above the average.

The average rainfall for the whole period was 31·1 inches. The greatest 10 year average was 33·3 in. from 1872 to 1881. The least 10 year average was 29·1 in. from 1862 to 1871. The wettest year was 1872, when 46·6 in. was registered. The driest, 1887, with 23·1 in. registered. The greatest fall in 24 hours was 2·3 in. on October 12th, 1865.

On July 4th, 1883, in one hour, 1·6 in. fell; this is an important point to know, as a guide to the capacity required for traps, grates and drains.

A copper gauge was used, 8 inches in diameter, the funnel 1 foot above the ground level, placed in a box.

The three consecutive driest years at Banbridge were 1885, 1886 and 1887, averaging 28·60 in.

Bann Reservoir at Lough Island Reavy.

I give also a summary of the 40 years' observations at this station, giving the same elements as in the case of Milltown, Banbridge.

The average rainfall for the whole period was 44·0 inches. The greatest 10 year average was 46·61 in. from 1863 to 1872. The least 10 year average 40·81 in. from 1873 to 1882. The wettest year was 1872, when 61·2 in. was registered. The driest was 1887, with a fall of 26·5 in. The three driest consecutive years were 1878 to 1880, when the average fall was 35·2 in. The greatest fall in 24 hours was 3·9 in., November 29th, 1868.

Bateman's mountain gauge was used for nearly all these observations up to 1892, when an ordinary copper 5 inch gauge was substituted. Bateman's gauge was of 8 inches diameter, read by means of a rod resting on a float, the reading being facilitated by a vernier carried on a temporary cover placed on the gauge for that purpose.

Foffanny, near Lough Island Reavy.

At the Belfast Meeting of the British Association, 1874, I read a paper on the Rainfall of Ulster, and in the discussion it was seen that there was a great want of gauges all over the country, and the Rainfall Committee of the Association supplied gauges to a number of suitable applicants whom I was enabled to induce to undertake the work. I was particularly anxious to get observations on the highest point possible near the reservoir, so employed a man called Patrick McAlinden, who lived in the highest inhabited house, to take the three years' observations which I herewith supply. It will be seen that the average at this high elevation (920 feet) is nearly double that at the reservoir; such, however, was to be expected from its position close to the higher range of mountains (rising to from 2000 to nearly 3000 feet) which intercept the southerly water-laden currents and cooling them cause them to precipitate their moisture as they pass over. I would have been glad, however, to have had a longer series, but McAlinden left the place and went to live near the Deers Meadow Mountain, where the River Bann rises. I got him to try the gauge there, at an elevation of 1300 feet, but two miles from his house; it was soon interfered with, however, so I removed it to Divis Mountain, near Belfast, where the late Mr. Lavens Ewart, employed a gamekeeper to observe, but the arrangement did not work well.

Rainfall at Foffanny, near Lough Island Reavy Reservoir, for the years 1875, 1876 *and* 1877.

Lat. 54° 12′. Lon. 6° 2′ 30″. Above sea level 920 ft. On Butter Mountain, 2½ miles on Muddock River above intake to Lough Island Reavy Reservoir. Mountain rain gauge, 8 in. diameter, 3 ft. above surface of ground.

Month.	1875.	1876.	1877.
	in.	in.	in.
January	17·73	5·00	16·15
February	1·93	7·50	2·60
March	3·04	2·63	3·90
April	·90	5·20	10·10
May	4·25	·60	6·50
June	6·25	3·90	4·15
July	6·00	1·74	6·00
August	5·86	7·82	5·50
September	11·60	8·72	3·75
October	12·25	9·15	7·00
November	9·30	11·37	10·00
December	4·75	19·05	8·50
	83·86	82·68	84·15

Ten Years' Averages.

Milltown, Banbridge.	in.	Bann Reservoir, Reavy.	in.
1862–1871	29·13	1863–1872	46·61
1872–1881	33·27	1873–1882	40·81
1882–1891	31·25	1883–1892	42·82
1892–1901	30·63	1893–1902	46·34
40 years' average	31·07	40 years' average	44·15

Summary of Rainfall at Milltown, Banbridge, co. Down.

Lat. 54° 15′ N. Lon. 6° 18′ W. 200 ft. above sea level.

YEAR.	Jan.	Feb.	Mar.	Apl.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1862.....	3·6	1·0	2·7	2·8	3·8	2·8	3·5	1·8	1·9	3·6	2·6	3·1	33·2
1863.....	3·1	0·8	1·7	1·3	2·5	2·7	0·8	3·8	3·0	5·6	2·3	1·8	29·4
1864.....	1·4	1·2	2·0	2·1	1·8	2·6	1·3	2·4	2·5	2·4	3·5	2·0	25·2
1865.. ...	2·7	2·7	2·2	0·6	4·2	0·5	1·5	2·7	0·3	6·0	3·5	2·2	29·1
1866.....	3·5	2·3	2·5	1·5	0·9	2·1	2·1	2·7	3·5	2·0	2·3	2·7	28·1
1867.....	3·7	1·7	2·0	3·8	2·9	1·0	6·4	2·0	1·7	4·3	0·8	1·6	31·9
1868.....	2·5	2·2	2·9	2·1	2·3	0·7	0·9	4·0	1·6	1·8	2·5	4·5	28·0
1869.....	3·4	4·1	1·9	2·0	2·1	0·9	1·5	1·6	3·9	1·5	3·1	3·2	29·2
1870.....	3·0	2·4	1·1	1·1	1·6	1·0	1·8	1·6	2·5	7·2	1·8	2·5	27·6
1871.....	3·1	2·8	1·4	2·9	0·8	1·8	4·0	3·4	3·6	2·3	1·6	1·9	29·6
Average of 10 years	3·0	2·2	2·0	2·0	2·3	1·6	2·4	2·6	2·4	3·7	2·4	2·5	29·1
1872.....	4·1	3·5	2·4	4·1	2·7	3·6	3·3	4·2	4·4	4·5	4·2	5·6	46·6
1873.....	4·0	1·1	2·3	0·5	1·9	1·5	4·1	4·4	2·7	2·7	1·8	0·6	27·6
1874.....	1·7	1·8	1·3	1·7	0·7	1·1	2·9	4·4	2·9	3·6	3·2	3·0	28·3
1875.....	3·9	1·8	1·0	0·4	1·5	3·3	3·9	2·4	4·7	3·5	3·3	1·7	31·4
1876.....	1·1	3·4	2·9	2·1	0·5	2·0	2·0	2·9	3·4	4·5	3·5	7·7	36·0
1877.....	5·9	2·4	3·6	3·1	3·5	2·4	4·8	3·4	2·1	2·7	3·3	2·8	40·0
1878.....	3·1	2·0	1·5	1·4	3·8	3·0	0·4	2·5	3·3	2·9	1·5	1·5	26·9
1879.....	2·3	1·5	2·0	1·7	3·8	4·0	6·1	3·8	4·4	1·1	1·3	1·3	33·3
1880.....	1·0	2·5	1·8	3·7	0·6	2·9	4·8	0·9	3·2	1·2	2·4	2·6	27·6
1881.....	0·7	2·8	2·9	1·7	2·6	4·2	2·9	4·7	2·2	3·5	3·8	3·0	35·0
Average of 20 years	2·9	2·2	2·1	2·0	2·2	2·2	3·0	3·0	2·9	3·3	2·6	2·7	31·1
1882.. ...	1·9	2·1	2·4	2·7	2·9	3·1	5·0	3·6	4·3	2·4	4·6	2·6	37·6
1883.....	3·5	3·1	1·5	1·4	2·0	2·1	4·7	3·8	3·7	2·6	3·3	1·9	33·6
1884.....	3·8	3·4	2·7	1·9	2·1	0·8	2·9	1·8	3·0	2·4	2·5	3·1	30·4
1885.....	2·2	3·7	1·6	2·0	1·8	0·7	1·9	1·4	4·6	3·1	1·6	2·0	26·6
1886	3·8	2·1	2·6	1·4	5·1	1·4	3·5	2·4	2·4	4·1	2·9	4·4	36·1
1887.....	2·5	1·0	1·5	2·0	1·5	0·7	2·7	2·1	3·0	1·9	2·5	1·7	23·1
1888.....	1·8	0·5	3·4	1·7	2·7	4·4	4·6	2·7	1·0	1·1	3·9	2·4	30·2
1889.....	1·8	2·1	2·3	3·3	3·4	0·3	3·7	7·6	1·7	3·2	1·6	2·9	33·9
1890.....	3·3	1·3	2·7	1·1	1·5	2·9	2·1	2·6	3·2	1·5	6·0	1·7	29·9
1891.....	1·1	0·2	1·2	2·5	3·1	3·0	2·9	5·3	1·9	3·6	2·4	3·9	31·1
Average of 30 years	2·8	2·1	2·3	2·0	2·3	2·1	3·1	3·1	2·9	3·1	2·8	2·7	31·2
1892.....	2·1	1·8	0·6	0·8	3·4	3·1	2·6	5·5	2·9	3·0	3·5	1·8	31·1
1893.....	2·7	2·5	0·7	1·1	0·9	1·6	2·7	4·3	1·7	1·8	1·4	2·6	24·0
1894.....	2·9	1·9	1·1	2·4	1·6	3·5	3·3	2·3	0·3	5·0	1·7	2·8	28·8
1895.....	1·9	0·7	3·1	2·0	0·2	2·5	4·7	5·0	0·5	3·5	3·4	2·8	30·3
1896.....	1·7	1·3	3·0	1·3	0·3	2·5	7·4	2·0	4·5	2·1	0·7	3·8	30·6
1897.....	1·8	1·8	4·2	2·4	1·7	4·5	1·7	4·0	2·1	2·2	3·2	3·2	32·8
1898.....	1·2	2·6	0·9	3·5	3·7	3·0	0·6	3·6	4·8	3·2	2·0	1 9	31·0
1899.....	2·9	2·5	1·4	2·9	3·6	2·4	3·5	1·2	3·4	1·8	2·8	4·0	32·3
1900	2·0	2·3	0·9	1·7	2·7	3·2	3·0	4·8	1·8	3·6	4·9	3·2	34·1
1901.....	2·8	1·4	2·1	2·1	1·5	2·7	1·1	4·3	3·5	2·6	4·0	3·2	31·3
Average of 40 years	2·6	2·1	2·2	1·8	2·2	2·3	3·1	3·2	2·8	3·0	2·8	2·8	31·1
1902.....	1·9	2·5	1·6	2·6	3·5	2·2	3·6	2·4	3·7	1·3	3·3	2·4	31·0
1903.....	4·3	1·8	3·9	0·9	2·3	1·2	6·0	5·1	3·9	...	...	...	...

Summary of Rainfall at Bann Reservoir, Lough Island Reavy, near Castlewellan.

Lat. 54° 15′ N. Lon. 6° 2′ W. 440 ft. above sea level.

Diameter of Gauge 8 in. up to 1892, after which 5 in. Plane of receiver 1 ft. above ground.

