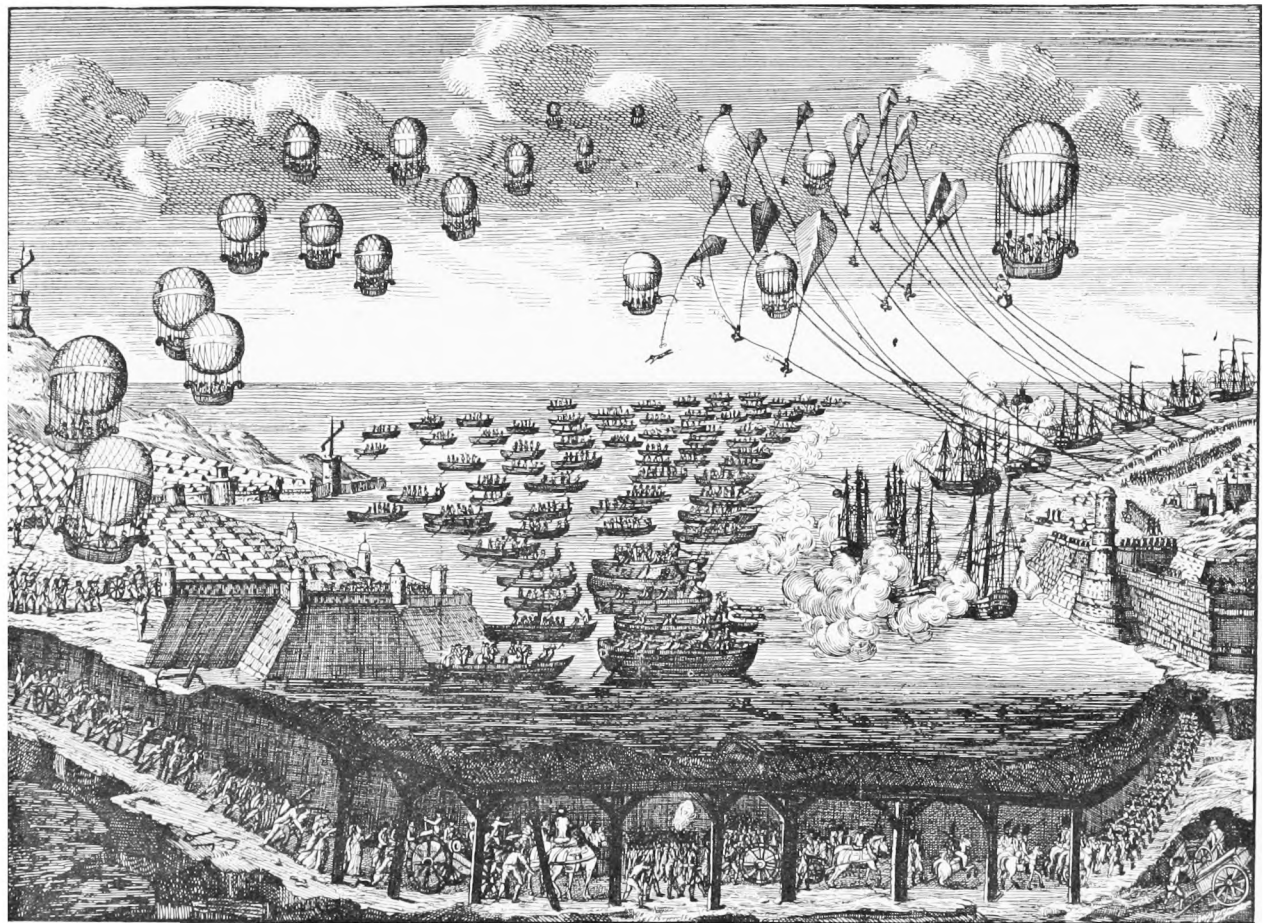
THE MASTERY OF THE AIR. FACSIMILE OF A FRENCH PRINT PROBABLY PUBLISHED IN 1804, AND INTENDED TO SATIRIZE THE SUGGESTIONS FOR AN INVASION OF ENGLAND BY MEANS OF UNPROVED SCHEMES FOR CROSSING THE STRAIT OF DOVER THROUGH THE AIR OR UNDERNEATH THE BED OF THE CHANNEL.

Symons's Meteorological Magazine for 1908, Volume **43**.

[Frontispiece]

(See p. 225).



Divers Projets sur la descente en Angleterre.

SYMONS'S METEOROLOGICAL MAGAZINE.

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

VOLUME THE FORTY-THIRD.

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Symons's

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No. 505. FEBRUARY, 1908. Vol. XLIII.

OUR NEW VOLUME.

In commencing the Forty-third Volume of this Magazine, the eighth under the present editorship, we look back with some satisfaction to a steady, if slow, growth in the number of readers. The circulation of the Magazine has doubled within the last ten years, and as we were assured by "practical men," both publishers and newsagents, eight years ago, that it had already reached the limit it was reasonable to expect, we are satisfied that this not having been the case then is not the case now. The difficulty of inducing newsagents to place on sale a Magazine from which they cannot expect to make a large profit is insuperable, and the expense of advertising is prohibitive, so we must trust to the good-will of present readers for the gradual percolation of a knowledge of our existence through the mass of people who do not care until it reaches one by one the quite considerable number who would welcome the information. We will gladly supply specimen copies of back-numbers of the Magazine to anyone who would care to distribute them; and we take this opportunity of reminding our readers generally that all observers of rainfall who desire so far to assist our work should send their subscriptions direct to the Editor, at 62, Camden Square, London, N.W., while other members of the public can only be supplied through booksellers or the publisher.

We have long felt some doubt as to the desirability of publishing in our Tables the records of temperature sent by rainfall observers. Many observers have instruments of the highest accuracy and their records are absolutely trustworthy; but regarding others we have no information, and the erratic and contradictory readings of some of the thermometers have occasionally caused us much trouble. We have often wished to return to the system formerly followed, by which a concise account of the temperature and other weather conditions of the month was contributed by a correspondent specially skilled in such work. We are now happy to have secured the co-operation of Mr. F. J. Brodie, of the Meteorological Office, and this month we publish the first of his articles. With such a summary the temperature data of our table become less important, and we are

glad to reduce the width of the pages occupied by the rainfall table to their normal dimensions, thereby saving unsightliness in the bound volumes, the margins of which are often shorn too close.

We have it in our mind also to publish each month a rainfall map of the country around London, embracing the whole basin of the Thames; but we have not yet been able to overcome some technical difficulties as to the production of a map which cannot be drawn until immediately before publication. Next month we may have something farther to say on this subject, and meanwhile we beg any rainfall observers in the Thames Valley, who do not already report to us monthly, to apply for the special postcard forms, which will be willingly forwarded for that purpose.

BLACK RAIN IN IRELAND, OCTOBER 8th–9th, 1907.

By Dr. Otto Boeddicker.

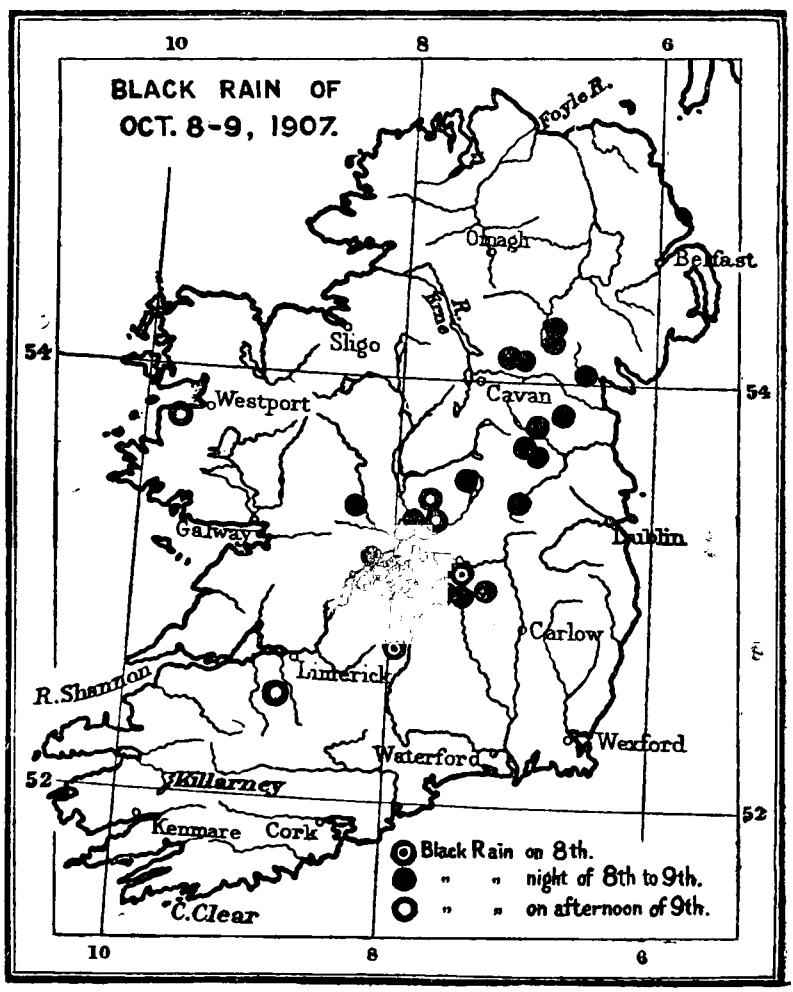
At 12.30 p.m. on the 8th October, a very heavy and threatening cloud approached Birr, from the S.E., its colour was blackish-brown, and it discharged rain over Birr in the early afternoon. This rain was not discoloured; there are, however, two records of black or soot-impregnated rain during that afternoon. The one comes from Roscrea, where my informant who attended the cattle fair in that town noticed "during the afternoon" a shower of black rain. The other comes from a place near Thurles, in Tipperary. There the rain-water was being collected in a tub—it is mentioned as "lovely clear,"—when at 5 o'clock p.m., "suddenly a very heavy shower that did not last long," came down and turned the water in the tub quite black. The blackness of the rain was also noticed as it fell.

The next information reached me on the morning of the 9th. The rain-water in the Birr Castle gauges was discoloured, and the water standing in pools on the roads to the S., S.E., and E. of Birr, was black, or, as I was told by one observer, "inky." On the other hand, a gentleman cycling at 7 a.m. on the 9th to Banagher, ($7\frac{1}{2}$ miles from Birr to the N.N.W.) though he noticed the water standing on the road, is positive that the pools were not black. A letter sent to the *Irish Times* by Lord Rosse inviting further observations produced a large number of replies, which may be summarized as follows:—

The records extend in the direction S.W. to N.E., from Roscrea, in Tipperary, to Keady, in Armagh, just on the border of Monaghan; in the direction S.E to N.W., from half-way between Athy and Abbeyleix, in Queen's County, to Ahascreagh, near Ballinasloe, in East Galway. Absolutely the most eastern station is 2 to 3 miles east of Dundalk, in County Louth. As evidently the absence of communication does not necessarily imply an absence of black rain, we can thus only conclude that the greatest width of the soot-laden cloud as it approached from the S.E. was not less than, roughly, 110 miles. In the absence of any definite observations as to the

time of the fall nothing can be ascertained with regard to the breadth of the cloud in the direction S.E. to N.W. It is, however, worth noting that at Killart, near Clonaslee, in Queen's County, a "most peculiar and disagreeable smell in the air" was noticed at 6.30 to 7 a.m. on the 9th. As the same smell was perceived in the afternoon on the same day, immediately after a fall of black rain (to be mentioned later), it is reasonable to suppose that near Clonaslee the fall took place shortly before 6.30 a.m., on the morning of the 9th.

The amount of soot deposited seems to have been very different in different places. As mentioned before, it was greater to the S.E. and E. of Birr than to the N.W. Again; it was very considerable in Meath and Westmeath—evidently greater than near Birr—and the records from Monaghan also speak of "a very heavy fall." As



to the specific effects of the black rain it is most generally mentioned that rain-water tanks had to be emptied and cleaned. At Lynbury, near Mullingar, the deposit of soot in a recently cleaned tank was sufficient to choke a half-inch pipe. Clothes hung out to bleach were blackened in many places. Near Drum, Co. Monaghan, it took two washings to restore them to their original colour. In Keady, Co. Armagh, the clothes were found to be covered with "smuts," suggesting discrete particles of soot rather than a general stain observed elsewhere; at Gurteen (6 miles S.W. of Birr), for instance, "clothes were still of a bad colour after the second washing." From Dundalk, on the other hand, it is reported that "one washing easily removed the stain." In Arraghmore (1½ miles N.N.W. of Gurteen), sheep were blackened; from Nobber, Co. Meath, some leaves of a lime tree were sent to me by Mr. P. Condra, which are thickly coated with soot, suggesting a very heavy fall. Nobber is 20 miles distant from the east coast, and it is worth mentioning that Mr. Condra writes that black rain "is not a very unusual occurrence when the wind blows east." I should add, finally, that nearly all stations report sheet-lightning during the night of the 8th to the 9th.

The next and last observations of a soot-laden cloud and black rain were made in the afternoon of the 9th October. The cloud approached Birr from E.S.E., about 2 o'clock p.m. At 3 the sky was darkened to such an extent that lamps had to be lit; at 3.30 it began to rain, certainly *not* black, with lightning and two peals of thunder about 4 o'clock, towards the west. Sheet-lightning was noticed till late in the evening. This cloud moved in a north-westerly direction, and discharged *black* about 4 p.m., at Rathcabbin, 6 to 7 miles from Birr, also about the same time on the east coast of Lough Derg, not far from Portumna. At Killart, Clonaslee, about 15 miles to the east of Birr, black rain fell in the afternoon, followed by a disagreeable smell (as mentioned before). This is thus the only place from which black rain is reported as having fallen both during the night preceding and on the afternoon of the 9th. At Coolatore, Moate, Co. Westmeath,—N.N.E. of Birr—the rain in the gauge was found to be black on the 10th, "when measuring rainfall for previous day." From Clara, only a few miles distant from Moate, I am informed that "the rain-water which fell here on the 9th was blackish." At Croagh, 12 miles from Limerick, toward the S.W., black rain fell about 2 o'clock p.m., on the 9th, which seems to indicate that the cloud extended essentially like the previous one, from S.W. to N.E., and that its greatest width cannot have been less than 80 miles. The last tidings of this cloud reached me from Faelduff, 12 miles to the west of Westport, where it again discharged black rain "much darker than bog-water."

Thus we have here evidence of a soot-laden cloud, originating probably in South Wales, crossing the channel and the whole of Ireland, and disgorging its soot into the Atlantic.

ROYAL METEOROLOGICAL SOCIETY.

THE annual general meeting of this Society was held on Wednesday evening, January 15th, at the Institution of Civil Engineers, Great George Street, Westminster, Dr. H. R. Mill, President, in the chair.

The Council, in their report, expressed their pleasure at the marked and increasing interest which is being taken in the science of meteorology throughout the country. The lectures and exhibitions inaugurated by the Society are bearing fruit, and that the efforts of the Society are appreciated is shown by the large increase in the roll of the Fellows, who now number 732.

After the report had been adopted and the usual votes of thanks passed, the President presented the Symons Memorial Gold Medal to Monsieur Léon Teisserenc de Bort, of Paris, it having been awarded to him by the Council, "in consideration of the distinguished work which he had done in connection with meteorological science, especially the study of the upper air," and M. Teisserenc de Bort, in replying, gave expression to his high esteem of Mr. Symons, whose work the medal commemorates.

The President then delivered an address on "Map-Studies of Rainfall." He said that the special problem which he had before him was to determine the normal annual rainfall of the British Isles in relation to the general configuration of the land, and to ascertain how the rainfall of individual years and months, and even of the constituent showers was related to the normal. The most useful method of working towards this end is by the preparation and study of maps of rainfall. He described the methods which he adopted in preparing annual, monthly, and daily maps of the distribution of rainfall. He dwelt upon the remarkable fact that while heavy cyclonic and thunderstorm rains fell equally on high or low ground, on land or on sea, with a complete disregard of the surface features, the total rainfall for a year—and, still more, the average annual rainfall—showed the closest relationship with the configuration of the country.

Dr. Mill, in conclusion, said:—It happens that rainfall is not only the most difficult of all the meteorological distributions to map accurately, it is also that one which is of the greatest importance, for by rain the rivers are fed, and the rivers both water and drain the land. Every year makes clearer the vast national importance of accurate knowledge of the rainfall of a country, for the problem of the rivers is becoming acute. The growing populations of the great towns are tapping the upper waters and diverting the water from its natural channels, and at the same time they are polluting the lower courses with the waste of the factories and the streets. Toll is taken all along the banks of industrial streams for raising steam and carrying on the multitudinous processes of manufacture. There is sometimes anxiety as to whether the waterways can be kept sufficiently supplied to float the water-borne traffic or to fight the silting

action of the tides, and there is growing alarm as to the possibility of fish traversing the depleted and polluted streams to reach their spawning beds. Of recent years the value of the water-power which may be generated in the lonely and lofty places amongst the western heights of Great Britain, where the rainfall is large and unfailing, has been recognised, and chemical works for the production in electrical furnaces of what a few years ago were rare substances are becoming familiar features in Wales and the Highlands. In Ireland, too, the rainfall is an unrecognised source of wealth, which as yet has not been drawn upon to any appreciable extent. The increasing strenuousness of the struggle for the possession of large water-supplies is producing in England, and especially in Wales, a great amount of local jealousy and strife, for the boundaries of parishes and counties coincide but rarely with water-partings; and the argument has been brought forward again and again that the rainfall of one county should not be diverted for the use of the inhabitants of another. The feeling is intensified when the boundary to be crossed is that of a historical division of national importance, like the boundary between England and Wales; but I think that the map-study of rainfall can do something to suggest the lines on which such disputes should be settled. Although the exceptional deluges of a thunderstorm or a great depression fall with equal and impartial heaviness on the hills of the west or the flat plains of the east, the common every-day rains are precipitated on the high lands and in the mountain valleys which cross the track of the prevailing wind in much greater abundance than on level and low stretches of country. Most of the rain is borne to our islands from the Atlantic, and when it comes torrentially it is of the air, and no boundary checks it; the largest amount however comes down on and near the high watersheds, because there the land produces its maximum influence as a rain-compeller.

From the high ground the rivers seek the plains, carrying off the excess of rainfall into the less liberally watered districts. The Dee, the Severn, the Wye and the Usk restore to England part of the rains which the Welsh mountains have abstracted as the air passed over them. The high rainfall of the whole Pennine district, sometimes by circuitous routes across the comparatively dry plains of the east, swells the volume of fresh water that pours into the Humber. The Thames itself receives the comparatively high rains of the Cotteswolds, the Chilterns and the Downs, and forwards the water slowly through less and less rainy districts, until it reaches the sea in the driest part of England. Thus, I think, at least as good an argument can be drawn from this consideration of physical geography in favour of supplying the great towns of the east from the large precipitation of the west, as can be drawn in the opposite sense from the artificial divisions of political geography. It seems to me that care for the water-supply of the country, coming as it does from the air that knows no bounds, across the land, is by no means a parochial

but in the fullest sense a national matter, and should be dealt with in the interests of the nation as a whole; the units of sub division, when such are required, being the natural units of river-basins.

A hearty vote of thanks was given to Dr. Mill for his services as President, and also for his address.

The following were elected as the Council for 1908 :—

President, Dr. H. R. Mill; *Vice-Presidents*, Mr. R. Bentley, Mr. W. H. Dines, F.R.S., Mr. E. Mawley, and Dr. W. N. Shaw, F.R.S.; *Treasurer*, Dr. C. Theodore Williams; *Secretaries*, Mr. F. C. Bayard and Mr. H. Mellish; *Foreign Secretary*, Dr. R. H. Scott, F.R.S.; *Councillors*, Mr. W. W. Bryant, Capt. W. F. Caborne, C.B., Capt. M. H. Clarke, Mr. R. H. Curtis, Dr. H. N. Dickson, Mr. F. Druce, Mr. W. Ellis, F.R.S., Capt. M. W. C. Hepworth, C.B., Mr. R. Inwards, Mr. B. Latham, Mr. R. G. K. Lempfert and Capt. D. Wilson-Barker.

During the evening the following were elected Fellows of the Society:—Mr. C. J. Barker, Mr. E. S. Currey, M.Inst.C.E., Rev. R. P. Dansey, Mr. C. E. J. Esdaile, J.P., Mr. M. T. Foster, Mr. E. Gold, M.A., Rev. G. R. Hadow, Mr. J. R. G. Jones, Mr. J. J. Kermode and Miss C. Marshall.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE BLACK BULB.

I HAVE lately been reading a discussion of observations made with the "solar maximum thermometer," an instrument that, for various reasons, may fairly be called the *bête noire* of the meteorologist. It has occurred to me that some of your readers, learned in the history of meteorological measurements, could give information, of considerable interest to those whose historical knowledge is less complete, about that instrument.

The particular point to be elucidated is whether before the introduction of the black bulb in vacuo, observations were taken with a thermometer that had its bulb blackened, but was not sheltered by a vacuum jacket. Such observations would be of considerable climatic interest, because the conditions of exposure would be similar to those of natural objects. A pedestrian in a frock coat and a silk hat is a walking example of a black bulb not *in vacuo*, just as the same gentleman in the shade, with his coat off, is the personification of the wet bulb. Many vegetable products are also exposed to the sky in varying aspects, but no one is expected to occupy a vacuum either in sun or shade.

I can understand that a vacuum jacket might have been considered an essential improvement when it was supposed that the solution of

questions on the intensity of solar radiation and atmospheric absorption could be effectively approached in that way; but the result of experience has been to disclose many serious difficulties in the use of the instrument for that purpose, and other methods are now being advocated.

But if the vacuum does not enable us to reach the sun, it separates us effectively from the mundane conditions that represent climate. I do not venture to strain the patience of your readers by asking them awkward questions about the real significance of a reading of the black bulb *in vacuo*, but merely to say that some of the practical difficulties of the *bête noire* would disappear if the vacuum jacket were discarded, and the usefulness of the instrument for the comparative purposes of climatology might be not less, though the observations would be, of course, on a different plane as regards the physical processes involved.

But a previous generation may have already exhausted the possibilities of a black bulb not *in vacuo*, and the comparison of its results for, say, Fleet Street, Margate, Oxford and Valencia—not to go beyond the British Isles. If that is so, I feel sure some of your readers will know it, and will not be unwilling to give you references to the records of the observations and the discussion of the results.

W. N. SHAW.

10, Moreton Gardens, S.W., Jan. 11th, 1908.

A WHITE RAINBOW (?)

AN unusual phenomenon was seen here on Sunday, February 2nd, *viz.*, a bow of light, *not* a rainbow, but in the position where a rainbow would have been, *i.e.*, opposite to the sun, on a film of cirrus cloud. This was at 9.15 a.m. The bow was of pale white light, which a faint tinge of apricot colour along its outer edge. It was just discernable at 11 a.m. on cirro-cumulus cloud, and again was very clearly visible at 1.35 p.m. on a nearly pure blue sky. It was a pleasant, mild sunny day, but so calm that one could not tell to what quarter the weathercock should have pointed!

H. A. BOYS, F.R.Met.Soc.

North Cadbury Rectory, Somerset, February 3rd, 1908.

THERE was visible here on Sunday afternoon what I had not seen before, *viz.*, a white bow in the place of a rainbow. It was reflected on rather dim cirrus cloud. I don't think any downfall was taking place.

It was a still, bright day, the rest of the sky being quite clear, and the thermometer just down to 32° in the shade. It was visible at 2 o'clock for about half-an-hour, and again from 3 to 3.20—the sky having cleared a little during the interval.

C. B. GOODACRE.

The Vicarage, Thornton Curtis, Ulceby, February 4th, 1908.

THIS forenoon, from 9.30 till 12, there was a beautiful bow in the position of a rainbow, though hardly coloured at all. It appeared to be formed on filmy stratus. It was not a fog-bow, which I have seen several times. What name would you give it? I have never seen it before, and perhaps you may have other notices of it.

CHARLES P. HOOKER.

Dollarward House, Cirencester, Feb. 2nd, 1908.

FROM other communications we have received it is evident that the phenomenon referred to above was visible in many parts of the country. It was reported from several places in Wiltshire, Somerset, Gloucestershire, Worcestershire, Staffordshire, and Yorkshire. A correspondent of the "Yorkshire Post" quotes the following explanation from an article by the late Prof. P. G. Tait :—

"The overlapping of the colours in the rainbow, due to the apparent size of the sun's disk, is occasionally so greatly exaggerated that only faint traces of colour appear. This may happen, for instance, when the sun shines on raindrops in the lower strata of the atmosphere through clouds of ice-crystals in the higher strata. By reflexion from the faces of these crystals, the source of light is spread over a larger spherical angle, and there is no sharp edge to it as in the case of the unclouded disc. The rainbow is then much broader and fainter than usual, and nearly white."

WANTED! A NAME.

I DON'T see that we are shut up to the "non possumus"-tic view of Mr. Denning. Change is, no doubt, rather difficult and slow; but there are examples of its being achieved. Thus, Lord Kelvin, in early days, was made Professor of "Natural Philosophy"; but few call "Physics" that now, though the change has brought in "physicist" (a vile word). One rarely hears of "Galvanism" nowadays; and "Hypnotism" has displaced the old "Mesmerism" (with "Animal Magnetism" and "Electro-biology").

If meteorologists in council were to sanction a change to "Aerology," or other name, I should not wonder if it were taken up willingly.

A. B. M.

[We believe that "Natural Philosophy" is still the formal title of the Chairs of "Physics" in the Universities of Oxford, Cambridge, St. Andrews, Aberdeen, Glasgow, Edinburgh and Dublin; and we see no reason why anyone should want to change the old and honourable name of Meteorology. Certain critical persons desired to change the name of oxygen when acids were discovered without that element in their composition, but few chemists now trouble themselves about the matter.—ED. *S.M.M.*]

ON THE LEARNING OF METEOROLOGY.

By L. C. W. Bonacina.

It would be difficult to assign to meteorology its proper place in the classification of the sciences, and to decide whether it should be ranked among the more deductive sciences of Natural Philosophy, or the more inductive sciences of Natural History. In so far as it endeavours to discover and trace the relationship of cause and effect in the phenomena of the weather, and to explain these phenomena qualitatively and quantitatively, meteorology is a branch of physics; in so far as it merely observes, records, and compares them, it may be considered a branch of natural history. Meteorology may best, perhaps, be regarded as in the transition stage between natural history and natural philosophy.

The popular conception of meteorology is, no doubt, that of an inexact science, which for all practical purposes it certainly is. If, however, we could obtain a sufficient number of simultaneous observations from all parts of the Earth's atmosphere, that is to say, know something of the conditions of the atmosphere in all these parts, we could (if our knowledge of the laws of thermo-dynamics is sufficient, as I imagine it to be) go far towards rendering a complete explanation of weather, as well as issuing a forecast of it for long periods in advance; whence we see how the phenomena of meteorology are the proper subject-matter of natural philosophy or physics. But it is precisely the lack of such observations that prevents us from carrying meteorology farther than the natural history stage.

Notice, however, the great difference between meteorology regarded as a natural history science, and a highly inductive science like biology, for instance.

Given sufficient information respecting the conditions of pressure, temperature and humidity, etc., in different strata of the atmosphere over a wide enough area, you could, upon the basis of the laws of physics, calculate, if not to a nicety, at all events to an approximation, how much rain will fall, or may be expected to fall, over the area of London within a specified period of the near future. But no number of data relating to the physiological or chemical condition of your favourite terrier, would enable you to predict (supposing, for the sake of argument, that you were forgetful of his habits and temper, except that he was a normally constituted animal) whether, on seeing your friend, he will take it into his head to snap at your friend's leg with a hostile growl of disapproval, or to jump up with a wag of his tail and expect from him a friendly act of recognition. Or, again, plant an acorn in known conditions of soil and climate; though you might, from the general character and health of the acorn, and of the parent tree, be able to foretell to some extent whether it would germinate, or even into what kind of an oak it would probably develop, the most complete and comprehensive data relative to your acorn, would, in the present state of knowledge,

avail you nothing for the purpose of endeavouring to deduce therefrom the individuality of the future tree, that is to say, those qualities and attributes which will distinguish it, not only from all existing oaks, but from all past and future ones. And this because the biological sciences are still, as compared with the physical and mathematical, in an early inductive stage; we are, so to speak, for the most part engaged in learning their language by laborious processes of observation and experiment; whereas in the case of physics, the language is so far already learnt as to render the sciences included under that term more largely deductive for many purposes.

As Huxley well put it in his essay, "On the Educational Value of the Natural History Sciences":—"The mathematician deals with two properties of objects only, number and extension, and all the inductions he wants have been formed and finished long ago. He is occupied now with nothing but deduction and verification."

"The biologist deals with a vast number of properties of objects, and his inductions will not be completed, I fear, for ages to come; but when they are his science will be as deductive and as exact as the mathematics themselves."

Having tried to show the present relationship which meteorology bears towards the so-called inductive and deductive sciences, let me now pry into the main channels through which a knowledge of the atmosphere may be acquired.

The three great channels of revelation which are slowly, but surely, building up the science of meteorology are (1) the study by direct personal observation of weather, sky and atmosphere; (2) the study of statistics; (3) the study of atmospheric physics.

As regards No. 1, it is, of course, needless to remark that in meteorology, as in every branch of natural science, accuracy and persistency of observation of the phenomena of which it treats is of paramount importance and the fundamental requisite. Every public-schoolboy knows the hopelessness of trying to learn the rudiments of chemistry out of a book. He may take up the most clearly illustrated and plainly-worded text-book extant, and read that the addition of hydrate of ammonia to the aqueous solution of certain salts of iron will produce a red-brown precipitate of a hydrated oxide of iron; but unless he has seen this simple experiment performed, or better still performed it himself, and photographed on his memory, so to speak, the appearance of the precipitate, its precise colour, texture and consistency, he has acquired no true knowledge—has only learnt so many words evoking so many ill-defined and second-hand mental images. And so it is with meteorology; the student of which must above all be an acute and accurate observer. A striking example as to the inextricable confusion into which persons not trained to scientific habits of observation, may be led by the use of words to which they attach no very sharply-defined and definite ideas forced itself upon my notice not long ago. I was standing one muggy afternoon in the middle of last autumn at the margin of an extensive

tract of woodland on the borders of Middlesex and Hertfordshire, when I heard a lady, who was passing by with her child, exclaim, "Look at the frost on the grass. How extraordinary!" Now this lady doubtless knew what she saw, and if she chose to call it "frost" that was no affair of mine; but a minute's inspection might have brought home to her the difference between what she then saw in her superficial glance upon the ground, namely, pearly drops of water on the blades of grass, and the frozen dew or hoar-frost which (supposing she had lived in England) she must have seen times without number, but had probably never once *looked at.* But to pass on. Meteorology is the science of the "pure air and the bright heaven"; consequently, the true meteorologist will spend as much time as he can in the open air, preferably in the country, where he may behold the varying complexions of the sky and the changes of the weather in their purity and undefiled beauty. He will see, hear and *feel*—which word I italicize, as implying the psychological as well as the physiological sense, and for this reason: that the phenomena of weather and climate, forming part of our immediate environment, not only exert a profound influence on the mind directly, but also indirectly, by imposing a concomitant modification npon the general tone and appearance of the familar scenes of landscape (or sea-scape) with all the details which constitute them; so that they are thus in a two-fold manner instrumental in affecting the thoughts and emotions of men. And it is by observation of this kind that we are rendered cognizant of the various subtle attributes of weather and climate, which instrumental or verbal data are powerless to convey to us. To give a concrete illustration. A few years ago I made a sojourn among the Cumberland hills, from the middle of summer till far into the darkening days, penetrating into their inmost and wildest recesses—places, I say, black and bare, where the anguish of nature might be seen, felt and heard, in the relentless driving of the sleet, in the distressful bleating of the mountain sheep, and in the hideous distortions of the ragged hawthorns robbed by the fury of wind and weather by the leanness of soil and barrenness of rock, of that sweet commingling and harmonious blending of stubbornness and beauty which characterizes their race, manifesting itself in snowy purity of blossom, as the pride of the June lowlands; and whilst learning, from day to day, what elevated land in a high latitude meant, I began to appreciate more fully than ever before, to what extent the sternness of the elements perceived in the lake-country amid scenes, varying from the most inhospitable loneliness to the utmost loveliness, had its share in moulding and colouring the solemn power of the poetry of Wordsworth. But this leads me to the threshold of a subject of extraordinary interest which I could not, neither with propriety nor adequacy, develop in this article.

(*To be continued.*)

REVIEWS.

Report on the Administration of the Meteorological Department of the Government of India in 1906-07. Calcutta, 1907. Size 13 × 8. Pp. 22.

DR. G. C. SIMPSON was appointed Imperial Meteorologist in succession to Mr. W. L. Dallas, who retired in November, 1906, to be precise "on the forenoon of the 8th." The designations of the chief officials have been changed. The head of the Service (Dr. Walker) is now designated Director-General of Observatories, the next three are termed Imperial Meteorologists, and then follow four in charge of the meteorology of the provinces of Bengal, United Provinces, Bombay and Madras, with the title Meteorologist; the old designation of Meteorological Reporter has been entirely dropped. Kite and balloon observations are being continued, and the observations on snowfall in the Himalayas are being supplemented by large-scale photographs of the snows as seen from Simla, a system which seems to give good results. The seasonal forecasts, which hitherto have been confidential documents, are now published and supplied to the press. Observations at the Andaman Islands are forwarded by wireless telegraphy to the head office in India, and the system worked satisfactorily. Balloon and kite observations at Belgaum have secured important data as to the thickness of the monsoon air currents. The form of the report is sternly official, but it shows an increasing amount of research as well as administrative work.