Year.	Jan.	Feb.	Mar.	Apl.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1862.....	6·0	2·6	5·6	3·3	3·0	5·0	4·4	2·0	2·0	5·7	5·0	8·3	52·9
1863.....	4·3	1·0	4·9	1·0	2·4	3·4	0·8	5·2	2·0	11·8	3·5	2·5	42·8
1864.....	5·2	1·2	6·7	2·0	1·7	2·7	1·6	1·8	3·1	4·5	10·3	3·9	44·7
1865.....	5·0	3·7	1·9	0·5	4·6	0·8	2·9	4·5	0·3	12·0	9·3	6·8	52·3
1866.....	7·7	4·0	8·4	3·9	0·9	5·0	1·4	4·0	6·4	4·8	3·9	4·2	54·6
1867.....	4·4	2·0	7·1	5·0	8·2	0·5	6·5	1·7	3·0	6·6	0·5	1·7	47·2
1868.....	3·8	1·7	3·1	1·3	2·4	0·2	0·4	7·0	2·5	1·9	7·9	11·1	43·3
1869.....	7·1	2·6	1·9	1·2	2·1	0·1	1·2	1·6	4·7	0·8	1·9	3·7	28·9
1870.....	5·9	8·4	0·9	0·8	3·4	0·5	0·9	1·6	2·8	14·7	2·5	5·7	48·1
1871.....	4·5	6·5	2·1	5·3	0·5	1·8	3·3	2·4	5·7	5·0	3·3	2·6	43·0
Average of 10 years	5·4	3·4	4·3	2·4	2·9	2·0	2·3	3·2	3·2	6·8	4·8	5·1	45·8
1872.....	7·2	9·0	3·0	3·6	1·5	3·3	3·1	3·3	4·0	5·4	6·8	11·0	61·2
1873.....	6·2	0·8	4·4	0·3	1·2	1·9	4·2	3·9	1·9	1·6	4·0	0·8	31·2
1874.....	2·1	4·0	0·8	3·0	0·3	0·7	2·0	3·9	4·8	6·3	3·6	4·0	35·5
1875.....	7·1	1·2	1·4	0·3	2·2	3·8	3·2	2·8	5·6	6·3	5·1	2·4	41·4
1876.....	2·3	3·7	2·1	2·0	0·2	2·0	0·8	3·4	5·8	8·9	8·7	13·0	52·9
1877.....	11·9	1·7	3·6	5·6	3·8	3·3	2·7	4·2	1·9	3·8	6·0	5·6	54·1
1878.....	2·2	4·2	0·4	1·8	6·9	2·9	0·4	2·6	4·8	4·1	0·9	0·7	31·9
1879.....	2·7	3·0	2·2	3·5	1·6	6·1	5·9	4·7	7·2	0·9	0·9	1·1	39·8
1880.....	1·1	4·4	1·7	5·8	0·1	3·0	6·2	0·3	4·5	2·3	3·5	0·9	33·8
1881.....	0·4	4·6	4·7	0·7	0·8	4·0	0·8	3·6	1·2	2·8	6·0	4·8	34·4
Average of 20 years	4·8	3·5	3·3	2·5	2·4	2·6	2·6	3·2	3·7	5·5	4·7	4·7	43·7
1882.....	1·6	5·9	2·5	6·1	2·4	2·7	4·7	4·5	4·4	6·9	6·6	4·8	53·1
1883.....	5·8	9·2	1·9	1·8	1·3	0·7	2·5	3·5	9·0	4·0	2·7	0·9	43·3
1884.....	5·7	7·9	7·4	2·1	2·5	0·3	3·0	1·3	1·9	1·7	4·3	2·5	40·6
1885.....	3·8	6·0	2·4	6·6	2·0	0·4	0·8	2·1	7·4	4·0	5·0	0·4	40·9
1886.....	2·2	2·2	3·4	1·8	5·7	1·3	3·3	2·0	2·2	9·1	3·8	5·3	42·3
1887.....	3·9	1·0	0·7	1·3	1·0	0·8	3·1	3·0	3·1	2·5	4·0	2·1	26·5
1888	1·6	0·0	5·6	2·8	4·1	5·2	6·6	1·5	0·5	1·2	8·4	5·8	43·3
1889.....	6·3	0·4	3·2	6·1	6·3	0·0	3·5	4·6	2·5	7·6	0·9	3·3	44·7
1890.....	4·8	2·7	5·7	2·0	2·5	2·8	2·0	4·2	4·4	1·3	10·9	3·0	46·3
1891.....	1·6	0·3	1·8	6·3	3·5	6·5	2·9	8·4	2·5	10·4	8·7	6·1	59·0
Average of 30 years	4·5	3·5	3·4	2·9	2·6	2·4	2·8	3·3	3·7	5·3	5·0	4·3	43·8
1892.....	4·1	1·9	0·5	0·9	4·2	3·6	1·8	6·2	3·9	6·9	6·0	1·3	41·3
1893.....	5·7	3·6	0·6	1·2	1·0	1·8	2·9	4·6	1·5	1·5	2·6	6·1	33·1
1894.....	5·9	2·9	0·6	4·5	4·0	3·8	3·9	2·2	0·3	10·9	5·7	3·9	48·6
1895.....	3·6	0·5	4·9	3·7	0·1	1·2	5·2	6·9	0·3	3·5	8·1	4·1	42·1
1896	1·8	2·8	3·7	1·0	0·4	3·4	6·7	1·9	6·8	2·4	2·2	7·2	40·3
1897.....	3·1	2·7	6·8	3·4	1·6	6·1	1·7	6·9	2·4	4·1	3·8	5·9	48·6
1898.....	1·9	2·8	1·0	6·7	4·6	4·3	0·5	3·7	4·0	5·1	4·5	3·9	43·0
1899.....	5·5	5·7	2·0	4·6	4·6	3·2	3·6	1·8	3·6	1·4	5·5	8·4	49·9
1900.....	3·3	5·4	1·0	2·6	4·9	3·4	4·4	5·1	1·2	5·7	7·2	4·9	49·1
1901.....	6·9	3·4	3·3	4·3	2·2	3·7	1·7	3·3	7·0	4·6	4·6	4·6	49·6
Average of 40 years	4·4	3·4	3·2	3·0	2·7	2·6	3·0	3·5	3·6	5·1	5·0	4·5	44·0
1902.....	3·3	5·6	2·2	5·1	7·0	4·1	5·2	4·5	4·8	2·7	9·8	4·9	59·2
1903.....	7·4	5·0	7·6	1·8	2·8	1·2	5·7	5·9	5·2	...	...	...	...

THE ELEVEN MONTHS' RAINFALL OF 1903.

Aggregate Rainfall for January—November, 1903.

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 .....+	15·95	176	Arncliffe ...+	21·75	139	Braemar ...+	9·50	130
Tenterden .....+	6·51	127	Hull .....+	5·63	125	Aberdeen ...+	8·49	130
Hartl'yW'ntn'y+	13·40	159	Newcastle...+	9·05	139	Cawdor .....+	5·55	120
Hitchin .....+	14·35	167	Seathwaite +	34·36	129	Glencarron +	20·50	125
Winslow .....+	11·91	155	Cardiff .....+	14·57	141	Dunrobin ...+	8·26	130
Westley.....+	7·07	130	Haverf'dwest+	13·37	135	Darrynane +	6·07	114
Brundall.....+	5·25	123	Gogerddan +	17·86	145	Waterford +	9·32	127
Alderbury .....+	11·62	147	Llandudno +	8·14	130	Broadford.. +	11·27	138
Ashburton .....+	15·43	135	Dumfries ...+	17·94	146	Carlow .....+	11·36	138
Polapit Tamar +	14·43	144	Lilliesleaf ...+	12·89	147	Dublin .....+	5·05	120
Stroud .....+	13·64	155	Colmonell ...+	9·09	123	Mullingar...+	12·68	138
Woolstaston ...+	14·48	155	Glasgow ...+	20·06	162	Ballinasloe +	10·53	132
Boston .....+	9·93	153	Inveraray ...+	18·19	128	Clifden .. ...+	7·83	111
Hesley Hall ...+	6·36	133	Islay .....+	12·28	130	Crossmolina +	13·27	129
Derby.....+	9·16	144	Mull .....+	13·51	127	Seaforde ...+	11·37	135
Bolton .....+	11·64	131	Loch Leven +	16·74	152	Londonderry+	6·99	119
Wetherby .....+	14·50	167	Dundee .....+	7·41	130	Omagh .....+	14·90	142

The rainfall in November was for the first time since February below the monthly average at most stations. If it had not been for a depression with very heavy rainfall which crossed our islands on the 27th, the month would have been extremely dry. Consequently the rainfall for the year to date shows a less remarkable excess over the average than it did at the end of October, although the excess over the average of the ten years 1890–99 amounts to about 43% for England and Wales, 34% for Scotland and 29% for Ireland.

METEOROLOGICAL NEWS AND NOTES.

THE ROYAL METEOROLOGICAL SOCIETY held its opening meeting for the new session on November 18th, when a communication on the Great Dust Fall of February, 1903, was submitted by Dr. H. R. Mill and Mr. R. G. K. Lempfert. We are obliged to hold over our report until next month.

IN BINDING THIS VOLUME our readers will please note that the photograph accompanying the present number is to be placed as a frontispiece. New reader may be reminded that the last number of Volume XXXVIII. will be published on January 16th, and will contain the usual index.

REVIEWS.

Die Luftströmungen auf dem Gipfel des Säntis (2504 *m.*) *und ihre jährliche Periode.* [The air currents on the summit of the Säntis (8215 ft.) and their annual period.] Von J. HANN. From the *Sitzber. k. Akad. Wiss. Wien, Math.-naturwiss. Klasse; Bd.* CXII. *Abt.* II. *a.* Vienna: 1903. Size, 9½ × 6. Pp. 42.

THE unwearied activity of Dr. Hann has led him to discuss in detail the hourly observations of wind made at the high-level Alpine observatory on the Säntis and to compare them with similar observations at low-level stations. He says the work was made "inviting and light" by the way the observations were published by M. Billwiller, the head of the Swiss meteorological service. Westerly winds were found to predominate at the summit both in frequency and intensity, the average direction for the fifteen years considered being nearly W.S.W. The wind in summer averages nearly true west, in winter north-east, and in autumn nearly south. The contrast with Zürich is very marked, both by the comparative absence of calms at the higher station and the relative frequency of easterly winds at the lower.

Monthly Record of Bright Sunshine measured at Upton, near Slough. [By RICHARD BENTLEY.] *Privately printed.* Size, 10 × 6. Pp. 10.

MR. BENTLEY'S record of sunshine was taken with a Campbell-Stokes Recorder and commenced in May, 1898. Records are given for five years to 1902. Of the four complete years the sunniest was 1899, with 1754¾ hours; the dullest, 1902, with 1355½. The sunniest month was July, 1900, with over 9⅓ hours sunshine per day as an average; the dullest month was December, 1900, when the average duration of sunshine was only 1 hour per day. The longest succession of sunny days was 105, from June 21st to October 3rd, 1901; the longest succession of sunless days was only 7, in December, 1899, and again in December, 1902.

Weather Warnings. By J. REGINALD ASHWORTH, D.Sc. (Reprinted from the *Transactions* of the Rochdale Literary and Scientific Society). Rochdale: 1903. Size, 8½ × 6. Pp. 4.

DR. ASHWORTH has tested certain weather prognostics and gives the result of two years' observations. The most complete are—(1) The rosy glow after sunset, which was observed 59 times and followed by a fine day on 52 occasions, by a wet day on 7. (2) Smoke rising vertically from chimneys, which was noticed 48 times and was followed by a fine day on 42 occasions, by a wet day on 6. (3) Smoke hanging round the tops of chimneys, which was observed 21 times and was followed by a wet day on 15 occasions, by a fine day on 6. It is always interesting to find the truth of old weather proverbs demonstrated by observation.

RAINFALL AND TEMPERATURE, NOVEMBER, 1903.

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) ...	1·85	— ·37	1·05	27	12	57·2	1	29·9	20	3	14
II.		Tenterden	2·33	— ·24	1·12	27	19	57·0	2	30·0	20	2	12
,,		Hartley Wintney	1·76	— ·72	·87	27	10	54·0	1*a*	29·0	19*e*	8	13
III.		Hitchin	2·15	— ·27	1·05	27	16	54·0	9	27·0	6,19	7	...
,,		Winslow (Addington)	1·68	— ·79	·78	27	15	56·0	10	25·0	20	8	17
IV.		Bury St. Edmunds (Westley)	2·18	— ·32	1·01	27	16	55·0	2	28·0	30	...	...
,,		Norwich (Brundall)	1·87	— ·59	·26	2	23	56·0	2	28·2	7	6	16
V.		Winterborne Steepleton	1·91	...	·64	27	15	55·2	2	26·0	20	5	14
,,		Torquay	1·44	...	·73	27	12	58·7	1	33·4	30	0	5
,,		Polapit Tamar [Launceston]..	3·42	— ·46	·89	27	21	56·3	2	23·3	19	5	8
VI.		Stroud (Upfield)	1·59	— 1·10	·70	27	10	55·0	13	27·0	19	7	...
,,		Church Stretton (Woolstaston)	2·70	— ·08	1·00	27	20	54·0	12	25·0	30	2	...
,,		Worcester (Diglis Lock)	1·25	— ·85	·53	27	13	...	...	...	...	...	...
VII.		Boston	1·59	— ·26	·50	27	11	52·0	21	28·0	19	...	...
,,		Hesley Hall [Tickhill].....	1·16	— ·78	·33	27	13	55·0	10*b*	25·0	7,19	8	...
,,		Derby (Midland Railway).....	1·96	+ ·03	·52	27	18	55·0	4	27·0	6	8	...
VIII.		Bolton (The Park).....	4·71	+ 1·20	·67	14	23	53·7	1	28·0	19	3	13
IX.		Wetherby (Ribston Hall) ...	1·79	— ·17	·31	2	18	...	...	...	...	...	...
,,		Arncliffe Vicarage.....	3·35	— 2·72	·48	14	23	...	...	...	...	...	...
,,		Hull (Pearson Park).....	1·63	— ·66	·32	2	17	56·0	10	27·0	30	7	20
X.		Newcastle (Town Moor)	2·04	— ·42	·50	30	16	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	9·70	— 4·28	1·29	23	19	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	2·36	— 1·60	·54	27	20	...	...	...	...	...	...
,,		Haverfordwest	3·35	— 1·51	1·07	1	17	56·6	2	25·4	19	3	11
,,		Aberystwith (Gogerddan) ...	6·01	+ 1·06	1·42	27	16	61·0	13	20·0	18	13	...
,,		Llandudno.....	3·89	+ ·55	·85	27	21	59·0	12	32·0	19*f*	2	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·62	— ·92	·61	8	17	56·0	4	22·0	30	9	...
XIII.		Edinburgh (Royal Observatory)	1·47	...	·55	28	14	54·9	12	25·6	30	5	12
XIV.		Colmonell	4·92	+ ·28	·74	24	20	56·0	1	21·0	29	4	...
XV.		Tighnabruaich	5·83	...	·68	14	22	51·0	4	27·0	29	5	7
,,		Mull (Quinish).....	5·36	— ·61	·84	23	23	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·63	— 2·02	·39	28	13	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	·85	— 1·96	·20	2	14	55·6	12	26·0	30	6	...
XVII.		Braemar	1·99	— 1·78	·36	13	20	51·2	6, 12	20·2	30	9	26
,,		Aberdeen (Cranford)	3·45	+ ·09	·54	15	24	55·0	5	24·0	6	13	...
,,		Cawdor (Budgate)	3·40	+ ·66	·55	14	22	...	...	...	...	...	...
XVIII		Strathconan (Dalbreac)	5·85	+ ·20	·73	10	14	...	...	...	...	...	...
,,		Glencarron Lodge.....	11·69	+ 1·77	2·19	23	28	55·2	13	19·0	30	7	...
XIX.		Dunrobin	4·78	+ 1·49	·87	14	16	55·0	14	25·0	30	8	...
,,		Castletown.....	5·27	...	·69	14	24	52·0	11	22·0	27	8	...
XX.	IRELAND.	Darrynane Abbey.....	3·09	— 1·86	·75	1	22	...	...	33·0	30	0	...
,,		Waterford (Brook Lodge) ...	2·10	— 1·42	·63	13	9	56·0	12	23·0	19	7	...
,,		Broadford (Hurdlestown) ...	2·44	— ·81	·42	11	21	52·0	18	28·0	29*f*	7	...
XXI.		Carlow (Browne's Hill)	2·73	— ·34	·46	28	13	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·13	— ·43	·62	28	16	60·0	12	29·2	30	3	8
XXII.		Ballinasloe	2·35	— 1·22	·42	11	22	61·0	11*c*	23·0	30	11	...
,,		Clifden (Kylemore)	4·70	— 3·24	1·10	13	22	...	...	...	...	...	...
XXIII		Seaforde.....	2·06	— 1·64	·70	28	19	53·0	10*d*	26·0	29	6	10
,,		Londonderry (Creggan Res.).	3·99	+ ·12	·73	27	25	...	...	...	...	...	...
,,		Omagh (Edenfel)	3·04	— ·67	·64	27	26	54·0	11	26·0	30	7	12

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

a and 9, 10. *b* and 12, 13, 14, 23. *c* and 13. *d* and 11. *e* and 25, 30. *f* and 30.

SUPPLEMENTARY RAINFALL, NOVEMBER, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Harrow Weald	1·85	XI.	Llandefaelog-fach.....	2·82
II.	Dorking, Abinger Hall .	2·53	,,	New Radnor, Ednol.....	3·06
,,	Sheppey, Leysdown	2·62	,,	Rhayader, Nantgwillt...	6·49
,,	Hailsham	2·33	,,	Lake Vyrnwy	3·75
,,	Crowborough.....	2·56	,,	Ruthin, Plâs Drâw	2·95
,,	Ryde, Beldornie Tower..	1·45	,,	Criccieth, Talarvor	5·59
,,	Bournemouth, Kempsey	1·70	,,	I. of Anglesey, Lligwy..	3·24
,,	Emsworth, Redlands ...	1·76	,,	Douglas, Woodville.....	4·21
,,	Alton, Ashdell	1·92	XII.	Stoneykirk, Ardwell Ho.	3·35
,,	Newbury, Welford Park	2·05	,,	Dalry, Old Garroch	5·46
III.	Oxford, Magdalen Coll..	1·40	,,	Moniaive, Maxwelton Ho.	4·25
,,	Banbury, Bloxham	1·38	,,	Lilliesleaf, Riddell	1·86
,,	Pitsford, Sedgebrook ...	1·49	XIII.	N. Esk Res. [Penicuick]	3·25
,,	Huntingdon, Brampton.	2·30	XIV.	Dalry, Blair	...
,,	Wisbech, Bank House...	1·82	,,	Glasgow, Queen's Park..	2·70
IV.	Southend	2·85	XV.	Inveraray, Newtown ...	6·83
,,	Colchester, Lexden	1·98	,,	Ballachulish, Ardsheal...	7·78
,,	Saffron Waldon, Newport	1·77	,,	Campbeltown, Redknowe	4·80
,,	Rendlesham Hall	1·96	,,	Islay, Eallabus.....	5·63
,,	Swaffham	1·63	XVI.	Dollar.....	1·68
V.	Salisbury, Alderbury ...	1·31	,,	Balquhidder, Stronvar...	...
,,	Bishop's Cannings	2·04	,,	Coupar Angus Station...	·86
,,	Ashburton, Druid House	2·97	,,	Blair Atholl	2·00
,,	Okehampton, Oaklands.	4·43	,,	Montrose, Sunnyside ...	1·57
,,	Hartland Abbey	3·09	XVII.	Alford, Lynturk Manse..	2·71
,,	Lynmouth, Rock House	3·23	,,	Keith H.R.S.....	3·33
,,	Probus, Lamellyn	3·10	XVIII.	Fearn, Lower Pitkerrie..	2·95
,,	Wellington, The Avenue	1·99	,,	S. Uist, Askernish	5·60
,,	North Cadbury Rectory	1·95	,,	Invergarry.....	6·97
VI.	Clifton, Pembroke Road	1·91	,,	Aviemore, Alvey Manse.	3·50
,,	Ross, The Graig	1·18	,,	Loch Ness, Drumnadrochit	3·61
,,	Shifnal, Hatton Grange	2·29	XIX.	Invershin	5·65
,,	Wem Rectory	2·27	,,	Bettyhill	5·88
,,	Cheadle, The Heath Ho.	2·96	,,	Watten H.R.S.....	4·93
,,	Coventry, Kingswood ...	1·93	XX.	Cork, Wellesley Terrace	1·64
VII.	Market Overton	1·85	,,	Killarney, District Asyl.	2·90
,,	Grantham, Stainby	1·88	,,	Glenam [Clonmel]	1·44
,,	Horncastle, Bucknall ...	1·53	,,	Ballingarry, Hazelfort...	2·64
,,	Worksop, Hodsck Priory	1·41	,,	Miltown Malbay	3·62
VIII.	Neston, Hinderton	3·46	XXI.	Gorey, Courtown House	2·19
,,	Southport, Hesketh Park	3·06	,,	Moynalty, Westland ...	2·43
,,	Chatburn, Middlewood.	3·60	,,	Athlone, Twyford	2·38
,,	Duddon Val., Seathwaite Vic.	6·86	,,	Mullingar, Belvedere ...	2·68
IX.	Langsett Moor, Up. Midhope	2·85	XXII.	Woodlawn	2·87
,,	Baldersby	1·26	,,	Westport, Murrisk Abbey	3·33
,,	Scalby, Silverdale	2·95	,,	Crossmolina, Enniscoe ..	4·59
,,	Ingleby Greenhow Vic..	2·47	,,	Collooney, Markree Obs.	3·82
,,	Middleton, Mickleton ...	2·08	XXIII.	Enniskillen, Portora ...	2·55
X.	Beltingham	2·16	,,	Warrenpoint.....	2·02
,,	Bamburgh	2·10	,,	Banbridge, Milltown ...	2·07
,,	Keswick, The Bank	3·46	,,	Belfast, Springfield	2·59
,,	Melmerby Rectory	2·54	,,	Bushmills, Dundarave..	4·25
XI.	Llanfrechfa Grange	1·84	,,	Stewartstown	2·37
,,	Treherbert, Tyn-y-waun	5·56	,,	Killybegs	...
,,	Castle Malgwyn	3·12	,,	Horn Head	3·78

METEOROLOGICAL NOTES ON NOVEMBER, 1903.

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.—Until the 27th the R was very light and the weather on the whole was fair and mild, but dull and cloudy. On the 27th and 28th 1·38 in. of R fell during a deep depression, bringing the total to within half-an-inch of the average. There was very little fog. Slight S on 30th. Mean temp. 44°·8, or 1°·8 above the average.

ABINGER HALL.—Mild and genial throughout, with 1·43 in. of R on 27th.

TENTERDEN.—Very little R till the 27th. Three or four inches of S on 30th. Gales on 21st and 27th. Duration of sunshine 64·6 hours.

CROWBOROUGH.—Dull and cold on the whole, but more or less sun on 18 days. Till the 25th it was dry, but heavy R fell on the subsequent days. S on the night of the 29th. Frost on 10 nights. Mean temp. 43°·5.

HARTLEY WINTNEY.—Beautifully fine until the last few days. Little fog or frost. Storm of wind and R on 27th, followed by colder days till the end. Ozone every day; mean 4·35.

WINSLOW, ADDINGTON.—Not much R until the end, and the land was getting dry, so that it was possible to get over fields in comfort. But the R of 27th and 28th brought back the state of saturation and covered the meadows with water. Some S on 30th.

PITSFORD, SEDGEBROOK.—Dry, but dark and gloomy. R ·93 in. below the average of 10 years. Mean temp. 42°·2. Hoar frost on several nights.

BURY ST. EDMUNDS, WESTLEY.—R fell in small quantities till the 27th, when 1·01 in. fell in 24 hours causing floods.

TORQUAY, CARY GREEN.—R 2·37 in. below the average. Up to 22nd only ·22 in. fell. Mean temp. 48°·8, or 1°·4 above the average. Duration of sunshine 92·6 hours, or 29·0 hours above the average. Mean amount of ozone 4·9; max. 8·5 on 21st with W.N.W. wind; min. 1·0 on 19th with N.W. wind.