Recherches expérimentales sur la Résistance de l'Air exécutées à la Tour Eiffel. (Experimental researches on the resistance of air carried out at the Eiffel Tower.) Par G. EIFFEL. Paris: L. Maretheux, 1907. Size, 13 × 10. Pp. 98. Plates.

THE designer of the famous tower at Paris spent a great deal of time between 1903 and 1906 in measuring the resistance of air on falling bodies moving at different velocities, by dropping a weight provided with an ingenions recording device along a vertical cable, extending from the second storey of the tower to the ground, a distance of 320 feet. The result of the experiment was to show that for velocities between 30 and 40 metres (*i.e.*, 100 and 135 feet) per second, the resistance of the air is very nearly proportional to the square of the velocity. The same law must hold good for the resistance of a fixed body to wind, hence the interest of the determination from the point of view of the engineer. The co-efficient of resistance deduced from the experiments is ·074, while nineteen previous experimental determinations which are quoted gave values varying from ·07 to ·125.

Annual Report of the Director Kodaikanal and Madras Observatories for 1906. Madras, 1907. Size, 13 × 8. Pp. 26. *Not for sale.*

THIS report contains a summary of the meteorological observations at Kodaikanal and Madras, including an interesting table of visibility at the former station showing the number of days when the Nilgiri Hills were very clear, visible, just visible, or tops only visible.

Die Niederschlags-Verhältnisse von Deutsch-Südwestafrica [The rainfall conditions of German South-West Africa]. Von DR. EMIL OTTWEILER. From *Danckelmann's Mitteilungen aus den Deutschen Schutzgebieten.* Vol. **20**, Part I. Berlin, 1907. Size, 13 × 9½. Pp. 84. Maps and diagrams.

THIS is an exhaustive study of all existing data bearing on the rainfall of German South-West Africa, a country the extreme aridity of which gives prodigious importance to an accurate knowledge of all the precipitation which falls upon the ground. The first rain gauge was established at Omaruru in Damaraland in December, 1882, but very few stations were in existence before 1890, when military officers and settlers began to reinforce the efforts of missionaries in obtaining information regarding the resources of the country. The records in the German colony are supplemented by those in northern Cape Colony on the south and in southern Angola on the north. Since almost the whole rainfall of the year falls in the late spring, summer and early autumn, *i.e.*, from October to March, Dr. Ottweiler decided to reckon the year from July to June, thus keeping undivided the rainfall of each rainy season. Less than 100 stations supply all the returns available to determine the distribution of rainfall over an area three times as large as the British Isles. The arithmetical means for the various stations are reduced in the usual way by comparison with longer records for other stations; but, naturally, the result is less likely to be accurate than for a European country because the distance of the stations from one another is so great. In some of the tables use is made of colour in a way we have not seen before, and the result is both curious and effective. For instance, in a long table of figures of monthly rainfall the three columns of winter months are distinguished by a wash of blue, the spring months by brown, the summer by red and the winter by purple. In the instance cited the device is the more serviceable on account of the confusion which is apt to overtake a European reader in dealing with the reversed seasons of the southern hemisphere. The memoir is illustrated by several ingenious diagrams and an admirable rainfall map, in which Dr. Ottweiler allows (rightly in our opinion) the configuration of the land to guide the isohyetals where no rainfall figures are available. As giving some idea of the character of the country we may note that the rainfall is less than 2 inches in the year along the coast for a distance of 50 miles inland, and only reaches 10 inches at a distance of about 150 miles from the sea.

Relations between mortality of infants and high temperatures, by DR. E VAN EVERDINGEN, *Koninklijke Akademie van Wetenschappen te Amsterdam.* Reprinted from Proceedings of the meeting of Saturday, October 26th, 1907. Size, 10 × 7. Pp. 14.

WE are grateful to our Dutch friends for their consideration in publishing important papers in the English language. The investigation in question indicated that infant mortality showed hardly any relation to mean monthly temperature, but the number of days with temperature over 77° F., counted for periods from May 15th to June 15th and so on, correspond distinctly with the infant mortality in the months of June, &c. For every day above 77° F. in excess of the average number for the mid-monthly periods the mortality of the month, beginning 15 days later, the death-rate at Groningen is increased 5% and at Utrecht 4% above the mean monthly rate.

Hints to Meteorological Observers in Tropical Africa, with notes on methods of recording lake-levels and a memorandum on the organisation of Meteorological Observations. Published by the authority of the Meteorological Committee. London: Printed for H.M. Stationery Office, 1907. Size, 10 × 6. Pp. 36. Price 9d.

THIS edition has an interesting memorandum, by Dr. W. N. Shaw, on the organization of meteorological observations, adapted for a tropical Colony or Protectorate desirous of establishing a system.

Rapport de la Conférence météorologique internationale. Réunion d'Innsbruck, 1905. Paris, Imprimerie Nationale, 1907. Size, 10 × 6½. Pp. x. + 160.

THE French official report of the Conference of Directors of Meteorological Institutions held in Innsbruck in 1905.

Estudio sobre la Climatologia de La Paz [A study of the climatology of La Paz], par VICTOR E. MARCHANT. La Paz, 1906. Size, 9 × 6. Pp. 48. Plates.

THE author is Chief of the Section of Climatology and agricultural exploration of the Ministry of Agriculture in Bolivia. The city of La Paz is situated in 16° 30′ S., at an elevation of 11,900 feet above the sea on the great Andean plateau of South America. The mean annual temperature (for 6 or 7 years apparently) is given as 50°·4 F., the coldest months being June and July with 45°·3, and the warmest November and March with 53°·9 and 54°·7 respectively. The absolute extremes were 75°·2 on January 17th and 18th, 1903, and 26°·6 on June 4th, 1901. The rainfall varied from 15·88 in. in 1901 to 32·84 in. in 1903.

Bulletin Météorologique du départment de l'Herault publié sous les auspices du Conseil Général. Année 1906. Montpellier, 1907. Size, 11 × 9. Pp. 128 + 12 plates.

THIS annual report is remarkable for the thoroughness and promptitude with which the weather conditions of a small area are recorded and discussed. We note as special features the map of the distribution of thunderstorms, and the systematic treatment of phenological observations.

Beiträge zur Klimatologie und Hydrographie Mittelamerikas. [Contributions to the Climatology and Hydrography of Central America.] Von Dr. ALFRED MERZ. Leipzig : C. G. Naumann. Size 8½ × 6. Pp. 96. Plates. Price 2 marks 60 pf.

DR. MERZ has discussed all the available data bearing on the rainfall and the river flow in the region traversed by the Panama Canal and the neighbouring parts of Central America, much of the material utilized being that collected by the United States Government before they undertook the giant task of completing the Canal. A rainfall map is given, showing the enormous range of isohyetals from 1 metre (say 40 inches) in the interior to 6 metres (about 235 inches) on the east coast at the mouth of the San Juan river. The annnal evaporation amounts to about 43 inches.

Die Meteorologische Elemente und ihre Beobachtung mit Ausblicken auf Witterungskunde und Klimalehre. Unterlagen für Schulgemässe Behandlung sowie zum Selbstunterricht. [The elements of Meteorology and their observation with reference to the study of weather and climate. Arranged for use in schools or private study.] Von OTTO MEISSNER. Leipzig : B. G. Teubner, 1906. Size 10½ × 7. Pp. vi.+94. Illustrations.

A SHORT text-book for use in German schools. The author acknowledges in the preface his indebtedness to the late Prof. von Bezold for reading the book before publication. It is curious, however, to find the wind-scale 1—12 attributed to the *French* Admiral Beaufort; Herr Meissner lays appropriate stress on the derivation of scientific terms from foreign tongues, but here the philological method seems to have led him astray. It is even more curious to find the honoured name of Hann spelled Hamm, and to find amongst the literature quoted no reference to his great *Lehrbuch der Meteorologie.* Despite these little slips, the book is systematically designed, and abounds in fresh and interesting observations.

The Psycho-Physical Aspect of Climate, with a Theory concerning intensities of Sensation. By W. F. TYLER, F.R.Met.Soc., Assoc.Inst. C.E. London: Bale, Son & Danielsson, Ltd. 1907. Size, 10 × 6. Pp. 46. Plates.

IN his preface, Mr. Tyler quotes as a justification for his temerity the following sentence from Mr. H. G. Wells's "Mankind in the Making" :—"There are phases in the development of any science when an incautious outsider may think himself almost necessary, when sketchiness ceases to be a sin, when the mere fact of irresponsibility and untrained interest permits a freshness, a freedom of mental gesture, that would be inconvenient and compromising to the specialist."

We think Mr. Tyler deserves thanks for his courage in endeavouring to estimate the relative intensity of sensations with regard to climate, which we all know to exist and to have little relation to variation in instrumental readings. Some time ago, in 1904, he proposed a classification of climates according to the amount of discomfort experienced in muggy weather, due to moist heat (*hydro-thermos*), and he suggested the term hyther as the measure of mugginess, estimating the amount of hyther from 0 to 10, much as one estimates the force of the wind from 0 to 12. The subject is now elaborated, and this pamphlet, reprinted from the *Journal of Tropical Medicine and Hygiene*, for April 15th, 1907, is well worth reading and thinking over. Mr. Tyler presents his views with a clearness and restraint that command attention and respect.

THE WEATHER OF JANUARY, 1908.

By F. J. BRODIE.

EXPOSED as it was to the rapidly alternating influence of cyclonic and anticyclonic conditions, the weather of January was of an exceedingly changeable character. In the opening days a large high pressure system came down from the northward, and brought with it an instalment of the cold air derived from its place of origin. Between the 1st and the 5th a very sharp frost was, in fact, experienced over the whole kingdom, the minimum temperatures recorded in the screen being below 20° in portions of all but our extreme southern districts, and below 15° at many places situated in the northern and central parts of Great Britain. On the surface of the grass the readings were naturally even lower, the exposed thermometers descending below 10° at a number of stations, and to within a degree of zero at Balmoral. On the 5th the anticyclone withdrew to the southward in the face of a deep depression which advanced towards the Scottish coast, and on the following day a strong south-westerly current of air blowing round the northern disturbance produced a rapid thaw over the entire kingdom, the

morning temperatures of the 6th being in many cases from 20° to 25° higher than that of the 5th. The milder weather was, however, of short duration. After the passage of a deep cyclonic system across Ireland and England on the 7th (when gales and heavy falls of rain or snow occurred over a wide area), a new anticyclone advanced over these islands from the north-westward and the thermometer again fell fast, the readings observed over England between the 9th and 12th being in many instances nearly, if not quite, as low as those recorded a week earlier. In the screen the minima were below 15° in several isolated localities, while on the surface of the grass readings below 10° were equally common, the exposed thermometers falling to 5° at Canterbury and to 3° at Llangammarch Wells. With the rapid departure on the 14th of this second frost the really wintry weather of the month may be said to have come to an end. Sharp touches of cold occurred at various other times, mainly about the 21st, the 29th and the 30th, and the day temperatures were frequently below the average, but no frost of any particular severity was experienced. Between the 18th and 24th, when an anticyclone lay over nearly the whole kingdom, a good deal of thick wet fog prevailed, especially over England, its effect being seen at Nottingham, and possibly in other parts of the Midlands, in a complete absence of bright sunshine during the week ending the 25th. Towards the close of the month the weather was influenced, on the other hand, by large cyclonic disturbances which passed along from Iceland to Scandinavia. Strong winds or gales from south-west or west were now experienced over nearly the whole of the United Kingdom, with mild weather between the 23rd and 27th, but with colder weather and showers of snow as the wind subsequently veered to the north-westward.

For the month as a whole, the mean temperature was a little above the average in Scotland and the north of Ireland, but below it in nearly all the English districts. At the London observing station of the Meteorological Office (in St. James's Park) the mean temperature was the lowest in January since the year 1897, and the absolute minimum of 20° on the 6th the lowest since 1895. On the west and south coasts of Great Britain the total duration of bright sunshine was largely in excess of the average, but at many places in the north it was slightly below the normal.

METEOROLOGICAL NEWS AND NOTES.

PROFESSOR G. HELLMANN, Director of the Royal Prussian Meteorological Institute, will deliver a lecture on "The Dawn of Meteorology," at the meeting of the Royal Meteorological Society, on Wednesday, March 11th, in the rooms of the Institution of Civil Engineers. Dr. Hellmann has devoted particular attention to the early history of Meteorology, and is the leading authority on the subject.

MR. G. W. C. SHIELD, who was the printer of this Magazine and of *British Rainfall* from their foundation, died, we regret to have to record, on 28th January, at the age of 79. Mr. Shield was an early friend of Mr. Symons, and took a deep interest in the work of the British Rainfall Organization. His admirable accuracy as a printer greatly facilitated the mechanical work of editorship, and his unfailing kindness saved the reputation for punctuality in appearance of this Magazine by helping us through many tight places when the urgency of our other work delayed the dispatch of copy or proofs to the eleventh hour, or beyond. Three years ago Mr. Shield communicated a few reminiscences of his connection with our publications, which appeared on p. 2 of Vol. **40**, and he lived to complete a full half-century of association with rainfall work, as, if we are not mistaken, he printed the forms for the Thunderstorm enquiry which was the first piece of Mr. Symons's independent work in 1858.

MR. A. WATT, Meteorological Secretary of the Scottish Meteorological Society, will deliver a lecture on the Climate of the British Isles to the Royal Scottish Geographical Society, in Edinburgh, on February 19th, and later to the branches of the Society in Glasgow, Aberdeen and Dundee.

A CONFERENCE OF IMPERIAL AND COLONIAL METEOROLOGISTS has been convened by the Royal Society of Canada, to meet at Ottawa in May, at which it is hoped representative meteorologists from the United Kingdom and from the British Dominions beyond the Seas may attend and discuss matters relating to the larger problems of meteorology in which the various dominions could advantageously co-operate. The date is one at which it is difficult for many meteorologists to get away from routine work, and perhaps if the meeting could have been postponed to 1909, when the British Association will visit Canada, the attendance would probably have been larger. We wish the meeting all success.

METEOROLOGICAL OBSERVATIONS AT TRISTAN D'ACUNHA, the lonely mid-Atlantic islet in 37° S., have, we understand, been undertaken by the Rev. Mr. Barrow, at the instance of the South African Philosophical Society. A complete second-order station has been established, and the observations will, it is hoped, throw light on many problems connected with the weather of South Africa and the atmospheric circulation of the world. The importance of this station will be enhanced by the observations which are being kept up by the government of the Argentine Republic in the Atlantic islands nearer the antarctic circle.

THE MONTEVIDEO METEOROLOGICAL SOCIETY (*Sociedad Meteorologico Uruguaya*) has been re-constituted under the title of the *Instituto Nacional Fisico-Climatologico*, its headquarters remaining at Montevideo.

RAINFALL TABLE FOR JANUARY, 1908.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea.	RAINFALL OF MONTH.	
					Aver. 1870-99.	1908.
		° ′	° ′	ft.	in.	in.
Camden Square	*London*	51 32	0 8	111	1·89	1·93
Tenterden	*Kent*	51 4	*0 41	190	2·36	1·64
West Dean	*Hampshire*	51 3	1 38	137	2·68	1·41
Hartley Wintney	,,	51 18	0 53	222	2·39	1·52
Hitchin	*Hertfordshire*	51 57	0 17	238	1·81	1·41
Winslow (Addington)	*Buckinghamshr.*	51 58	0 53	309	2·05	1·94
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·70	·89
Brundall	*Norfolk*	52 37	*1 26	66	1·67	·98
Winterbourne Steepleton	*Dorset*	50 42	2 31	316	3·90	1·50
Torquay (Cary Green)	*Devon*	50 28	3 32	12	3·19	1·26
Polapit Tamar [Launceston]	,,	50 40	4 22	315	3·87	2·24
Bath	*Somerset*	51 23	2 21	67	2·52	1·24
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·46	1·58
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·81	1·41
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·34	·77
Boston	*Lincolnshire*	52 58	0 1	25	1·59	·97
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·74	1·02
Derby (Midland Railway)	*Derbyshire*	52 55	1 28	156	1·95	1·13
Bolton (Queen's Park)	*Lancashire*	53 35	2 28	390	3·38	3·87
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	1·89	1·26
Arncliffe Vicarage	,, ,,	54 8	2 6	732	6·33	6·59
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·80	1·35
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	1·96	1·46
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	14·71	16·82
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	3·85	2·73
Haverfordwest (High Street)	*Pembroke*	51 48	4 58	95	5·13	3·07
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	3·87	3·84
Llandudno	*Carnarvon*	53 20	3 50	72	2·57	2·53
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·54	5·02
Hawick (Branxholm)	*Roxburgh*	55 24	2 51	457	3·19	3·45
Edinburgh (Royal Observy.)	*Midlothian*	55 55	3 11	442	...	2·17
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	4·92	5·25
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·25	4·68
Tighnabruaich	*Argyll*	55 55	5 14	50	5·86	6·95
Mull (Quinish)	,,	56 36	6 13	35	5·85	6·02
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·10	1·61
Braemar	*Aberdeen*	57 0	3 24	1114	2·91	2·56
Aberdeen (Cranford)	,,	57 8	2 7	120	2·32	1·44
Cawdor	*Nairn*	57 31	3 57	250	2·14	2·09
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	5·10	5·28
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	8·75	11·20
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·62	3·37
Castletown	*Caithness*	58 35	3 23	100	...	2·61
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	6·57	4·48
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	4·06	2·42
Broadford (Hurdlestown)	*Clare*	52 48	8 38	167	2·98	2·86
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·14	3·22
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·16	2·06
Ballinasloe	*Galway*	53 20	8 15	160	3·49	3·36
Clifden (Kylemore House)	,,	53 32	9 52	105	7·86	7·32
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	5·00	7·13
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·61	4·44
Seaforde	*Down*	54 19	5 50	180	3·63	2·66
Londonderry (Creggan Res.)	*Londonderry*	54 59	7 19	320	3·56	3·17

RAINFALL TABLE FOR JANUARY, 1908—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.				Mean Annual 1870-1899.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1870-99. in.	1908. in.	Diff. from Aver. in.	% of Av.	in.	
+ ·04	102	1·38	7	10	...	...	...	...	25·16	Camden Square
— ·72	69	1·31	7	12	...	...	...	...	28·36	Tenterden
—1·27	53	·73	7	13	...	...	...	...	29·93	West Dean
— ·87	64	1·10	7	13	...	...	...	...	27·10	Hartley Wintney
— ·40	78	·69	7	11	...	...	...	...	24·66	Hitchin
— ·11	95	1·39	7	14	...	...	...	...	26·75	Addington
— ·81	52	·26	7	13	...	...	...	...	25·39	Westley
— ·69	59	·15	7	20	...	...	...	...	25·40	Brundall
—2·40	38	·58	7	16	...	...	...	...	39·00	Winterbourne Stpltn
—1·93	39	·47	7	12	...	...	...	...	35·00	Torquay
—1·63	58	·82	7	16	...	...	...	...	38·85	Polapit Tamar
—1·28	49	·61	7	13	...	...	...	..	30·75	Bath
— ·88	64	·84	7	15	...	...	...	...	29·85	Stroud
—1·40	50	·26	6	17	...	...	...	...	33·04	Wolstaston
—1·57	33	·19	5	12	...	...	...	...	29·21	Coventry
— ·62	61	·27	5	8	...	...	...	...	23·30	Boston
— ·72	59	·30	8	13	...	...	...	...	24·70	Hodsock Priory
— ·82	58	·29	6	16	...	...	...	...	26·18	Derby
+ ·49	114	·83	26	16	...	...	...	...	42·43	Bolton
— ·63	67	·33	6	12	...	...	...	...	26·96	Ribston Hall
+ ·26	104	1·44	26	15	...	...	...	...	60·96	Arncliffe Vic.
— ·45	75	·28	8	16	...	...	...	...	27·02	Hull
— ·50	74	·80	7	12	...	...	...	...	27·99	Newcastle
+2·11	114	3·30	15	18	...	...	...	...	132·68	Seathwaite
—1·12	71	·60	16	19	...	...	...	...	42·81	Cardiff
—2·06	60	·79	7	16	...	...	...	...	47·88	Haverfordwest
— ·03	99	·93	15	16	...	...	...	...	45·41	Gogerddan
— ·04	98	·48	6	16	...	...	...	...	30·98	Llandudno
+ ·48	110	·84	15	14	...	...	...	...	43·43	Cargen
+ ·26	108	1·20	8	16	...	...	...	...	34·80	Branxholm
...	...	1·07	7	12	...	...	...	...	...	Edinburgh
+ ·33	107	·95	5	19	...	...	...	...	48·87	Girvan
+1·43	144	·67	7	18	...	...	...	...	35·80	Glasgow
+1·09	119	·98	25	18	...	...	...	...	57·90	Tighnabruaich
+ ·17	103	·81	14	19	...	...	...	...	57·53	Quinish
— ·49	77	·86	7	17	...	...	...	...	28·95	Dundee
— ·35	88	...	...	...	...	...	...	...	36·07	Braemar
— ·88	62	·67	7	14	...	...	...	...	33·01	Aberdeen
— ·05	98	·31	17	14	...	...	...	...	29·37	Cawdor
+ ·18	104	·74	25	20	...	...	...	...	43·71	Fort Augustus
+2·45	128	1·97	25	22	...	...	...	...	86·50	Bendamph
+ ·75	129	·75	27	13	...	...	...	...	31·60	Dunrobin Castle
...	...	·49	5	21	...	...	...	...	...	Castletown
—2·09	68	1·36	17	21	...	...	...	...	58·11	Killarney
—1·64	60	·54	15	21	...	...	...	...	39·30	Waterford
— ·12	96	·45	6	21	...	...	...	...	33·47	Hurdlestown
+ ·08	103	·78	6	19	...	...	...	...	35·19	Abbey Leix
— ·10	95	·71	6	16	...	...	...	...	27·75	Dublin
— ·13	96	·73	6	20	...	...	...	...	37·04	Ballinasloe
— ·54	93	1·10	6	18	...	...	...	...	80·23	Kylemore House
+2·13	143	·88	6	23	...	...	...	...	50·50	Enniscoe
— ·83	123	·60	6	20	...	...	...	...	41·83	Markree Obsy.
— ·97	73	·61	7	15	...	...	...	...	38·61	Seaforde
— ·39	89	·41	25	21	...	...	...	...	41·20	Londonderry

SUPPLEMENTARY RAINFALL, JANUARY, 1908.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	1.99	XI.	Rhayader, Tyrmynydd	3·13
,,	Ramsgate	1·84	,,	Lake Vyrnwy	4·51
,,	Steyning	2·03	,,	Llangyhanfal, Plâs Draw	2·68
,,	Hailsham	1·87	,,	Criccieth, Talarvor	3·70
,,	Totland Bay, Aston House	·95	,,	Llanberis, Pen-y-pass	...
,,	Emsworth, Redlands	1·02	,,	Lligwy	3·35
,,	Stockbridge, Ashley	1·64	,,	Douglas, Woodville	3·62
,,	Reading, Calcot Place	1·57	XII.	Stoneykirk, Ardwell House	2·76
III.	Harrow Weald, Hill House	1·81	,,	Dalry, The Old Garroch	8·89
,,	Oxford, Magdalen College	1·55	,,	Langholm, Drove Road	6·78
,,	Pitsford, Sedgebrook	1·10	,,	Moniaive, Maxwelton House	5·76
,,	Huntingdon, Brampton	1·09	XIII.	N. Esk Reservoir [Penicuick]	4·50
,,	Woburn, Milton Bryant	1·57	XIV.	Maybole, Knockdon Farm	4·19
,,	Wisbech, Bank House	·87	XV.	Campbeltown, Witchburn	4·51
IV.	Southend Water Works	1·00	,,	Inveraray, Newtown	9·67
,,	Colchester, Lexden	·62	,,	Ballachulish House	10·74
,,	Newport, The Vicarage	1·10	,,	Islay, Eallabus	4·26
,,	Rendlesham	·58	XVI.	Dollar Academy	4·61
,,	Swaffham	·94	,,	Loch Leven Sluice	4·59
,,	Blakeney	·84	,,	Balquhidder, Stronvar	9·09
V.	Bishops Cannings	2·02	,,	Perth, Pitcullen House	1·89
,,	Ashburton, Druid House	2·51	,,	Coupar Angus Station	2·02
,,	Honiton, Combe Raleigh	1·40	,,	Blair Atholl	2·50
,,	Okehampton, Oaklands	2·93	,,	Montrose, Sunnyside Asylum	1·81
,,	Hartland Abbey	1·90	XVII.	Alford, Lynturk Manse	1·69
,,	Lynmouth, Rock House	2·10	,,	Keith Station	1·95
,,	Probus, Lamellyn	1·38	XVIII.	N. Uist, Lochmaddy	4·02
,,	North Cadbury Rectory	1·15	,,	Alvey Manse	2·06
VI.	Clifton, Pembroke Road	1·76	,,	Loch Ness, Drumnadrochit	3·74
,,	Ross, The Graig	·72	,,	Glencarron Lodge	10·44
,,	Shifnal, Hatton Grange	1·27	,,	Fearn, Lower Pitkerrie	1·24
,,	Blockley, Upton Wold	1·39	XIX.	Invershin	3·27
,,	Worcester, Boughton Park	·68	,,	Altnaharra	4·26
VII.	Market Overton	·96	,,	Bettyhill	2·95
,,	Market Rasen	1·34	XX.	Dunmanway, The Rectory	6·42
,,	Bawtry, Hesley Hall	·61	,,	Cork	2·52
,,	Buxton, Lismore House	3·02	,,	Darrynane Abbey	4·92
VIII.	Neston, Hinderton Lodge	1·56	,,	Glenam [Clonmel]	2·24
,,	Southport, Hesketh Park	1·95	,,	Ballingarry, Gurteen	3·10
,,	Chatburn, Middlewood	5·95	,,	Miltown Malbay	4·56
,,	Cartmel, Flookburgh	4·27	XXI.	Gorey, Courtown House	1·86
IX.	Langsett Moor, Up. Midhope	4·11	,,	Moynalty, Westland	3·17
,,	Scarborough, Scalby	2·03	,,	Athlone, Twyford	2·65
,,	Ingleby Greenhow	1·29	,,	Mullingar, Belvedere	3·54
,,	Mickleton	2·12	XXII.	Woodlawn	3·82
X.	Bardon Mill, Beltingham	2·17	,,	Westport, St. Helens	4·66
,,	Ewesley, Fallowlees	1·70	,,	Mohill	3·28
,,	Ilderton, Lilburn Cottage	1·82	XXIII.	Enniskillen, Portora	3·21
,,	Keswick, York Bank	5·97	,,	Dartrey [Cootehill]	2·76
XI.	Llanfrechfa Grange	2·09	,,	Warrenpoint, Manor House	2·76
,,	Treherbert, Tyn-y-waun	8·35	,,	Banbridge, Milltown	2·09
,,	Carmarthen, The Friary	3·88	,,	Belfast, Springfield	3·55
,,	Castle Malgwyn [Llechryd]	2·41	,,	Bushmills, Dundarave	2·70
,,	Plynlimon	12·20	,,	Stewartstown, The Square	2·13
,,	Crickhowell, Ffordlas	2·20	,,	Killybegs	6·28
,,	New Radnor, Ednol	1·76	,,	Horn Head	3·47

METEOROLOGICAL NOTES ON JANUARY, 1908.

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.

LONDON, CAMDEN SQUARE.—In the first two weeks two short spells of severe frost occurred, separated by a sudden thaw and 1·38 in. of R on 7th, the heaviest daily fall in January since the record started in 1858. In the latter half anticyclonic conditions prevailed, and dense fogs were frequent, but the temp. was considerably higher. Fine and bright after 27th. Mean temp. 36°·7, or 1°·4 below the average. Duration of sunshine 32·5* hours, and of R 34·6 hours.

WEST DEAN.—A cold and variable month, with R less than half the average. The temp. was low and there was an unusual amount of fog. S on 6, and fog on 12, days.

WINTERBOURNE STEEPLETON.—The night temp. was very low in the first half, and there was an unusual amount of fog in the latter half. The mean temp. was 2°·3 below the average of 15 years.

TORQUAY.—Duration of sunshine 62·8* hours, or 2·2 below the average. Mean temp. 41°·4, or 1°·0 below the average.

NORTH CADBURY.—A month of violent and remarkable changes many days being warm and bright, and many dismal or foggy. The R was less than half the average, and the wind normal with no great gale. Between 5th and 6th a rise of 30° of temp. occurred in 13 hours.

BOLTON.—Generally dull, foggy and damp. Duration of sunshine 8·7* hours, being 12·2 hours below the average, and the lowest on record for January; 23 sunless days. The earth temp. was the lowest since 1895. S fell on two days and H was frequent.

SOUTHPORT.—Very sunny and rather dry, with high bar. There were notable day to day changes of temp., unprecedented in 36 years. Mean temp. 36°·8, or 1°·8 below the average. Duration of sunshine 55·3* hours, or 14·0 above the average. R ·75 in. below the average; duration 45·4 hours.

HAVERFORDWEST.—Cold and frosty generally till 12th, then mild and changeable. The R was moderate, and there was much fog. Duration of sunshine 75·9* hours.

DOUGLAS.—An unusually disagreeable month for the almost unbroken spell of cold winds of great strength and much wet weather. There were, however, six brilliantly fine frosty days.

DUMFRIES.—Remarkable for extremely changeable weather, keen frost being suddenly followed by high temp. There was little sunshine, and when not raining it was damp and muggy. Farm work was well advanced.

COUPAR ANGUS.—The R and mean temp., 35°·9, were both practically the average values. The coldest period occurred during the first week. There were several N.W. gales.

DRUMNADROCHIT.—R ·02 in. below, and rain days 1 above, average of 22 years.

CASTLETOWN.—Except for a W. gale on 6th it was fine to 25th, with S.W. winds and a good deal of sunshine. From that date R, H and S showers continued to the end. Whole W. gale, force 10, on 30th and 31st.

DUNMANWAY.—Wet on the whole, with fine cold intervals. Frost on first four days and from 9th to 11th. Skating was possible on flooded fields.

CORK.—R 1·71 in. below, and mean temp. 3°·2 below the average.

MILTOWN MALBAY.—Intense frost to 4th, when, after a thaw, there was 1·40 in. of R in one continuous fall. Light frosts, succeeded by heavy R, prevailed nigh a fortnight; thence to the end was cold.

DUBLIN.—Very cold during the first five days; on 5th the temp. rose briskly. This warm wave was transitory, but a second set in on the 13th lasting till 17th, and another from 22nd to 27th. Mean temp. 41°·5.

KYLEMORE.—Wild and stormy, with black frost at the beginning and much R towards the end.

* Campbell-Stokes.

Climatological Table for the British Empire, August, 1907.

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	78·3	4	44·1	2	70·6	52·4	53·6	77	120·7	41·2	1·94	13	...
Malta	94·1	12	69·9	24,27	84·8	73·6	66·5	70	150·0	...	...	...	1·0
Lagos	84·2	30,31	68·0	8	81·6	71·5	70·4	77	164·0	62·0	1·29	2	8·6
Cape Town	81·8	15	40·6	5	64·1	47·3	48·5	79	...	...	1·49	8	4·4
Durban, Natal ...	87·6	12	45·7	4	77·3	55·2	...	...	139·8	...	·01	1	1·3
Johannesburg	75·8	30	34·1	4	66·4	45·9	40·4	60	133·7	29·8	·00	0	0·8
Mauritius	77·3	27,29	49·9	8	75·1	58·7	55·5	68	141·8	40·0	·12	3	6·0
Calcutta...	92·3	6	75·5	18,19	88·4	79·1	77·8	86	159·0	74·0	10·05	18	8·3
Bombay...	85·3	1	74·6	13	82·9	77·1	75·4	86	131·1	72·3	15·93	30	9·2
Madras	101·0	20	73·6	11	96·9	78·7	71·5	67	151·2	72·4	4·08	19	6·4
Kodaikanal	64·6	18	49·3	27	61·1	51·8	51·0	88	135·1	45·3	6·36	27	8·3
Colombo, Ceylon ...	87·1	24	73·0	13	85·0	76·3	73·4	81	154·5	70·2	1·76	13	6·0
Hongkong	91·6	29	74·5	12	86·7	78·3	75·5	81	142·7	...	14·86	17	6·2
Melbourne	66·7	1	38·5	28	60·1	45·2	42·9	72	123·2	29·4	1·97	13	6·1
Adelaide	73·3	30	39·9	17	62·3	46·6	45·7	72	124·7	36·4	1·81	16	5·1
Coolgardie	...	...	...	...	...	...	...	...	...	...	...	...	...
Sydney	75·4	27	42·0	18	65·3	47·4	41·3	67	109·1	32·0	·29	13	2·9
Wellington	59·0	10	33·0	4	53·6	43·3	42·1	79	103·0	24·0	4·13	17	6·8
Auckland	63·0	7	40·0	4	57·2	47·5	45·2	77	118·0	35·0	...	...	5·7
Jamaica, Negril Point.	89·9	4	69·2	18	87·8	71·9	72·2	76	...	...	9·00	18	6·4
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	86·2	3	71·0	12	84·1	73·5	72·9	79	140·6	...	5·71	25	5·0
Toronto	87·0	11	47·8	23	76·2	54·4	...	...	105·5	43·7	1·09	5	3·7
Fredericton	84·3	13	40·5	23	72·7	51·4	...	75	...	...	3·81	15	6·0
St. John's, N.B. ...	73·2	12	50·0	27	66·1	54·3	...	...	...	...	3·92	14	5·8
Victoria, B.C.	78·1	20	43·7	12	...	...	...	...	...	...	·23	7	5·0
Dawson	79·0	11	30·0	25	67·4	40·9	...	...	...	...	1·28	9	6·0

MALTA.—Mean temp. of air 78°·7.