WELLINGTON, THE AVENUE.—The driest month of the year except February and one of the finest. R about 1·25 in. below the normal amount.

NORTH CADBURY RECTORY.—The least abnormal month since January. The number of wet days was very large, but the R below the average. Temp. slightly below the average. The month ended with a bright, quiet frost in spite of the deep barometric depression.

CLIFTON, PEMBROKE ROAD.—A whole day's R on 2nd was followed by a week of dry weather with easterly winds and morning fog. Westerly winds prevailed for the rest of the month, with frequent light R and strong winds. Frost on 29th and 30th, with N.E. winds. R 1·50 in. below the average.

ROSS, THE GRAIG.—Very fine and a contrast to October. Tender plants were not injured till the 4th, which is late, although a fortnight earlier than in 1902. R less than half the average. Although there were several severe frosts, the mean temp. was slightly above the average.

BOLTON, THE PARK.—From 1st to 9th fine and calm weather prevailed, afterwards the weather was less settled. The temp. was above the average until the 19th and again from 21st to 29th, the mean being 42°·7, or 0·1 below the average. Bright sunshine on 19 days, making a total of 41·25 hours, or 15·7 hours above the average, and the greatest amount in any November since 1886, when 41·7 hours was reached. The total R for the 11 months of 1903 was 49·19 in., or 3·70 in. more than the previous greatest annual fall.

SEATHWAITE VICARAGE.—Another sad, rainy month, but mild until the last two days.

HULL, PEARSON PARK.—Frequently cold and dull, with but 38·5 hours of sunshine, half of which occurred on 4 days. Occasional dense fog. The first heavy S fell on 30th, followed by sleet and H.

LLANFRECHFA GRANGE.—Free from much fog, but very damp. Mild, with frost on 19th and 30th, and mild nights until 29th. R much below the average.

HAVERFORDWEST.—Very cold from 15th to 20th, a storm system of considerable magnitude developing between 2 a.m. on 20th and 21st. The last two days were cold and dry. Duration of sunshine 62·2 hours.

ABERYSTWITH, GOGERDDAN.—A considerable amount of R, the heaviest being on 27th, when there were floods again. Two spells of sharp frost.

DOUGLAS, WOODVILLE.—Weather most unsettled, with absence of any defined type. Very stormy at times, with violent W. and N.W. gales on 20th, 21st and 25th. H on 3 days. Sharp frosts on 29th and 30th.

SCOTLAND.

CARGEN [DUMFRIES].—Although no heavy fall occurred on any single day, it was an exceptionally damp month, many days on which no R fell being moist and misty. A considerable quantity of the grain crop was still in the fields at the end, and much that had been "secured" was absolutely valueless.

LILLIESLEAF, RIDDELL.—The weather was variable, with a very heavy storm and some S near the end. Wind westerly throughout.

MULL, QUINISH.—Very mild and wet and singularly sunless up to the 29th, when S fell, followed by frost and sunshine.

COUPAR ANGUS.—R on 15 days, in all cases very sparingly, the total being two inches below the average. There was a great improvement in the weather, and a good potato crop. The temp. became very low during the last week.

MONTROSE, SUNNYSIDE ASYLUM.—A capital month, favourable for finishing the harvest and pitting potatoes.

ALFORD, LYNTURK MANSE.—Somewhat early S, a slight fall on the 21st and lasting from 24th more or less to the end.

DRUMNADROCHIT.—R ·56 in. above the average of 17 years. Notwithstanding the almost daily R, the farmers on higher lands secured crops in good condition except potatoes, which became frost-bound in the ground. Of the 63 days ending on 30th, ·01 in. of R, or more, fell on 56.

WATTEN, H.R.S.—Very changeable. Cloudy and wet, with a series of storms of wind and R; then frost and S, thaw and renewed S.

CASTLETOWN, THE CLETT.—The first 8 days were fairly dry, giving farmers some opportunity to finish cutting and partly secure their corn. Broken wet weather to 19th, with an occasional dry day and high winds. From the 19th to the end was very wet and cold with high winds, and on 25th a steady S storm set in, continuing to the end. Some grain still in the fields buried under S, and some still uncut. The potato crop is generally still in the ground.

IRELAND.

DARRYNANE ABBEY.—Mild, with some very fine days in the first half. Some S on 30th.

CORK, WELLESLEY TERRACE.—R 2·42 in. less than the average, and for the 11 months 14·35 in. over the average. The mean temp. was 41°·1, the lowest for 25 years. Gales on 21st and 27th, the latter after a fall of ·58 in. in 9 hours. First S on 30th.

MILTOWN MALBAY.—The last 5 days of the first week were calm, dry and sunny, and splendid for gathering the remainder of a bad harvest, but the remainder was damp and rainy, finishing with sharp frost and slight S.

DUBLIN, FITZWILLIAM SQUARE.—An average month as regards temp. and R. Frost and S showers in the last two days. Mean temp. 45°·4, or exactly the average. Duration of sunshine 98 hours. High winds on 8 days, attaining the force of a gale on 21st and 23rd. Foggy on 6 days.

COLLOONEY, MARKREE OBSERVATORY—Very broken and stormy at times, with R. Temp. about the average. The amount of bright sunshine was very small as the weather was cloudy. A few fogs in the early part.

OMAGH, EDENFEL.—A typical November, with a good deal of weather that in another year, with an atmosphere and soil less saturated by previous R, would have been fine. It was dark, humid and mild, with practically no frost until the last few days.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1903.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.										
	Temp.	Date.	Temp.	Date.	Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	85·9	28	39·7	13	67·5	48·6	49·4	76	133·7	35·4	6·43	10	6·0
Malta	86·7	17	59·5	1	78·4	63·9	60·7	74	136·6	52·5	·08	1	2·5
Lagos, W. Africa	81·0	3, 4	69·0	5	83·8	75·0	73·9	83	134·0	69·0	21·62	21	...
Cape Town	72·3	7	38·8	10*a*	60·2	47·7	48·4	83	...	...	6·79	19	6·3
Durban, Natal	80·4	1	46·1	27	73·9	52·7	...	...	131·3	...	·70	5	2·0
Mauritius	79·6	2, 13	56·5	11	77·5	63·7	61·8	75	142·2	48·2	1·98	16	5·1
Calcutta	98·9	2	72·5	3	94·0	78·2	76·4	75	156·2	71·5	10·70	11	7·2
Bombay	93·1	12	74·8	23	87·6	79·4	77·5	82	135·7	73·4	19·75	19	6·7
Madras	103·1	27	74·3	14	96·8	79·7	73·8	71	143·7	73·7	1·46	7	5·4
Kodaikanal	72·3	6	52·0	19	66·4	54·7	52·2	79	152·1	40·2	5·29	11	7·2
Colombo, Ceylon	89·2	29	70·8	3	87·5	78·2	75·6	84	146·5	70·0	5·42	25	7·6
Hongkong	90·5	12	73·4	28	86·4	78·5	76·0	82	145·3	...	25·23	18	7·4
Melbourne	60·1	30	33·1	24	54·6	42·8	42·6	82	115·6	25·8	3·35	16	7·7
Adelaide	64·0	2	38·2	19*b*	58·6	44·9	45·4	81	124·3	31·6	3·87	18	7·2
Coolgardie	71·8	6	35·0	16	62·2	45·1	45·7	73	139·0	31·1	1·58	8	6·2
Sydney	64·9	23	38·4	26	59·7	47·6	42·0	75	96·0	30·0	1·74	13	4·3
Wellington	62·0	30	32·0	8	53·1	40·3	39·6	79	95·0	25·0	3·04	16	4·9
Auckland	62·0	12	40·5	26	57·4	48·1	44·3	74	120·0	38·0	3·20	21	6·3
Jamaica, Negril Point	91·8	29	69·6	11	87·6	74·5	73·4	75	...	...	2·65	7	...
Trinidad	96·0	1	61·0	4	75·1	73·7	72·3	79	167·0	62·0	5·42	15	...
Grenada	88·8	9	72·0	2	84·5	74·7	71·7	78	152·0	...	8·73	29	4·0
Toronto	87·6	30	44·3	19	71·1	52·5	52·6	74	104·0	39·4	3·34	15	6·3
St. John's, N.B.	75·0	23	41·8	5	65·3	49·2	...	...	...	...	3·13	12	7·1
Winnipeg	87·0	26	34·5	15	75·4	47·6	...	...	...	...	·49	8	4·5
Victoria, B.C.	87·8	8	42·3	3	66·6	51·4	...	...	...	...	·67	13	6·4
Dawson	89·5	19	34·5	7	71·5	46·1	...	...	...	...	·50	8	3·6

a and 22. *b* and 28.

MALTA.—Mean temp. of air 69°·6 or 2°·0 below, mean hourly velocity of wind 10·2 miles or 1·4 above, averages. Mean temp. of sea 73°·3.

Mauritius.—Mean temp. of air 1°·1, dew point 1°·0, and R ·07 in., above averages. Mean hourly velocity of wind 10·3 miles, or 0·9 below average; extremes, 28·7 on 26th and 1·7 on 3rd; prevailing direction E.S.E.

MADRAS.—Bright sunshine 126·3 hours, or 32·8 per cent. of possible.

KODAIKANAL.—Mean temp. of air 58°·7. Mean velocity of wind 337 miles per day. Bright sunshine 107·2 hours.

COLOMBO.—Mean temp. of air 81°·8 or 0°·8 above, of dew point 1°·4 above, and R 2·90 in. below, averages. Mean hourly velocity of wind 9·8 miles, prevailing direction S.W.

HONGKONG.—Mean temp. of air 82°·0. R 9·42 in. above average. Bright sunshine 151·6 hours. Mean hourly velocity of wind 11·7 miles, prevailing direction S.S.W.

Adelaide.—Mean temp. of air 51°·8 or 1°·6 below, and R ·98 in. above, the average. Very cloudy month, with humid weather and frequent rain in settled areas, but rains deficient inland.

Sydney.—Mean temp. of air 0°·7, humidity 4·8, and R 3·87 in. below, averages.

Wellington.—Mean temp. of air 2°·6 below, and R 2·06 in. below, averages.

Auckland.—Mean temp. of air slightly below average. R 1·50 in. below average of 35 years. Cloudy and showery.

TRINIDAD.—R 2·90 in. below the 40 years' average.

SYMONS'S

METEOROLOGICAL MAGAZINE.

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THE RAINFALL OF 1903.

THE usual cumulative table of rainfall differences from the average of 1890-99 assumes this month the form of a summary of the rainfall of the year. The 51 stations included in it are not sufficient to allow us to calculate the difference of the rainfall of the country as a whole from the average, but it suffices to show that, speaking generally, the excess was greatest in England and Wales and least in Scotland and Ireland. It shows also that the British Isles were very wet from north to south and from east to west. The largest excesses were recorded at London, Hitchin and Hartley Wintney, where they averaged over 60 per cent.; but it must be remembered that in the south of England the ten years employed for an average in these pages was drier than the thirty years' average by nearly ten per cent. The north-west of Scotland also showed large excesses, more than 50 per cent. in several places, and there the average for the ten years used does not differ appreciably from the long period average.

In discussing the rainfall of the country on the basis of 62 stations with 30 years averages in a letter to *The Times* of January 11th, we pointed out that the excess of rainfall for England seemed to be about 28 per cent., for Wales (and this was due especially to the mountainous part of North Wales) 33 per cent., for Scotland 26 per cent., for Ireland 29 per cent., and for the British Isles 28 per cent. These, of course, are preliminary figures liable to correction. The heavy rainfall of the Thames basin, and especially of London, seems to be quite unprecedented, but taking a wider sweep we must recognise that the year was not so wet as 1872 or as 1852. There does not seem to be any recent year, with those exceptions, approaching 1903, unless 1877 may possibly have some claim to consideration. The driest areas relatively to the average, and probably the driest absolutely for the year, seem to have been in Norfolk and in a narrow strip of country running from south of Leicester through Lincolnshire to Hull; the excess there not exceeding ten per cent. of the thirty years' average.