JOHANNESBURG.—Bright sunshine 339 hours or 98 °/₀ of the possible amount.

Mauritius.—Mean temp. of air 1°·6, of dew point 3°·9, relative humidity 6·7 per cent., and R 2·07 in., below, averages. Mean hourly velocity of wind 9·9 miles, or 2·4 miles below average.

KODAIKANAL.—Bright sunshine 72 hours.

COLOMBO.—Mean temp. of air 79°·9 or 0°·9 below, of dew point 0°·2 above, and R 1·84 in. below, averages. Mean hourly velocity of wind 7·1 miles.

HONGKONG.—Mean temp. of air 81°·9. Bright sunshine 222·5 hours. Mean hourly velocity of wind 11·7 miles.

Adelaide.—Mean temp. of air 0°·6 above, and R ·54 in. below, averages, and sunshine 6 hours above average.

Sydney.—Mean temp. of air 1°·8 above, and R 2·87 in. below, averages.

Wellington.—Mean temp. of air 0°·1 below, and R ·82 in. below, averages. Fogs on two nights.

Auckland.—Wet and stormy, strong gales on two days. R 2·22 in. above average.

Symons's
Meteorological Magazine.

No. 506. MARCH, 1908. Vol. XLIII.

Lieut.-Gen. Sir Richard Strachey, G.C.S.I., F.R.S.

24th July, 1817—12th February, 1908.

The death of Sir Richard Strachey removes a veteran in many departments of public activity, and it is impossible in this place to do more than refer to some points in his career, and say a few words about his connection with meteorology. Entering the East India Company's Engineers in 1836, he served in India in military or high civil employment until 1878. During the earlier part of that time he conducted some important journeys of exploration in the Himalayan regions, then very little known, and he was prominently concerned in the great works for the irrigation of the arid regions of India. He served for many years on the Council of India, and it is impossible to enumerate the manifold services he rendered to that Empire.

He was President of the Royal Geographical Society from 1886 to 1889, and when in that position did much to advance the study of physical geography, and to promote the development of geographical teaching at the Universities.

In 1873 he became a member of the Meteorological Council of the Royal Society, the body which at that time controlled the Meteorological Office, and in 1883 he became Chairman of the Council, and continued to hold that position until the Meteorological Office was re-organized in 1905, and the Meteorological Council abolished. He governed the Meteorological Council with great force and ability, and had a very large share in guiding the destinies of official meteorology in the British Isles, as well as in organizing the meteorological service in India.

Sir Richard's own contributions to meteorology were numerous, and he took special interest in the treatment of meteorological statistics by the method of harmonic analysis. In 1906 he received the Symons memorial gold medal of the Royal Meteorological Society, and we may refer to the summary of his work given in Vol. **32**, p. 156, of the *Quarterly Journal* of that Society for the titles of his principal papers, and for an able summary by Dr. W. N. Shaw, of the guiding principles in regard to meteorological work which he inculcated.

A. Albert Lancaster,

24TH MAY, 1849—4TH FEBRUARY, 1908.

MONSIEUR A. LANCASTER, whose recent death we regret to have to record, was born at Mons, in Belgium, and entering the Royal Observatory at Brussels, in 1866, passed through all the lower stages in that institution, until in 1898 he became Director of the Meteorological Department. He remained at work to the last, and was at the Observatory only a few hours before his death. He devoted a great part of his attention to climatological investigations, and dealt very comprehensively with the climate of Belgium, his important rainfall map of that country appearing in 1895. He was engaged at the time of his death on a new cloud atlas; but with this exception, and a study of the climate of the Congo State, his scientific activity was mainly devoted to the conditions of his own country. He compiled a remarkable historic summary of earthquakes in Belgium, and was much interested in the progress of seismology. He was one of the founders of the popular and successful journal *Ciel et Terre*, in 1880, and in it a large number of his original articles appeared.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, February 19th, at the Institution of Civil Engineers, Great George Street, Westminster. Dr. H. R. Mill, President, in the chair.

Mr. C. Browett read a paper describing the formation of "snow rollers," which he observed at Ryton-on-Dunsmore, near Coventry, on January 29th–30th, 1907. There had been some snow showers during the afternoon and evening, amounting to a depth of about $1\frac{1}{2}$ inches. The next morning he noticed that the snow on the lawn to the east of the house was heaped up as though someone had run with a spade in front of him. The snow was cleared away to the bare grass (except for slight bars of snow across) in tadpole-like markings, whose tails all pointed to the direction from which the wind had been blowing all night, viz: north-north-east, and at whose heads was heaped up the snow that had been on the bared grass, all neatly turned over in a roll. A few markings only were seen on the other lawns, and none at all in a field to the north; but on the drive and grass in front of the north side of the house there were markings in the opposite direction, but with little snow actually curled up. These were evidently caused by the deflection of the wind from the sides of the house. The temperature during the night ranged between 32° and 34°.

A number of extracts giving descriptions of similar phenomena observed elsewhere were appended to the paper. It seems that the flakes of a light fluffy layer of surface snow are made adhesive by a

rise in the temperature of the air above the freezing point, while the under snow remains cold and dry, and the particles of damp surface snow are enabled to adhere to each other, but not to the dry under snow. A strong wind may then push over little projections of the surface snow and start them rolling, when, of course, they will travel and grow until the resistances overcome the propelling power of the wind. These "snow-rollers" vary in size, some being only a few inches in diameter, while at times others have been seen two feet or more in length.

Mr. H. Mellish stated that he had observed the phenomenon of "snow-rollers" several times at Hodsock. Last winter he had seen them on three occasions, one of which was on the morning referred to in the paper, although he lived sixty miles from Coventry.

Mr. W. Marriott showed lantern slides of "snow-rollers" seen by Mr. W. A. Bentley at Jericho, Vt., and by Mr. M. L. Fuller at Canton, New York.

Mr. J. E. Clark said that one interesting point about the "snow-rollers" was their extreme lightness when compared with similar rolls made by hand.

A paper, by Mr. Ernest Gold, on a "Comparison of ship's Barometer readings with those deduced from land observations," was also read. This contained the result of a preliminary investigation, undertaken at the Meteorological Office, into the relation between the barometer readings taken on ships during their passage across a line between Falmouth and Brest, and the readings deduced for the ship's position from the observations at these places and the trend of the isobars, on the assumption of regular pressure changes. Mr. Gold concluded by saying that taking into account the various causes which can appreciably influence the height of the barometer on board ship, we are compelled to say that until the two chief elements of disturbance—the wind and the vertical acceleration effects—are eliminated, it will be impossible to draw any satisfactory conclusions regarding the relative values of atmospheric pressure over sea and land. One can say in general that there appears to be a tendency for the barometric pressure to be lower between Falmouth and Brest than would be expected from the land observations.

Capt. Campbell Hepworth said that with regard to the "pumping" of the barometer in a seaway, he thought the observations should be taken when the mercury had touched its lowest level, instead of observing the highest and lowest and taking the mean. If they looked at the wind charts of the great oceans, they would see that the wind had a tendency to cling to the land.

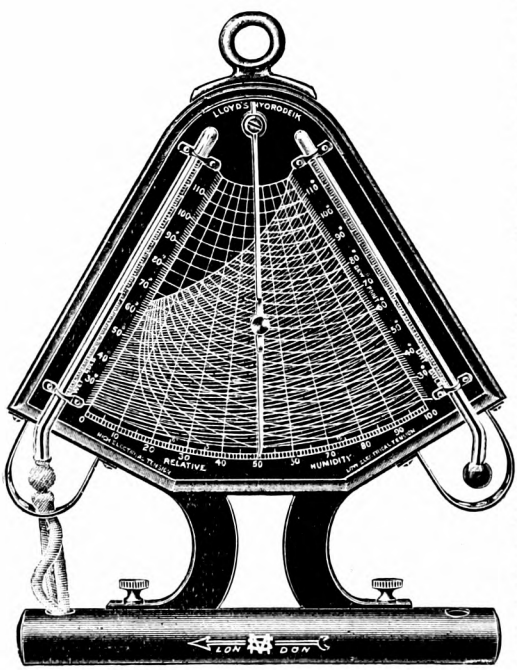
Dr. W. N. Shaw referred to the difficulties experienced at the Ben Nevis Observatory with the reading of the barometer when the wind exceeded force 3 on the Ben Nevis scale. He considered it desirable that a number of observations should be made to enable them to know how to expose a barometer on board the ship in order that it should indicate the proper pressure.

Mr. H. Harries, Mr. R. Inwards and Capt. R. Warden also took part in the discussion.

The following gentlemen were elected Fellows of the Society :— Mr. M. M. Hoosein, Mr. P. R. Jameson, Mr. G. R. Jebb, M.Inst.C.E., Capt. J. R. Rae, Mr. S. V. S. Setti, B.A., Capt. H. Strong, Mr. O. Thomas, M.Inst.C.E., Mr. J. Wrench Towse, Mr. F. Woolnough and Mr. J. H. Wylie.

HYGROMETERS WITHOUT CALCULATION.

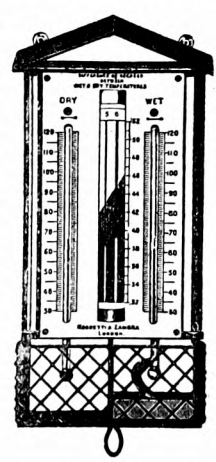
We have received from Messrs. Short and Mason a specimen of the very neat and convenient form of hygrometer known as Lloyd's Hygrodeik—the name indicating, we presume, the fact that the instrument *shows* without calculation the hygrometric conditions of the atmosphere. The instrument consists of a wet and a dry-bulb thermometer properly divided on the stem, which is so shaped as to magnify the breadth of the mercury column, making it very easy to read when viewed at the proper angle. The thermometers could, no doubt, be verified at Kew if required. They are mounted, as shown in the illustration, on a triangular brass frame, the base of which is ingeniously adapted as the water-vessel ; but the characteristic feature is the modification of the slide-rule which fills the space between the thermometers. A brass radius is hinged at the top of the frame and provided with a sliding point which can be adjusted so as to coincide with any degree of the thermometer. The mode of ascertaining the relative humidity is to set the sliding point to the wet-bulb temperature on the left hand side of the chart, and then to swing the radius until the sliding point cuts the red line curving down from the actual dry-bulb temperature. At this point the extremity of the radius points to the relative humidity on the arc at the bottom. The dew-point and absolute humidity are observed with equal ease by following the black lines curving up from the dry-bulb scale through the points of intersection. The



relative humidities can be read easily to less than 1 per cent., and the dew-point to within a degree. We have tested the instrument and find is as accurate in use as the ordinary reduction table as given in the "Hints for Meteorological Observers."

The hygrodeik is a handsome instrument, strongly made and neatly finished. While it is just as good as the ordinary wet and dry-bulb thermometer for scientific purposes, it is particularly well suited for the use of the amateur observer, who often wants to know the relative humidity or the dew-point, and seldom cares to turn up a table to compute the figures.

Messrs. Negretti and Zambra have introduced a horticultural hygrometer, which should be of real utility to gardeners by calling their attention to the probability of frost at night. The principle is the fact that when the falling temperature reaches the dew-point and condensation commences, the liberation of heat in this process checks the fall of temperature in such a way that the dew-point may be said to control the minimum temperature. The calculation of the dew-point from the readings of the wet and dry-bulb temperatures is a somewhat tedious process, and is accomplished automatically in the horticultural hygrometer by a modification of the slide rule, as in the hygrodeik; but instead of giving the temperature of the dew-point, the instrument is boldly graduated so as to show at a glance whether frost is highly improbable, doubtful, or very probable. Between the two thermometers there is a vertical cylinder, the lower part of which is black, the middle part shaded, and the upper part white, the lines separating the three areas being spirals on the cylinder. Vertical lines are ruled down the cylinder, and numbered 1, 2, 3, 4, &c. To use the instrument the temperature of the wet and dry bulb is read late in the evening; the cylinder is rotated to bring the line corresponding to the number of degrees' difference between the two readings to the right-hand side of the slit in which it rotates, and the figure on the scale marked on that side of the slit which corresponds to the wet-bulb reading falls opposite the black, the shaded, or the white part of the cylinder according as frost is very probable, doubtful, or highly improbable. The instrument is very strongly constructed, but the thermometers are not divided on the stem. This does not detract from the usefulness of the indications, which could not in any case be taken as an exact forecast; and we consider that it is a useful piece of garden equipment.



The principle on which both instruments are founded is not new, but they are none the less interesting on that account.

ON THE LEARNING OF METEOROLOGY.

By L. C. W. Bonacina.

(Concluded.)

So much then, for the supreme importance of observational meteorology in its completest sense; now for a few words upon the statistical method of learning the science. Meteorological statistics refer, of course, to instrumental and non-instrumental observations. They are of very great importance, for without their aid climates could not be satisfactorily described; and they, moreover, open up hosts of interesting questions in connection with the physical causes of the diverse peculiarities of climates, etc., which they reveal.

It is not wise, however, to entertain as from the peculiar interest of this branch of the subject there is often a temptation to, a too exclusive regard for statistical meteorology. Statistics should be regarded rather as a means to an end than an end in themselves—a means of opening out diverse interesting physical problems bearing upon the cause and effect aspect of meteorological or climatic phenomena. For, on the one hand, they cannot of themselves elevate us to those lofty heights of intellectual sublimity, to attain which is the grand reward that awaits those who investigate the abstruse physical and mathematical problems of the atmosphere; and, on the other hand, they are unable to tell us anything of the characteristic qualities of the various phenomena to which they refer. It is not enough, for instance, to know that the average rainfall of London amounts to 25 inches in the year; the true meteorologist will not be content till he has endeavoured to ascertain the causes of this amount of rainfall; nor will this information as to it be particularly interesting to him, unless he knows by *personal observation* the structure, so to speak, of the rainfall of London—not only the seasonal distribution and quality of the rain considered as a whole, but also those of all the various phenomena which in London go by the generic term of rain, the thunder *rain* and the cyclonic *rain* being as distinct from one another as both are from snow or hail. Before then, we may advantageously burden our memories with all the anomalies of rainfall, temperature, etc., which have occurred during the last fifty years, their departure from means and approximation to extremes, and so on; it would be well to make sure that we have observed accurately the rainbow from time to time and understood it; that we have watched the cumulus clouds banked up along the horizon in their majesty and power, and the cirrus fibres curled, twisted and interwoven; assimilated those reflections of bewitching purple that respond to the winter's sun, touching with faintest flush the expanse of snow-clad mead; wondered at the storm shadows that encroach upon the mountain flanks and steal over the darksome hollows where lie the sullen tarns; delighted in the shades of mellowed pink subduing in softening tones the bared forest-limbs swaying and creaking in November dusk

—even as the sweet fragrance, the chorus of song, and wealth of bloom, and those evanescent phrases of subtle and surpassing beauty which the skies show in fairest May.

With regard to the method of meterological inquiry under heading No. 3 above, namely, atmospheric physics, I need hardly say that the knowledge of this subject—the understanding of causes—is the height to which every meteorologist should aspire. Our knowledge of the laws of physics is probably well in advance of meteorology ; and it is now generally recognised that what we now want is data wherewith to apply that knowledge, particularly in relation to that immensely important practical application of meteorology—the forecasting of weather. So far as can be at present foreseen, the forecasting of weather for long periods in advance will never be possible until simultaneous observations can be obtained from stations well representing each of the four quarters of the globe ; moreover, the earnestness with which the meteorological exploration of the upper air, by means of kites and balloons, has been commenced does but testify that the need for data from that upper region also is well recognised.

In conclusion, I may remark, as a matter of interest, that the real nature of the problem at issue was demonstrated a very long time ago, long before ordinary meteorologists had begun to realise it, by John Ruskin, when quite a young man, by a remarkable flash of prophetic genius—remarkable when one remembers that the absorbing nature of the multitudinous duties with which Ruskin's mind was occupied permitted him to cast but an occasional glance at the science of meteorology, passionately devoted to watching the sky and clouds though he was. The following passage, in which this demonstration occurs, I quote from his essay written at Oxford on the founding of the Meteorological Society :—

"The Meteorological Society, therefore, has been formed, not for a city, not for a kingdom, but for the world. It wishes to be the central point, the moving power, of a vast machine, and it feels that unless it can be this it must be powerless ; if it cannot do all, it can do nothing. It desires to have at its command, at stated periods, perfect systems of methodical and simultaneous observations ; it wishes its influence and its power to be omnipresent over the globe, so that it may be able to know at any given instant the state of the atmosphere at every point on its surface. Let it not be supposed that this is a chimerical imagination—the vain dream of a few philosophical enthusiasts. It is co-operation which we now come forward to request, in full confidence that if our efforts are met with a zeal worthy of the cause, our associates will be astonished, individually, by the result of their labours in a body. Let none be discouraged because they are alone or far distant from their associates. What was formerly useless will now become strength. Let the pastor of the Alps observe the variations of his mountain winds ; let the voyager send us notes of their changes on the surface of the sea ;

let the solitary dweller in the American prairie observe the passage of the storms and the variations of the climate; and each, who alone would have been powerless, will find himself part of one mighty Mind—a ray of light entering into one vast Eye—a member of a multitudinous Power, contributing to the knowledge and aiding the efforts which will be capable of solving the most deeply hidden problems of Nature, penetrating into the most occult causes, and reducing to principle and order the vast multitude of beautiful and wonderful phenomena, by which the wisdom and benevolence of the Supreme Deity regulates the course of the times and the seasons, robes the globe with verdure and fruitfulness, and adapts it to minister to the wants and contribute to the felicity of the innumerable tribes of animated existence."

METEOROLOGICAL NEWS AND NOTES.

BEN NEVIS OBSERVATORY was the subject of a question in the House of Commons on February 17th, when Major Anstruther-Gray asked the Chancellor of the Exchequer whether he could hold out any prospect of a grant towards the upkeep of the observatory on Ben Nevis, and the Chancellor of the Exchequer replied:—"I explained, in answer to a question by my hon. friend the member for Inverness, on August 1 last, that the only scheme which has up to the present been placed before me is one under which the whole cost of the re-equipment and maintenance of the observatories would be thrown upon public funds, and to this I should not feel justified in assenting. I am, however, quite prepared to consider the question of renewing the Government grant, which was for many years given to these institutions through the Meteorological Council, provided that an adequate contribution towards their re-establishment and maintenance is forthcoming from other sources. So far as I am aware there has been no change in the position since that date."

MR. G. G. CHISHOLM has been appointed Lecturer on Geography in the University of Edinburgh, and it is gratifying to know that so distinguished a geographer has been found to fill the new post. Lectureships on Geography now exist in a good many universities and colleges where there is as yet no systematic teaching in meteorology, and as a properly planned geographical course necessarily involves a good deal of climatology, if it does not require to go further into the science of the atmosphere, they form valuable centres for encouraging a wider interest in meteorology.

DR. H. R. MILL has been elected a Corresponding Member of the Physical Geography Section of the Imperial Russian Geographical Society of St. Petersburg.

THE WEATHER OF FEBRUARY.

By Fred. J. Brodie.

The month of February included two clearly defined periods of weather of a widely different character. For the first twelve days or so a large portion of the United Kingdom lay under the eastern edge of an anticyclone, which extended in from the Atlantic, the western limits of the system being situated, as a rule, beyond the Azores. The barometer was therefore high, especially on the 6th and 7th, when readings above 30·8 in. were recorded in the west and south of Ireland; and the prevailing winds were from the westward or north-westward. The weather, although mainly fair and dry, was less settled than might have been expected with the existing type of pressure distribution, slight falls of rain occurring from time to time in most districts. In the extreme western and northern parts of the kingdom, where the weather was affected by cyclonic disturbances moving from Iceland to northern Europe, rain was more frequent, though seldom heavy. The temperatures registered during this 12-day period were mostly above the average, but keen frosts were occasionally experienced, the sharpest of these occurring respectively on the nights of the 1st and 2nd and of the 11th and 12th. On the former occasion, the sheltered thermometer fell to 23° at Marlborough and Llangammarch Wells, and to 25° at Rounton and Raunds; the readings on the grass being as low as 15° at Llangammarch Wells, 18° at Crathes, and 19° at Newton Rigg. On the latter occasion, the screened thermometer fell to 21° at Nottingham, 22° at Bawtry and Wisley, and 23° at Rothamsted; the exposed instrument sinking to 17° at Greenwich, 18° at Llangammarch Wells, and 19° at Kew, Cambridge and Tunbridge Wells.

In the second period of weather, lasting from about the 13th until very nearly the close of the month, the Atlantic low pressure systems, which had hitherto kept well to the northward of these islands, pursued a more southerly track and occasioned rough wet weather over the entire kingdom. Gales from some westerly quarter were experienced very frequently, the storm of the 22nd being unusually severe in the north-western and extreme northern districts. Temperature was higher than with the previous anticyclonic conditions, the only frost of any note occurring in central Scotland on the night of the 16th, when the thermometer on the grass fell to 19° at Crathes, and to 25° at Balmoral. Between the 27th and 29th of the month, one of the northern low pressure systems passed southwards down the North Sea, and a cold wind from north and north-west set in very generally, with squalls of hail or snow (the latter being heavy in many northern districts), and thunderstorms in several isolated localities.

For the month as a whole the mean temperature was above the average; the excess varying in most districts between two and two and a half degrees. One of the leading features in the weather of

the period was the rarity of frost. In London (at Westminster) the thermometer in the screen reached 32° on four occasions only, as against an average for the previous 37 Februarys of 10·7. At Leith, there were only 2 nights with a screened temperature as low as 32°, the number being the smallest in February for at least 36 years. Further to the northward the number of frosts last month increased to 7 at Aberdeen, to 10 at Wick, and to 14 at Sumburgh Head.

THE RAINFALL OF THE THAMES DISTRICT IN FEBRUARY, 1908.

In accordance with the promise made last month we now present our readers with a rainfall map for February of that portion of England which may, without unduly straining the meaning of words, be termed the Thames District, that is to say it is a map of the valley of the Thames from source to sea filled up so as to occupy a rectangle the size of our page. The groundwork of the map, which is printed in brown, shows by means of two tints the areas occupied by land more than 250 and more than 500 feet above sea level, and in this way it brings the form of the country clearly before the eye. The brown dotted lines mark the boundaries of the drainage areas of the Thames and Lee above Teddington and Feilde's Weir respectively, and so defines those parts of the country the rainfall of which is contributing to the water supply of London derived from surface sources. It will be noticed that the plain of the upper Thames and Cherwell is surrounded by the Cotteswold Hills on the west and north, and barred off from the plain of the lower Thames by the line of the White Horse Downs in Berkshire and the Chiltern Hills, which is broken only by the narrow gorge at Goring through which the river runs. South of London the curved line of the North Downs will be noted stretching from Guildford to Maidstone, and on to the south-east.

The black lines which cross the map are isohyetals or lines of equal rainfall for February, and they are drawn from the rainfall at about 200 stations, records from which were received before the 8th of March. There is not time to transfer these figures neatly from the working map to the copy for reproduction, but a black dot is placed on the site of each station, so that our readers can see from what districts additional records would be most useful.

The map for February is not a particularly interesting one, because the rain was very uniformly distributed. No station recorded so much as 2 inches, and none so little as half an-inch, and we have only been able to draw the lines of 1 inch and of 1·5 inches. The result is to show that a large area in the upper Thames valley and a smaller area in the lower Thames Valley had less than an inch of rain in the month, while there were areas with more than one and a half inches along the south-eastern

RAINFALL OF FEBRUARY 1908.

side of the broad belt of hills which runs across the middle of the valley from south-west to north-east, and it is interesting to note that the north of London was the wettest part of the whole area. The rainfall was on the whole rather below the average, but it fell on a large number of days, most stations reporting rain on about 15. The only day with more than a small fall was the 16th, when between a quarter and half-an-inch was recorded at most stations.

The map as reproduced is a portion of a rainfall map of the British Isles which is supplied to the Meteorological Office, and published in the *Monthly Weather Report*, but which could not be completed in time for publication in this Magazine. Indeed, we cannot guarantee the appearance of this map every month, and unless there is some indication that its monthly appearance is appreciated we may only insert it when it possesses some feature of more than ordinary interest.

Those readers who regret the omission of the temperature figures from the Tables in this Magazine will find that a good many are now added to the remarks in the last page but one, and special attention is given to temperature in Mr. Brodie's article on the Weather of the Month.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE WHITE RAINBOW.

THE white rainbow observed in England on February 2nd, and described in the February number of your Magazine, was very probably a halo, since it appeared in cirriform clouds composed apparently of ice crystals. This supposition is confirmed by all the circumstances referred to, particularly the large extent of country from which it was visible and the state of the weather. A halo has already been observed more than once occupying the place of a rainbow, and Dr. Pernter in his *Meteorologische Optik*, p. 393, has given it the name of the Halo of Bouguer, and has endeavoured to explain it by a double reflection of solar light in the interior of hexagonal prisms of ice, terminated by pyramids. I have proposed another explanation, founded on the hypothesis of assemblages of tetrahedric or octohedric prisms. Such assemblages would furnish double mirrors set at 109° 28′ or at 70° 32′, which would give, by external double reflection, a white halo of 141° 4′ radius round the sun, that is to say, of 38° 56′ radius round the point opposite to the sun. (See *Comptes rendus* Academy of Sciences, 27th May, 1907.)

LOUIS BESSON.

Montsouris Meteorological Observatory, Paris, 3rd March, 1908.

THE STORM OF 22nd FEBRUARY AT NORWICH AND NEIGHBOURHOOD.

ONE of the most extraordinary storms of wind, lightning, thunder, hail and rain within the recollection of the writer occurred on the afternoon of Saturday, 22nd February. The morning had been unsettled and stormy; the barometer, which had been steady throughout the night, stood at 8 a.m. (corrected and reduced) at 29·80 in. A sudden fall then set in, and continued steadily till 4.30 p.m., when it had descended to 29·33 in., or at the rate of nearly half an inch in 8 hours. At about 4.30 p.m., without any previous warning, the sky suddenly became inky black, and the wind, which was S.W. or W.S.W., suddenly blew with almost hurricane fury. Brilliant lightning and long peals of thunder accompanied the storm, but the thunder was almost overwhelmed with the noise of the wind. Rain and hail fell furiously, but the storm had commenced but a short time when it became bright in the west, and in about ten minutes the sun, which was low in the sky, shone brightly, and cast a strange lurid light on the landscape and on the receding dark clouds. The lightning went on for some time after the sun had begun to shine, and the effect was most weird. The barometer rose about ·07 in. in a few minutes, then fell slightly, and after being very unsteady for about an hour, commenced a steady rise. The wind blew hard again from the N.W. during the evening, but there was no recurrence of any electrical disturbances. The damage done by the gale was immense; in fact, the devastation wrought to the south of Norwich was the greatest seen in the neighbourhood since the furious gale of 24th March, 1895, but the severity of the recent storm may be imagined when it is recollected that it only lasted ten minutes, whereas in 1895 the gale lasted over two hours. The maximum force of the wind as recorded at the anemometer at the Meteorological Station at Yarmouth was 90 miles an hour (which would equal force 11), which is greater than was recorded there in 1895. Large trees were blown down in all directions, houses stripped of tiles, and chimney stacks blown over, and many stacks of corn or hay were swept across the fields. Many people returning from Norwich (it was market day) had narrow escapes from the trees being blown across the roads, even large oaks being rooted up and falling over like ninepins. Forncett Station of the G.E.R. (on the London main line), which stands in a very exposed position, was completely wrecked by the gale, and the trains had to be brought to a standstill till the wreckage could be removed and the line cleared. Damage was done to several houses by lightning, and in some cases it is thought that this caused injury to trees which was at first attributed to the gale. There was no loss of life in this neighbourhood, but a miller at Torrington, near Lynn, was killed by the mill, which was struck by lightning, falling upon him. The amount of rain registered by me during the day was ·21 in.

I find that St. Mark's Vicarage, Dunham Massey, Cheshire, where my cousin, the Rev. R. K. Preston, had a chimney stack blown over at 2.30 p.m., is 160 miles from Norwich. Consequently if it was the same storm which struck Norwich two hours later, it would have travelled at the rate of 80 miles an hour. Other details of the storm will disclose to you its route, and it will be interesting to see if it was a "line squall," somewhat similar to that of 8th Feb., 1906.

ARTHUR W. PRESTON.

Christchurch Lodge, Eaton, Norwich, 1st March, 1908.

[The squall described above seems to have traversed the whole breadth of England, and we are informed that much damage was done to buildings in course of erection in an exposed position on Snowdon on February 22nd, by a sudden squall lasting for a very short time, and accompanied by a rapid rise of the barometer and sharp change in the direction of the wind.—ED. *S.M.M.*]

SOME OBSERVATIONS ON MIST, FOG AND CLOUD.

To the northward of Epsom the line of demarcation between the clay and the chalk is sharply marked by the distribution of mist. A series of observations I have carried out shows the following facts: The first formation of mist always takes place over the fields situate on the clay deposits, the mist rises steadily in a white stream until it reaches a certain altitude, when a drifting motion is imported to it; on reaching the chalk a descent of the mist takes place, and it settles down in a layer over the chalk at a height of about 2 feet above the ground, but never touching the ground. It is thus easy to distinguish between the clay and the chalk; over the former the mist, so to say, grows, whereas over the latter the mist is suspended in a thin pall. The phenomenon, to be seen at its best, requires a still air and a clear sky. The actual formation of mist over the chalk when in close proximity to the clay, if it occurs, I have so far never observed.

The distribution of fog over the clay and the chalk is equally diverse. Over the clay the fog is much denser, whereas over the chalk the tendency of the fog is to form in patches of variable density. The temperature prevailing in fog over the clay is very much more uniform than that over the chalk. I have frequently recorded a variation of as much as 6° over the latter, whereas over the former the maximum variation has not exceeded 2°. The general tendency is for the fog to be warmer over the clay than over the chalk. These observations on the variability of temperature were of necessity somewhat roughly carried out.

The extreme variability of fog within a very restricted area is well exemplified here; the height of the place of observation is 160 feet

above sea level, to the southward the South Downs lie, attaining a height of about 450 feet above sea level, at a distance of half-a-mile. It is of frequent occurrence during anticyclonic weather accompanied by fog, for a thick grey fog to prevail at the lower station, whereas at the higher (distance half-a-mile) continuous sunshine with a cloudless blue sky is in evidence.

A peculiar formation of mist developing into stratus, was witnessed from Epsom Downs on the 12th inst., brilliant weather prevailed at the time; in the valleys to the westward, which run more or less North and South, mist was observed forming at 11 a.m., by noon the outline of the valleys was lost, being filled with white stratus cloud extending up to, and in places, capping the hills on either side; the phenomena lasted about an hour, when on the sky temporarily clouding over, the cloud in the valleys dispersed.

A certain cloud formation over the lower ground as seen from Epsom Downs, frequently occurs after the passage of a thunderstorm; a ripple or wave-like motion then appears to prevail in the atmosphere, which causes the formation over the low ground of a cloud pallium composed of thin pleated roll stratus, as viewed from above, from the lower station the sky appears uniformly overcast; when once formed this cloud pall lasts, with very slight alterations, for many hours. The formation is intimately connected with the rear of a thunderstorm, as I have never seen its occurrence except under such circumstances.

Epsom, Surrey, Feb. 25th, 1908. SPENCER C. RUSSELL.

SIZE OF HAILSTONES.

THE following extract from the Memoirs of Benvenuto Cellini, of a terrible storm near Lyons, in 1544, may interest your readers. He writes of the storm :—"The hail at length rose to the size of lemons . . . at about half-a-mile's distance all the trees were broken down, and all the cattle were deprived of life; we likewise found a great many shepherds killed; and we saw hailstones which a man would have found it a difficult matter to have grasped in both hands."

Bromley, Kent. CHAS. ALFRED CASE.

BLACK BULB TEMPERATURE.

IN a letter from Dr. W. N. Shaw, which appears in the February number of your Magazine, and contains some interesting and valuable remarks upon observations made with the solar maximum thermometer, he expresses a wish for references, from your readers, relating to the use of the black bulb not in vacuo.

In this connexion. the following passage may be appositely quoted, which occurs in that fascinating book by Sir James Ross, entitled: "Voyage in the Southern and Antarctic Regions":—"At

noon on the 4th (January, 1841), the ships (H.M.S. 'Erebus' and 'Terror') were in latitude 65° 22′ S., longitude 172° 42′ E., and at 9 p.m. the sun's radiation was measured by means of a thermometer, whose bulb was blacked with Indian ink; it rose from 33° to 40°·2, the sun's altitude being at the time four degrees."

From the manner in which the incident is related, the observation may, I think, be regarded as not uncommon; although I must admit that I cannot recall the mention of a similar observation in any other part of the eminent seaman's delightful narrative.