Speaking generally, we may say that 1903 was wetter than any year since 1872, and was not previously excelled for wetness since 1852.

Rainfall of the year 1903, *showing excess on the average of the ten years* 1890–99.

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 .....+	15·32	167	Arncliffe ...+	20·25	133	Braemar ...+	9·40	127
Tenterden .....+	6·03	123	Hull .....+	4·23	117	Aberdeen ...+	8·32	126
Hartl'yW'ntn'y+	13·94	156	Newcastle...+	8·56	133	Cawdor .....+	3·57	112
Hitchin .....+	14·31	162	Seathwaite +	31·89	124	Glencarron +	14·44	115
Winslow .....+	11·10	147	Cardiff .....+	15·23	139	Dunrobin ...+	6·22	120
Westley.....+	6·19	124	Haverf'dwest+	13·50	131	Darrynane +	4·40	109
Brundall.....+	4·45	118	Gogerddan +	16·54	137	Waterford +	11·32	129
Alderbury .....+	12·26	145	Llandudno +	7·95	126	Broadford.. +	13·29	140
Ashburton .....+	16·61	133	Dumfries ...+	16·96	139	Carlow .....+	10·97	133
Polapit Tamar +	15·41	142	Lilliesleaf ...+	11·90	139	Dublin .....+	4·29	116
Stroud .....+	13·07	149	Colmonell ...+	9·14	121	Mullingar...+	11·70	132
Woolstaston ...+	14·61	150	Glasgow ...+	19·33	153	Ballinasloe +	10·30	128
Boston .....+	9·49	147	Inveraray ...+	16·47	123	Clifden .. ...+	7·70	110
Hesley Hall ...+	5·38	125	Islay .....+	11·21	124	Crossmolina +	12·69	124
Derby.....+	8·53	138	Mull .....+	12·96	123	Seaforde ...+	12·42	134
Bolton .....+	10·03	124	Loch Leven +	16·36	146	Londonderry+	5·56	113
Wetherby .....+	13·95	159	Dundee .....+	7·10	126	Omagh .....+	15·20	138

AN UNEXPECTED USE FOR SUNSHINE RECORDERS.

It is only a commonplace remark that some of the most important discoveries of science have been the unexpected results of investigations made with quite different objects in view. It is perhaps to descend from great things to small—and it is certainly without wishing to suggest that the "discovery" is likely to rank as more than an interesting one—to point out that something analogous to this has occurred in connection with the Campbell-Stokes sunshine recorder, since it has quite recently been found that that instrument, designed to record bright sunshine, is also capable of registering the presence in the air of substances likely to obstruct the passage of the sun's rays.

Our readers will no doubt remember the paper on the great dust fall of February 21st, 1903, which Dr. Mill read before the Royal Meteorological Society at its November meeting. From a large body of evidence it was shown that over a large part of the British Isles, and also over a considerable portion of the Continent, a great quantity of dust had been deposited, after having been borne on the wings of the wind over land and sea for vast distances. This evidence was obtained from various sources. In many instances the dust was found as a deposit in the rain water collected in rain gauges. In others it was seen on window-panes, upon which the

rain had beaten; and in others the fall had been sufficiently large to be seen upon the ground, or upon objects open to the sky, and sometimes without the agency of rain for its deposition. Amongst other sources of information were the cards which had been exposed in sunshine recorders, on many of which the red dust had left indelible marks, as well as specimens of the dust itself.

Since then similar evidence has been found of another dust fall which occurred on the 27th of November last, and which seems to have extended itself over a great part of England, but to have been specially well marked in the south-eastern districts. In this instance, as in the former, not only were the cards stained by the wetted dust, but unmistakeable specimens of the dust itself had been left attached to the cards. In both falls, however, cases were noticed in which those who removed the cards had tried to remove the stains also, evidently because it was thought to be "dirt" which had no business there; and the chief object of this note is to call the attention of sunshine observers to the fact that records of such dust falls may be expected, and will certainly be useful, and to get them to handle the cards at such times as it may be noticed carefully, and to record their appearance before the dust, or the stains of the dust if it has fallen in conjunction with rain, has been partially removed or obliterated by rubbing.

One noteworthy fact in connection with the records may be mentioned, namely that in nearly every instance, in both falls, it was found upon the *eastern* side of the card, as a result of the dust having been carried along by a *westerly* wind. During the severe gale of February 26th-27th, 1903, the sunshine card at Blackpool, although exposed on a stand on high ground a couple of miles back from the coast, was *thickly* encrusted over its eastern half with sand and salt brought from the shore by the westerly wind; and not only did a similar thing occur at other places on that coast, but traces of a similar deposit were also found on cards from a few places many miles to the eastward, a fact which proves that sand can travel through the air for considerable distances. In the case of the dust falls which Dr. Mill aud Mr. Lempfert have discussed, a good deal of light has been thrown upon the general circulation of the air, which has proved to be extremely interesting and instructive when considered in conjunction with the views of Dr. W. N. Shaw, F.R.S., as to the actual motion of the air in a travelling storm. It is possible, and indeed probable, that with more precise observations of dust falls, and with more reliable continuous records of pressure, our knowledge respecting atmospheric circulation may be considerably extended and improved.

R. H. C.

ROYAL METEOROLOGICAL SOCIETY.

THE openiug meeting of this Society for the present session was held on Wednesday evening, November 18th, at the Institution of Civil Engineers, Great George Street, Westminster, Capt. D. Wilson-Barker, F.R.S.E., President, in the chair.

The following gentlemen were elected Fellows of the Society :— Mr. H. L. Attridge, Rev. D. C. Bates, Mr. C. Lowthian Bell, Mr. W. Cleeve Edwards, Assoc.M.Inst.C.E., Captain R. Ford, Dr. R. D. Fulton, Mr. T. M. Guest, Mr. R. T. A. Innes, F.R.A.S., Mr. T. N. Leslie, F.G.S., Captain C. H. Ley, R.E., Dr. J. D. Macdonogh, Dr. E. Mather, Mr. W. Morris, M.Inst.C.E., Mr. G. E. J. Rose, Captain W. R. Rowe, and Captain L. H. Tamplin.

Dr. H. R. Mill and Mr. R. G. K. Lempfert gave a Report on "The Great Dustfall of February, 1903, and its Origin."

Dr. Mill read extracts from many of the letters which he had received bearing on the enquiry, and exhibited maps showing the distribution of the dust, from which it appeared that the dust reported on February 21st or 22nd fell over nearly all parts of England and Wales to the south of a line drawn from Anglesey through Wrexham and Northampton to Ipswich, except in parts of northern Cornwall, Somerset, Wilts and Mid Wales. To the north of that line there was an apparently isolated fall in northern Norfolk, and at a few remotely isolated stations, at most of which the fall did not attract the attention of any observers, but is believed to have taken place, on account of distinct marks of yellow dust detected on the sunshine cards sent in to the Meteorological Office. The dust usually attracted attention either in the form of a dense yellow haze, like a London fog, or as a reddish yellow powder lying thickly on trees or roofs, or adhering to windows. In some instances it was noticed in the form of drops of muddy rain, in others the circumstance which struck the observer was the soapy appearance of the water in a rain gauge, a water butt, or, in one case at least, in an open leet carrying the water-supply of a town. The fall was often accompanied by temperatures considerably above the average and by remarkably low relative humidities. In order to ascertain whether the composition of the dust threw any light on its origin about fifty samples, including some from the Continent and some collected at sea, were submitted to the Geological Survey and examined by Dr. J. S. Flett.

Mr. Lempfert exhibited maps showing the meteorological conditions prevailing during the period when the dust appeared. With the help of these isobaric charts he endeavoured to trace the source from which the air was being supplied to north-west Europe on the morning of February 22nd. Trajectories of the air had been drawn from a number of points in a manner similar to that employed in Dr. W. N. Shaw's paper on the Storm of February 26-27, 1903. The trajectory which reached the southern part of England could be traced backwards in a south-westerly direction to the neighbourhood

of the Azores, but here it turned to the south, and finally to the south-east, and was carried back to the north-west coast of Africa on the morning of the 19th. He was, therefore, of opinion that there is reason to believe that the air which reached the southern half of England on the 22nd started from the north-west coast of Africa on the 19th, and he considered this afforded strong evidence of the African origin of the dust, and of its having travelled to north-west Europe by a path not very different from that indicated by the trajectories.

Dr. J. S. Flett said that the result of his examination of the specimens of the dust was to show that the bulk of each consisted of comparatively coarse particles of mineral and organic origin derived from the locality where it was collected. These coarser particles consequently presented a great variety of composition, some being mainly calcareous, others made up of sand or clay, in fact, just such local dust as might be expected to be mixed with the finer particles falling from the air. In addition to the coarser particles all the samples contained a very fine grained reddish clay, the particles of which were too minute to be satisfactorily determined mineralogically. This clay was certainly derived from some source beyond the British Isles, but it was not distinctive enough to afford much evidence as to its place of origin.

The President, Mr. R. H. Curtis, Mr. F. Druce, Mr. F. J. Brodie, and Mr. C. Harding took part in the discussion, and Dr. H. R. Mill and Mr. R. G. K. Lempfert replied.

The second monthly meeting of this Society for the present session was held on Wednesday evening, December 16th, at the Institution of Civil Engineers, Great George Street, Westminster, Captain D. Wilson-Barker, F.R.S.E., President, in the chair.

Mr. C. O. Baines, Mr. J. N. Beadles, Mr. R. Brown, Assoc.M.Inst.C.E. Mr. F. J. Finglah, Mr. V. Smith, Mr. J. H. Taylor, M.Inst.C.E., Mr. T. G. Taylor, Mr. T. J. Thomas, Assoc.M.Inst.C.E., and Mr. C. T. R. Wilson, F.R.S., were elected Fellows of the Society.

Mr. W. Marriott gave an account of the meteorological work of the late Mr. James Glaisher, F.R.S., who was the founder of the Society, in 1850, and who died on February 7th last at the advanced age of 93 years. Mr. Glaisher was appointed Superintendent of the Magnetic and Meteorological Department of the Royal Observatory, Greenwich, on its formation in 1840. He soon became interested in and conversant with all kinds of meteorological investigations, and through his instrumentality numerous meteorological stations were equipped in various parts of the country. He supplied quarterly the results from those stations to the Registrar General from 1847 up to March, 1902. He prepared various Tables of Corrections for the use of these observers, the principal of which were his "Hygrometrical Tables," which have passed through nine editions. He was a juror of the Great Exhibition of 1851, and as such he caused a

great stimulus to be given to the manufacture of reliable meteorological instruments. Mr. Glaisher was best known to the public by the twenty-eight balloon ascents which he made for scientific purposes in 1862-66 on behalf of a British Association Committee. Mr. Marriott illustrated his address with numerous lantern slides and also exhibited the instruments, used by Mr. Glaisher in his balloon ascents, which by the courtesy of his son, Dr. J. W. L. Glaisher, F.R.S., had recently come into the possession of the Royal Meteorological Society.

A paper by Mr. J. R. Sutton, M.A., on "Certain Relationships between the Diurnal Curves of Barometric Pressure and Vapour Tension at Kenilworth (Kimberley), South Africa," was, in the absence of the author, read by the Secretary. The author referred to the views of a number of leading meteorologists on the part played by "vapour tension" as a component of barometric pressure, and brought forward a series of observations at Kimberley designed to throw light on the still unsolved problem of the cause of the diurnal barometric wave. The paper elicited some discussion, in which Dr. W. N. Shaw and Mr. Dines took part.

Correspondence.

GREENWICH RAINFALL OF 1821 AND 1824.

To the Editor of Symons's Meteorological Magazine.

Will you kindly permit me to point out an error of some importance in your article on "The Unexampled London Rainfall of 1903." In that article (p. 181) the following values marked "doubtful records" are given for Greenwich Observatory for the years 1821 and 1824—viz., 34·5 in. and 36·3 in. These values are not correct, the amounts recorded in the Observatory Journals being 31·53 in. and 32·98 in. Dines, in his paper on the "Rainfall of the London District, 1813—1872," gives rainfall for 1821 as 31·69 in. and for 1824, 32·43 in. (*Quarterly Journal, Meteorological Society, 1873.*)

W. C. NASH.

Mycena Road, Westcombe Park, S.E.,
7th January, 1904.

[We think it right to publish this letter at once, so that it may appear in the same volume as the original statement; but the figure for 1824 quoted by Mr. Nash coincides with that observed by Mr. J. H. Belleville, at Park Row, Greenwich, and not, we understand, at the Observatory itself. We have a copy of a record for "Greenwich Observatory," giving the figures quoted in our article, but there is a note attached by Mr. G. Dines which seems to cast doubt upon it, hence the mark "doubtful." We shall look into the matter further at a less busy period of the year.—*Ed. S.M.M.*]

THE CLIMATE OF KODAIKÁNAL.

By C. Michie Smith.

The Kodaikánal Observatory is situated on the Palani Hills in South India, in about latitude 10° 14′ N. and longitude 77° 30′ E. The height of the barometer cistern above sea level is taken as 7,688 feet, but this may be in error by several feet. Observations of the barometer, wet and dry bulb thermometers, and of rainfall, were begun in May, 1899, and complete observations were begun in January, 1900, except for wind direction and force, which were not made in a satisfactory way till the completion of the anemometer tower early in 1902. As usual in India the thermometers are exposed in an open shed covered with six inches of thatch. The means are determined from Richard records standardised by four eye readings of the thermometers daily. It may be thought that the observations have continued for so short a time that the means cannot be taken to be of much value, and for this reason they are given only to the nearest degree. At the same time it may be noted that the differences between the several years are so small in the case of pressure and temperature that, I believe, the provisional means given below are very near the truth. As regards wind and rain, and perhaps sunshine, this is not the case, and though the means are given in the table they cannot be considered to be satisfactory.

The outstanding feature of the climate is, undoubtedly, the remarkable uniformity of the temperature throughout the year—the range of the mean monthly temperature being only 7° F. The extreme range from highest shade maximum to lowest shade minimum is 37°. In the shed, four feet above the ground, the temperature has never fallen below 39°, but on the grass outside it has fallen as low as 23°·4. Hoar frost is not uncommon in the early mornings from November to February, but this is largely an effect of evaporation. It is most intense on low-lying, damp ground, and on very dry mornings when the relative humidity (as calculated by the ordinary tables) may fall as low as 5 %.

Kodaikánal is, during the summer months, a fairly popular health resort. Most of the houses lie near the lake, which is some 800 feet below the Observatory, and are sheltered by hills and woods. The soil is mainly gravel, so that the ground dries quickly even after a heavy shower of rain. The most unpleasant part of the year is usually from the middle of October till towards the end of December, when heavy mist and rain may be expected at frequent intervals. The first three months of the year are usually very fine, but the station is then nearly deserted, since the heat of the plains has not yet driven people up to the hills. After that, though the mornings and evenings are usually fine, there are frequent showers in the afternoons. With its fine scenery and splendid climate Kodaikánal has probably a great future before it as a health resort, especially for persons of moderate means or for those who shun the excessive gaieties of stations like Simla and Ootacamund.

Mean Monthly and Annual Meteorological Averages (provisional) for Kodaikánal Observatory.

	BAROMETER.		DRY BULB THERMOMETER.				WET BULB.		Tension of Vapour	Relative Humidity.	Sun Max. in Vac.	Min. on Grass	WIND.			RAIN.		Clear Sky.	Bright Sunshine.
	Reduced to 32°.	Daily Range.	Mean	Max.	Min.	Range.	Mean	Min.	By Blandford's Tables.				Daily Velocity.	Mean Direction.		Amount	Days		
	in.	in.	°	°	°	°	°	°	in.	cents.	°	°	miles.	points.	points.	in.	No.	cents	hours.
Jan.....	22·853	0·071	54	63	47	16	47	41	0·261	63	120	38	368	6	E.N.E.	*4·12	5	67	238
Feb.....	·878	·070	55	65	48	17	48	42	·271	61	129	39	292	6	E.N.E.	*2·20	4	60	202
March..	·867	·068	58	68	51	17	49	42	·255	53	134	43	346	6	E.N.E.	2·69	4	69	251
April ...	·833	·071	59	69	53	16	54	48	·358	70	138	46	260	5	N.E. by E.	4·99	10	46	202
May ...	·822	·068	60	69	55	14	55	51	·386	73	136	50	250	2	N.N.E.	4·36	11	42	194
June ...	·779	·057	58	66	54	12	54	50	·363	77	132	50	355	28	N.W.	3·54	12	29	144
July ...	·765	·056	57	63	52	11	53	49	·380	83	128	49	400	27	N.W.byW.	4·38	13	24	103
August..	·777	·063	57	64	53	11	54	50	·394	84	130	49	302	29	N.W.byN.	3·95	12	27	118
Sept. ...	·812	·071	57	64	52	11	56	50	·396	85	132	49	287	31	N. by W.	7·52	15	33	106
Oct.....	·827	·076	55	62	51	11	54	49	·386	86	127	47	252	4	N.E.	11·16	20	31	118
Nov. ...	·835	·070	54	61	49	12	52	47	·373	87	121	45	243	3	N.E. by N.	6·60	16	32	88
Dec. ...	·845	·074	54	62	48	14	49	44	·307	73	118	42	247	5	N.E. by E.	5·73	10	51	156
Annual ..	22·824	0·068	56	65	51	14	52	47	0·344	75	129	46	300	2	N.N.E.	61·24	132	43	1920
																5·10	11		160

* Rainfall certainly abnormally high.

Sun passes through zenith April 16th and August 26th.

Extreme Monthly Meteorological Results at Kodaikánal, 1899-1902.

	Barometer.		Dry Bulb Thermometer.		Wet Bulb.	Humidity	Sun Thermom.	Grass Thermom.	Wind. miles per day.		Rain.
	Highest.	Lowest.	Highest.	Lowest.	Lowest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Greatest Fall.
	In.	In.	°	°	°	%	°	°			In.
Jan.....	22·953	22·751	71	39	30	5	147	27	569	105	4·08
Feb.	·989	·781	71	43	33	5	147	29	544	113	1·23
Mar.....	·994	·782	75	45	35	6	154	32	562	113	3·74
April ...	·921	·730	74	49	40	16	155	37	882	102	1·59
May....	·955	·733	76	51	43	25	150	41	441	88	1·53
June....	·905	·654	72	50	41	36	157	43	790	80	1·67
July....	·886	·660	69	49	41	5	148	42	722	82	1·58
Aug.. ..	·865	·656	69	49	42	40	157	39	758	88	2·16
Sept. ...	·927	·710	68	48	42	36	151	42	682	77	2·66
Oct.....	·960	·682	68	44	37	37	148	37	720	55	1·81
Nov.....	·948	·720	67	39	33	13	149	28	554	72	2·25
Dec.	·944	·730	70	42	33	7	141	23	700	52	3·21

METEOROLOGICAL NEWS AND NOTES.

THE DAILY WEATHER REPORT for January 1st achieved a record in up to date information by publishing the annual totals of rainfall for 1903 at all the telegraphic reporting stations on the very day on which the last readings of the gauges were taken.

THE SCOTTISH ANTARCTIC EXPEDITION, after cruising in high latitudes in Weddell Sea and carrying out important oceanographical investigations, wintered in the South Orkneys, where Mr. Mossman remained behind while the *Scotia* went north to the Falklands and Buenos Aires to obtain supplies and communicate with home. Mr. Mossman, writing from the South Orkneys, informs us that he has obtained very interesting meteorological observations, a report of which we hope soon to receive. It is gratifying to see from the daily press that Mr. Bruce, the leader of the expedition, has obtained additional funds, which justify him in returning to Antarctic waters before the close of the present summer.

THE SWEDISH ANTARCTIC EXPEDITION, under Dr. Otto Nordenskiöld, spent the southern winter of 1903 in the exploration of the Antarctic Archipelagoes south of South America. The main party wintered on Seymour Island and experienced terrible weather, an unceasing succession of gales with very low temperatures. Their ship, the *Antarctic*, was crushed in the ice and lost, and the expedition was rescued by the very successful voyage of a vessel equipped by the Argentine Government and commanded by an Argentine naval officer.

A METEOROLOGICAL CHRISTMAS CARD sent to us by an esteemed correspondent succeeded in being both artistic and apposite. It represents a person closing an umbrella marked "1903," and the legend runs—

"We bid you farewell without much regret;
You'd have been a fine year if you hadn't been wet."

THE TEMPERATURE OF 1903 IN LONDON.

The following table gives a summary of the mean and extreme shade temperatures at Camden Square during the past year as compared with the average of 45 years.

Mean and Extreme Shade Temperature in 1903 *at Camden Square.*

	Mean Temp.	Diff. from Average	Mean Max.	Diff from Average	Mean Min.	Diff. from Average	Absolute Max.	Absolute Min.
	°	°	°	°	°	°	°	°
January	40·8	+2·7	45·2	+2·2	36·0	+2·7	53·8	22·1
February	45·1	+5·3	50·8	+5·3	40·0	+5·3	59·0	25·7
March	46·4	+4·3	53·9	+3·7	39·5	+4·0	67·9	29·9
April	45·2	—2·9	53·6	—4·5	37·1	—2·6	61·1	27·8
May	55·0	+1·0	65·1	+0·4	45·8	+1·4	80·9	34·9
June	57·6	—2·8	67·5	—3·8	48·6	—2·3	85·9	39·7
July	63·2	—0·1	73·1	—1·0	54·5	—0·5	87·2	45·2
August	60·7	—1·4	70·1	—2·5	52·4	—0·9	80·6	45·4
September	58·4	+0·7	67·6	+0·3	50·8	+1·1	83·7	38·1
October	53·1	+3·3	59·1	+1·6	47·8	+4·5	67·4	36·0
November	44·8	+1·8	50·2	+1·5	39·7	+2·0	57·2	29.9
December	39·0	—0·2	42·6	—1·4	35·5	—1·1	52·3	26·1
Year	50·8	+1·0	58·2	+0·1	44·0	+1·4	87·2	22·1

The most notable point is the extremely mild character of the year as a whole. This seems to be chiefly the result of high minima during the winter months, although in February and March, relatively the warmest months of the year, high maxima were almost equally prominent. The first three months all showed temperatures exceeding the average to an extraordinary extent, but this was in some measure balanced by cold weather in April, June and August. The summer was, as a whole, cold, June in particular being exceedingly unseasonable in this respect. A return to milder conditions in the autumn and the almost entire absence of frost until December, brought the mean temp. for the year to 50°·8, a degree above the average, and a figure not often reached in London.

REVIEWS.

Knowledge Diary and Scientific Handbook for 1904. London: *Knowledge* Office, 1903. Size, 9½ × 6. Pp. (text) 108.

A CONVENIENTLY arranged diary for the desk, with letterpress of interest to scientific amateurs.

The Production and Prediction of Magnetic and other Storms. By HUGH CLEMENTS. London: Wm. Hutchinson & Co. 1903. Size, 7½ × 5. Pp. 16. Price 1s.

How to Predict the Weather, Winds, and Magnetic Storms and Sunspots, by HUGH CLEMENTS. (No publisher's name). 1904. Size 7½ × 5, pp. 16 + 26. Price 1s.

WE are unable to make anything of these pamphlets. Such of our readers as are interested in meteorological paradoxes may like to read the assertions they contain; but the misprints often render the arguments obscure. The assertion is very plainly made that the author can forecast the weather from astronomical considerations; but, unfortunately, he has not succeeded in making the method of so doing intelligible to a reader of ordinary scientific education.