CAMPBELL HEPWORTH.

2, Amherst Road, Ealing, W., Feb. 21st, 1908.

OBSERVATIONS IN THE FALKLAND ISLANDS.

As you have, perhaps, seen by the papers, I am conducting a new scientific expedition round the Falklands and Tierra del Fuego. I have always been very interested in the influence of climate upon the vegetable kingdom, especially on the composition and character of the plant formations, and it is one of the main objects of the present expedition to study this question. But what can one do where no regular meteorological work is carried on? The Falkland Islands are very interesting indeed, from the climatological point of view. Observations are now being made in Stanley, on the east coast of the East Island, but they are not at all complete, especially since the lighthouse-keeper had to give up his meteorological work some eight months ago, when the new light was started, which keeps him too busy to allow him to do anything but look after it. Now I have been round the West Falkland. Everybody there tells me that the climate, *especially on the west coast*, is different from that of the East Falkland. That is certainly very noteworthy, and I am very desirous of getting this question settled, as there are certain differences in the geography and in the distribution of plants on which it should throw light. Could not the Meteorological Office provide one of the farmers with the instruments necessary for observations. There is one spot especially fitted for a station, *West Point Island*, where Mr. A. Felton has made most interesting observations on the weather of that region. He tells me that he would be glad to have the instruments necessary for regular meteorological observations if they could be obtained for him.

Now, can you possibly do anything in this matter? I think that the knowledge would well pay the cost and trouble of sending out a set of instruments with instructions. I should like very much to know if anything can be done.

CARL SKOTTSBERG.

Fort Stanley, Falkland Islands, Dec. 29th, 1907.

RAINFALL TABLE FOR FEBRUARY, 1908.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1870-99.	1908.
		° ′	° ′		in.	in.
Camden Square	*London*	51 32	0 8	111	1·62	1·68
Tenterden	*Kent*	51 4	*0 41	190	1·85	1·06
West Dean	*Hampshire*	51 3	1 38	137	2·27	1·15
Hartley Wintney	,,	51 18	0 53	222	2·06	1·14
Hitchin	*Hertfordshire*	51 57	0 17	238	1·54	1·20
Winslow (Addington)	*Buckinghamshr.*	51 58	0 53	309	1·73	·96
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·55	1·90
Brundall	*Norfolk*	52 37	*1 26	66	1·49	2·00
Winterbourne Steepleton	*Dorset*	50 42	2 31	316	3·11	2·37
Torquay (Cary Green)	*Devon*	50 28	3 32	12	2·87	1·79
Polapit Tamar [Launceston]	,,	50 40	4 22	315	2·84	3·56
Bath	*Somerset*	51 23	2 21	67	2·12	1·32
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·13	1·08
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·27	1·77
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	1·99	1·04
Boston	*Lincolnshire*	52 58	0 1	25	1·55	1·54
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·58	1·41
Derby (Midland Railway)	*Derbyshire*	52 55	1 28	156	1·66	1·42
Bolton (Queen's Park)	*Lancashire*	53 35	2 28	390	2·67	4·35
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	1·63	1·69
Arncliffe Vicarage	,, ,,	54 8	2 6	732	4·74	6·07
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·86	2·18
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	1·58	1·75
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	11·64	9·49
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	3·13	2·53
Haverfordwest (High Street)	*Pembroke*	51 48	4 58	95	3·70	2·33
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	3·03	4·59
Llandudno	*Carnarron*	53 20	3 50	72	1·97	3·42
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	3·62	3·37
Hawick (Branxholm)	*Roxburgh*	55 24	2 51	457	2·62	2·21
Edinburgh (Royal Observy.)	*Midlothian*	55 55	3 11	442	...	·96
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	4·00	4·28
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·53	2·39
Tighnabruaich	*Argyll*	55 55	5 14	50	4·57	6·19
Mull (Quinish)	,,	56 36	6 13	35	4·50	4·79
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·10	·60
Braemar	*Aberdeen*	57 0	3 24	1114	2·70	3·56
Aberdeen (Cranford)	,,	57 8	2 7	120	2·43	1·41
Cawdor	*Nairn*	57 31	3 57	250	1·86	3·06
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	3·88	5·22
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	6·77	10·97
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·39	5·05
Castletown	*Caithness*	58 35	3 23	100	...	4·85
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	5·44	3·08
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·30	1·63
Broadford (Hurdlestown)	*Clare*	52 48	8 38	167	2·19	1·95
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·58	1·86
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	1·98	1·37
Ballinasloe	*Galway*	53 20	8 15	160	2·48	2·07
Clifden (Kylemore House)	,,	53 32	9 52	105	6·08	5·39
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	4·01	3·85
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	2·84	4·81
Seaforde	*Down*	54 19	5 50	180	2·97	2·51
Londonderry (Creggan Res.)	*Londonderry*	54 59	7 19	320	2·73	4·29

RAINFALL TABLE FOR FEBRUARY, 1908—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Date.	No. of Days	Aver. 1870-99. in.	1908. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1870-1899. in.	STATION.
+ ·06	104	·31	16	15	3·51	3·61	+ ·10	103	25·16	Camden Square
— ·79	57	·18	16	17	4·21	2·70	—1·51	64	28·36	Tenterden
—1·12	51	·49	16	15	4·95	2·56	—2·39	52	29·93	West Dean
— ·92	55	·33	16	15	4·45	2·66	—1·79	60	27·10	Hartley Wintney
— ·34	78	·21	16	16	3·35	2·61	— ·74	78	24·66	Hitchin
— ·77	55	·20	16	15	3·78	2·90	— ·88	77	26·75	Addington
+ ·35	123	·27	16	17	3·25	2·79	— ·46	86	25·39	Westley
+ ·51	134	·25	15	18	3·16	2·98	— ·18	94	25·40	Brundall
— ·74	76	1·05	16	20	7·01	3·87	—3·14	55	39·00	Winterbourne Stpltn
—1·08	62	·53	16	14	6·06	3·05	—3·01	50	35·00	Torquay
+ ·72	125	·68	16	22	6·71	5·80	— ·91	86	38·85	Polapit Tamar
— ·80	62	·41	16	17	4·64	2·56	—2·08	55	30·75	Bath
—1·05	51	·36	16	17	4·59	2·66	—1·93	58	29·85	Stroud
— ·50	78	·36	16	14	5·08	3·18	—1·90	63	33·04	Wolstaston
— ·95	52	·30	16	11	4·33	1·81	—2·52	42	29·21	Coventry
— ·01	99	·20	16	14	3·14	2·51	— ·63	80	23·30	Boston
— ·17	89	·31	27	15	3·32	2·43	— ·89	73	24·70	Hodsock Priory
— ·24	86	·24	16	17	3·61	2·55	—1·06	71	26·18	Derby
+1·68	163	·78	16	21	6·05	8·22	+2·17	136	42·43	Bolton
+ ·06	104	·31	16	15	3·52	2·95	— ·57	84	26·96	Ribston Hall
+1·33	128	1·80	14	19	11·07	12·66	+1·59	114	60·96	Arncliffe Vic.
+ ·32	117	·41	28	17	3·66	3·53	— ·13	96	27·02	Hull
+ ·17	111	·60	29	15	3·54	3·21	— ·33	90	27·99	Newcastle
—2·15	81	1·75	14	24	26·35	26·31	— ·04	100	132·68	Seathwaite
— ·60	81	·88	16	24	6·98	5·26	—1·72	75	42·81	Cardiff
—1·37	63	·83	16	18	8·83	5·40	—3·43	61	47·88	Haverfordwest
+1·56	152	·76	16	25	6·90	8·43	+1·53	122	45·41	Gogerddan
+1·45	173	·53	14	24	4·54	5·95	+1·41	131	30·98	Llandudno
— ·25	93	·76	27	13	8·16	8·39	+ ·23	103	43·43	Cargen
— ·41	84	·33	30	18	5·81	5·66	— ·15	97	34·80	Branxholm
...	...	·23	21	13	...	3·13	...	...	...	Edinburgh
+ ·28	107	·70	28	28	8·92	9·53	+ ·61	107	48·87	Girvan
— ·14	94	·38	22	19	5·78	7·07	+1·29	122	35·80	Glasgow
+1·62	136	·68	27	26	10·43	13·14	+2·71	126	57·90	Tighnabruaich
+ ·29	107	·78	21	26	10·35	10·81	+ ·46	104	57·53	Quinish
—1·50	29	·17	22	14	4·20	2·21	—1·99	53	28·95	Dundee
+ ·86	132	...	...	...	5·61	6·12	+ ·51	109	36·07	Braemar
—1·02	58	·26	29	17	4·75	2·85	—1·90	60	33·01	Aberdeen
+1·20	165	·76	29	18	4·00	5·15	+1·15	129	29·37	Cawdor
+1·34	134	·85	22	24	8·98	10·50	+1·52	117	43·71	Fort Augustus
+4·20	162	1·38	21	29	15·52	22·17	+6·65	143	86·50	Bendamph
+2·66	211	1·32	29	17	5·01	8·42	+3·41	168	31·60	Dunrobin Castle
...	..	·94	26	23	...	7·46	...	...	...	Castletown
—2·36	57	·51	27	25	12·01	7·56	—4·45	63	58·11	Killarney
—1·67	49	·61	16	13	7·36	4·05	—3·31	55	39·30	Waterford
— ·24	89	·30	16	25	5·17	4·81	— ·36	93	33·47	Hurdlestown
— ·72	72	·30	14, 16	20	5·72	5·08	— ·64	89	35·19	Abbey Leix
— ·61	69	·38	14	20	4·14	3·43	— ·71	83	27·75	Dublin
— ·41	83	·47	14	25	5·97	5·43	— ·54	91	37·04	Ballinasloe
— ·69	89	·77	16	23	13·94	12·71	—1·23	91	80·23	Kylemore House
— ·16	96	·39	14	24	9·01	10·98	+1·97	122	50·50	Enniscoe
+1·97	169	·48	29	26	6·45	9·25	+2·80	144	41·83	Markree Obsy.
— ·46	85	·72	16	18	6·60	5·17	—1·43	78	38·61	Seaforde
+1·56	157	·50	27	25	6·29	7·46	+1·17	119	41·20	Londonderry

SUPPLEMENTARY RAINFALL, FEBRUARY, 1908.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	1·47	XI.	Rhayader, Tyrmynydd	4·06
,,	Ramsgate	1·01	,,	Lake Vyrnwy	4·57
,,	Steyning	1·74	,,	Llangyhanfal, Plâs Draw	2·15
,,	Hailsham	1·40	,,	Criccieth, Talarvor	3·02
,,	Totland Bay, Aston House	1·02	,,	Llanberis, Pen-y-pass	...
,,	Emsworth, Redlands	1·20	,,	Lligwy	2·51
,,	Stockbridge, Ashley	1·17	,,	Douglas, Woodville	2·20
,,	Reading, Calcot Place	·95	XII.	Stoneykirk, Ardwell House	2·27
III.	Harrow Weald, Hill House	1·42	,,	Dalry, The Old Garroch	6·37
,,	Oxford, Magdalen College	·76	,,	Langholm, Drove Road	2·59
,,	Pitsford, Sedgebrook	1·06	,,	Moniaive, Maxwelton House	3·35
,,	Huntingdon, Brampton	...	XIII.	N. Esk Reservoir [Penicuick]	2·40
,,	Woburn, Milton Bryant	·76	XIV.	Maybole, Knockdon Farm	2·10
,,	Wisbech, Bank House	1·32	XV.	Campbeltown, Witchburn	3·36
IV.	Southend Water Works	1·43	,,	Inveraray, Newtown	6·13
,,	Colchester, Lexden	1·29	,,	Ballachulish House	7·81
,,	Newport, The Vicarage	1·22	,,	Islay, Eallabus	4·31
,,	Rendlesham	1·51	XVI.	Dollar Academy	2·02
,,	Swaffham	1·78	,,	Loch Leven Sluice	1·92
,,	Blakeney	1·44	,,	Balquhidder, Stronvar	5·07
V.	Bishops Cannings	1·25	,,	Perth, Pitcullen House	1·28
,,	Ashburton, Druid House	3·21	,,	Coupar Angus Station	1·34
,,	Honiton, Combe Raleigh	2·20	,,	Blair Atholl	2·54
,,	Okehampton, Oaklands	3·57	,,	Montrose, Sunnyside Asylum	1·02
,,	Hartland Abbey	2·60	XVII.	Alford, Lynturk Manse	1·52
,,	Lynmouth, Rock House	2·30	,,	Keith Station	2·54
,,	Probus, Lamellyn	2·32	XVIII.	N. Uist, Lochmaddy	3·16
,,	North Cadbury Rectory	1·15	,,	Alvey Manse	3·20
VI.	Clifton, Pembroke Road	1·80	,,	Loch Ness, Drumnadrochit	4·75
,,	Ross, The Graig	·79	,,	Glencarron Lodge	10·31
,,	Shifnal, Hatton Grange	1·24	,,	Fearn, Lower Pitkerrie	...
,,	Blockley, Upton Wold	1·18	XIX.	Invershin	4·56
,,	Worcester, Boughton Park	1·29	,,	Altnaharra	7·24
VII.	Market Overton	1·27	,,	Bettyhill	4·76
,,	Market Rasen	2·11	XX.	Dunmanway, The Rectory	3·01
,,	Bawtry, Hesley Hall	1·55	,,	Cork	1·15
,,	Buxton, Lismore House	5·20	,,	Darrynane Abbey	4·06
VIII.	Neston, Hinderton Lodge	1·56	,,	Glenam [Clonmel]	2·11
,,	Southport, Hesketh Park	2·15	,,	Ballingarry, Gurteen	2·37
,,	Chatburn, Middlewood	3·60	,,	Miltown Malbay	3·08
,,	Cartmel, Flookburgh	2·55	XXI.	Gorey, Courtown House	·98
IX.	Langsett Moor, Up. Midhope	3·77	,,	Moynalty, Westland	2·66
,,	Scarborough, Scalby	2·19	,,	Athlone, Twyford	1·98
,,	Ingleby Greenhow	2·22	,,	Mullingar, Belvedere	2·17
,,	Mickleton	2·34	XXII.	Woodlawn	2·73
X.	Bardon Mill, Beltingham	3·33	,,	Westport, St. Helens	3·59
,,	Ewesley, Fallowlees	2·05	,,	Mohill	2·85
,,	Ilderton, Lilburn Cottage	1·45	XXIII.	Enniskillen, Portora	3·09
,,	Keswick, York Bank	4·39	,,	Dartrey [Cootehill]	2·93
XI.	Llanfrechfa Grange	1·98	,,	Warrenpoint, Manor House	1·84
,,	Treherbert, Tyn-y-waun	5·55	,,	Banbridge, Milltown	1·67
,,	Carmarthen, The Friary	3·72	,,	Belfast, Springfield	3·28
,,	Castle Malgwyn [Llechryd]	2·78	,,	Bushmills, Dundarave	2·76
,,	Plynlimon	10·35	,,	Stewartstown, The Square	...
,,	Crickhowell, Ffordlas	2·40	,,	Killybegs	6·93
,,	New Radnor, Ednol	2·37	,,	Horn Head	3·78

METEOROLOGICAL NOTES ON FEBRUARY, 1908.

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

LONDON, CAMDEN SQUARE.—The first half was dry and fine, with high bar.; the second half cloudy and showery. Mean temp. 41°·7, or 1°·9 above the average; shade max. 54°·5 on 17th, min. 28°·0 on 13th. F 6, f 22. Duration of sunshine 53·1* hours, and of R 28·8 hours.

TENTERDEN.—Duration of sunshine 89·5† hours. Shade max. 53°·5 on 14th, min. 28°·5 on 11th. F 8, f 17.

TOTLAND BAY.—Duration of sunshine 79·3* hours. Shade max. 52°·0 on 19th, min. 30°·2 on 12th. F 3, f 11.

TORQUAY.—Duration of sunshine 71·5* hours. Mean temp. 44°·8, or 1°·8 above the average. Shade max. 55°·1 on 18th, min. 30°·0 on 2nd. F 2, f 11.

NORTH CADBURY.—Shade max. temp. 53°·5 on 19th, min. 26°·0 on 2nd. F 5, f 16.

CLIFTON.—Dry till 12th, with occasional fogs under the influence of anticyclonic conditions. Then more or less R every day till 18th, and afterwards weather of the westerly type. R ·65 in. below the average.

ROSS.—Mean max. in shade 3°·0 above, and mean min. 1°·6 above, the average. Shade max. 55°·3 on 19th, min. 26°·5 on 13th and 14th. F 8, f 15.

BUXTON.—R 1·20 in. above the average of 35 years. Duration of sunshine 30·8* hours. Mean temp. 38°·0, or 1°·9 above the average. Shade max. 45°·6 on 21st, min. 24°·0 on 29th. F 9, f 20.

BOLTON.—Duration of sunshine 39·2* hours, or 0·4 below the average. Mean temp. 40°·5, or 2°·7 above the average. Shade max. 50°·6 on 22nd, min. 29°·2 on 29th.

SOUTHPORT.—Mean temp. 41°·6, or 2°·0 above the average. Shade max. 51°·1 on 22nd, min. 30°·2 on 29th. F 1, f 9. Duration of sunshine 69·0* hours, or 4·0 above the average. R ·09 in. above the average. Duration of R 53·2 hours. Wind movement above the average by 140 miles per day.

HULL.—Max. temp. in shade 52°·0 on 7th, 11th and 18th; min. 26°·0 on 29th. F 5, f 22.

HAVERFORDWEST.—Generally fine and mild, but stormy from 15th to the end. Agricultural operations were well advanced. Shade max. 52°·0 on 19th, min. 35°·6 on 29th. F 0, f 0. Duration of sunshine 55·1* hours.

LLANDUDNO.—Fine and mild, with excessive R. Duration of sunshine 60·0* hours. Shade max. 52°·2 on 22nd, min. 33°·4 on 29th. F 0, f 0.

DUMFRIES.—Fair and calm to 12th, succeeded by a wet stormy period for the remainder. On 22nd a severe N.W. gale did considerable damage to woods and houses. Cold bizzard on 25th terminated in 9 inches of S on 27th.

EDINBURGH.—Max. shade temp. 50°·4 on 8th, min. 27°·9 on 29th. F 4, f 10.

COUPAR ANGUS.—R ·50 in. or 30 per cent. below the average of 30 years. Mean temp. 33°·9, or 3°·5 above the average. Shade max. 53°·0 on several days, min. 28°·0 on 19th. F 19.

ABERDEEN.—Fine till 22nd; afterwards high wind, S and R. Shade max. 55°·0 on 7th, min. 25°·0 on 27th. F 9.

FORT AUGUSTUS.—Max. 50°·0 on 5th, 6th and 11th; min. 27°·0 on 28th. F 8.

CASTLETOWN.—Breezy and fairly dry till 14th, then rough and wet. Shade max. 51°·0 on 12th, min. 20°·0 on 28th. F 14, f 19.

CORK.—Mean temp. 43°·0. Shade max. 53°·0 on 20th, min. 31°·0 on 29th. F 1, f 6. The R was the least since 1891.

MILTOWN MALBAY.—Fog and R till 20th, then keenly cold and stormy.

DUBLIN.—Strong but soft oceanic winds, and frequent showers. An anticyclone of remarkable staying power lay over Ireland in the first half. Mean temp. 44°·8, or 2°·4 above the average. Max. 53°·2 on 22nd, min. 33°·0 on 29th. F 0, f 2.

MARKREE.—Shade max. 51°·4 on 20th, min. 31°·4 on 28th. F 2, f 8.

WARRENPOINT.—Max. 56°·0 on 6th, min. 33°·0 on 27th and 28th. F 0, f 4.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, September, 1907.

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	80·1	25	39·4	24	70·0	49·7	52·8	86	113·9	35·5	·62	8	6·1
Malta	86·7	2	60·0	18	79·8	69·7	70·9	89	146·0	...	2·30	5	4·8
Lagos	88·0	27	70·0	13	83·6	73·1	72·5	79	159·0	67·0	2·92	15	8·7
Cape Town	91·7	23	37·6	14	67·6	49·0	49·8	69	...	...	1·71	10	3·8
Durban, Natal ...	84·2	2	54·0	15	75·8	59·6	...	...	138·2	...	2·89	13	5·1
Johannesburg	78·9	13	36·0	14	68·9	47·5	46·9	74	143·1	35·4	3·02	5	3·0
Mauritius	81·8	30	55·5	1	78·2	60·9	58·0	68	146·1	46·0	·47	9	5·8
Calcutta...	93·7	18, 30	75·1	20	90·0	78·9	77·4	82	158·5	73·0	4·48	7	6·7
Bombay...	88·3	28	74·4	9	86·0	77·2	74·9	81	134·6	71·5	2·75	13	5·8
Madras	100·6	10	72·6	1, 24	95·0	77·9	74·1	75	149·7	74·0	·29	6	4·6
Kodaikanal	68·5	19	49·4	6	63·6	52·0	51·6	84	139·3	42·4	3·64	14	6·5
Colombo, Ceylon ...	90·0	8	72·1	30	87·0	77·4	73·8	76	157·1	71·0	3·35	12	5·9
Hongkong	88·6	8	73·7	15	85·1	76·6	73·1	78	151·0	...	19·47	18	5·9
Melbourne	82·3	30	31·9	13	64·9	46·5	41·6	62	132·4	24·7	·52	6	5·6
Adelaide	88·5	20	39·7	1	70·3	49·6	46·4	63	140·3	31·2	1·08	11	4·8
Coolgardie	89·0	18	34·0	6	74·4	46·9	40·2	56	152·2	31·2	·51	4	2·5
Sydney	91·1	24	42·8	5	71·2	51·7	41·0	60	130·1	30·9	·27	10	1·7
Wellington ...	63·0	21, 22	37·5	10	54·3	45·2	41·6	73	110·0	27·0	3·01	15	7·0
Auckland	66·0	26	46·0	17	58·8	47·9	45·1	74	124·0	34·0	5·42	24	5·7
Jamaica, Negril Point.	91·0	10	70·4	4	88·2	72·7	73·2	77	...	...	7·39	16	7·3
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	88·2	6, 11	71·8	8, 16	86·7	73·6	72·3	78	146·4	...	8·36	27	5·0
Toronto	82·7	20	40·3	26	69·4	54·0	...	...	100·0	36·2	4·80	14	...
Fredericton	78·0	21	31·5	19	64·4	46·9	...	78	...	...	5·12	15	5·8
St. John's, N.B. ...	69·3	9	39·5	19	61·3	50·5	...	...	...	...	4·83	15	...
Victoria, B.C.	84·7	9	40·2	13	66·5	50·3	...	77	...	...	1·17	11	5·3
Dawson	64·0	12	24·0	15	51·6	33·2	...	...	...	...	1·89	9	6·4

MALTA.—Mean temp. of air 74°·5. Average hours bright sunshine 7·7.

JOHANNESBURG.—Bright sunshine 263·4 hours.

Mauritius.—Mean temp. of air 0°·7, of dew point 2°·6, relative humidity 4·4 per cent., and R ·91 in., below, averages. Mean hourly velocity of wind 9·5 miles, or 2·5 miles below average.

MADRAS.—Rainfall 7 per cent. of the average. TSS on 3 days.

KODAIKANAL.—Bright sunshine 129 hours.

COLOMBO.—Mean temp. of air 80°·0 or 0°·4 above, of dew point 0°·5 above, and R 1·66 in. below, averages. Mean hourly velocity of wind 6·5 miles. TS on 29th.

HONGKONG.—Mean temp. of air 80°·6. Bright sunshine 187·9 hours. Mean hourly velocity of wind 11·3 miles. R 11·25 in. above average. Violent E. gale 13th—14th; maximum hourly velocity 75 miles.

Adelaide.—Mean temp. of air 3°·0 above, R ·66 in. below, averages. Warmest September, with one exception (1886) in 50 years.

Sydney.—Mean temp. of air 2°·6 above, and R 2·60 in. below, averages.

Wellington.—Mean temp. of air 1°·8 below, and R 1·49 in. below, averages.

Auckland.—Cold and squally throughout. R nearly 2 inches above, and mean temp. below, averages.

RAINFALL OF THAMES VALLEY, MARCH, 1908.

Symons's
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THE GEOGRAPHICAL DISTRIBUTION OF RAINFALL IN THE BRITISH ISLES.

During January and February Dr. H. R. Mill delivered at the request of the Council of the Royal Geographical Society, a course of six lectures on the Geographical Distribution of Rainfall in the British Isles. The course was well attended and at the end, a party was conducted over the headquarters of the British Rainfall Organization at Camden Square, where the whole process of dealing with rainfall returns was explained and illustrated. The following is a brief summary of the lectures.

Lecture I.—In considering the geographical distribution of any condition over a given area, the first essential is a clear view of the position and configuration of the area in question. The importance of the position of the British Isles from the point of view of climatology and especially of rainfall, lies in its relation to the continent on the east, and the ocean on the west in the track of the prevailing south-westerly winds which blow from ocean to continent, carrying warmth and wetness to the land they first encounter. Ireland standing well to the west of the larger island and thus enjoying more of the oceanic climate is remarkably open to the sweep of the wind. The central plain is practically continuous, broken only near the edges by the mountain groups of the north-west and the north-east and by the more compact masses of high land which run through the south of the island from south-west towards north-east, forming a fairly continuous highland belt from Kerry to Wicklow. Great Britain shows a more elaborate vertical relief, the great groups of high land being clearly marked off from one another by plains narrower than that of Ireland, but like it stretching in most cases from sea to sea. In order from north to south the lofty land-masses include the Highlands and the Southern Uplands of Scotland, each filling nearly the whole breadth of the country and separated by the Lowland Plain with its lines of low ridges and abrupt bosses of volcanic rocks. Lying as Scotland does on the whole to the west as well as to the north of England and Wales it possesses distinct differences in climatic character from South Britain. The southern and larger part of Great Britain may be best divided into a Western and an Eastern

Division. The Western comprises the separate highland masses of (1) The Lake District, (2) The Pennine Chain, (3) Wales and (4) the western horn of Cornwall and Devon. These four groups of elevations are separated by low plains over which the rivers taking their rise in the high ground pass to the sea. The Eastern Division is in the main, a plain traversed by long ridges of low hills of well-marked individuality radiating from near the Bristol Channel to the north-east and east. The line commencing with the Cotteswold Hills stretches, now higher, now lower to the moors of the North Riding of Yorkshire. The next line, including the White Horse Downs and the Chiltern Hills, though broken by the flat of the Fenland, rises again in the Wolds of Lincolnshire and the East Riding of Yorkshire, while the third line runs broadly through Salisbury Plain and splits into the curved sweeps of the North Downs and the South Downs with the Forest Ridges between them, each of the members of the system being defined and separated from the others by narrrow plains. The river-systems of the country emphasize the divisions of the plain which bounds the masses of high ground and serve as the most natural units of surface for the discussion of rainfall data. Taken as a whole the vertical relief of the land is the effective agent in directing the action of wind and all climatic conditions arising from the effect of aspect and shelter.

Lecture II.—Before bringing into relation the land and the rain it is necessary to consider the character and causes of the latter. The term *rain* for purposes of measurement includes all forms of condensation of water from the atmosphere, not merely the fall of liquid drops. The principal agent for the transformation of solar radiation into work is water, which evaporated from the surface of the hydrosphere ascends as vapour, and is condensed and precipitated whenever it reaches a height where the temperature is below the point of saturation, and where appropriate nuclei are present upon which condensation of water can take place. These nuclei are usually considered to be supplied by dust, but it is now suggested that the part may be played by electrons also. While it is the lowering of the temperature of air which produces condensation of the aqueous vapour into water, the most usual cause of fall of temperature in masses of air is the ascent of the air, either by expansion due to heat, or release of pressure, or by wind blowing along the slope of a land surface; ascending air may thus be looked upon as practically the only cause of rain. When condensation takes place in minute globules, the friction exercised by the air causes them to fall so slowly that they often appear to float as clouds; but the apparent stability of a cloud is frequently an optical effect, due to the formation of fresh cloud above and the simultaneous evaporation of the water globules below, when they fall into air which is not saturated. In a cloud formed in saturated air the globules have an opportunity to run together, and fall in drops, which sometimes attain a considerable size. In a cyclonic system, and still more in

a whirlwind, there is a rapid ascensional movement of air, and those conditions are consequently associated with excessive precipitation; electrification also plays an important part in the production of torrential rainfall. The magnitude of rain as a working power in nature can only be realized when one remembers that all the water of every river is merely rain on its way back to the sea, whence it came.

Lecture III.—The method of measuring rainfall is very simple; but many small precautions have gradually been discovered to be necessary in order to secure satisfactory results, and thus it happens that there are few good records of rainfall of any great length. Christopher Wren designed, in 1662, the earliest rain gauge which has been described; but the first known record was begun at Paris, in 1668, and the second at Townley Hall, near Burnley, in 1677. Very few records exist before the commencement of the nineteenth century, and our comprehensive knowledge of the distribution of rain over the British Isles may be said to have started in 1860, when the late Mr. G. J. Symons initiated the British Rainfall Organization, and in 1861 published 507 records for the year. The work of this Organization is still carried on in Mr. Symons's old house, 62, Camden Square, London, but now it deals with the records of 4500 stations every year. Experiments were made in the early days to determine the best form of instrument and the best method of observation, and the outcome was to establish the use of the Snowdon pattern of rain gauge, 5 inches in diameter, or the Meteorological Office pattern, 8 inches in diameter (the two differ only in size), set with the receiving surface one foot above the ground, read once daily at 9 a.m., and recorded to the date of the commencement of the 24 hours to which the reading refers. Elevation above the surface of the ground or exposure to strong wind causes a loss in the catch of the rain, on account of ascending eddies formed round the instrument, and various sheltering devices have been employed in very exposed places to counteract this effect. Rainfall observers in the British Isles belong to all classes of society, and for the most part they do the work voluntarily on account of its interest to themselves, the efforts of the Rainfall Organization—which, unlike the state-supported rainfall services of all other countries, is a private and self-supporting body—being mainly (1) to collect the records and publish them in the annual volumes of *British Rainfall*; (2) to encourage accuracy and regularity in observers, and (3) as far as is practicable to endeavour to enlist the aid of new observers in the large areas where as yet there are no rain gauges. New records are urgently wanted in all parts of Ireland, and of the Scottish Highlands, but also in many parts of England, such as Northumberland, the East and North Ridings of Yorkshire, in the west of Wales, and in general in all places more than 500 feet above the sea.

Lecture IV.—The first essential in mapping rainfall is to make sure of the accuracy of the individual records on which the map is

based. It is a rule to which the longest experience offers no exception that rainfall varies gradually from point to point. The gradation may sometimes be very gentle, sometimes almost abrupt, but whatever the period may be for which the rainfall is plotted, an erroneous figure stands out with manifest discordance. A map is thus a valuable means of detecting errors which may usually be corrected by enquiry or by comparison with neighbouring records. The distribution of rainfall may be delineated by means of isohyetal lines similar to isotherms or isobars, and the areas of maximum rainfall may be brought into prominence by the use of deepening tints of colour. The general rainfall or mean depth of rain over a particular area is best obtained by measuring the area between successive isohyets, multiplying each area by the mean rainfall of the zone, adding all such volumes together and dividing by the total area. In this way the difficulty of irregularly distributed stations, which would falsify an arithmetical mean, is practically overcome. In the case of mapping the rainfall of a single day, which is very often the rainfall of the natural unit, a shower, the most important precaution is to make sure all the observations used were made at the same hour and entered to the same date. This can be done much more readily in the case of heavy than in the case of light rains. The area enclosed by an agreed-upon isohyet to represent the superficial extent of a shower, may conveniently be referred to as a *splash*, and such splashes are very sharply defined in the case of thunderstorm rains, or the rain accompanying a line squall. But when the rain accompanies, or is produced by a moving depression of the familiar cyclonic type, the result is a series of confluent splashes which forms a belt across the country, and may be comprehensively termed a *smear*. The smear as a rule lies mainly to the left of the track of a depression. A heavy shower may dominate the rainfall of a month, but in the course of a year the inequality due to any one shower ceases to appear. The peculiarity of heavy showers due to meteorological causes, such as a thunderstorm, a squall, or a cyclone, is that they depend upon the condition of the air alone, and may fall with equal intensity in any part of the country, on a mountain, on a plain or over the sea; the configuration of the land seems to exercise no control upon them.

Lecture V.—While the rain of a heavy shower shows no trace in its distribution of any effect of configuration or of the elevation of the land, the total rainfall of a year, whether it be relatively a dry year or a wet one, shows so complete a congruence with the configuration that there can be no doubt as to the relation of cause and effect. The highest annual rainfall is always in the neighbourhood of the highest land, the lowest is always on the low and level plains. An average rainfall map isolates the high land as areas of high rainfall with nearly the same precision as a map coloured for elevation. The Highlands of Scotland, the Southern Uplands, the Lake District, the Pennine Chain, Wales, the western horn of Cornwall and Devon, and the mountains of Ireland, all stand out as wet areas, and even

the gentle hills of the Eastern Division of England are seen to be wetter than the surrounding plains. It appears probable that after deducting from the annual total the heavy rains due to meteorological causes there remains the bulk of the rain which must be assigned to geographical causes, and which is in all probability produced by the cooling of the air consequent on the uplift of the wind blowing over ascending slopes. This very reasonable deduction has not yet been rigidly proved, because it is exceedingly difficult and laborious to separate into meteorological and geographical showers, the rainfall for a number of stations, sufficient to allow a map of any particular year to be drawn.

The dependence of rainfall on configuration, which is apparent in the rainfall map of any year, is much more marked when the average rainfall of many years is considered. The making of an average rainfall map is beset by special difficulties. The length of the period is important because the total rainfall of one year varies greatly from that of another; and speaking generally the wettest year may amount to 150 per cent., and the driest to 65 per cent. of the average, and even a period of ten years may be much in excess or much in defect of the average of a longer period. The rainfall record maintained at Camden Square shows an average of 25·0 inches for 50 years; but the five consecutive decades from its commencement gave averages of 25·5, 25·5, 27·0, 24·0 and 23·5 respectively, the wettest individual year (1903) was 38·10 in., and the driest (1864) 16·93 in. A period of 35 years is the shortest time which can yield a really satisfactory average rainfall in the British Isles and probably the rainfall of one period of 35 years does not differ from that of any other by more than 2 per cent. As it is imposible to make a map from the small number of 35 years' records which exist, it is necessary to apply a correction to the means of shorter records so as to allow for the relative dryness or wetness of the years they comprise. Reinforced by such computed data the long records suffice for the compilation of a very satisfactory rainfall map of the British Isles; but the labour, or in other words the expense, of doing so would be very considerable. The best way of making a true average rainfall map is to prepare a map of the rainfall of each year since records were sufficiently numerous and then to combine these by some mechanical method so as to produce a map on which every individual yearly total would receive due weight. The preparation of annual maps from the current year back to 1870, or perhaps to 1865, is now in progress.

Lecture VI.—Average rainfall maps of many small districts have been prepared by the method of correcting the shorter records to their equivalent averages for 35 years, and such maps of counties have been published on a small scale in the Geological Survey's "Water Supply Memoirs" for Lincolnshire, Suffolk, and the East Riding of Yorkshire, while they are in preparation for Northamptonshire, Bedfordshire, Kent, Sussex, Oxfordshire, and Hampshire. In the case of some counties the number of observing stations is so great that it has been possible

to plot the data on maps of the large scale of 2 miles to an inch. The result has been to show that the relation of average rainfall to configuration is astonishingly close, and to prove that in bare patches for which no records are available the contour lines of elevation may be taken as guides for the most probable run of the isohyets. The relation is nevertheless not altogether a simple one, as it involves altitude, slope and exposure to the prevailing wind. It is found for instance, that while the rainfall gradually increases with altitude on the slope facing the prevailing wind, this increase continues for a short but variable distance down the leeward slope, the suggesting being that the wind, forced to rise by the slope of the ground towards the summit, continues to ascend for a short distance after the summit is passed, and drops the maximum rainfall from the point where it attains its greatest height. The economic aspects of rainfall were referred to, and attention was called to the damage done by floods and torrential falls, the influence of rainfall in agriculture, the rapidly increasing importance of the question of water supply for consumption in towns and for the generation of electrical power. The problem of water supply was shown to be one of national and not of merely local importance, and it was in its main lines a geographical question which ought to be dealt with in a far more comprehensive way than the public yet realized.

Some curious effects of rainfall on architecture and on processes of agriculture were pointed out and illustrated, as were all the points in the lectures, by lantern slides.

NOTES ON SOME GREAT FROSTS IN RECENT WINTERS.

By L. C. W. Bonacina.

The public mind of our country, to judge from many sections of the daily press which is its mirror, is quite keenly interested, personally if not scientifically, in the weather of the passing moment, but has an incredibly short-lived and inaccurate memory for that of the past. Now the weather, in virtue of the very evanescence of its interesting and beautiful phenomena, is evidently meant to be remembered, and the least we as rational creatures permitted to behold it can do for the weather as we see it in all its infinite variety from day to day, month to month, and year to year, is surely to take such an intelligent interest in it that we may remember its more important features with as much accuracy as many other events of the past; for just as every man or woman, or if you like, phase of humanity, is in his or her individuality the product of a vast number of causes operating through ancestry, so every phase of weather that passes before our eyes depends in its existence and intensity upon ante-

cedent phases in such a way that we may legitimately say that the kind of weather which prevailed, for instance, during the battle of Hastings is connected with, and in a sense responsible for, the precise intensity and type of weather of this present moment. Yet it cannot rain, nor snow, nor freeze, nor become warm with more than usual intensity but there appear on the morrow in certain sections of the London press all sorts of exaggerated, or altogether untrue, statements as to its being the wettest, coldest or hottest day for many years, when in as many cases as not it is only necessary to go back a single year to find the same phenomenon repeated with similar or greater intensity. Such erroneous comparisons do not, of course, affect the meteorologist; but they are harmful to intelligent or sometimes even intellectual persons who do not make a special study of meteorology, and who consequently cannot be expected to be weather-wise to the extent of remembering accurately the conditions of the past, by causing them to acquire an altogether false impression of the climate of their own country.

Thus, after a somewhat severe frost in the early part of January, 1908, one was everywhere confronted by newspaper placards announcing in large letters, red and sensational, "coldest day for 20 years"; when, in point of fact, to go by the Greenwich Observatory records, it was the sharpest night frost in the neighbourhood of the metropolis for five years since February, 1902, but not, as I believe, the coldest *day* since that time. In order to protest against this piece of utterly false newspaper information, I resolved, with the permission of the editor, to use the authority of the *Meteorological Magazine* as being the only monthly meteorological organ in the United Kingdom, for making a short review of severe frosts from 1890 up to the present winter. The period embraces nearly twenty years, and my personal recollection of general weather conditions extends with distinctness no further back than 1890. All temperatures given below have been carefully ascertained and verified by reference to meteorological records. The Greenwich Observatory observations are used because they are more representative of the temperature conditions—at all events in time of frost—than those of any other metropolitan station, of the south-east of England, and are less affected by the artificial warmth of the large tract of town forming London. All frosts are arbitrarily included in the review and ranked as "severe," during which the air temperature has fallen below 20° F. at Greenwich Observatory. It should be noted, however, that brief spells of very low temperature have sometimes occurred locally in other parts of England, even on the usually mild south coast, in years when no "severe" frost has occurred at Greenwich.

The following are the winters (the table shows the number of months during which temperature fell below 20°):—

Winter of.	Month or Months and Number of Days in each with Temperature below 20° F.	Absolute Minimum in each of the Months.
1889-90	March ; 1	13° F.
1890-91	November ; 1	18° ,,
,, ...	December ; 6	13° ,,
,, ...	January ; 3	12° ,,
1891-92	December ; 3	17° ,,
,, ...	February ; 1.....	19° ,,
1892-93	December ; 1	18° ,,
,, ...	January ; 5	14° ,,
1893-94	January ; 5	13° ,,
1894-95	February ; 11	7° ,,
1899-1900	December ; 1	19° ,,
,, ...	February ; 2..	18° ,,
1901-02	February ; 3.....	14° ,,
1904-05	January ; 1	19° ,,
1907-08 (up till Jan. 31st) ...	January ; 3	18° ,,

It will be thus seen how feebly the frost of January, 1908, compares, both as regards intensity and persistency, with many others of recent years. The two very hard winters of 1890-91 and 1895 stand out very conspicuously. The two intensely cold months of the period are December, 1890, and February, 1895. December, 1890, had 6 nights below 20° and only 4 slightly above 32° ; whilst February, 1895, had 11 nights below 20°, with 2 below 10°, and only 4 slightly above 32°. The absolute maximum shade temperature in December, 1890, was 43°, and in February, 1895, 45°.

December, 1890, formed part of the long period of severe weather remaining unbroken for two months from about November 21st till January 21st ; the great frost of February, 1895, began moderately about January 21st and ended very gradually about March 5th. The 1890-91 frost affected only the southern half of Great Britain, whilst that of 1895, during which temperatures below zero were common in the inland parts of England, Ireland and Scotland, prevailed all over the British Isles, even in the Scilly Isles, and was, if anything, more severe in Scotland than in the south of England.

Of other severe frosts during the period under notice, that of the early part of January, 1894, deserves attention for a very low maximum temperature at Greenwich of 19°, with keen east wind and snow on the 5th.

Of the heavy snowstorms affecting more or less large areas that have occurred since 1890, three are very prominent, namely those of (1) March, 1891, (2) February, 1900, (3) December, 1906.

The great blizzard of March 9th and 10th, 1891, proved a suitable termination to one of the most terrible winters for cold and darkness

ever known in the south of England, and the herald of a most inclement spring.

This storm, which affected the whole of southern England including London, raged with its greatest fury over the counties of Devon and Cornwall. The snow was dry and powdery and driven by a fierce easterly gale, so that the conditions were almost truly "blizzard." Trains from Paddington were choked for days in Cornwall. In the streets of South Devon seaside resorts like Torquay and Sidmouth, the snow lay a foot deep, whilst on and around Dartmoor the tremendous drifts produced effects which none but eye-witnesses could easily deem credible. (See this Magazine for an account of this storm).

In the first half of February, 1900, snow fell in enormous quantities over the whole of the United Kingdom, especially perhaps in northern England; the amount of snow was described in *British Rainfall, 1900*, as being probably unprecedented for the British Isles. The recent storm of the last week of December, 1906, was especially severe only in the north-east of England, east of Scotland, and north of Ireland. Severe snows, disorganizing traffic and cutting off villages are, however, so common in many parts of Scotland that they do not draw so much attention as when they occur in the south of England.

ROYAL METEOROLOGICAL SOCIETY.

THE March meeting of this Society is always the "popular" night of the session, and the meeting on the 11th ult. was no exception to the rule, for a large audience gathered in the hall of the Institution of Civil Engineers, to hear a lecture on "The Dawn of Meteorology," by Dr. G. Hellmann, the Director of the Royal Prussian Meteorological Institute, and an Honorary Member of the Society, who had been good enough to come from Berlin at the invitation of the Council.

The President, Dr. H. R. Mill, announced the awards which had been made by the Council in connection with the Prize Competition for Teachers (see p. 55). He then introduced the lecturer, and said that Dr. Hellmann's last visit to the Society was when he had been present at the Jubilee celebration of the Society, in 1900, conveying the congratulations of German meteorologists.

Dr. Hellmann began his lecture by saying that meteorology as a science is young, but as a branch of knowledge it is very old, perhaps as old as mankind; indeed, the beginnings of meteorology are to be found at the origin of human civilization. In referring to weather proverbs, he pointed out that it would be wrong to imagine that the rich weather lore found in the Bible, especially in the book of Job, and in the writings of Homer and Hesiod—that is in the

writings of the eighth century B.C.—originated then in Palestine or Greece. On the contrary, the familiarity of the people with the sayings and rules concerning the weather, revealed to us by these writings, show clearly that they must be considered as a primeval stock of the culture of the time. There is every reason to believe that the origin of much of modern weather lore can be traced to an Indo-germanic source. Some of the tablets excavated from old Babylon, which have been deciphered by English and German authorities, have been found to contain references to the weather: the lecturer gave several examples.

The Greeks were the first to make regular meteorological observations as far back as the fifth century B.C., and had parapegmata, a kind of weather almanack, fixed on public columns, some of which are still preserved. The Greeks at this early period also used wind-vanes, and in connection with this Dr. Hellmann referred to the "Tower of the Winds," at Athens, which was erected in the first century B.C.

The lecturer next pointed out that the earliest quantitative observations, viz.: the measurement of rain, were found in the first century A.D. These were made in Palestine, and the results of the observations are preserved in the Mishnah. He also made the most interesting statement that the amount of rainfall then considered as normal for a good crop corresponds pretty much with that deduced from modern observations made by Mr. Thomas Chaplin, at Jerusalem; whence it may be inferred that the climate of Palestine has not changed.

After mentioning that meteorology made but little progress among the Romans, Dr. Hellmann proceeded to show that the barbarous state of Europe after the fall of the Occidental Empire was not adapted to the furthering of science, which was barely kept alive within the Christian Church. Yet the pursuit of meteorology never wholly ceased: for the Fathers of the Church writing commentaries on the work of the seven days, often took occasion, when dealing with the first day of the Mosaic creation, to insert long elaborations on the atmosphere and its phenomena. The resuscitations of experimental science in the thirteenth century led to the development of regular meteorological observations in the fourteenth century. The earliest known record of systematic observations of the weather in this country was kept by the Rev. William Merle, at Oxford, from January, 1337, to January, 1344. The MS. is still preserved in the Bodleian Library.

Dr. W. N. Shaw proposed, and Mr. Richard Bentley seconded, a hearty vote of thanks to Dr. Hellmann for his interesting lecture.

Mr. J. E. T. Barbary, Mr. E. H. Brandt, Mr. E. Howarth, F.R.A.S., Mr. A. E. Jones, Mr. W. R. Nash, Dr. A. A. Rambaut, F.R.S., and Mr. G. Penn Simkins, were elected Fellows of the Society.

THE ROYAL METEOROLOGICAL SOCIETY'S ESSAY COMPETITION.

In response to the offer of three prizes for the best essays on Climate or Weather, treated in a manner adapted for elementary school teaching, no fewer than 180 essays were sent in. These have been carefully examined, and proved to be of such excellence that the Council of the Society resolved to increase the number of prizes, so as to reward various classes of competitors whose work it would have been hardly fair to judge by the same standard. If the purpose of the competition was to stimulate the study of meteorology, and extend the interest taken in the explanation of common phenomena, this decision appears likely to serve it well. We understand that one or more of the essays will be published in the *Quarterly Journal* of the Society. The following is the official list of awards:—

1st prize. *Five pounds.*—W. C. Upshall, Broughton, Stockbridge.
2nd prize. *Three pounds.*—Miss A. B. Phillips, 34, Blythe Hill, Catford.
3rd Prize. *Two pounds.*—Albert V. Stevenson, St. Paul's School, Sunderland.
Extra prizes. *One pound each.*—John Young, Barrock School, by Wick. Henry Collar, Lavender Hill School, Clapham Junction.

In addition to the above the following prizes have been awarded for essays sent in by pupil teachers:—

First prize. *One pound.*—Arnold B. Tinn, 28, Macauley Road, Birkby, Huddersfield.
2nd prize. *Ten shillings.*—Miss Daisy E. James, Church House, Wokingham.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THUNDERSTORMS, APRIL 3rd, 4th and 5th.

A somewhat unusual phenomenon, in this neighbourhood at least, is the occurrence of a thunderstorm on three consecutive days, but such has been the case during the present month. On the 3rd, heavy thunder clouds (cu.-nim.) came up from W. and N.W., at 1.10 p.m., moving with exceptional rapidity. A sharp thunder squall broke at 1.20 p m., accompanied by several loud claps of thunder and vivid fork lightning of a red and blue colour. The storm passed away in an E. direction, rain of varying intensity falling to 1.30 p.m. Distant rolling thunder was again heard to the E. at 2.10 p.m. The barograph remained steady at 29·90 in.

On the 4th, very massive electrical cu. of a bright pearly white to a coppery hue formed soon after midday. Towards 3.45 p.m., cu.-nim. in extended formation moved up quickly from N.W., travelling towards S.E., but on reaching the zenith, a few minutes before 4 p.m., were deflected in a N.E. direction. A short but sharp thunderstorm broke at 4 p.m., being accompanied by very loud thunder exactly overhead, the interval to fork lightning (colour red) being inappreciable, heavy rain, with some large snowflakes, fell at 4.5 p.m. The barograph reading at 4 p.m. was 29·75 in., when a jump of 0·02 occurred, followed by a fall of 0·05.

On the 5th, the weather was showery to 1.30 p.m., when thunder clouds were again seen forming to N. and N.E., moving up rapidly, a bright flash of sheet lightning was noticed at 1.40 p.m., when a heavy fall of hail commenced. During heavy rain, accompanied by some flakes of snow, distant rolling thunder was heard in S.E. at 1.50 p.m. Barograph steady at 29·78 in.

The latter part of this day was marked by typical thunder rains, occasional hail and snow, with dense blue-black to brown gloom. The outstanding features of all three storms were the low elevation and rapidity of movement of the storm clouds.

SPENCER C. RUSSELL, F.R.Met.Soc.

Epsom, April 5th, 1908.

TEMPERATURE EXTREMES.

I READ with interest, on page 236 of your Magazine for January, the number of days at Slough with shade temperature over 80° F.—with which it is interesting to compare the figures at Totland :—

	Slough.	Totland.		Slough.	Totland.
1898.....	19	1	1904.....	14	1
1899.....	31	2	1905.....	14	0
1900.....	23	1	1906.....	21	1
1901.....	19	2	1907.....	0	0
1902.....	9	0		—	—
1903.....	6	0		156	8

For the same ten years shade temperature here fell below 20° F., as follows :

1898 1907.
0. 0. 0. 0. 0. 0. 0. 0. 0. 0. = 0.

for the preceding ten years :

1888 1897.
0. 0. 1. 2. 0. 0. 2. 5. 0. 0. = 10.

Could you give us some midland station, say, Slough or Oxford, for contrast of cold?

JOHN DOVER.

Aston House, Totland Bay, Isle of Wight.

THE CLIMATE OF PENZANCE.

THE climate of Penzance (where I now write) has some interesting points of contrast to that of Greenwich One might ask to what extent Londoners benefit as regards escape from winter cold by coming to the "Cornish Riviera." I find the average number of frost days here to be about *eight*, against *fifty-four* at Greenwich. Sometimes there are none (*e.g.*, the winter 1897-8).

A comparison day by day of the Penzance minima in December to March, 1906-7 with those for Greenwich shows the former to be higher by about 7° on the average. In one case (in January) the difference rose to 18°·7, and one day only (25th February) Penzance had a *lower* minimum than Greenwich (37°·0 against 40°·1).

The rainfall (average 40·1 in. for 1887-1907) culminates in December, and is least in June (Greenwich, October and February or March).

The rise of temperature in spring in the Cornish Riviera is more gradual than in Greenwich. Thus, taking Mr. Bayard's figures (of mean temperature) for Falmouth, we have:—

	Falmouth.	Rise.		Greenwich.	Rise.
	°	°		°	°
January	42·6			38·5	
February	43·7	+1·1	.....	39·5	+1·0
March	44·6	+0·9	.....	41·7	+2·2
April	49·0	+4·4	.....	47·2	+5·5
May	52·7	+3·7	.....	53·1	+5·9

Greenwich is warmer than Falmouth in May, June, July and August.

My thanks are due to Mr. A. C. Benn, F.R.Met.Soc, for access to his excellent record.

A. B. M.

Tregenna House, Penzance, 1st Feb., 1908.

METEOROLOGICAL NEWS AND NOTES.

THE CONFERENCE OF METEOROLOGISTS of the British Empire, originally intended to meet at Ottawa in the month of May, has been postponed to July.

THE RAINFALL OF THE THAMES VALLEY in March, which is the subject of the map inserted in the present number, proved to be very interesting and characteristic. The high rainfall, it will be observed, corresponds closely to the high land, while the lowest rainfall occurs in the Thames estuary. The distribution of rain is very similar to that which prevails in an average year.

MESSRS. NEGRETTI AND ZAMBRA have issued a new catalogue of rain gauges, in which we are pleased to note that due prominence is given to the deep rimmed patterns, which can alone be looked upon as trustworthy instruments for common use.

MESSRS. CASELLA & Co. have introduced a new coloured liquid for minimum thermometers which is sufficiently transparent to allow the index to be read with the same ease as when colourless alcohol is used, while the intense light red tint of the liquid makes it much easier to see that the instrument is properly set and that no portion of the alcohol column is detached. The colouring matter is, so far as we can judge, permanent.

THE WEATHER OF MARCH.

By FRED. J. BRODIE.

THE seasonal division of the year into four quarterly periods affords a convenient working arrangement for the statistician, but is not always held in respect by the forces of nature. With the close of February meteorological custom has decreed that winter should come to an end. March is, however, sometimes as vigorous as any of the three preceding months—this year it was actually colder than February. The origin of last month's cold is not far to seek. In the winter time a wind from south-west is the only one which may be relied upon to produce a spell of warmth much in excess of the normal. The same thing holds good in the early springtime, and the general coldness of last month may be attributed to the fact that on five days only out of the thirty-one was a south-westerly breeze experienced over any considerable portion of the United Kingdom. On each of those occasions the thermometer rose above the average, the greatest warmth occurring on the 8th or on the 23rd or 24th. On the earlier date the shade maxima were above 55° in many parts of England and also in the south of Ireland; at Hereford the thermometer reached 59°, while at Raunds (in Northamptonshire) it touched 61°. On the later occasion the warmth was more general, shade temperatures of 55° and upwards being recorded at many places situated in all but the extreme northern parts of the country, and a reading of 61° at Cromer, Norwich and Geldeston.

At other times in the month the winds were most commonly from some polar quarter, and at rather frequent intervals sharp touches of frost were experienced in nearly all districts. The lowest temperatures of all were experienced between the 1st and the 5th, when the sheltered thermometer fell below 20° at many places in the northern and central parts of Great Britain, and reached a minimum of 10° at Balmoral and 16° at Newton Rigg (Cumberland). On the surface of the grass the readings about this time were as low as 4° at Balmoral, 11° at Newton Rigg, and 17° at Buxton and Crathes. After this the sharpest frosts occurred in the third week—mostly between the 15th and 17th or between the 19th and 21st. At one or other of those times the thermometer again fell below 20° at several places in the eastern parts of Great Britain. In the screen a

reading as low as 18° was registered at Balmoral, and a reading of 19° at Cambridge; while on the grass the thermometer fell to 14° at Crathes and 15° at Balmoral, Rauceby, Cambridge and Greenwich. Each touch of cold was accompanied by falls of snow or sleet, and at the commencement of the month a considerable depth was reported in several parts of our northern and central districts.

The most important feature in the weather of the month was, however, not so much the occasional presence of sharp frost, as the general absence of spring-like warmth. At the London Observing Station of the Meteorological Office in St. James's Park the thermometer never rose above 57°. In 1901, and in 1883, the highest March temperature was only 55°, and in 1900 and 1888 only 56°, but in every other year back to 1871 the absolute maximum of the present year was exceeded. In the north the conditions were equally inclement. At Leith the mean of all the maximum temperatures for the month was the lowest observed in March since the year 1888, or with that exception since 1883. Over the United Kingdom as a whole the March of 1883 was the coldest on record.

REVIEW.

Konstant auftretende secundäre Maxima und Minima in dem jährlichen Verlauf der meteorologischer Erscheimungen. Von Dr. Van Rijckevorsel, Dritte und Vierte Abteilung. Rotterdam, 1907.

This pamphlet dealing with observations for many years, from places scattered all over the globe, is divided into two parts; the one discussing atmospheric pressure, and the other rainfall, and is a sequel to a previous one discussing temperature. It shows the form of the curves of the minor variations of pressure and rainfall for each hemisphere and for the whole earth. The rainfall curves of January and July for the tropical portion of the northern hemisphere, and for the extra-tropical portion, show not only a much greater mean rainfall within the tropics, but also that the maxima and minima or the minor variations during these months are more sharply pronounced than in the temperate latitudes. The ratio is approximately 1·25; and is probably the same for the southern hemisphere. The rainfall curve for the northern hemisphere agrees with the temperature curve better in the winter than in the summer months, but there is no such correspondence between the rainfall and pressure curves. L.C.W.B.

RAINFALL TABLE FOR MARCH, 1908.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1870-99. in.	1908. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	1·62	2·37
Tenterden	*Kent*	51 4	*0 41	190	1·89	2·16
West Dean	*Hampshire*	51 3	1 38	137	1·79	3·31
Hartley Wintney	,,	51 18	0 53	222	1·77	3·27
Hitchin	*Hertfordshire*	51 57	0 17	238	1·53	2·80
Winslow (Addington)	*Buckinghamshr.*	51 58	0 53	309	1·62	2·63
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·64	2·01
Brundall	*Norfolk*	52 37	*1 26	66	1·65	2·56
Winterbourne Steepleton	*Dorset*	50 42	2 31	316	2·41	3·51
Torquay (Cary Green)	*Devon*	50 28	3 32	12	2·45	3·13
Polapit Tamar [Launceston]	,,	50 40	4 22	315	2·41	5·05
Bath	*Somerset*	51 23	2 21	67	1·94	2·72
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	1·86	3·38
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·01	3·37
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	1·75	2·66
Boston	*Lincolnshire*	52 58	0 1	25	1·36	2·17
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·55	2·80
Derby (Midland Railway)	*Derbyshire*	52 55	1 28	156	1·49	2·72
Bolton (Queen's Park)	*Lancashire*	53 35	2 28	390	2·88	3·66
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	1·85	3·82
Arncliffe Vicarage	,, ,,	54 8	2 6	732	5·03	6·34
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·79	2·17
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·10	3·37
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	10·51	11·57
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	2·79	3·11
Haverfordwest (High Street)	*Pembroke*	51 48	4 58	95	3·03	4·86
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	2·93	4·01
Llandudno	*Carnarvon*	53 20	3 50	72	1·97	2·27
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	3·01	5·31
Hawick (Branxholm)	*Roxburgh*	55 24	2 51	457	2·55	4·67
Edinburgh (Royal Observy.)	*Midlothian*	55 55	3 11	442	...	3·07
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	3·47	5·85
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·33	4·03
Tighnabruaich	*Argyll*	55 55	5 14	50	4·36	7·47
Mull (Quinish)	,,	56 36	6 13	35	4·23	5·90
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	1·92	3·88
Braemar	*Aberdeen*	57 0	3 24	1114	2·42	...
Aberdeen (Cranford)	,,	57 8	2 7	120	2·43	4·09
Cawdor	*Nairn*	57 31	3 57	250	2·16	3·12
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	3·68	5·05
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	6·38	12·13
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·47	4·34
Castletown	*Caithness*	58 35	3 23	100	...	2·98
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	4·03	5·97
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	2·55	3·79
Broadford (Hurdlestown)	*Clare*	52 48	8 38	167	2·17	3·48
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·38	3·58
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	1·85	2·94
Ballinasloe	*Galway*	53 20	8 15	160	2·45	3·83
Clifden (Kylemore House)	,,	53 32	9 52	105	5·67	7·08
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	3·95	6·74
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	2·99	5·33
Seaforde	*Down*	54 19	5 50	180	2·56	4·84
Londonderry (Creggan Res.)	*Londonderry*	54 59	7 19	320	3·06	4·60

RAINFALL TABLE FOR MARCH, 1908—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1870-99. in.	1908. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1870-1899. in.	STATION.
+ ·75	146	·83	25	18	5·13	5·98	+ ·85	117	25·16	Camden Square
+ ·27	114	·51	5	20	6·10	4·86	—1·24	80	28·36	Tenterden
+1·52	185	·89	3	17	6·74	5·87	— ·87	87	29·93	West Dean
+1·50	185	·51	5	15	6·22	5·93	— ·29	95	27·10	Hartley Wintney
+1·27	183	·89	25	19	4·88	5·41	+ ·53	111	24·66	Hitchin
+1·01	162	·74	25	20	5·40	5·53	+ ·13	102	26·75	Addington
+ ·37	123	·26	1	18	4·89	4·80	— ·09	98	25·39	Westley
+ ·91	155	·35	1	23	4·81	5·54	+ ·73	115	25·40	Brundall
+1·10	146	·71	24	18	9·42	7·38	—2·04	78	39·00	Winterbourne Stpltn.
+ ·68	128	·81	5	19	8·51	6·18	—2·33	73	35·00	Torquay
+2·64	209	·73	30	20	9·12	10·85	+1·73	119	38·85	Polapit Tamar
+ ·78	140	·51	5	19	6·58	5·28	—1·30	80	30·75	Bath
+1·52	182	·75	24	19	6·45	6·04	— ·41	94	29·85	Stroud
+1·36	167	·83	24	21	7·09	6·55	— ·54	92	33·04	Wolstaston
+ ·91	152	·54	24	18	6·08	4·47	—1·61	73	29·21	Coventry
+ ·81	160	·36	25	17	4·50	4·68	+ ·18	104	23·30	Boston
+1·25	181	·72	25	20	4·87	5·23	+ ·36	107	24·70	Hodsock Priory
+1·23	183	·46	24	19	5·10	5·27	+ ·17	103	26·18	Derby
+ ·78	127	·61	7	20	8·93	11·88	+2·95	133	42·43	Bolton
+1·97	206	·77	25	19	5·37	6·77	+1·40	126	26·96	Ribston Hall
+1·31	126	1·02	8	25	16·10	19·00	+2·90	118	60·96	Arncliffe Vic.
+ ·38	121	·26	4, 6	22	5·45	5·70	+ ·25	105	27·02	Hull
+1·27	160	1·03	6	21	5·64	6·58	+ ·94	117	27·99	Newcastle
+1·06	110	1·50	8	21	36·86	37·88	+1·02	103	132·68	Seathwaite
+ ·32	111	·75	24	21	9·77	8·37	—1·40	86	42·81	Cardiff
+1·83	160	1·03	5	18	11·86	10·26	—1·60	87	47·88	Haverfordwest
+1·08	137	1·39	24	18	9·83	12·44	+2·61	126	45·41	Gogerddan
+ ·30	115	·49	24	21	6·51	8·22	+1·71	126	30·98	Llandudno
+2·30	176	1·10	24	12	11·17	13·70	+2·53	123	43·43	Cargen
+2·12	183	·71	30	21	8·36	10·33	+1·97	124	34·80	Branxholm
...	...	1·04	24	22	...	6·20	...	...	...	Edinburgh
+2·38	169	·98	24	24	12·39	15·38	+2·99	124	48·87	Girvan
+1·70	173	·82	24	20	8·11	11·10	+2·99	137	35·80	Glasgow
+3·11	171	1·46	8	17	14·79	20·61	+5·82	140	57·90	Tighnabruaich
+1·67	139	·95	8	19	14·58	16·71	+2·13	115	57·53	Quinish
+1·96	202	1·27	24	20	6·12	6·09	— ·03	100	28·95	Dundee
...	...	...	...	...	8·03	...	...	...	36·07	Braemar
+1·66	168	·61	24	23	7·18	6·94	— ·24	97	33·01	Aberdeen
+ ·96	144	·85	24	14	6·16	8·27	+2·11	134	29·37	Cawdor
+1·37	137	·90	27	17	12·66	15·55	+2·89	123	43·71	Fort Augustus
+5·75	190	1·27	1	25	21·90	34·30	+12·40	156	86·50	Bendamph
+1·87	175	1·16	24	17	7·48	12·76	+5·28	171	31·60	Dunrobin Castle
...	...	·89	24	21	...	10·44	...	...	...	Castletown
+1·94	148	·84	30	26	16·04	13·53	—2·51	84	58·11	Killarney
+1·24	149	·75	5	23	9·91	7·84	—2·07	79	39·30	Waterford
+1·31	160	·81	5	24	7·34	8·29	+ ·95	113	33·47	Hurdlestown
+1·20	150	·79	5	22	8·10	8·66	+ ·56	107	35·19	Abbey Leix
+1·09	159	·70	5	22	5·99	6·37	+ ·38	106	27·75	Dublin
+1·38	156	·85	5	24	8·42	9·26	+ ·84	110	37·04	Ballinasloe
+1·41	125	1·25	21	21	19·61	19·79	+ ·18	101	80·23	Kylemore House
+2·79	170	1·37	30	25	12·96	17·72	+4·76	137	50·50	Enniscoe
+2·34	178	·76	30	24	9·44	14·58	+5·14	155	41·83	Markree Obsy.
+2·28	189	1·10	5	24	9·16	10·01	+ ·85	109	38·61	Seaforde
+1·54	150	·59	8	27	9·35	12·06	+2·71	129	41·20	Londonderry

SUPPLEMENTARY RAINFALL, MARCH, 1908.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	3·50	XI.	Rhayader, Tyrmynydd	5·34
,,	Ramsgate	1·90	,,	Lake Vyrnwy	5·98
,,	Steyning	2·53	,,	Llangyhanfal, Plâs Draw	3·89
,,	Hailsham	3·38	,,	Criccieth, Talarvor	3·25
,,	Totland Bay, Aston House	2·98	,,	Llanberis, Pen-y-pass	13·52
,,	Emsworth, Redlands	2·51	,,	Lligwy	2·16
,,	Stockbridge, Ashley	3·85	,,	Douglas, Woodville	3·64
,,	Reading, Calcot Place	2·90	XII.	Stoneykirk, Ardwell House	3·53
III.	Harrow Weald, Hill House.	3·21	,,	Dalry, The Old Garroch	8·01
,,	Oxford, Magdalen College	2·34	,,	Langholm, Drove Road	7·02
,,	Pitsford, Sedgebrook	3·06	,,	Moniaive, Maxwelton House	7·08
,,	Huntingdon, Brampton	2·55	XIII.	N. Esk Reservoir [Penicuick]	4·80
,,	Woburn, Milton Bryant	2·58	XIV.	Maybole, Knockdon Farm	3·99
,,	Wisbech, Bank House	1·68	XV.	Campbeltown, Witchburn	5·63
IV.	Southend Water Works	1·86	,,	Inveraray, Newtown	6·92
,,	Colchester, Lexden	1·66	,,	Ballachulish House	9·84
,,	Newport, The Vicarage	2·36	,,	Islay, Eallabus	5·06
,,	Rendlesham	1·57	XVI.	Dollar Academy	4·59
,,	Swaffham	2·16	,,	Loch Leven Sluice	4·15
,,	Blakeney	2·22	,,	Balquhidder, Stronvar	8·40
V.	Bishops Cannings	...	,,	Perth, Pitcullen House	3·97
,,	Ashburton, Druid House	5·44	,,	Coupar Angus Station	3·41
,,	Honiton, Combe Raleigh	3·88	,,	Blair Atholl	3·93
,,	Okehampton, Oaklands	5·04	,,	Montrose, Sunnyside Asylum	3·30
,,	Hartland Abbey	3·35	XVII.	Alford, Lynturk Manse	3·78
,,	Lynmouth, Rock House	4·46	,,	Keith Station	3·37
,,	Probus, Lamellyn	5·17	XVIII.	N. Uist, Lochmaddy	4·89
,,	North Cadbury Rectory	2·88	,,	Alvey Manse	4·55
VI.	Clifton, Pembroke Road	3·06	,,	Loch Ness, Drumnadrochit.	5·36
,,	Ross, The Graig	3·11	,,	Glencarron Lodge	6·20
,,	Shifnal, Hatton Grange	3·13	,,	Fearn, Lower Pitkerrie	2·25
,,	Blockley, Upton Wold	3·31	XIX.	Invershin	3·78
,,	Worcester, Boughton Park.	2·92	,,	Altnaharra	4·05
VII.	Market Overton	2·73	,,	Bettyhill	3·81
,,	Market Rasen	2·20	XX.	Dunmanway, The Rectory	6·48
,,	Bawtry, Hesley Hall	2·85	,,	Cork	4·00
,,	Buxton, Lismore House	4·05	,,	Darrynane Abbey	6·02
VIII.	Neston, Hinderton Lodge	3·12	,,	Glenam [Clonmel]	3·86
,,	Southport, Hesketh Park	2·49	,,	Ballingarry, Gurteen	3·42
,,	Chatburn, Middlewood	3·47	,,	Miltown Malbay	3·23
,,	Cartmel, Flookburgh	3·48	XXI.	Gorey, Courtown House	3·24
IX.	Langsett Moor, Up. Midhope	4·32	,,	Moynalty, Westland	4·14
,,	Scarborough, Scalby	3·45	,,	Athlone, Twyford	3·21
,,	Ingleby Greenhow	2·87	,,	Mullingar, Belvedere	3·16
,,	Mickleton	3·19	XXII.	Woodlawn	3·96
X.	Bardon Mill, Beltingham	3·68	,,	Westport, St. Helens	5·43
,,	Ewesley, Fallowlees	4·05	,,	Mohill	3·95
,,	Ilderton, Lilburn Cottage	3·94	XXIII.	Enniskillen, Portora	4·14
,,	Keswick, York Bank	5·96	,,	Dartrey [Cootehill]	4·18
XI.	Llanfrechfa Grange	4·23	,,	Warrenpoint, Manor House	4·73
,,	Treherbert, Tyn-y-waun	7·58	,,	Banbridge, Milltown	3·30
,,	Carmarthen, The Friary	4·72	,,	Belfast, Springfield	4·71
,,	Castle Malgwyn [Llechryd].	5·03	,,	Bushmills, Dundarave	4·06
,,	Plynlimon	7·70	,,	Stewartstown, Ballyclog	3·82
,,	Crickhowell, Ffordlas	4·50	,,	Killybegs	5·95
,,	New Radnor, Ednol	4·64	,,	Horn Head	5·00

METEOROLOGICAL NOTES ON MARCH, 1908.