Hints to Meteorological Observers in Tropical Africa, with Instructions for taking Observations and Notes on Methods of recording Lake Levels. Published by the Authority of the Meteorological Council. London: H.M. Stationery Office, 1902. Size, 10 × 6. Pp. 16. *Plate.* Price 9d.

A REVISED edition of the "Hints" published by the British Association Committee on the climate of Tropical Africa, with the addition of notes on lake levels supplied by the Admiralty. We congratulate the Meteorological Office on interesting the Hydrographic Office in African fresh water lakes, a task which has frequently been attempted in vain for home waters. We note with interest that in his preface, dated November, 1902, Dr. Shaw states that the Meteorological Council have in view the publication of meteorological observations from the outlying parts of the British Empire. On a small scale we have published such reports in this Magazine for 23 years.

The Meteorological Office has also issued a list of 62 Colonial and Foreign Returns received by them in MS., mainly from tropical Africa and the islands of the Atlantic Ocean. We are surprised that the Pacific Islands are not better represented, as we believe observations are taken at a good many islands occupied by British firms engaged in the copra industry. A list of printed records follows which cannot fail to be useful. We note as a trifling error the omission of "*'s Meteorological*" in the title of this Magazine, which shrivels into "*Symons' Magazine.*"

RAINFALL AND TEMPERATURE, DECEMBER, 1903.

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) ...	1·30	— ·63	·34	10	12	52·3	9	26·1	31	9	18
II.	Tenterden	1·75	— ·48	·46	7	15	51·5	9	22·0	31	10	19
,,	Hartley Wintney	2·68	+ ·54	·66	11	11	52·0	9, 10	25·0	30	10	13
III.	Hitchin	1·90	— ·04	·63	10	15	50·0	9	22·0	30	13	..
,,	Winslow (Addington)	1·20	— ·81	·35	12	13	50·0	9, 22	24·0	3, 31	10	18
IV.	Bury St. Edmunds (Westley)	1·23	— ·88	·30	10	10	49·0	9	24·5	29	...	...
,,	Norwich (Brundall)	1·28	— ·80	·26	10	15	49·0	14	26·0	5	9	18
V.	Winterborne Steepleton	5·06	...	1·37	12	18	51·1	8	20·0	3	12	15
,,	Torquay	5·20	...	1·14	12	20	53·0	7	29·9	1	4	12
,,	Polapit Tamar [Launceston]..	4·64	+ ·98	·74	12	21	51·3	8	20·9	2	12	13
VI.	Stroud (Upfield)	1·66	— ·57	·47	12	14	...	...	25·0	2, 31	11	...
,,	Church Stretton (Woolstaston)	2·68	+ ·13	·56	12	20	47·5	22	22·0	30	15	...
,,	Worcester (Diglis Lock)	1·15	— ·77	·20	8	16	...	...	...	...	...	...
VII.	Boston	1·11	— ·44	·25	8	7	48·0	22	24·0	2	13	...
,,	Hesley Hall [Tickhill].....	·88	— ·98	·17	7	17	49·0	22	20·0	30	15	...
,,	Derby (Midland Railway).....	1·23	— ·63	·40	8	15	49·0	9, 22	26·0	5*b*	12	...
VIII.	Bolton (The Park).....	2·07	— 1·61	·62	3	16	48·4	22	25·1	2	8	18
IX.	Wetherby (Ribston Hall) ...	1·37	— ·55	·26	7	18	...	...	...	...	...	...
,,	Arncliffe Vicarage.....	4·96	— 1·50	1·10	3	21	...	...	...	...	...	...
,,	Hull (Pearson Park).	·80	— 1·40	·19	7	12	49·0	22	26·0	1	11	24
X.	Newcastle (Town Moor)	1·94	— ·49	·40	24	21	...	...	...	...	...	...
,,	Borrowdale (Seathwaite).....	12·46	— 2·47	4·13	3	17	...	...	...	...	...	...
XI.	WALES. Cardiff (Ely).....	4·75	+ ·66	·75	12	20	...	...	...	...	...	...
,,	Haverfordwest	4·84	+ ·13	·61	3	20	52·7	22	22·0	2	10	18
,,	Aberystwith (Gogerddan) ...	3·23	— 1·32	·58	3	16	52·0	21	19·0	1	22	...
,,	Llandudno.....	2·71	— ·19	·90	3	18	56·2	22	27·5	30	4	...
XII.	SCOTLAND. Cargen [Dumfries]	3·74	— ·98	·46	9	17	52·0	22	21·0	2, 30	16	...
XIII.	Edinburgh (Royal Observatory)	1·08	...	·20	3, 13	16	53·1	22	25·6	1	11	25
XIV.	Colmonell	4·90	+ ·05	·85	6	17	56·0	9	18·0	29	14	..
XV.	Tighnabruaich	4·93	...	·82	21	18	46·0	21*a*	27·0	1, 30	12	14
,,	Mull (Quinish).....	5·70	— ·55	1·49	2	16	...	...	...	...	...	...
XVI.	Loch Leven Sluices	3·27	— ·38	·50	3	17	...	...	...	...	...	...
,,	Dundee (Eastern Necropolis)	2·50	— ·31	·60	13	22	53·0	22	23·0	30	12	...
XVII.	Braemar	2·91	— ·10	·79	22	19	47·8	22	13·8	2	24	29
,,	Aberdeen (Cranford)	2·81	— ·17	·74	7	24	50·0	22	19·0	1*c*	18	...
,,	Cawdor (Budgate)	·63	— 1·98	·12	1, 11	10	..	..	...	...	...	...
XVIII	Strathconan (Dalbreac)	1·09	— 4·86	...	...	...	...	...	...	...	...	...
,,	Glencarron Lodge.....	4·37	— 6·06	1·73	2	16	...	...	...	...	...	...
XIX.	Dunrobin	1·42	— 2·04	·40	2	12	47·0	21*a*	24·5	30	17	...
,,	Castletown.....	2·26	...	·48	2	21	48·0	23	22·0	30*d*	19	...
XX.	IRELAND. Darrynane Abbey.....	3·66	— 1·67	·42	6	24	...	...	29·0	2	...	...
,,	Waterford (Brook Lodge) ...	5·87	+ 2·00	·83	14	23	52·0	21	24·0	5	13	...
,,	Broadford (Hurdlestown) ...	5·28	+ 2·02	·65	11	20	48·0	9	22·0	1	11	...
XXI.	Carlow (Browne's Hill)	2·99	— ·39	·44	22	18	...	...	..	...	...	...
,,	Dublin (Fitz William Square)	1·59	— ·76	·29	12	16	55·8	21	27·1	2	8	15
XXII.	Ballinasloe	3·36	— ·23	·72	7	21	61·0	3	21·0	30	22	...
,,	Clifden (Kylemore)	8·09	— ·13	1·33	21	17	...	...	...	...	...	...
XXIII	Seaforde.....	4·48	+ 1·05	·96	6	19	48·0	21*a*	25·0	1	14	18
,,	Londonderry (Creggan Res.).	2·69	— 1·43	·61	7	22	...	...	...	...	...	...
,,	Omagh (Edenfel)	4·24	+ ·30	·54	6	21	51·0	21	13·0	1	16	20

+ Shows that the fall was above the average ; — that it was below it.
a and 22. *b* and 6, 29. *c* and 2, 5. *d* and 31.

SUPPLEMENTARY RAINFALL, DECEMBER, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Harrow Weald	2·06	XI.	Llandefaelog-fach.....	...
II.	Dorking, Abinger Hall .	3·13	,,	New Radnor, Ednol.....	4·46
,,	Sheppey, Leysdown	1·03	,,	Rhayader, Nantgwillt...	6·44
,,	Hailsham	2·08	,,	Lake Vyrnwy	5·70
,,	Crowborough.....	2·84	,,	Ruthin, Plâs Dráw	2·59
,,	Ryde, Beldornie Tower..	2·47	,,	Criccieth, Talarvor	3·83
,,	Bournemouth, Kempsey	2·71	,,	I. of Anglesey, Lligwy..	4·94
,,	Emsworth, Redlands ...	2·33	,,	Douglas, Woodville.....	4·58
,,	Alton, Ashdell	3·77	XII.	Stoneykirk, Ardwell Ho.	3·09
,,	Newbury, Welford Park	2·05	,,	Dalry, Old Garroch	6·86
III.	Oxford, Magdalen Coll..	1·02	,,	Moniaive, Maxwelton Ho.	4·73
,,	Banbury, Bloxham	1·50	,,	Lilliesleaf, Riddell	1·83
,,	Pitsford, Sedgebrook ...	1·10	XIII.	N. Esk Res. [Penicuick]	1·80
,,	Huntingdon, Brampton.	1·31	XIV.	Dalry, Blair	...
,,	Wisbech, Bank House...	·88	,,	Glasgow, Queen's Park..	3·20
IV.	Southend	1·12	XV.	Inveraray, Newtown ...	6·49
,,	Colchester, Lexden	1·20	,,	Ballachulish, Ardsheal...	7·52
,,	Saffron Waldon, Newport	1·33	,,	Campbeltown, Redknowe	5·46
,,	Rendlesham Hall	1·06	,,	Islay, Eallabus..... ...	4·41
,,	Swaffham	1·14	XVI.	Dollar.....	2·58
V.	Salisbury, Alderbury ...	3·30	,,	Balquhidder, Stronvar...	8·06
,,	Bishop's Cannings	2·34	,,	Coupar Angus Station...	2·81
,,	Ashburton, Druid House	7·18	,,	Blair Atholl	...
,,	Okehampton, Oaklands.	7·35	,,	Montrose, Sunnyside ...	3·20
,,	Hartland Abbey	4·43	XVII.	Alford, Lynturk Manse..	2·89
,,	Lynmouth, Rock House	6·18	,,	Keith H.R.S.....	1·48
,,	Probus, Lamellyn	6·95	XVIII.	Fearn, Lower Pitkerrie..	1·21
,,	Wellington, The Avenue	4·19	,,	S. Uist, Askernish	4·41
,,	North Cadbury Rectory	3·30	,,	Invergarry.....	4·80
VI.	Clifton, Pembroke Road	3·13	,,	Aviemore, Alvey Manse.	·40
,,	Ross, The Graig	2·11	,,	Loch Ness, Drumnadrochit	1·26
,,	Shifnal, Hatton Grange	1·86	XIX.	Inversbin	1·53
,,	Wem Rectory	1·64	,,	Bettyhill	1·22
,,	Cheadle, The Heath Ho.	1·93	,,	Watten H.R.S.....	1·55
,,	Coventry, Kingswood ...	1·45	XX.	Cork, Wellesley Terrace	4·67
VII.	Market Overton	1·31	,,	Killarney, District Asyl.	5·11
,,	Grantham, Stainby	·82	,,	Glenam [Clonmel]	5·63
,,	Horncastle, Bucknall ...	·88	,,	Ballingarry, Hazelfort...	3·07
,,	Worksop, Hodsck Priory	·93	,,	Miltown Malbay	6·51
VIII.	Neston, Hinderton	1·56	XXI.	Gorey, Courtown House	4·26
,,	Southport, Hesketh Park	2·98	,,	Moynalty, Westland ...	3·36
,,	Chatburn, Middlewood.	3·18	,,	Athlone, Twyford	2·70
,,	Duddon Val., Seathwaite Vic.	7·77	,,	Mullingar, Belvedere ...	2·57
IX.	Langsett Moor, Up. Midhope	2·71	XXII.	Woodlawn	3·54
,,	Baldersby	1·29	,,	Westport, Murrisk Abbey	4·54
,,	Scalby, Silverdale	1·50	,,	Crossmolina, Enniscoe ..	5·47
,,	Ingleby Greenhow Vic..	1·32	,,	Collooney, Markree Obs.	3·22
,,	Middleton, Mickleton ...	1·83	XXIII.	Enniskillen, Portora ...	3·22
X.	Beltingham	1·87	,,	Warrenpoint.....	3·93
,,	Bamburgh	2·32	,,	Banbridge, Milltown ...	2·26
,,	Keswick, The Bank.....	4·53	,,	Belfast, Springfield	3·07
,,	Melmerby Rectory	3·00	,,	Bushmills, Dundarave..	2·42
XI.	Llanfrechfa Grange	3·95	,,	Stewartstown	3·47
,,	Treherbert, Tyn-y-waun	8·81	,,	Killybegs	4·16
,,	Castle Malgwyn	3·91	,,	Horn Head	3·52

METEOROLOGICAL NOTES ON DECEMBER, 1903.