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

LONDON, CAMDEN SQUARE.—Much R and S fell in the early part, followed by strong winds from 8th to 11th. Changeable weather, with a good deal of R and low temp. characterised the latter part. Mean temp. 41°·1, or 1°·0 below the average; shade max. 58°·1 on 24th, min. 25°·6 on 15th. F 10, f 22. Duration of sunshine 97·6* hours, and of R 76·4 hours.

TENTERDEN.—Shade max. 58°·0 on 23rd and 24th, min. 27°·5 on 14th and 20th. F 13, f 22.

TOTLAND BAY.—Duration of sunshine 135·5* hours. Shade max. 53°·3 on 23rd, min. 28°·7 on 5th. F 5, f 20.

WEST DEAN.—Cold and rough with heavy S measuring 6¼ in., without drift, and causing much damage to trees and shrubs. Shade max. 54°·0 on 23rd, min. 19°·0 on 5th. F 20, f 24.

TORQUAY.—Duration of sunshine 149·2* hours. Mean temp. 43°·2, or 1°·0 below the average. Shade max. 56°·9 on 23rd, min 29°·2 on 5th. F 2, f 17.

NORTH CADBURY.—Shade max. 58°·0 on 23rd, min. 25°·5 on 5th. F 9, f 21.

CLIFTON.—R on nearly every day to 16th, and S on 4 days. Then dry and frosty till 21st, and afterwards unsettled, with heavy R and some fine intervals. R ·65 in. above the average.

ROSS.—Shade max. 57°·0 on 23rd, min. 25°·0 on 5th. F 12, f 21.

BUXTON.—R ·12 in. above the average of 35 years. Duration of sunshine 77·5* hours. Mean temp. 35°·7, or 2°·8 below the average. Shade max. 50°·8 on 23rd, min. 20°·3 on 5th. F 18, f 26.

BOLTON.—Duration of sunshine 51·0* hours, or 25·1 hours below the average. Mean temp. 38°·2, or 1°·6 below the average. Shade max. 53°·5 on 23rd, min. 28°·4 on 5th.

SOUTHPORT.—Mean temp. 40°·1, or 1°·4 below the average. Duration of sunshine 120* hours, or 11 hours above the average. R ·32 in. above the average. Duration of R 88·2 hours. Shade max. 53°·7 on 27th, min. 25°·0 on 20th.

HULL.—Duration of sunshine 38 hours. Shade max. 58°·0 on 24th, min. 26°·0 on 15th. F 12, f 22.

HAVERFORDWEST.—Cold, wet and stormy. Agricultural operations were well advanced, but vegetation was backward. Duration of sunshine, 124·9* hours. Shade max. 52°·4 on 23rd, min. 24°·1 on 5th. F 9, f 14.

LLANDUDNO.—Cold and wet, with excessive R. Vegetation at a stand-still. Shade max. 53°·2 on 8th, min. 28°·2 on 20th.

DOUGLAS.—Persistently wet, often very cold, and exceedingly stormy. The ground was full of water, and gave no chance of a dry seed bed. The outlook was as cheerless as the retrospect.

DUMFRIES.—An exceptionally wet March; 4·03 in. of R fell in last 8 days.

EDINBURGH.—Shade max. 53°·2 on 23rd, min. 28°·5 on 5th. F 7, f 20.

COUPAR ANGUS.—R 60 per cent. above the average. A flood occurred on 24th, when 1·07 in. fell. Mean temp. 37°·2, or 1°·7 below the average. Shade max. 50°·5 on 28th, min. 26°·0 on 13th.

ABERDEEN.—Cold, wet and stormy, with S. and S.W. winds. Spring work very backward. Shade max. 50°·0 on 28th, min. 24°·0 on 20th. F 18.

FORT AUGUSTUS.—Shade max. 52°·4 on 23rd, min. 24°·8 on 21st. F 15.

CASTLETOWN.—Shade max. 52°·0 on 23rd, min. 24°·0 on 15th and 21st. F 19, f 23.

CORK.—R was 1·33 in. above the average, and mean temp. 3°·6 below. Shade max. 52°·0 on 23rd, min. 29°·0 on 2nd. F 9, f 19.

DUBLIN.—Shade max. 57°·0 on 8th, min. 30°·0 on 5th. F 3, f 16.

MARKREE.—Shade max. 54°·1 on 26th, min. 24°·8 on 4th and 26th. F 11, f 26.

* Campbell-Stokes.

Climatological Table for the British Empire, October, 1907.

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	68·2	1	37·1	24, 26	59·0	45·0	48·6	91	104·1	32·7	2·52	22	7·8
Malta	90·5	5	57·3	20	77·3	67·8	62·7	74	147·6	...	5·34	7	4·6
Lagos	88·0	25	70·0	2, 8	84·8	73·1	73·8	81	159·0	67·0	8·30	20	7·9
Cape Town	87·5	31	45·0	17	68·6	52·7	49·0	65	...	...	1·20	13	5·5
Durban, Natal ...	83·5	23	52·8	26	74·2	59·7	...	...	141·7	...	4·56	18	6·7
Johannesburg	84·6	23	43·0	6	71·7	49·7	51·7	77	151·8	37·6	2·38	11	3·9
Mauritius	87·8	31	57·2	15	81·1	65·1	61·4	68	148·1	47·2	·67	12	6·5
Calcutta...	93·8	9	64·8	29	90·7	74·2	72·5	74	153·1	59·5	1·06	1	2·4
Bombay...	92·8	29	73·8	31	88·6	77·5	75·5	80	136·2	64·8	·02	1	2·3
Madras	99·3	15	71·4	14	88·6	75·3	73·4	81	145·4	68·9	11·83	16	5·1
Kodaikanal	68·5	19	48·1	28	62·3	51·4	51·0	85	137·6	40·6	6·24	21	7·1
Colombo, Ceylon ...	87·5	20	71·8	10	85·5	75·1	75·1	84	161·1	70·3	14·73	30	6·6
Hongkong	87·1	22	67·7	31	83·4	75·4	72·3	80	141·5	...	8·97	17	6·6
Melbourne	89·3	29	38·3	6	68·0	48·4	42·1	60	144·4	30·6	1·51	9	5·1
Adelaide	97·7	29	41·2	4	72·7	50·8	46·7	57	150·7	38·0	1·71	13	3·7
Coolgardie	92·0	27	37·4	2	77·6	49·8	40·0	44	153·4	34·2	·15	2	2·2
Sydney	90·1	1	49·9	4	72·9	57·5	51·6	62	127·6	39·9	·59	5	4·5
Wellington	63·0	3, 27	38·0	1	57·5	47·1	43·8	73	115·0	27·0	2·79	15	7·0
Auckland	68·0	23	44·0	5	62·0	51·5	47·7	72	128·0	38·0	5·02	18	5·6
Jamaica, Negril Point.	89·9	7	68·9	5	87·4	71·8	72·8	78	...	...	4·25	12	6·5
Trinidad	90·0	sev.	65·0	3, 4	89·3	68·8	75·1	87	160·0	62·0	7·65	13	...
Grenada	89·0	31	74·0	18, 30	87·8	75·4	74·0	80	142·0	...	2·90	15	6·5
Toronto	70·9	3	24·0	26	53·6	36·3	...	...	86·2	17·8	1·98	7	...
Fredericton	67·0	18	17·3	27	51·8	31·9	...	...	...	...	4·15	6	...
St. John's, N.B. ...	60·3	29	27·0	31	52·1	39·2	...	...	...	...	4·19	16	...
Victoria, B.C.	68·0	10	35·5	18	57·7	45·4	...	89	...	...	·73	15	7·0
Dawson	49·0	3	-15·0	16	32·0	19·7	...	...	...	...	4·09	17	6·7

MALTA.—Mean temp. of air 72°·0. Average hours bright sunshine 7·1.

Natal.—R ·10 in. above 30 years' average.

Johannesburg.—Bright sunshine 276·2 hours.

Mauritius.—Mean temp. of air 0°·6 above, of dew point 0°·4 below; relative humidity 2·1 per cent., and R ·88 in., below averages. Mean hourly velocity of wind 10·2 miles, or 1·8 below average.

KODAIKANAL.—Bright sunshine 124 hours.

COLOMBO.—Mean temp. of air 78°·6 or 1°·5 below, of dew point 2°·0 above, and R ·03 in. above, averages. Mean hourly velocity of wind 5·1 miles. TS8 on 3 days.

HONGKONG.—Mean temp. of air 79°·0. Bright sunshine 191·2 hours, or 24 hours below average. Mean hourly velocity of wind 13·6 miles. R 4·23 in. above average.

Adelaide.—Mean temp. of air 0°·2 below, R ·05 in. below averages. Bright sunshine 256 hours, or 32 hours above average.

Sydney.—Mean temp. of air 1°·8 above, and R 2·30 in. below averages.

Wellington.—Mean temp. of air 2°·0 below, and R 1·44 in. below averages. Bright sunshine 165·2 hours.

RAINFALL OF THAMES VALLEY, APRIL, 1908.

The Edinburgh Geographical Institute

J.G. Bartholomew

Symons's Meteorological Magazine.

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THE EASTER SNOWSTORM OF 1908.

Mr. Brodie's article on the weather of the month gives due prominence to the remarkably wintry character of April, 1908; but the snowstorms of the last ten days of April claim special treatment. We have received a large amount of correspondence on the subject, a selection from which is given below, and we may note, in passing, that a good deal of editorial time has had to be expended in changing condensed notes full of contractions into continuous English, or in cutting down narrations which were too detailed for our scanty space. The correspondence has been supplemented by a vast mass of newspaper cuttings from all parts of the country. It has frequently been observed that Easter snowstorms, especially when Easter occurs late in April, as it did this year, have a tendency to be heavier in the south of England than in those parts of the country where falls of snow in spring are less uncommon, and this occasion proved no exception. Several correspondents refer to the beauty of the snow as it lay on the ground and trees, but although many photographs must certainly have been taken none were forwarded to us for reproduction until we were revising these pages for press. We regret this the more as on the occasion of the storm we were in Scotland, where, although the cold was severe, there was no great depth of snow. At Mill Hill, 6 miles north of Camden Square, the snow on the morning of the 24th, when it lay thickest, was between 5 and 6 inches deep, on the average, and a great many branches and some large shrubs were broken by the weight of the snow. The largest tree to suffer was a lilac, the stem of which was broken across at a point where it was about 5 inches in diameter.

The worst of the snowstorm was experienced on Saturday, 25th, when a gale of unusual severity was blowing in the Channel, and railway communication was much hampered in several parts of the south of England. At Reading, the railway service was disorganized, and at Southampton work at the docks was brought to a standstill. The conditions at Oxford are interesting in a special degree on account of the length of the meteorological records at the Radcliffe Observatory which run from 1853. The depth of snow there was 17 inches, and the only instance of a greater amount being recorded at any time of year was on February 13th and 14th, 1888, when 24 inches of

undrifted snow was measured. Throughout Oxfordshire, Berkshire, and the north of Hampshire, traffic by road was completely stopped, the carriers who supply the outlying villages had in several instances to leave their carts in the drifts and make the best of their way to shelter on foot, leading their horses. Many observers in those counties refer to the great snowstorm of January, 1881 (see this Magazine, No. 181, February, 1881), as the only occasion when a storm of greater severity occurred, but fortunately this year's storm proved of much shorter duration and the records tell more frequently of discomfort than of disaster. The thaw, when it occurred, naturally gave rise to a severe flood in the Thames, though fortunately the upper tributaries of the river lay beyond the region of heavy snow, so that only the middle courses of the Cherwell and Kennet were subjected to a great rush of snow-water.

Heavy snow makes many corrections necessary in the records of rainfall, and in order to help those observers whose returns came from the areas most affected, we made maps of the total precipitation (rain and melted snow) of the three days April 23rd to 25th, and were thus able to judge in what cases a considerable correction of the amount recorded by any particular rain gauge ought to be made. Unfortunately the east of Oxfordshire is deplorably lacking in observers, and our task would have been greatly lightened by records from, say, Thame and Brill. It cannot be too clearly stated that only deep-rimmed rain gauges, either of the Snowdon or the Meteorological Office pattern, can be trusted to take account of snowfall, and the indications of these even should always be controlled by measuring the average depth of the new fallen snow in places where there has been little drifting.

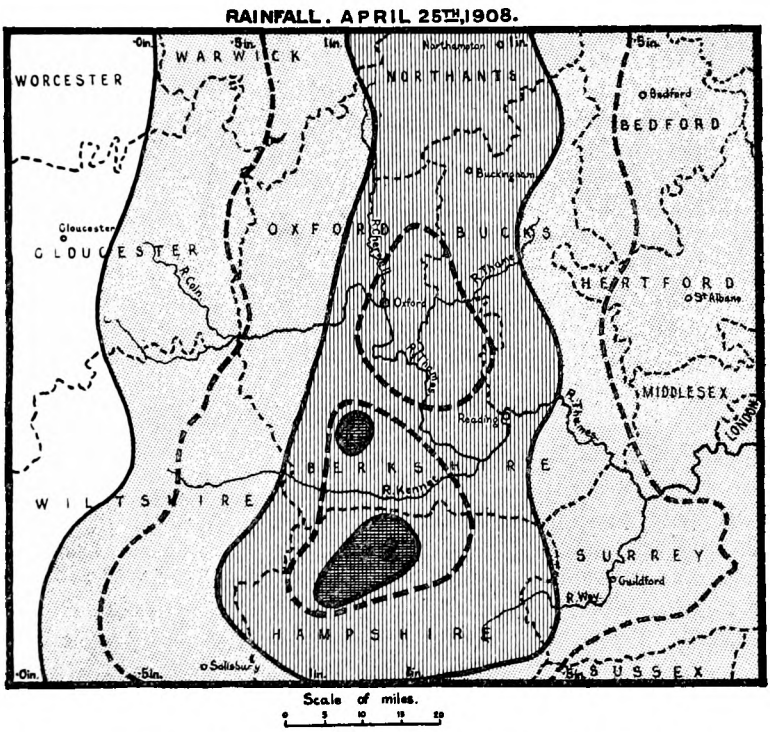
On April 23rd, more than an inch of rain, which may roughly be taken as about a foot of snow, was recorded only on the high ground from Buntingford to Bury St. Edmunds, a distance of about 40 miles, and the area was perhaps 15 to 20 miles wide, although the small number of observers in the east of Hertfordshire, the west of Essex, and the south-west of Suffolk, make it difficult to define the southern limit. There was nearly an inch of precipitation along the Chiltern Hills, south-westward to High Wycombe, but the amount fell off rapidly to the westward, and was below half-an-inch along the Thames and Kennet from Staines to Newbury.

On the 24th there was practically no precipitation in the eastern half of the area shown in our monthly map, and the fall only reached half-an-inch or upwards in a comparatively narrow strip running southward, south of the Thames between Farnham on the east and Andover on the west.

The map of the 25th is so interesting that we reproduce the central portion, showing nearly the whole area with more than half-an-inch of precipitation, or say six inches of snow.

It will be observed that the area with more than an inch of "rain," or a foot of snow, stretches from north of Daventry to Winchester, a

distance of some 90 miles, and the breadth of this central zone of the snowstorm increases from 20 miles in the north to 45 miles in the south. Within this a strip 50 miles long from north to south, and averaging 15 or 20 miles wide, had more than 1·50 in. of rain, or about 18 inches of snow, perhaps separated along the Thames by a strip where there was a little less, and the two centres of heaviest fall are shown by one small area just over 2·00 in. near Abingdon, and another slightly larger between Kingsclere and Andover. To the west the snow fell off rapidly, and westward of a line drawn from Evesham to Calne there was practically none.



The map of total rainfall for the month, which is given as a frontispiece to this number, shows how the snowfall of the three days dominated the precipitation of the month. The wettest area, with more than 4 inches, runs from north to south, following the area of more than 1 foot of snowfall on the 25th, and the extension of the area with more than 3 inches to the north-east corresponds almost exactly to the area with more than 1 foot of snow on the 23rd. Beyond the limits of the Thames valley map the rainfall of April shows little worthy of remark. The Midland area with more than 4 inches extended northwards to Rugby; but the greater part of the north of England had less than 3 inches. The month was a dry one in Scotland, rainfall exceeding 3 inches, occurring only in the west,

while the east and centre of the country had less than 2 inches, and a small area round the Firth of Tay, extending inland to Crieff, had the distinction of being drier than any other part of the British Isles, with less than 1 inch of total precipitation. In Ireland the driest part was round the Shannon estuary in the south-west and inland along that river, with less than 2 inches; but more than 4 inches fell in isolated patches on the mountains of the south-west, south-east, north-east, north-west and west.

MELTHAM.

I SEND a few notes on this arctic period :—

(1) Mean temp., week ending April 25th, 36°·2, or 9°·6 below the average.

(2) Three consecutive days, 23rd—25th, with maxima below 39°·0.

(3) Snow on four consecutive days, 22nd—25th; amount of water collected ·88 in.; depth not measurable but approximately 9 inches.

(4) Minimum 15°·0, maximum 34°·5, noon temp. 25°6, on the 24th.

The record for this day must be quite unprecedented so late in the year; the next lowest minimum I have is 20°·2 on April 19th, 1892. The next lowest maximum 38°·9 on April 23rd, 1888. I have also the lowest minimum in May, 23°·8, on 18th in 1891, and the lowest maximum in May, 39°·7, on 12th in 1886. All thermometers are verified at Kew and are exposed in a Stevenson screen; the register extends from 1880 to 1908. CHARLES L. BROOK.

Harewood Lodge, Meltham, Yorks.

BURY ST. EDMUNDS.

All during Easter Day (April 19th) there was a series of blizzards, with the sun coming out between times the snow melted rapidly. On looking out about 11 p.m., I was surprised to find about 2 or 3 inches of snow on the ground, and the fir trees and laurels laden.

Between sunrise and 9 a.m. on Monday the 20th it snowed heavily, and I think there were nearly 4 inches on the level when I went to the rain gauge at 9 a.m. I am surprised to find in the daily papers little mention of the quantity of snow, though there were observations as to the wind and snow flurries. I do not think any rain fell during the 24 hours, all the moisture was in the form of snow or hail. Another downfall of snow began on Thursday, the 23rd, after 9 a.m., and by noon there was a steady snowfall, which increased all the afternoon, but it was not until sundown that the snow began to lie on the ground—up to that time the snow melted as it fell. A little after midnight when I got home from a concert the whole county was deep in snow, and this steady snowfall appears to have continued all night and up to 10 a.m. on Friday the 24th.

When I went to my rain gauge at 9 a.m. the top was heaped up with snow, and looked as if it had been so for some time, and I measured ·78 in. of water from it. I feel certain that a great deal of snow was lost to the rain gauge, for in spite of the continual thaw

at noon there was a good six inches on the open meadow, and in some fairly exposed places it reached 7 and 8 inches by a foot rule.

Thus we have had eight and nine inches of snow within a few days (19th and 23rd April), say, 1 ft. 6 in. of snow. I recollect nothing of the sort in my experience; but old people about here have often told me of a 23rd April (the local Hartest fair day) when the booths and tents were broken down by the weight of snow. It apperas to have been about fifty-three years ago.

B. P. OAKES.

Hawkedon Rectory, Bury St. Edmunds, 25th April, 1908.

MIDDLESEX.

On Sunday, the 19th, the wind was north or north-west; very heavy snow showers fell throughout the day, and, as is frequently the case after snow showers in spring, the meadows were steaming. Monday, the 20th, was a repetition of the previous day, with bitter squalls of sleet and snow. Tuesday, the 21st, was distinctly milder; the sky more or less overcast, with white sharp-edged snow clouds and the wind westerly. On the 22nd, the wind was south-west and the sky overcast with rain towards evening. On Thursday, the 23rd, the wind was north-east, with rain in the morning when I went to London. The temperature passed below 40° towards 5 p.m. I left Marylebone terminus for Northwood by the 5.25 p.m. train, and the rain had turned to sleet before the train left London, and before it passed Harrow-on-the-Hill the fields and hedges were thickly covered with snow—the outlook being suggestive rather of Christmastide than the last week in April; blizzard conditions prevailed all night.

On Friday, the 24th, 3 inches of snow lay at Northwood; the trees were heavily laden with snow, which remained unthawed all day in places sheltered from the strong spring sun. On Saturday, the 25th, heavy snow fell in the early morning, and the surface wind was very variable. I went to Amersham, intending to walk to Great Missenden and Wendover to study the drifts in the hollows of the Chiltern Hills; but a blinding snowstorm set in at 10 a.m. and made the roads impassable under 4 inches of snow. The predominant beech trees of the neighbourhood were splendidly decked. Snow ceased about 12, and a rapid thaw occurred in the afternoon.

On Sunday, the 26th, the ground was thickly covered with snow again in the early morning after another heavy snowstorm on Saturday night, with strong north-east wind. The day was fine and bright, and I heard the cuckoo for the first time.

L. C. W. BONACINA.

Northwood, Middlesex, April 27th, 1908.

CHIPPING NORTON.

On Thursday, 23rd April, sleet began to fall shortly after 9 a.m., and towards 1 o'clock the ground commenced to get white, the sleet gradually developing into clean snow at 5 o'clock. The wind was

due N. with the barometer and temperature both sinking. The temperature during the night fell to 26°.

On Friday, at 9 a.m., the rain measured ·40 in., and there was 2½ in. of snow. A change of wind from the W. rapidly dispelled the snow during the forenoon. Snow again began to fall at 5 o'clock, and towards 9 o'clock there was thunder and lightning. 4° of frost was registered in the night.

On Saturday, at 9 a.m., the rain measured ·21 in. and 4 inches of snow were lying. Temperature 30°. Snow continued without a break till 7 p.m., when it finally ceased leaving a deposit of 14 inches of undrifted snow and registering ·74 inches of melted snow in the rain gauge.* 6° of frost was registered during the night.

On Sunday, there was bright sunshine and it was thawing rapidly with a W. wind. At 12.30 there was but 4 inches of snow where 14 inches was measured the previous evening.

JAMES M. BLAIR.

Chipping Norton, 27th April, 1908.

ADDINGTON.

On April 23rd up to mid-day we had rain mixed with bits of snow, after 2 o'clock snow fell continuously and the ground got quite covered. Next morning I measured it on the top of our thermometer screen; it was just 5 inches deep. At 9 o'clock, when I measured the rain and melted snow, it gave me ·78 in. Between 6 a.m. and 8 a.m. the shade thermometer fell to 25°.

The still greater fall of snow of Saturday, the 25th, did a great amount of damage to trees and shrubs of all kinds. Conifers suffered most, but deciduous trees such as oak, beech and elm had a great many large branches broken off. On Sunday morning the snow was about a foot deep all over the ground and very soft, it melted quickly, leaving the roads and walks in a very slushy condition.

JOHN MATHISON.

Addington, 2nd May, 1908.

OXFORD.

On Thursday, April 23rd, we had rain with S.E. to N.E. wind, becoming sleet, and by 4 o'clock snow, pretty thick, and a good deal of wind at times; the barometer going down steadily, but not fast. On Friday morning there were some 3 or 4 inches of snow on the ground, perhaps more, but it was hard to estimate as it had drifted somewhat. The gauge gave ·61 in. of rain and melted snow. The morning was gloriously fine but very cold, and the snow never melted in the shade all day. In the afternoon we had snow showers, and in the evening. I do not know at what hour it set in to snow continuously, but at 5 a.m. on Saturday, the 25th, the ground and the trees were quite covered, and it continued to snow heavily till after

* This is apparently too small a figure.

dark, and, I *think*, ceased altogether at 11 p.m. At 4 p.m. the rim of the rain gauge, which is 13 inches above ground, stood just clear of the snow on the lee side, whilst the wind (which blew very gustily and pretty hard at times) had heaped the snow on it on the other side. At 7 p.m. the gauge had quite disappeared underneath the snow. However, I suppose the snow was soft and settled in the night, for it measured 12⅔ inches only, and I do not think it had thawed appreciably at 9 o'clock this morning.

To-day we have brilliant sunshine and W.S.W. wind. Under its influence the streets are becoming slush and the gutters are running freely, but in the shade it only just thaws. The rain gauge this morning yielded 1·17 in. of melted snow, but I am inclined to think a not inconsiderable portion of snow must have been lost in the process of moving the funnel to melt the contents, as I see they had half-an-inch more at the Observatory. Lilacs and birches are much broken by the weight of snow.

ELEANOR M. TAWNEY.

62, Banbury Road, Oxford, April 26th, 1908.

GORING.

You may like a few facts as to the great snowstorm of yesterday. Omitting sensational matters, which we may leave to the press, here is what I can tell you.

We had 3 inches of snow on Thursday, the 23rd, and a snow shower or two on Friday. This had all gone in the valley by Friday night, and the ground was bare. From what I can gather, snow began to fall at about 4 a.m. on Saturday, the 25th. By 6.30 a.m. there were 2 inches of snow everywhere. The fall continued without a single interruption till 7 p.m., when it stopped. At 7.45 there was a shower, but none fell after that. There was practically no wind up to 4 p.m., only a light air from the north. But at 4 a strong wind sprung up from the same quarter and blew heavily till about 8 p.m. The rain gauge cannot be relied on for mine got choked, and finally buried. I allowed it to thaw out *in situ* this morning and it then gave ·77 in.

I had many measurements of the depth of snow taken by my men. These varied from 22 to 13 inches. I consider, however, the fall to have been not less than 16 inches. The drifts are very deep. Against cedars and such like trees in my garden the snow stood solid to a height of 9 feet, and still measures 7 ft. this afternoon, though the day has been almost cloudless and with a bright warm April sun. Much damage has been done to cypresses, junipers and such like. On the hills, I am told by a man who has just come through, that the road from Goring to Park Farm there is drifted up from hedge to hedge and is shoulder deep. He came through on and behind a bank and hedge on the south side. The up-relief line was blocked here yesterday afternoon. Last night the signalling was done by hand lamps.

E. GAMBIER PARRY, Major.

Elmcroft, Goring-on-Thames, 25th April, 1908.

PRYTON HILL.

RAIN commenced about 9 a.m. on 23rd, this changed to snow about 1—2 p.m, and by 7 p.m. the ground was covered; and there were drifts of a foot or more in depth. Precipitation for the day ·65 in. Except in the drifts most of this snow had melted by the evening of April 24th.

On the morning of April 25th the fresh snow was 2 in. deep, ·16 in. measured; at 2 p.m. 4 in., at 7 p.m. 11 in., and at 11.30 p.m. 14 in. The next morning the average depth of snow in the open was about 14 inches. The snow chiefly fell between 3 p.m. and 6 p.m., with a west wind. The measurement from the rain gauge is useless, as the gauge was twice buried in drift, but the mean of several measurements in the open gave 1·88 in. This is undoubtedly too little, as a good deal must have melted at the bottom by contact with the warm ground.

Fortunately in this district there was not much wind and but little drifting, but the mails could not be got through either in or out at Watlington before Monday, and the outlying villages had to do without their customary supply of provisions on Saturday.

W. H. DINES.

Pyrton Hill, Watlington, 1st May, 1908.

WANTAGE.

ON the 23rd, rain fell quietly till about noon when it gradually changed to snow, and by 3.30 p.m. a slight sprinkling lay on the grass, by sunset everything was white. On the morning of the 24th several inches lay on the ground, and trees and shrubs were thickly coated; the yield of the rain gauge at 9 a.m. was ·60 in. The sun shone brightly from 7.30 a.m., but the snow lay all day on all the north slopes and sheltered places. The frost was so sharp after dark that the taps in the stable yard were frozen.

Snow commenced again at 9 p.m. on the 24th, and fell uninterruptedly to 7.30 p.m. on the 25th. The yield of the rain gauge was ·25 in. at 9 a.m. on the 25th, and ·46 in. at 9 a.m. on Sunday, the 26th. Starlight night with frost, followed by bright sun and milder N.W. wind. I am inclined to think the gauge registered too low as high wind probably swept off much snow which lay over a foot deep in sheltered spots.

GERTRUDE ELLIOT.

Ginge Manor, Wantage, Berks.

SLOUGH.

GARDENER'S report at breakfast.—Sunday, April 26th, 1908, 6° of frost in night on *outside* thermometer. Depth of snow, by foot-rule, in three different places, over 5 in., in one place 5½ in. ·77 in. of melted snow in the gauge. One Douglas pine and two poplars broken by snow.

RICHARD BENTLEY.

Upton, Slough.

FARNHAM.

On 23rd April the wind was light from the north-east, cloud 9, continual rain, sleet and snow in afternoon which measured, when melted, ·51 of an inch. On 24th April the wind was north-west, light, fine, cloud 0, rain (melted snow) measured ·21 of an inch On 25th April there was thick snow falling, 2 inches deep at 8 a.m., wind at 8 a.m. east, light, cloud 10. The snow began to fall at 6.30 a.m., continued without stopping until 2.20 p.m., then a short interval of twenty minutes without snow and a small patch of blue sky appearing, when it recommenced again with a furious gale from north-west and blinding snow. Snow measured, when melted, at 0.30 p.m., ·46 in.; at 7 p.m., ·62 in.; after 7 p.m., ·47 in.; total in the 24 hours, 1·55 in. This morning (the 26th) the wind is light westerly and weather fine, cloud 1. MORRIS BIRKBECK.

Dippen Hall Cottage, Farnham, Surrey, 26th April, 1908.

On April 24th the snow was all melted in the receiver, it measured ·62 in. On 25th the funnel was choked and there was a little frozen snow in the receiver. This gave no proper idea of the fall, so I went by the depth of undrifted snow, 6 in. = ·50 in., and I allowed ·05 in. for snow melting at first on falling—total ·55 in. On the 26th the snow was all melted in funnel and receiver = ·80 in. Some snow may have been blown off the funnel as it was piled on it, but the gauge is well sheltered on the north by the house (wind was N.), and ·80 in. represents pretty accurately what I would estimate from appearances to have fallen. GEO. CHRYSTIE.

Short Heath Lodge, Farnham, Surrey, May 2nd, 1908.

SOUTHAMPTON.

Snowstorm commenced at 5 a.m. on April 25th, and lasted more or less until 4 p.m., the heaviest fall, probably 13 to 14 inches, was between 5 a.m. and 10 a.m. The total depth was 15 inches on the level, this being the average of 12 measurements on the lawn of my house, the variations being small, *i.e.*, 14½ to 15½ inches, six of them exactly 15 inches. The snow was very light and dry.

Wm. MATTHEWS, M.Inst.C.E.

33, French Street, Southampton, April 26th, 1908.

WORTHING.

At noon on the 23rd the weather was fine with a strong breeze from S.E., and the dry bulb stood at 53°. Half-an-hour later rain commenced, and continued all day, the wind shifting in the afternoon to S.W., and falling light. At about midnight the wind came up strong from the N.W., and in the morning of the 24th there was from 4 to 6 inches of snow on the ground, and enough on roofs to slide off with a clatter when the sun melted it. The temperature at 9 a.m. was 35°, the minimum during the night having been as low as 31°. The temperature at noon on the 24th was 40° (a delightful April warmth!) with the wet bulb at 37°. The rainfall measured at 9 a.m. was ·57 in. On the 25th the snow lay to the depth of from 4 to 6 inches.

Worthing, Sussex. D. W. HORNER.

WINCHFIELD.

SNOW began at this station about 5 a.m. on April 25th, and continued, more or less, until 8 p.m., the snow varying in different places from 14 in. to 24 in., yielding a total of 1·03 in. We have not had any such snow storm recorded here in April since I have been reporting to your meteorological notes. W. G. MACHIN.

Winchfield, Hants, April 27th, 1908.

NORTH CADBURY.

YOU will like some particulars of the extraordinary fall of snow with which St. Mark has favoured us this day. Since Saturday, 18th, Easter Eve, it has been very cold, the temperature rising to 56° on 22nd, but otherwise 51°·5 at most, and for 23rd, 24th and 25th not reaching 47°. We had light snow showers on the 20th, not measurable, a cold rain from early morning of 23rd, continuous but not heavy, till after 4 p.m. it was snow and rain combined. On the morning of the 24th it was sharp frost, ice on my porch roof, and here and there a little powdering of snow. Not a bit warmer for change of wind, but a strong W. wind dried roads marvellously, and the day was bright and sunny, showers of small snowballs the size of peas and later of sleet in the afternoon, and no warmer even when the wind had got to S. On April 25th I woke at 4.15 a.m. to find it snowing fast and everything deeply covered. For the bulk of the snow had fallen when I woke first, and it continued to snow freely till after 6, but it had quite stopped by 9 a.m. There had been almost no wind with the snowfall, and the snow was spread as evenly as it well could be; but to estimate its depth was no easy matter. There was 7 in. depth on the top of a wall at 8 a.m., which had shrunk to 6 in. by 9 a.m., by which time it was in the middle part of my large open lawn also 6 in. deep, and the same on my thermometer shed. The snow caught in the gauge yielded ·42 in. of rain, but was evidently much below its proper amount. I reckon that the depth of snow at 6 or 6.30 must have been 8 inches or more (sodden snow) and I have put down ·65 in. as its probable equivalent in water. It was slowly melting all day; 4 in. deep at noon, 3 in. at 2 p.m. The wind has boxed the compass twice in the last 72 hours, backing continuously the whole time. As it got dark there was still about 1 inch left wherever the snow had not been disturbed, even where there had been full sun. Our big hills still look like snow-capped and snow-sided mountains. This has been by far the heaviest snow we have had since the very similar snowfall of February 21st-22nd, 1898, though that was windier and drifted a little. H. A. BOYS.

North Cadbury Rectory, Somerset, April 25th, 1908.

THE COLD WEATHER OF APRIL.

By FRED. J. BRODIE.

MUCH of the air which drifted over these islands last month swept down from the northward, and was supplied by an anticyclone, which hung with considerable persistence over the Icelandic region. Of the remaining currents a large proportion came in from north-east, with their temperatures reduced by contact with the winter-chilled surface waters of the North Sea. Under these circumstances, it is not surprising to find that, in spite of a very fair allowance of bright sunshine, the mean temperature of the month was below the average over the whole of the United Kingdom, the deficit being greatest (three to four degrees) over Eastern and Central England.

The coldest periods occurred respectively on the 8th and 9th, between the 13th and 15th, and in the fourth week, mainly between the 23rd and 25th. On the first of these occasions the thermometer in the screen fell at least 5° below the freezing point in many parts of the country, while instruments exposed on the grass indicated readings as low as 15° at Llangammarch Wells, 16° at Newton Rigg, 17° at Birmingham (Edgbaston) and Wisley, and 18° at Kew. On the second occasion, between the 13th and 15th, the cold was less severe, but at many northern and central stations the grass temperatures were at least 10 degrees below freezing.

Both spells of cold were entirely eclipsed in the fourth week of the month, when frosts and snowstorms of phenomenal intensity, for so advanced a period in the season, were reported over nearly the whole kingdom. The week was undoubtedly the coldest experienced in these islands at any time in April for at least 30 years past, and at many northern and central stations in Great Britain the individual temperatures registered on the 24th or 25th were, for so late a period in the month, the lowest indicated by records extending over a very much longer period. The practice of comparing, for the purpose of record making, observations made in two different localities is not to be commended, but in view of their close proximity it may be fair to remark that at Leith the shade minimum temperature of 17° on the 25th was as many as 6° lower than any April reading observed in Edinburgh back to the year 1840. Several other places in our northern and central districts reported, at about the same time, readings below 20°, and at Balmoral on the 24th the sheltered thermometer fell to a minimum of 10°. On the ground the frost was naturally more intense, the exposed thermometer sinking to 4° at Balmoral, 8° at Crathes, 9° at Huddersfield, 11° at Glasgow, and to 15° or less at many other northern stations.

The only periods of weather of anything like seasonable character occurred between the 8th and 9th of the month, and between the 16th and 17th. On each occasion the thermometer rose a little above 60° in many parts of the kingdom, a reading of 65° being

recorded at Southampton on the 16th, and readings of 66° at Dumfries, and 68° at Crieff, on the following day.

In London a temperature as high as 60° was reached this year for the first time on as late a date as April 29th, a state of things without precedent in the meteorological history of the previous 37 years. The mean of all the daily maximum readings in the metropolis last month was as low as 51°·4, and was more than 5° below the average. In 1888 the mean value was only 51°·5, and in 1879 only 51°·9, but in every other April back to 1871 the mean maximum temperature was at least a degree higher than those of last month.

ROYAL METEOROLOGICAL SOCIETY.

The monthly meeting of this Society was held on April 15th, at the Institution of Civil Engineers, Great George Street, Westminster, Dr. H. R. Mill, President, in the chair.

The President referred to the forthcoming Franco-British Exhibition, at Shepherd's Bush, and said that the Society was exhibiting in the Science Section. Amongst the exhibits there would probably be a complete Climatological Station at work, for which it was hoped space would be found in the grounds. There was no difficulty in finding the station; but to show it at work would require the services of volunteer observers to take the observations at 9 a.m. and 9 p.m. He trusted that some of the Fellows would come forward and undertake these, for say a fortnight at a time, to share the work with those who had already promised. The observations would have to go on from May till October.

Mr. Edward Mawley presented his "Report on the Phenological Observations for 1907." He pointed out that the most noteworthy features of the weather as affecting vegetation were the cold and sunless character of April, May, and the three summer months, the frequent falls of rain during that period, the warm, dry and sunny weather in September and the heavy and continuous rainfall in October. Wild plants came into blossom behind their usual dates throughout the whole of the flowering season. Such early immigrants as the swallow, cuckoo and nightingale were also behind their average dates in reaching these Islands. The only deficient farm crop, taking the country as a whole, was that of potatoes, most of the other crops being much over average. On the other hand the yield of apples and pears (particularly of apples) was below average. There was also a deficient crop of strawberries, whereas plums raspberries, currants and gooseberries were over average. As regards the farm crops, Mr. Mawley stated that 1905 was a plentiful year, in 1906 the yield was even better, while the past year proved the most bountiful of the three.

Mr. R. H. Hooker, Mr. F. C. Bayard, Mr. H. Mellish, Mr. W. W. Bryant, Mr. C. Harding, Mr. W. H. Dines, and Mr. J. E. Clark took part in the discussion, and Mr. Mawley replied.

Colonel H. E. Rawson, R.E., C.B., read a paper on "The Anticyclonic Belt of the Southern Hemisphere." He said that from an examination of the daily synoptic charts of the northern hemisphere he was led to the conclusion that some of the permanent anticyclonic systems had a progressive seasonal movement which did not take place along the same latitude each year, but was in some years north and in others south of a mean latitude. This was noticeable in the years 1881-1891, and was capable of easy explanation if the belt itself in which they moved shifted its latitude from year to year in addition to migrating north and south with the sun. On analysing the isobaric charts of the southern hemisphere he found that the seasonal migration of the anticyclonic belt is seen to be accompanied by a real displacement of the action-centres within it to the northward and to the southward. But when the charts are compared great discrepancies are found to exist in the positions of the centres if the years to which they refer are not the same. Also when they are plotted for a long period of years the action-centres show a much wider displacement from a mean latitude than for a short period. In one case charts which were published in 1879 were considerably modified in 1883, the area of maximum pressure within the belt being shown farther south. At the Cape a "monsoon" influence associated with the winter months of the years 1896-1900, in connection with the north-west wind, is found to exist, which was not traceable in the years 1142-1855, or 1862-1865. At Durban a decided increase in the percentage frequency of winds with a westerly component in the winter months of the years 1892 and 1893 is traced to an increased prevalence of the same north-west wind, and it is found to prevail in an exceptional manner during the summer months also. This wind is proved to indicate the arrival at Durban of the south side of the anticyclonic belt, and the inference is drawn accordingly that during 1892 and 1893, when it prevailed throughout both summer and winter months, the south side of the belt was much farther north than usual. Colonel Rawson went minutely into these matters in his paper, and showed that the rainfall also varied according to the movement of the anticyclonic belt north or south of its mean position. It appears that there is a period of about 9·5 years between the greatest north and greatest south position of the anticyclonic belt over South Africa, the double oscillation thus taking 19 years.

Dr. Richard Assmann (Director of the Royal Prussian Aeronautical Institute, Lindenberg), Mr. K. Nakamura (Director of the Central Meteorological Observatory, Tokio), and Professor A. Lawrence Rotch (Director of the Blue Hill Observatory, Mass., U.S.A.) were elected Honorary Members; and Mr. C. Browett and Mr. A. Macmorran, K.C., were elected Fellows of the Society.

Sir John Eliot, K.C.I.E., F.R.S.

25TH MAY, 1838—18TH MARCH, 1908.

THE death of Sir John Eliot, occurring soon after his retirement from the position of Meteorological Reporter to the Government of India, but unhappily before the completion of the important summary of his life's work which he had in hand, is a serious loss to British meteorology in the widest sense. Sir John Eliot had taken a keen interest in organizing the meteorological services of the British Empire, and was looking forward to take part in the first conference of the meteorologists of the empire in Canada, when his very sudden death took place on March 18th, without the warning of any previous illness.

He was born at Lamesley, Durham, and had a distinguished career at the University of Cambridge, passing thence as Professor of Mathematics to Roorkee Engineering College, in 1869, to the Muir Central College, Allahabad, in 1872, and to the Presidency College, Calcutta, as Professor of Physics in 1874. In the same year he was appointed Meteorological Reporter to the Government of Bengal, and on the death of Mr. H. F. Blanford, in 1886, he succeeded to the highest position in the Indian Meteorological Service, which he held until his retirement in 1903. Sir John Eliot was an indefatigable worker, and an immense mass of data was discussed by him in the India Meteorological Memoirs, and utilized for the compilation of the Climatological Atlas of India, which was noticed in No. 490 of this Magazine (November, 1906). On his retirement Sir John went to live in the south of France, and although he presided over the short-lived Sub-section of Cosmical Physics at the British Association at Cambridge, in 1904, and was occasionally in London, he remained personally almost unknown to many of those in this country who were most familiar with his work.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

TEMPERATURE EXTREMES.

IN your April number Mr. Dover asks for figures from a station in the Midlands to compare with those given at Slough and the Isle of Wight. Perhaps the record kept here in North Notts, at a height of 56 feet above the sea may serve this purpose. During the last ten years, 1898-1907, we have had 62 readings of 80° F. and upwards in the screen, as compared with 156 at Slough and 8 at Totland Bay. Carrying the examination back to 1879 there have been four years during which 80° was not reached at all, viz. :—1879, 1882, 1883 and 1890, and two others with only one reading of 80°, 1889 and 1907.

In the same number Mr. Bonacina shows that during the last 19 winters there have been 47 nights on which the temperature in the screen at Greenwich fell below 20° F., and that in only one month, February, 1895, did it fall below 10°; during the same period we had here 125 nights on which temperature fell below 20°, on 24 of which it fell below 10°, including 2 readings below zero, viz.:—4·4 in January, 1894, and 4·0 in February, 1895.

H. MELLISH.

Hodsock Priory, Worksop, 20th April, 1908.

DIURNAL RANGE OF 40° IN SCOTLAND.

It may interest your readers to know that on the morning of the 17th inst. (Good Friday) I recorded here, in a Stevenson screen, a minimum of 27°·8 (probably occurring about 6 a.m.), and that at about 2 p.m. of the same day the temperature had risen to a maximum of 68°, thus giving a range of 40°·2. There was a brilliant sun with a light westerly air until about 3 p.m., when it became cloudy to the west and north. My screen thermometers are 4 ft. 6 in. above the grass, and some 60 ft. above sea level. I should suppose that a range of 40° within the day is very unusual in Britain, and would be interested to hear of any observers who have registered as much or more.

SYDNEY WILSON.

Bruna, Craigie Road, Perth, 21st April, 1908.

METEOROLOGICAL NEWS AND NOTES.

The Ben Nevis Meteorological Observations will, we are glad to know, soon be completed for publication, funds having now been found for that purpose. The records from 1884–1897, with various discussions, form Vols. **34**, **42** and **43** of the Transactions of the Royal Society of Edinburgh, and the expense of these was borne jointly by that society and the Royal Society. The remaining records will form a fourth similar volume, the cost of which, estimated at £400, has been provided for as follows:—The Royal Society of Edinburgh, £200; the Carnegie Trust, £100; the Royal Society, £50; the British Association, £25; Mr. R. T. Omond, £25.

A Frame for a Rainfall Register is extremely useful for keeping the sheet uncrushed, and convenient for hanging up in a hall or library for ready reference. An extremely neat and convenient frame for this purpose has been brought to our notice, and we feel sure that it will be appreciated by readers who are rainfall observers. The frame can be obtained from Mr. Lamport, 23, Strode Road, Willesden Green, N.W.

RAINFALL TABLE FOR APRIL, 1908.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1870-99. in.	RAINFALL OF MONTH. 1908. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	1·69	2·38
Tenterden	*Kent*	51 4	*0 41	190	1·77	2·04
West Dean	*Hampshire*	51 3	1 38	137	1·99	2·69
Hartley Wintney	,,	51 18	0 53	222	1·69	4·19
Hitchin	*Hertfordshire*	51 57	0 17	238	1·62	3·04
Winslow (Addington)	*Buckinghamshr.*	51 58	0 53	309	1·83	4·54
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·54	3·16
Brundall	*Norfolk*	52 37	*1 26	66	1·68	2·66
Winterbourne Steepleton	*Dorset*	50 42	2 31	316	2·60	2·99
Torquay (Cary Green)	*Devon*	50 28	3 32	12	2·45	2·47
Polapit Tamar [Launceston]	,,	50 40	4 22	315	2·23	2·52
Bath	*Somerset*	51 23	2 21	67	2·05	2·99
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·05	2·54
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·14	3·76
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	1·96	3·78
Boston	*Lincolnshire*	52 58	0 1	25	1·59	2·46
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·69	1·95
Derby (Midland Railway)	*Derbyshire*	52 55	1 28	156	1·72	2·34
Bolton (Queen's Park)	*Lancashire*	53 35	2 28	390	2·15	2·91
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	1·98	2·97
Arncliffe Vicarage	,, ,,	54 8	2 6	732	3·32	4·34
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·72	2·59
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	1·79	2·95
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	6·27	4·42
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	2·34	2·70
Haverfordwest (High Street)	*Pembroke*	51 48	4 58	95	2·67	2·85
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	2·39	2·90
Llandudno	*Carnarvon*	53 20	3 50	72	1·82	2·74
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	2·30	2·35
Hawick (Branxholm)	*Roxburgh*	55 24	2 51	457	1·92	1·29
Edinburgh (Royal Observy.)	*Midlothian*	55 55	3 11	442	...	1·87
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	2·45	2·07
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	1·77	1·37
Tighnabruaich	*Argyll*	55 55	5 14	50	2·89	2·18
Mull (Quinish)	,,	56 36	6 13	35	2·80	1·33
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	1·94	·82
Braemar	*Aberdeen*	57 0	3 24	1114	2·18	..
Aberdeen (Cranford)	,,	57 8	2 7	120	2·22	2·04
Cawdor	*Nairn*	57 31	3 57	250	1·49	1·18
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	2·04	1·42
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	4·31	4·21
Dunrobin Castle	*Sutherland*	57 59	3 56	14	1·81	2·31
Castletown	*Caithness*	58 35	3 23	100	...	2·17
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	3·71	2·82
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	2·56	2·92
Broadford (Hurdlestown)	*Clare*	52 48	8 38	167	2·17	1·95
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·40	2·10
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·00	2·34
Ballinasloe	*Galway*	53 20	8 15	160	2·32	2·35
Clifden (Kylemore House)	,,	53 32	9 52	105	4·74	5·34
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	2·90	2·62
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	2·30	2·92
Seaforde	*Down*	54 19	5 50	180	2·59	4·34
Londonderry (Creggan Res.)	*Londonderry*	54 59	7 19	320	2·32	2·95

RAINFALL TABLE FOR APRIL, 1908—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.				Mean Annual 1870-1899.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1870-99. in.	1908. in.	Diff. from Aver. in.	% of Av.	in.	
+ ·69	141	·67	23	18	6·82	8·36	+1·54	123	25·16	Camden Square
+ ·27	115	·64	28	15	7·87	6·90	— ·97	88	28·36	Tenterden
+ ·70	135	·55	25	15	8·73	8·56	— ·17	98	29·93	West Dean
+2·50	248	1·28	25	14	7·91	10·12	+2·21	128	27·10	HartleyWintney
+1·42	187	·87	23	17	6·50	8·45	+1·95	130	24·66	Hitchin
+2·71	248	1·05	25	19	7·23	10·07	+2·84	139	26·75	Addington
+1·62	205	·98	23	20	6·43	7·96	+1·53	124	25·39	Westley
+ ·98	159	·78	23	18	6·49	8·20	+1·71	126	25·40	Brundall
+ ·39	115	·99	29	12	12·02	10·37	—1·65	86	39·00	Winterbourne Stpltn
+ ·02	101	·71	27	14	10·96	8·65	—2·31	79	35·00	Torquay
+ ·29	113	·66	27	17	11·35	13·37	+2·02	118	38·85	Polapit Tamar
+ ·94	146	·58	29	14	8·63	8·27	— ·36	96	30·75	Bath
+ ·49	124	·44	28	16	8·50	8·58	+ ·08	101	29·85	Stroud
+1·62	176	1·11	27	18	9·23	10·31	+1·08	112	33·04	Wolstaston
+1·82	193	1·20	25	16	8·04	8·25	+ ·21	103	29·21	Coventry
+ ·87	155	·43	28	15	6·09	7·14	+1·05	117	23·30	Boston
+ ·26	115	·50	28	17	6·56	7·18	+ ·62	110	24·70	Hodsock Priory
+ ·62	136	·48	28	20	6·82	7·61	+ ·79	112	26·18	Derby
+ ·76	135	·66	28	16	11·08	14·79	+3·71	134	42·43	Bolton
+ ·99	150	·36	4	17	7·35	9·74	+2·39	133	26·96	Ribston Hall
+1·02	131	·90	30	20	19·42	23·34	+3·92	120	60·96	Arncliffe Vic.
+ ·87	151	·57	30	21	7·17	8·29	+1·12	116	27·02	Hull
+1·16	165	·70	26	17	7·43	9·53	+2·10	128	27·99	Newcastle
—1·85	70	1·02	28	17	43·13	42·30	— ·83	98	132·68	Seathwaite
+ ·36	115	·73	29	16	12·11	11·07	—1·04	91	42·81	Cardiff
+ ·18	107	1·06	27	15	14·53	13·11	—1·42	90	47·88	Haverfordwest
+ ·51	121	·78	24	13	12·22	15·34	+3·12	126	45·41	Gogerddan
+ ·92	151	·67	27, 29	17	8·33	10·96	+2·63	132	30·98	Llandudno
+ ·05	102	·72	28	8	13·47	16·05	+2·58	119	43·43	Cargen
— ·63	67	·22	2	20	10·28	11·62	+1·34	113	34·80	Branxholm
...	...	·49	23	15	...	8·07	...	...	...	Edinburgh
— ·38	84	·34	29	18	14·84	17·45	+2·61	118	48·87	Girvan
— ·40	77	·41	30	6	9·88	12·47	+2·59	126	35·80	Glasgow
— ·71	75	·45	30	10	17·68	22·79	+5·11	129	57·90	Tighnabruaich
—1·47	47	·26	8	14	17·38	18·04	+ ·66	104	57·53	Quinish
—1·12	42	·33	8	14	8·06	6·91	—1·15	86	28·95	Dundee
...	...	...	...	...	10·21	14·67	+4·46	144	36·07	Braemar
— ·18	92	·43	8	18	9·40	8·98	— ·42	95	33·01	Aberdeen
— ·31	79	·40	8	8	7·65	9·45	+1·80	124	29·37	Cawdor
— ·62	70	·39	2	13	14·70	16·97	+2·27	116	43·71	Fort Augustus
— ·10	98	1·05	2	12	26·21	38·51	+12·30	147	86·50	Bendamph
+ ·50	128	·60	4	11	9·29	15·07	+5·78	162	31·60	Dunrobin Castle
...	...	·35	26	18	...	12·61	...	...	...	Castletown
— ·89	76	·68	29	22	19·75	16·35	—3·40	83	58·11	Killarney
+ ·36	114	1·02	29	16	12·47	10·76	—1·71	86	39·30	Waterford
— ·22	90	·47	29	20	9·51	10·24	+ ·73	108	33·47	Hurdlestown
— ·30	87	·58	29	19	10·50	10·76	+ ·26	103	35·19	Abbey Leix
+ ·34	117	·91	27	16	7·99	8·71	+ ·72	109	27·75	Dublin
+ ·03	101	·50	29	21	10·74	11·61	+ ·87	108	37·04	Ballinasloe
+ ·60	113	1·50	30	13	24·35	25·13	+ ·78	103	80·23	KylemoreHouse
— ·28	90	·37	27	19	15·86	20·34	+4·48	128	50·50	Enniscoe
+ ·62	127	·47	29	17	11·74	17·50	+5·76	149	41·83	Markree Obsy.
+1·75	168	1·10	28	15	11·75	14·35	+2·60	122	38·61	Seaforde
+ ·63	127	·60	3	22	11·67	15·01	+3·34	129	41·20	Londonderry

SUPPLEMENTARY RAINFALL, APRIL, 1908.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	2·80	XI.	Rhayader, Tyrmynydd	3·60
,,	Ramsgate	1·53	,,	Lake Vyrnwy	4·15
,,	Steyning	2·45	,,	Llangyhanfal, Plâs Draw	2·55
,,	Hailsham	1·94	,,	Criccieth, Talarvor	2·15
,,	Totland Bay, Aston House	2·44	,,	Llanberis, Pen-y-pass	7·05
,,	Emsworth, Redlands	1·79	,,	Lligwy	2·08
,,	Stockbridge, Ashley	3·25	,,	Douglas, Woodville	2·99
,,	Reading, Calcot Place	4·47	XII.	Stoneykirk, Ardwell House	2·42
III.	Harrow Weald, Hill House.	3·10	,,	Dalry, The Old Garroch	2·22
,,	Oxford, Magdalen College	4·23	,,	Langholm, Drove Road	2·25
,,	Pitsford, Sedgebrook	3·77	,,	Moniaive, Maxwelton House	2·05
,,	Huntingdon, Brampton	2·40	XIII.	N. Esk Reservoir [Penicuick]	2·50
,,	Woburn, Milton Bryant	2·79	XIV.	Maybole, Knockdon Farm	1·50
,,	Wisbech, Bank House	2·34	XV.	Campbeltown, Witchburn	3·91
IV.	Southend Water Works	2·27	,,	Inveraray, Newtown	2·88
,,	Colchester, Lexden	2·31	,,	Ballachulish House	2·53
,,	Newport, The Vicarage	3·63	,,	Islay, Eallabus	2·47
,,	Rendlesham	2·53	XVI.	Dollar Academy	·90
,,	Swaffham	2·71	,,	Loch Leven Sluice	1·38
,,	Blakeney	2·14	,,	Balquhidder, Stronvar	1·63
V.	Bishops Cannings	3·22	,,	Perth, The Museum	·92
,,	Ashburton, Druid House	3·46	,,	Coupar Angus Station	·85
,,	Honiton, Combe Raleigh	2·37	,,	Blair Atholl	1·34
,,	Okehampton, Oaklands	3·11	,,	Montrose, Sunnyside Asylum	1·23
,,	Hartland Abbey	1·86	XVII.	Alford, Lynturk Manse	2·88
,,	Lynmouth, Rock House	1·98	,,	Keith Station	4·04
,,	Probus, Lamellyn	1·97	XVIII.	N. Uist, Lochmaddy	2·61
,,	North Cadbury Rectory	2·53	,,	Alvey Manse	2·52
VI.	Clifton, Pembroke Road	3·04	,,	Loch Ness, Drumnadrochit.	1·55
,,	Ross, The Graig	2·72	,,	Glencarron Lodge	5·05
,,	Shifnal, Hatton Grange	2·76	,,	Fearn, Lower Pitkerrie	1·54
,,	Blockley, Upton Wold	3·43	XIX.	Invershin	1·72
,,	Worcester, Boughton Park.	3·19	,,	Altnaharra	2·96
VII.	Market Overton	2·61	,,	Bettyhill	2·20
,,	Market Rasen	3·39	XX.	Dunmanway, The Rectory	4·55
,,	Bawtry, Hesley Hall	2·21	,,	Cork	2·27
,,	Buxton, Lismore House	3·31	,,	Darrynane Abbey	2·69
VIII.	Neston, Hinderton Lodge	3·70	,,	Glenam [Clonmel]	2·07
,,	Southport, Hesketh Park	2·42	,,	Ballingarry, Gurteen	2·08
,,	Chatburn, Middlewood	3·79	,,	Miltown Malbay	1·53
,,	Cartmel, Flookburgh	3·09	XXI.	Gorey, Courtown House	2·11
IX.	Langsett Moor, Up. Midhope	2·66	,,	Moynalty, Westland	2·31
,,	Scarborough, Scalby	2·56	,,	Athlone, Twyford	1·44
,,	Ingleby Greenhow	2·93	,,	Mullingar, Belvedere	1·76
,,	Mickleton	2·05	XXII.	Woodlawn	2·19
X.	Bardon Mill, Beltingham	2·10	,,	Westport, St. Helens	2·81
,,	Ewesley, Fallowlees	2·03	,,	Mohill	2·94
,,	Ilderton, Lilburn Cottage	2·32	XXIII.	Enniskillen, Portora	2·31
,,	Keswick, York Bank	1·86	,,	Dartrey [Cootehill]	2·46
XI.	Llanfrechfa Grange	2·01	,,	Warrenpoint, Manor House	3·15
,,	Treherbert, Tyn-y-waun	4·55	,,	Banbridge, Milltown	3·00
,,	Carmarthen, The Friary	2·10	,,	Belfast, Springfield	4·09
,,	Castle Malgwyn [Llechryd].	2·41	,,	Bushmills, Dundarave	1·97
,,	Plynlimon	5·50	,,	Stewartstown, Ballyclog	2·95
,,	Crickhowell, Ffordlas	4·70	,,	Killybegs	4·30
,,	New Radnor, Ednol	3·68	,,	Horn Head	2·48

METEOROLOGICAL NOTES ON APRIL, 1908.

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

LONDON, CAMDEN SQUARE.—Changeable, showery weather with low temp. characterised the first half, but from 15th to 17th bright, sunny conditions prevailed. Temp. again fell on 18th and then followed a week of wintry weather with much R and S. On the morning of 24th, S fell to a depth of 3½ in. in open places. Temp. rose considerably at the close. Mean temp. 44°·7, or 3°·4 below the average; shade max. 65°·5 on 30th, min. 28°·4 on 9th. F 5, f 15. Duration of sunshine 141·8* hours, and of R 66·1 hours.

TENTERDEN.—Duration of sunshine 159·6† hours. Shade max. 63°·0 on 29th, min. 29°·0 on 21st. F 6, f 13.

TOTLAND BAY.—Duration of sunshine 181* hours. Shade max. 63°·6 on 30th, min. 30°·7 on 25th. F 3, f 13.

ADDINGTON MANOR.—The wettest April since 1882. Great damage was done to trees and shrubs by the S storm on 25th, and floods occurred on 27th and 28th. Shade max. 60°·0 on 9th, min. 25°·0 on 24th. F 13, f 16.

TORQUAY.—Duration of sunshine 169·2* hours. Mean temp. 47°·5 or 0°·7 below the average. Shade max. 61°·4 on 16th, min. 29°·1 on 24th. F 2, f 9.

NORTH CADBURY.—Max. 64°·0 on 29th, min 27°·0 on 24th. F 8, f 16.

CLIFTON.—The first three weeks were dry and cold with N. winds. The last week was wet and cold with the heaviest S fall in April in 53 years. The depth on 25th was 4 inches. R ·80 in. above the average.

ROSS.—Shade max. 66°·4 on 30th, min. 25°·6 on 24th. F 6, f 20 (?).

BUXTON.—Duration of sunshine 110* hours. Mean temp. 39°·7, or 3°·3 below the average. Shade max. 57°·4 on 8th, min. 19°·7 on 24th. F 12, f 16.

BOLTON.—Duration of sunshine 70·8* hours, or 36·4 hours below the average. Mean temp. 41°·4, or 2°·5 below the average. Shade max. 59°·9 on 17th, min. 26°·2 on 24th.

SOUTHPORT.—Mean temp, 43°·5, or 2°·4 below the average. Duration of sunshine 161·7* hours or 1 hour below the average. R ·70 in. above the average. Duration of R 52·3 hours. Shade max. 59°·6 on 29th, min 26°·3 on 24th. F 6, f 15.

HULL.—Duration of sunshine 64 hours. Shade max. 60°·0 on 2nd, min. 29°·0 on 8th. F 6, f 14.

HAVERFORDWEST.—Cold with S storm on 24th and 25th. Duration of sunshine 155·7* hours. Shade max. 61°·9 on 16th, min. 26°·3 on 26th. F 6, f 12.

LLANDUDNO.—Shade max. 59°·8 on 30th, min. 29°·0 on 24th.

DOUGLAS.—The coldest April on record. S lay 3 inches deep on 25th.

DUMFRIES.—Dry weather during the first three weeks, culminated on the 25th in the most severe frost registered in April during 49 years. The last week was wet, 1·89 in. of R falling in 6 days.

EDINBURGH.—Shade max. 61°·5 on 17th, min. 22°·1 on 24th. F 5, f 9.

COUPAR ANGUS.—R 49 per cent. below the average. An unprecedented cold snap reduced the mean temp. to 40°·5, or 2°·5 below the average.

ABERDEEN.—Cold and wet with little N. winds and sunshine. Shade max. 60°·0 on 17th, min. 18°·0 on 23rd. F 9, f 14.

FORT AUGUSTUS.—Shade max. 55°·8 on 29th, min. 19°·8 on 24th. F 12.

CASTLETOWN.—The early part was cold with frequent H. and R. Fine, dry and sunny weather occurred from 10th to 16th, but the remainder of the month was cold and changeable with S storm on 23rd and 24th.

CORK.—The coldest April for at least 27 years. Shade max. 56°·0 on 16th, min. 26°·0 on 24th. F 5 f 12.

DUBLIN.—Mean temp. 44°·7, or 2°·9 below the average. Shade max. 63°·4 on 30th, min. 25°·1 on 24th. F 5, f 10.