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.—Extraordinarily sunless and gloomy throughout. There was little frost except during the first week and the last few days. The R was comparatively slight, and almost all fell in the earlier part of the month. Mean temp. 39°·0, or 0°·2 below the average.

TENTERDEN.—Cold at the beginning and end, and showery in the second week. The rest of the month was generally dull and fairly dry. Duration of sunshine 32 hours; 14 sunless days.

CROWBOROUGH.—Cold and dull with several misty days. Frost on first six and last seven days, with a partial thaw on the 4th. Light S on 25th, 26th and 27th. Mean temp. 36°·8. Wind chiefly E. and N.

HARTLEY WINTNEY.—The first 15 days were wet and cold, and the following fortnight warmer and more genial with slight fog. Snap of frost and biting E. winds in the last week. Ozone was registered on 14 days with a mean of 3·1.

WINSLOW, ADDINGTON.—Dull and dark. Sharp frost on 2nd and 3rd, and again at the end. Dense fog on 5th and 17th. The meadows were covered with water on 13th.

PITSFORD, SEDGEBROOK.—Wet, dull and uncomfortable, although the R was 1·02 in. below the average of 10 years. Fog on 20th, and S on 25th. Mean temp. 36°·9.

COLCHESTER, LEXDEN.—Almost sunless and very dry, except from the 7th to 12th. The first and last weeks were cold.

BURY ST. EDMUNDS, WESTLEY.—A dull dry month, without severe frost. On 6th there was a very heavy rime frost, which was black on the points of the crystals, and when melted showed a deposit of soot. It probably came from the Midland counties. This extended for miles, and looked like ink and water when the thaw came.

BRUNDALL.—Much cloud, mist and gloom. Mean temp. 0°·7 below the average, and range of temp. smaller than usual, there being no very mild days and no exceptionally cold nights.

WINTERBOURNE STEEPLETON.—R rather less than the average of 10 years. Mean temp. 39°·1, or 2°·2 below the average.

TORQUAY, CARY GREEN.—R 1·35 in. above the average. Duration of sunshine 44·6 hours, being 9 3 hours below the average. Mean temp. 43°·0, or 0°·5 below the average. Mean amount of ozone 3·8.

OKEHAMPTON, OAKLANDS.—A wet and mild month, with the last week dry and frosty.

WELLINGTON, THE AVENUE.—The month opened cold, then followed a wet and fairly mild period until the 24th, the last few days being very cold, R about the normal.

NORTH CADBURY.—Very cloudy and very damp. Unusually quiet, though rough on 3rd and 12th. Most of the R fell between the 7th and 13th, 1·76 in. falling between 9 a.m. on 12th and about 3 p.m. on 13th. Mean temp. a little below the normal.

CLIFTON, PEMBROKE ROAD.—The first two days were fine with sharp frost; then R nearly every day till 17th. The remainder was dull and gloomy, with E. winds, and the last few days very cold. R ·25 in. under the average.

ROSS, THE CRAIG.—The first 7 days were very cold; then scarcely any frost till 27th, when there was sharp frost and bleak E. winds to the end. The R was considerably below the average, and almost all fell from 8th to 17th. The sky was overcast, or nearly so, for no less than 22 days, and from 15th to 29th was hardly seen. Mean temp. below the average.

WEM, THE RECTORY.—Very dark and gloomy. Not very cold until E. wind and frost set in on 28th.

BOLTON, THE PARK.—Slight R, but very little sunshine, the total duration being only 3·2 hours, or 12·2 hours below the average. The temp. was low to the 3rd, milder from 8th to 27th, and cold from 29th to the close.

SEATHWAITE VICARAGE.—Mild and almost continuously wet till the third week, when frost prevailed to the close with keen N.E. wind.

HULL, PEARSON PARK.—A dull and depressing month, exceptionally dry, the R being the lowest December record since 1885. A great amount of cloud and frequently fog or mist. On the 1st 3·2 hours' sunshine were recorded, and none afterwards.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE.—Very dark, with thick damp fog. Temp. low till 6th, then much warmer till 27th. when frost set in with cold N.E. winds.

HAVERFORDWEST.—Commenced with cold sharp weather, especially for the first three days. The cold lasted until the 7th, after which R fell constantly more or less till 25th. No R in the last 6 days, but an increasingly severe frost.

ABERYSTWITH, GOGERDDAN.—The early part was rather wet, with cold winds and cold nights. Very little sun throughout, and a little fog.

DOUGLAS, WOODVILLE.—Generally mild, with strong winds, and almost daily R till 23rd. The remainder was fine and dry, with some slight frost. Bitterly cold N.E. winds from 27th to 31st.

SCOTLAND.

LILLIESLEAF, RIDDELL.—The month was day after day just the same—dull, calm, foggy and dark, with occasional light showers. The temp. for the most part was just round about freezing point, but rather higher at the beginning. There was practically no S.

COUPAR ANGUS.—Practically normal R, and persistent wet days. Mean temp. 34°·0, or 0°·6 below the average. The month began and closed cold.

ABERDEEN, CRANFORD.—S and hard frost in the first week. R more or less every day for the last three weeks, with light winds and overcast sky.

DRUMNADROCHIT.—R 2·19 in. below the average of 17 years.

CASTLETOWN, THE CLETT.—Very changeable, sometimes cold and dry, sometimes sharp and keen frosts, and the latter part especsally dry, clear and frosty. The greater part of the potato crop was still in the ground, and in some cases there was corn still uncut on 15th.

IRELAND.

CORK, WELLESLEY TERRACE.—R ·22 in. over the average. Mean temp. 5°·3 over the average. Gale from S. on 21st.

HURDLESTOWN.—A wet month till Christmas. Then dry frost with cold E. wind.

MILTOWN MALBAY.—Cold, rainy and boisterous for nearly all the first three weeks. The last week was frosty and dry, with overcast sky and strong icy cold wind from S.E.

DUBLIN, FITZWILLIAM SQUARE.—Cold spells of considerable intensity at the beginning and end, separated by a wave of warmth, which culminated in temperatures of 55°·8 and 55°·7 on 21st and 22nd. R was frequent, but deficient in amount. Mean temp. 40°·9, or 0°·8 below the average. High winds on 9 days, attaining the force of a gale on three.

MARKREE OBSERVATORY.—The first part of the month was very wet, with strong or fresh winds from S. or S.W., a few gales and 5 or 6 days with fogs. The end turned cold, with gloomy and dull days. Bright sunshine small, the total being only 32·7 hours.

OMAGH, EDENFEL.—The month opened with N.E. wind and frost; but with a change of wind to S.W. sharp frost never recurred, although polar winds were not infrequent. On the whole the mean temp. was rather below, and the rainfall again above the average, resulting in a month of general rawness, without any striking characteristic.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1903.

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	87·2	10	45·2	8	73·1	54·5	53·4	71	128·1	40·4	5·20	13	6·1
Malta	...	...	...	...	...	...	...	...	...	...	...	...	...
Lagos, W. Africa	88·0	3	69·0	20	81·8	73·8	72·4	83	141·0	68·0	8·75	14	6·5
Cape Town	73·6	8	37·7	1, 25	61·2	45·9	47·2	80	...	...	2·49	14	5·4
Durban, Natal	80·3	14	47·4	2	72·4	54·1	...	...	126·3	...	1·16	8	3·9
Mauritius	79·4	1	55·1	13	76·4	61·5	58·7	71	135·5	47·8	1·51	16	5·3
Calcutta	94·1	5	75·6	11	90·7	79·4	78·4	83	158·5	74·8	6·35	15	7·7
Bombay	88·0	7	75·1	17	84·2	77·7	77·2	88	137·5	74·2	24·82	29	9·2
Madras	99·1	3	74·4	8	94·0	78·2	72·8	72	141·4	71·7	3·82	19	7·4
Kodaikanal	67·1	4	51·7	25	61·7	53·2	51·8	85	141·6	46·2	5·42	16	8·5
Colombo, Ceylon	89·4	8	73·3	13	87·6	77·4	74·6	82	145·2	70·0	5·02	14	6·8
Hongkong	92·4	31	73·8	18	86·2	78·1	76·5	84	147·5	...	11·16	21	7·0
Melbourne	68·2	1	28·4	11	55·6	41·3	41·3	80	121·2	20·5	1·14	13	6·7
Adelaide	65·0	22	32·2	11	57·7	44·2	43·6	79	118·0	27·5	3·47	16	6·4
Coolgardie	66·2	20	35·8	8	57·5	41·3	41·2	73	131·5	34·1	1·29	8	6·3
Sydney	68·0	1	41·9	8	57·5	46·7	41·0	76	93·8	29·8	5·34	15	5·8
Wellington	60·0	4, 8	34·0	26	52·0	45·3	40·6	79	95·0	25·0	7·48	20	6·5
Auckland	61·5	13	34·0	16	56·0	46·1	43·2	75	120·0	32·0	3·46	20	5·5
Jamaica, Negril Point	91·8	9	69·4	18	88 0	73·8	72·6	75	...	...	6·99	17	...
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	85·4	31	71·6	16	83·4	74·3	72·1	80	144·2	...	10·00	29	4·8
Toronto	91·5	8	46·9	15	79·1	59·2	59·8	74	110·7	43·2	4·34	12	4·9
St. John's, N.B.	80·0	2	48·2	27	68·0	53·8	...	...	...	...	2·31	17	7·4
Winnipeg	93·8	23	35·5	31	77·8	52·9	...	...	...	...	3·05	12	5·4
Victoria, B.C.	75·1	20	47·0	15	64·5	51·9	...	...	...	...	·46	6	4·4
Dawson	85·5	26	38·8	23	73·3	47·5	...	...	...	...	1·11	7	4·0

Mauritius.—Mean temp. of air 0°·5 above, dew point 1°·1 and R ·71 in., below averages. Mean hourly velocity of wind 10·7 miles, or 1·1 below average; extremes, 31·9 on 21st and 1·8 on 20th; prevailing direction E.S.E.

MADRAS.—R normal, TSS on 3 days, T on 9 other days and distant L on 5 other days. Bright sunshine 99·6 hours, or 25·2 per cent. of possible.

KODAIKANAL.—Mean temp. of air 56°·1. Mean velocity of wind 618 miles per day. Bright sunshine 73·9 hours.

COLOMBO.—Mean temp. of air 81°·5 or 0°·9 above, of dew point 1°·1 above, and R ·56 in. above averages. Mean hourly velocity of wind 8·5 miles, prevailing direction S.W.

HONGKONG.—Mean temp. of air 81°·7. R 4·82 in. below average. Bright sunshine 208·1 hours. Mean hourly velocity of wind 11·4 miles, prevailing direction E. by S.

Adelaide.—Mean temp. of air 0°·5 below normal. R ·95 in. above 46 years' average.

Sydney.—Mean temp. of air 0°·2 below, humidity 1·0 below, and R ·74 in. above, averages.

Wellington.—Cold and disagreeable, foggy towards the end. Mean temp. of air 0°·2 below, and R 1·14 in. above, averages; prevailing wind N.W.

Auckland.—A mild July. Total R 1·25 in. under the average of 35 years.