MARKREE.—Shade max. 61°·3 on 16th and 30th, min. 22°·4 on 26th. F 9, f 19.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, November, 1907.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Maximum. Date.	Minimum. Temp.	Minimum. 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	60·4	9	30·1	16	51·1	40·3	43·3	92	80·8	27·5	2·16	12	8·7
Malta	79·0	12	55·0	26	69·3	61·1	55·9	74	140·0	...	3·92	9	4·6
Lagos	89·5	29	70·0	14	87·2	75·3	75·5	76	160·0	72·0	1·57	6	7·3
Cape Town	78·5	8, 30	44·9	6	70·9	54·3	51·8	67	...	...	·82	7	4·4
Durban, Natal ...	88·9	20	55·7	1	77·3	62·9	...	...	147·5	...	7·69	21	6·9
Johannesburg	80·2	13	46·0	8	72·7	52·7	53·0	75	152·1	44·3	4·61	15	4·6
Mauritius	89·9	14	63·7	25	85·8	68·8	66·0	70	150·2	59·1	1·34	15	6·0
Calcutta...	88·5	4	57·1	22	85·5	63·2	61·8	67	146·0	50·8	·00	0	0·8
Bombay...	93·2	2	72·8	25	89·4	75·4	69·2	67	138·5	59·9	·00	0	2·7
Madras	87·4	5	65·8	14	83·5	72·8	72·3	86	138·8	64·9	16·16	15	6·2
Kodaikanal	64·3	29	45·6	13	60·4	49·9	49·2	84	127·2	37·6	10·02	21	7·3
Colombo, Ceylon ...	88·6	2	71·2	24	85·0	73·9	73·6	83	158·9	66·4	16·96	21	6·5
Hongkong	81·1	23	54·2	28	76·0	67·5	62·8	73	132·2	...	1·27	10	7·3
Melbourne	94·8	12	44·3	19	75·2	52·8	49·1	60	153·7	38·0	2·34	8	5·5
Adelaide	100·0	29	46·9	6	80·2	56·2	49·2	49	156·2	40·8	1·48	9	4·8
Coolgardie	100·9	27	37·0	3	80·3	51·9	42·3	44	165·2	31·0	·60	5	3·5
Sydney	84·1	26	54·5	5, 8	72·9	60·2	56·0	65	127·7	45·8	2·00	15	6·3
Wellington	69·0	4	43·0	15	62·3	52·3	49·4	75	122·0	34·0	3·02	7	6·8
Auckland	74·0	3	52·0	15, 16	69·0	56·2	52·7	70	137·0	46·0	1·09	11	4·9
Jamaica, Negril Point.	88·0	sev.	74·0	3	86·1	78·4	70·7	73	...	...	·53	4	...
Trinidad	91·0	5, 13	67·0	25	87·4	69·7	74·3	90	190·0	64·0	10·69	18	...
Grenada	89·4	6	72·0	19	88·4	77·8	74·3	76	144·2	...	6·08	15	5·1
Toronto	51·1	21	21·1	30	42·2	31·9	...	...	72·0	14·7	3·52	14	...
Fredericton	57·0	3	11·5	21	41·6	25·0	...	81	...	...	6·61	9	6·0
St. John's, N.B. ...	57·0	7	19·3	30	43·9	32·6	...	...	...	...	5·36	10	...
Victoria, B.C.	...	...	...	...	...	...	...	...	...	...	...	...	...
Dawson	26·0	11	-31·0	6	7·6	—7·3	...	...	...	...	2·60	12	6·4

MALTA.—Mean temp. of air 64°·5. Average hours bright sunshine 6·9.

Durban.—R 2·69 in. above 30 years' average.

Johannesburg.—Bright sunshine 287·1 hours.

Mauritius.—Mean temp. of air 1°·4, of dew point 1°·7, relative humidity 1·7 per cent. above averages. R ·47 in. below average. Mean hourly velocity of wind 8·5 miles, or 2·2 below average.

KODAIKANAL.—Bright sunshine 124 hours.

COLOMBO.—Mean temp. of air 78°·0 or 1°·8 below, of dew point 1°·2 above, and R 4·59 in. above, averages. Mean hourly velocity of wind 5 miles. TS8 on 7 days.

HONGKONG.—Mean temp. of air 71°·5. Bright sunshine 122·9 hours, or 68 hours below average. Mean hourly velocity of wind 12·0 miles.

Adelaide.—Mean temp. of air 1°·2 above, R ·46 in. above, averages.

Sydney.—Mean temp. of air 0°·3 below, and R 1·04 in. below, averages.

Wellington.—Mean temp. of air 0°·3 above, and R ·57 in. below, averages. Bright sunshine 186·3 hours.

TRINIDAD.—Rainfall 3·71 in. above 43 years' average.

RAINFALL OF THAMES VALLEY, MAY, 1908.

The Edinburgh Geographical Institute

J. G. Bartholomew

Symons's
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THE RAINFALL OF MAY AND OF THE FIRST FIVE MONTHS OF 1908.

From the point of view of rainfall, May proved a dull month, unrelieved by extremes, boasting neither of flood nor drought. The distribution of rain was normal, offering little subject for remark, and the map of the rainfall of the Thames valley and the surrounding country which we present to our readers serves mainly to show what a prodigious amount of work is required to prove that things are very much as usual. On the whole the low land has had the lighter rainfall, the high land the heavier; but only one station reported as much as 3 inches, and it is only by inserting half-inch lines that any characteristic features are produced.

When, instead of considering the actual fall, we look at the relation to the average, we find that the rainfall was above the average for the month at one or two isolated stations in the south of England, but except for these the whole country south-east of a line drawn from Swansea to Scarborough had less than the average rainfall, the least occurring in the southern midlands. The north and west of England, the central strip of Scotland, and all Ireland except the north-east, had somewhat more than the average rain for May. The month as a whole was wet, and added on to the months which had gone before it secures a quite considerable excess of rain for the country as a whole during the current year. Indeed, for the five months the only places having decidedly less than the average rainfall are the east of Scotland along the coast of Forfar, Kincardine and Aberdeen, the south of Wales, and a strip of the south-west of England from Stroud to Torquay, the extreme south-west of Kent and the south of Ireland. Over the rest of the country the rainfall has been in excess, though scarcely anywhere to a greater degree than 25 per cent. There has been during May a marked absence of heavy individual falls; the column devoted to these in the Table on p. 101 shows only one fall exceeding an inch, and that was at Seathwaite where an inch of rain is a trifle.

THE WEATHER OF MAY, 1908.

By FRED. J. BRODIE.

THE weather experienced during the late spring afforded little ground for complaint even to the most practised of agricultural grumblers. In the early part of the season vegetation was in a very backward state—a merciful provision, designed, one may almost imagine, with the express object of warding off the effects of the bitter frosts which occurred so late in April. After that phenomenal wintry outburst the progress of vegetation was practically uninterrupted, the snaps of cold which so often put in an appearance in May, and especially about the third week, being of the mildest possible description. Grounds frosts were however not entirely absent, the principal cases occurring on the night of the 6th, between the nights of the 10th and 13th, and between those of the 21st and 23rd. The latest frost was apparently the sharpest of the three, the thermometer on the grass falling to a minimum of 25° at Crathes (Kincardineshire), 26° at Llangammarch Wells, and 27° at Balmoral, Morpeth (Cockle Park). and Greenwich. At most other times in the month an abundance of cloud checked the progress of terrestrial radiation, the general mildness of the nights being sufficiently attested by the fact that in Edinburgh the mean of all the minimum temperatures was more than 3°, and in London more than 5° above the average for May, as shown by records extending over the 35 years ending with 1905. At Leith the absolute minimum reading of 39° on the 22nd, and in London the absolute minimum of 41° on the following day, were, in each case, the highest observed in May since 1889, or, with that exception, since 1875.

Three spells of warmth occurred last month, the first at the very opening, when the thermometer rose to an unusually high level for so early a period of the season. In Ireland the maximum readings on the 1st and 2nd were above 70°, while in many parts of England and Wales they were slightly above 75°, the thermometer at Bettws-y-Coed and at St. Aubins, Jersey, reaching a maximum of 78°. Between the 17th and 19th shade readings of 70° and upwards were again recorded at several English stations, including readings of 76° at Hillington, and 78° at Barnet. The third period of warmth occurred in the last five days of the month (most commonly on the 27th and 28th) when the thermometer rose to 75° and upwards in many districts. The heat was in this case greatest in the north, the thermometer on the 28th rising to 79° at Dumfries, and to 81° at Carlisle, and on the 30th to 80° at Fort William.

Thunderstorms, accompanied in many cases by intense falls of rain or hail, were rather frequent; the most general of such visitations occurring over England on the 2nd, over North Britain on the 5th and 6th, over South-eastern England at the close of the third week, and in many parts of the country on the 30th.

THE GLAMOUR OF THE CUMULUS.

By L. C. W. Bonacina.

It is one of the compensatory advantages which attend our British climate as a relief from the sullen skies with which we are so familiar, and which are so inseparably associated with the wildness of northern fell and moor, that there are many days throughout the year when one may enjoy a spectacle which surely ranks among the most beautiful in nature, that of the cumulus clouds in the fulness of their development.

I do not say that in Italy, at times, when the storm-clouds with the electric forces of the air concentrated in them, press down upon the Apennine range—that range gaining in height and grandeur as it sweeps southwards through the peninsula, from whose snowy summits the soul of Italy shines forth so mightily in the radiant splendour of southern sun and sky—and lock the mountain fastnesses in their terrible darkness, striking down man and beast, and ravaging the fruits of the earth in fearful malignity of hail, the cumulus clouds may not assume an awful magnificence which is unknown here; but I do say that nowhere do they float by more majestically in all their strength and beauty than in their eastward drift, bearing with them the moisture of the Atlantic, across the green heart of England or over the venerable towers of Westminster.

At all times of the year they may be seen: in summer when the outlook is for thunder on sultry afternoons; in spring or autumn when the wind is between the south and west, and the weather showery; in winter sailing swiftly past in a north-westerly wind behind the great storm-bringing atmospheric depressions. And what veritable mountains in the air they are! Nor is their analogy to mountains confined solely to outline of form, but it extends in no small degree to the relative disposition of parts and in some sense also to structural configuration. With regard to outline of form as seen to the observer, this is, in the case of many cumulus clouds, as of many mountains, if one neglects irregularities of surface-contour, that of a scalene triangle, the summit of the cloud being unsymmetrically situated with regard to the base. In the growth of a well-developed cloud in showery or thunder weather it remains not for one minute without visible change; it may pass through all the stages of its evolution in less than an hour—wherein are effected all the changes of form and appearance which, in the case of the mountains, require the lapse of a geological age. But note the behaviour of the cloud in tending towards the precipitation of rain, as the accumulation of electricity and the increase of electric density within its mass go on apace. At first, before it has attained mature development, the summit is white and dazzling as snow, which, considering its height, 5 or 6,000 feet above sea-level, it probably is, and the whole mass exhibits a compactness of texture which shows that rain is not yet about to fall from it. Gradually the lower part

becomes steeped in inky blackness, and lurid tongues of flying scud play angrily about the body of the cloud. Surcharged now with electricity the restless mass begins to glimmer and rumble, and will, perhaps, be from time to time visibly rent by flashes of lightning. Then, as condensation proceeds, a purple haze steals over the cloud which grows watery and less compact; and finally the jagged, frozen peaks of the summit fall in, black streaks (due to falling rain-drops) appear beneath the base, and the flood-gates of heaven are opened. The structure of cumulus cloud presents, in nearly all instances, a peculiar laminated appearance, especially towards the top. The snowy summit is further marked by numerous dark curved lines which cause it to look as if it were composed of roughly globular masses. This apparent discontinuity of surface shows the presence of gulfs, chasms and ravines; sometimes when a cumulus is favourably situated with the summit tilted towards the observer, he can see right into these cloud depressions.

The phenomena exhibited in the structure of the higher portions of cumulus are akin to those in a cloud of steam escaping from an engine, and are the most puzzling in connection with this type of cloud. In both cases the internal movements of the mass causing the observed structure are due to the working of hydro-dynamic laws which affect a column of vapour when it suddenly condenses in rising through air. But we may surely inquire what compels a column of vapour, rising into the upper air, to condense into a mass consisting of semi-detached portions forming here and resolving there in seemingly so confused a manner, yet, aggregated round a central nucleus, appearing parts of some connected, as it were organic, whole.

Strangely mingled feelings of awe, wonderment, and fascination, cannot but be awakened in the mind that discerns in the sublime phenomena of nature the working of irrevocable laws imposed upon matter by the Causal Will of the Deity. I cannot do better than conclude with a passage on the cumulus cloud from the writings of a great and versatile genius, John Ruskin—a worshipper of the beautiful wheresoever manifested in nature, literature, or art. He writes*:—

"The rain which flooded our fields the Sunday before last was followed, as you will remember, by bright days, of which Tuesday the 20th was, in London, notable for the splendour towards the afternoon of its white cumulus clouds. There has been so much black east wind lately, and so much fog and artificial gloom besides, that I find it is actually some two years† since I last saw a noble cumulus cloud

* "The Eagle's Nest," Oxford Lectures, No. VII., delivered February 9th, 1872.

† These clouds must have struck Ruskin's mind as exceptionally fine; for I can confidently say that as long as our climate has been in the past what it is now, two years have never elapsed without many opportunities for seeing magnificent cumulus clouds. It is indeed rare for even the dark and gloomy month of December to pass without one or two days on which noble cumulus may not be observed in the neighbourhood of London.

in full light. I chanced to be standing under the Victoria Tower at Westminster when the largest mass of them drifted past that day from the north-west; and I was more impressed than ever yet by the awfulness of the cloud-form, and its unaccountableness in the present state of our knowledge. The Victoria Tower seen against it had no magnitude; it was like looking at Mont Blanc over a lamp-post. The domes of cloud-snow were heaped as definitely, their broken flanks were as grey and firm as rocks; and the whole mountain, of a compass and height in heaven which only became more and more inconceivable as the eye strove to ascend it, was passing behind the tower with a steady march, whose swiftness must in reality have been that of a tempest; yet along all the ravines of vapour* precipice kept pace with precipice, and not one thrust another. What is it that hews them out? Why is the blue sky pure there—cloud solid here, and edged like marble; why does the state of blue sky pass into the state of cloud in that calm advance? It is true that you can more or less imitate the forms of cloud with explosive vapour or steam; but the steam melts instantly and the explosive vapour dissipates itself. The cloud of perfect form proceeds unchanged. It is not an explosion, but an enduring and advancing presence. The more you think of it, the less explicable it will become to you."

A HOT WIND IN NEW ZEALAND.

DR. W. E. HOYLE, of the Manchester Museum, sends us the following extract from a letter addressed to him by Mr. C. H. Tripp, of Timaru, New Zealand, under date of January 23rd, 1908.

Yesterday at 6 a.m. it was cold for summer, about 45°, at 8 a.m. it rose to 55°, and then to 60° at about 9 a.m., when my wife and children went down to bathe in the sea, at 1 p.m., thermometer stood at about 70°, at 2 p.m. a W.N.W. wind suddenly sprang up, and at 2.30 the thermometer rose to 104°, the highest ever recorded here. At 6 p.m. it stood at 91° under a verandah on the shady side of my house and against the brick wall, at 7 p.m. it stood at 84°, at 8 p.m. 81°, and stopped at that till 9.15 p.m. when a S.W. wind came up (a V-depression I think), at 9.30 it had fallen to 63°, and this morning was 57°, but 55° was the minimum registered last night. All yesterday, especially at sunset, the light was very yellow. I noticed the yellow strongly at 6 a.m. There are large bush fires to the north-east of this place from 100 to 400 miles away but I do not think the yellow was from these fires. This last week it has been intensely hot in Australia, 114° in Adelaide, 121° in some inland places, and my theory is that the heat wave we got yesterday was from Australia, and the

* In many of his references to cloud, Ruskin employs, inaccurately, of course, so far as the modern language of physics is concerned, the term "vapour."

yellow was the smoke of Australian bush fires that are raging, though these fires must be 1,500 to 2,000 miles away, and the heat had crossed the Tasman sea about 1,000 miles wide.

The heat was a dry heat and felt like a blast from a furnace on one's face, and men motoring felt it most, strange to say. I did not find it exhausting like the heat of the Indian Ocean this side of Colombo, which seldom exceeds 85° or 87°, and the peculiar part was that, though it rose to 104° in a true shade 4 ft. from ground with a proper screen over it, it never exceeded 110° in the sun in so far as I can find out.

Last Monday we had a blow of a shorter duration. In the evening, at 9 p.m., my thermometer stood at 69°, it had been a very hot day, and everybody was complaining. At 9.30 it had commenced to blow from the W.N.W. and stood at 84°, at 11.30 p.m. it stood at 86°, at 12 midnight a S.W. came up and it fell to 60°. Yesterday was the greatest heat I ever felt in New Zealand, and last Monday night the hottest night.

ROYAL METEOROLOGICAL SOCIETY.

THE first of the afternoon meetings of this Society for the present session was held at 70, Victoria Street, Westminster, on May 20th, Dr. H. R. Mill, President, in the chair.

Mr. B. F. E. Keeling, Director of the Helwan Observatory, gave an account of the Upper Air Observations which are being carried out in Egypt He said that Egypt itself has comparatively little weather, and what there is has no influence commercially, except along a narrow belt on the Mediterranean coast; but, on the other hand, the whole prosperity of Egypt is wrapped up in the weather of the neighbouring country of Abyssinia. As the summer rainfall is greater or less in Abyssinia, so is the Nile flood; and in consequence the area of land cultivated and the general prosperity of the people of Egypt. In years when a bad low state of the river is to be expected, following on a poor flood, the early spring showers in Abyssinia are of very great importance. As unfortunately there is no meteorological service in Abyssinia, it is not possible to obtain information about the rainfall over that region, so steps have recently been taken to obtain observations on the upper air over Egypt by means of pilot balloons and kites. Mr. Keeling gave an account of the methods employed, and of the directions in which it was hoped in the near future to develop the work. He also stated that the observations of the anti-trade winds above the North-East Trades made by M. Teisserenc de Bort and Prof. A. L. Rotch, have been confirmed. At Helwan the anti-trade wind is reached at a height of about 6,500 feet above sea-level. The greatest height so far reached by a balloon was 54,000 feet, and on that occasion the south-west

anti-trade wind was apparently penetrated, and a north-west upper current encountered.

Mr. C. J. P. Cave said that Egypt was an interesting place for making observations, because of the clearness of the air, allowing balloons to be followed by the eye to a very great height.

Dr. W. N. Shaw remarked that a point of great interest about Mr. Keeling's results was that, although very frequently the upper air current set from the west or south-west, there were occasions when it set from the north. That must be a circumstance interesting to Egypt and other parts of the world meteorologically connected with Egypt.

Colonel H. E. Rawson said it was important to know what was going on in Egypt when the change took place from the tropical anticyclonic to the low-pressure equatorial belt, and *vice versâ*.

The President and Mr. E. S. Bruce also took part in the discussion, and Mr. Keeling replied.

The Secretary read a report by Prof. J. P. d'Albuquerque on the "Balloon Experiments in Barbados, November 6th–8th, 1907," which were carried out by himself and several other gentlemen at the request of Sir D. Morris for the Royal Meteorological Society.

Mr. Spencer C. Russell read a paper on "Observations on the Colour of Lightning made at Epsom, 1903 to 1907." He had for the past five years kept a record of the colours or series of colours noted during each thunderstorm or display of sheet lightning, and tabulated them under their respective colour. He had thus results of observations of fork lightning made during 57 thunderstorms, and 78 observations of sheet lightning. He found that in fork lightning red is the colour of most frequent occurrence, and this is followed closely by blue, the least frequent colours being orange and green. White is of greatest frequency in sheet lightning, red and yellow coming next. It seems that the presence of hail, when occurring in association with a thunderstorm, is intimately connected with blue lightning.

Mr. W. Marriott referred to the Report by the late Mr. G. J. Symons on the Thunderstorms in the years 1857–59. From this it appeared that in sheet lightning the most common colour was white, then yellow, blue and red; in fork lightning, however, the order was nearly reversed, blue being more than twice as frequent as any other colour, then red, white, and most rarely yellow. Blue (or violet) was by far the most frequently recorded colour.

Mr. J. A. Curtis, Mr. W. W. Bryant, Colonel H. E. Rawson, and the President also spoke in the discussion.

The following gentlemen were elected Fellows of the Society:—Mr. R. V. Gower, Mr. D. Hanson, Mr. W. F. Keates, Mr. A. L. Lang, Mr. W. R. F. Lukis, Mr. S. J. A. Mills, Mr. B. Ronalds and Capt. H. Williams.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE COLD SPRING.

THE spring of 1908 has been distinctly cold at Greenwich. Could this be foreseen? Was there anything in previous experience to render a cold spring probable? Such inquiries are, I think, useful; and I would offer the following for consideration.

Put down for each year from 1841 to 1907 the number of warm months in spring at Greenwich. Smooth this series with sums of five ('41—'45, '42—'46, &c.); then smooth this second series in the same way.

The values of the third series may be represented by dots in 11 columns, showing the distribution in the sunspot cycle. I enclose the diagram, which is not essential to this.

I will here, for clearness, give the concluding members of those three series:—

	1898.	'99.	1900.	'01.	'02.	'03.	'04.	'05.	'06.	'07.	'08.
(*a*)	1	0	1	2	1	2	2	3	2	3	(?)
(*b*)	6	5	5	6	8	10	10	12	(?)	—	—
(*c*)	34	30	30	34	39	46	(?)	—	—	—	—

Now, for 1908, the abstractly possible numbers are, of course, 0, 1, 2 or 3, and the corresponding numbers in (*c*) 50, 51, 52 or 53. But it so happens that in (*c*) 51 is the extreme upper limit previously reached in the first and second columns after max. (in diagram). It seemed unlikely that this would be exceeded in the present case. Thus, we are limited to 50 or 51; meaning in either case a cold spring with warm months 0 or 1.

Is there any fallacy here?

A. B. M.

SUNSHINE CARDS.

IT may perhaps be serviceable to draw attention to the increasing darkness of the blue cards supplied in recent years for measuring the sunshine by the Campbell-Stokes Recorder. The latest cards in use are of so deep a tint that much additional care and time are required (if measured at the close of the day by artificial light) to compute exactly the trace if it is at all complicated.

If there is no reason to the contrary one would suggest a return to the pale blue tint previously adopted—on which the burnt record stood out very clearly—also that a different or thinner line be employed for the half-hours, distinct from that of the hours. When *measuring* one is not always able to notice the difference in the *length* of the half-hour line.

RICHARD BENTLEY.

Upton, Slough.

APRIL SNOWS.

THE most severe snowstorms which I remember as having occurred during a period of 50 years in the fourth week of April were experienced here on April 23rd, 24th and 25th. Falling, however, on sodden ground the snow disappeared almost as quickly as it alighted, with the exception of the last storm on the night of the 24th and morning of 25th, after which it lay on the ground to the average depth of about 3½ inches. The evergreens were bent down and some broken with the weight. Had all the snow which descended during the various storms on 23rd—25th remained on the surface, it would probably have been about 14 inches deep. People who looked out of their windows on the early morning of the 25th viewed a very wintry but picturesque scene, and one which though commonly associated with Christmas-time, is very rarely displayed near the close of April; yet May 1st and 2nd proved ideal summer days, with max. shade temperatures of 73° and 79°.

While writing, I may mention that the greatest depth of snow that I have ever measured here was 16 inches on the evening of March 15th, 1887.

W. F. DENNING.

Bishopston, Bristol, May 9th, 1908.

WHAT DO METEOROLOGISTS MEASURE?

IN your introduction to the reports relating to "The Easter Snowstorm of 1908" (pp. 65-74) you state that at Oxford, in 1888, 24 inches of snow *was* measured. Confusion follows. Speaking of the quantity of snow, the Rev. B. P. Oakes states that there *were* 4 inches, and there *was* a good 6 inches. Mr. Blair also informs us that there *was* 2½ inches; 4 inches *were* lying; there *was* but 4 inches; and 14 inches *was* measured; while 4° of frost *was* registered, and also 6° *was*. Miss Tawney informed us there *were* 3 or 4 inches, and Major Gambier Parry likewise that there *were* 2 inches; whereas Mr. Horner asserts that there *was* from 4 to 6 inches, and the Rev. H. A. Boys that there *was* 7 inches; then, passing on to page 75, Mr. Brodie will have it that the minimum temperature was as *many* as 6° lower!

The situation is really comical! Where is the British Institute to determine this knotty problem? What is it we measure—the snow (or rain), or the inches? the temperature, or the degrees? the sunshine, or the hours? If we are at liberty to play ducks and drakes with the language, then I can enter on my register that "the *temperature* this morning fell to 10°, which *were* registered at 6 a.m."; that "the *rainfall* was 2 inches, which *were* measured at 9 p.m."; and that "the *sunshine* was 10 hours, which *were* registered up to 4 p.m." The expressions are extremely ugly, and I venture to say they are not English; but some of your readers may take quiet the opposite view.

F.R.MET.SOC.

May 30th, 1908.

[We have got into trouble by attempting—though, alas! not achieving—uniformity of diction; but we dare not tamper with "F.R.Met.Soc.'s" phrases, and are prepared with all humility to "take quiet" his rebuke. The fault is ours alone, for many of the letters and remarks we quote were dashed off hurriedly to catch the post, and never intended for the cruel pillory of cold print. We dress them for publication, and sometimes we do it carelessly. The fault, it seems to us, is a venial one; if we cared to delay publication by a day or two we could very easily trim the sentences of our correspondents into prim correctness, but is it worth the delay? Our impression is that rainfall, temperature or depth *is* or *was*; but that inches, degrees and hours *are* or *were*:—three hours of sunshine *were* recorded; the duration of sunshine *was* three hours; there *were* three inches of rain; there *was* a rainfall of three inches. Clumsy phrases at the best, and, writing for ourselves, we try to avoid them by periphrasis; but time is short and space is small in this office and in these pages. We are glad, however, to find a reader who reads so carefully, and we hope he will forgive us for holding our editorial hand which instinctively was drawing the sign of transposition round the two last letters of his last word but three, as a small token of our appreciation of his demonstration of the difficulty of being always correct.—Ed. *S.M.M.*]

THE ROYAL METEOROLOGICAL SOCIETY.

Receiving in an idle hour lately the new List of Fellows, it occurred to me to ask where, outside of England, our modest light is shining, or, at least, our Fellows are located. The following rough classification does not include the "Honoraries": Indian Region 35, Africa 34, Scotland 15, Australia and New Zealand 13, Ireland 12, Wales 12, South America 10, China 10, U.S.A. 7, France 3, Channel Islands 3, Canada 2, Japan 2; leaving nine cases of one each. Total, 167; or about 23 per cent. of the entire number.

F.R.Met.Soc.*

STORM OF 4th JUNE.

We have just had a wild storm of thunder and lightning, hail and rain in torrents, and I have just measured the rainfall—·44 in. in about a quarter-of-an-hour, 5·40 to 5·55 p.m. This storm came from the N.N.W., but it has been thundering in the east nearly all day. We had a great deal of thunder and vivid lightning in the night, from about 10.45 to nearly 2 o'clock, but it was not near us as this short storm has been. The hail was as large as small marbles.

The appearance of the clouds before the storm broke was awfully grand.

JULIANA FOSTER.

The Mount, Witley, Surrey, 4th June, 1908.

* But not the F.R.Met.Soc. of the foregoing letter.—Ed. *S.M.M.*

PARHELIA.

It may interest your readers to know that there was visible yesterday at Ifield, near Crawley, Sussex, a solar halo with two parhelia. The mock suns were on a level with the sun on the north and south sides; that on the north side was bright, and had had a bright bar of light extending from it for some distance outside the halo. That on the south side was less bright and had no bar. There was no supernumary circle. The halo was bright, but there were no prismatic colours. The mock suns were first noticed at 5.55 p.m., and lasted about 20 minutes.

A lunar halo was visible in the evening. F. DRUCE.

65, Cadogan Square, S.W., June 9th, 1908.

A SIMPLE METHOD OF FORECASTING STORMS.

I am much surprised that the official warnings are often given very late, while they are also usually insufficient and inaccurate. I, therefore, desire to draw attention to a simple method which every subscriber to the official "Weather Reports" may use. For over 18 years I have used the official charts in a special manner, as follows:—The isobars given on the last chart are drawn on tracing paper. This tracing is then superposed upon the isobaric chart of the day before. The outline of the land having been previously drawn on the tracing paper, it is easy to secure the correct superposition. The places where the isobars of the two charts cross each other are thus readily marked upon the tracing paper, the differences, positive or negative, at these points, being also carefully noted. By drawing lines through those points which have the same difference, a new series of "isobars" is obtained, as well as new "centres" of high and low pressure. In fact, a new chart is the result, to which I give the name "Differential Chart," and by comparing it with the last official charts it is not very difficult to trace the coming changes in position of the centres of high or low pressure.

It has been long known from experiments with balloons that such centres of high and low barometric pressure are to be regarded as self-subsisting or separate "bodies," which may lie one over the other, as well as side by side This, perhaps, accounts for the striking difference that is sometimes found to exist in respect to the positions of barometric maxima and minima, as indicated by the official and "differential" charts, respectively. In fact, the one may show a high centre where the other has a low, and so on. But the important point to notice is, that in such cases, great atmospheric disturbances usually follow in the course of the next few days. It is merely a question of increased meteorological skill to find out the actual districts likely to be affected, and where, therefore storm-warnings should be issued.

It must be pointed out, however, that the method does not lay claim to mathematical accuracy. It cannot, under the circumstances, give more than approximate results, but, nevertheless, these may be capable of being put to great practical use, especially by all who are in any way connected with seafaring. The storms of the past week, for example, were well indicated by this method. The matter is therefore, I think, one that is worthy deeper enquiry, so that practical application may be made of it. But for such an enquiry I have not myself time at present. I therefore send you these notes now so that others who have more leisure may devote their attention to a further investigation of the whole question.

For my own studies I find it very convenient to colour high centres blue and low red, and to arrange (say) 40 charts of each kind together on a board. The latest chart is every day inserted in place of the oldest, so that the series is always up to date.

J. F. NOWACK.

6, De Crespigny Park, Denmark Hill, S.E.

METEOROLOGICAL NEWS AND NOTES.

THE METEOROLOGICAL OFFICE has issued its usual notice with respect to telegraphic weather forecasts for the harvest season. It cannot be too widely known that anyone may obtain by telegram a forecast of the probable weather for the following day, sent out by the Meteorological Office at 2.30 p.m., or at certain other hours. On Saturdays a forecast for the two following days will be issued, so that some clue may be had to the probable weather of Monday, and for a slightly larger fee the Meteorological Office will send a notification by telegram whenever conditions favourable for a spell of fine weather set in. Application should be made to The Director, Meteorological Office, 63, Victoria Street, London, S.W.

THE ROYAL METEOROLOGICAL SOCIETY is arranging at the forthcoming Show of the Royal Agricultural Society, to be held at Newcastle-on-Tyne from June 30th to July 4th, a Meteorological Section in connection with the Agricultural Education and Forestry Exhibition. This will include various patterns of self-recording and other instruments, as well as diagrams relating to rainfall, temperature, sunshine, the influence of weather on crops, health, &c. A collection of photographs illustrating meteorological phenomena will also be exhibited. A fully equipped climatological station, with the various instruments in position, will be arranged in a railed-off enclosure outside the Exhibition building; and an address on "Meteorology in relation to Agriculture" will be given each day by Mr. W. Marriott. We hope that all rainfall observers who may visit the Show will make a point of inspecting the Meteorological Section, and of making themselves known to Mr. Marriott or his assistants, who will be happy to explain in detail any matters of special interest to observers.

THE CORPORATION OF DOUGLAS, Isle of Man, has accepted from Mr. A. W. Moore, C.V.O., Speaker of the House of Keys, the generous gift of the meteorological station which he has maintained for many years, and we hope that it will be carried on for all time to the benefit of science and the demonstration of the enlightened public spirit of that attractive town.

THE RAIN GAUGE ON SCAFELL, which Miss Marshall of Ambleside had erected in 1906, and which has been read regularly once a month, has been damaged again and again by the light-hearted idiots who bring the name of tourist into disrepute. Miss Marshall has written to the *Yorkshire Post* in the hope of bringing public opinion to bear. One would imagine that anyone who had sufficient intelligence to climb a mountain for pleasure might have sense enough to understand that even so unassuming a piece of apparatus as a rain gauge was placed there with no little trouble and for some useful purpose. Experience in many parts of the country shows that this is not the case.

LOCAL RAINFALL RECORDS are frequently lost through the absence of interest in such matters on the part of the community, and we are anxious to ascertain how many provincial newspapers are sufficiently alive to the importance of these statistics to publish, like the *Norfolk Chronicle*, monthly records of daily rainfall from a number of stations near the place of publication. We have long held the Norfolk paper in the highest esteem because of its care for scientific matters, and we rather think it is unique in this particular respect.

APRIL SNOW, says a frivolous correspondent, caused a newspaper reporter to remark that "on April 26th the sun rose at its earliest, and soon the roofs of all the houses were in a flood of dripping." What a chance for the cooks! adds our correspondent.

REVIEWS.

Scottish National Antarctic Expedition. Report on the scientific results of the voyage of S.Y. *Scotia* during the years 1902, 1903 and 1904, under the leadership of William S. Bruce, LL.D., F.R.S.E. Volume II., Physics. Part I., Meteorology, by R. C. MOSSMAN, F.R.S.E. Part II., Magnetism, by CHARLES CHREE, Sc.D., F.R.S., and R. C. MOSSMAN, F.R.S.E. Part III., Tides, by Sir GEORGE H. DARWIN, K.C.B., F.R.S. Edinburgh, the Scottish Oceanographical Laboratory, 1907. Price, one guinea. Size $12\frac{1}{2} \times 10$. Pp. vi. + 324. Plates.

IN this notice we confine our attention to the first memoir, which occupies 308 out of the 324 pages of the volume, and constitutes a very important contribution to knowledge. Meteorology has suffered on many expeditions from the careless belief that anyone can take meteorological observations with the slightest possible training, and it has not infrequently been a trying task for the meteorologist in whose hands the records have been placed on the return of the expedition, to make effective use of the data before

him, without any personal knowledge of the way in which they were collected.

Mr. Mossman is a born meteorologist, and from his boyhood he has taken pleasure in meteorological observations for their own sake, acquiring extraordinary skill as an observer in most difficult conditions, while a volunteer in the Ben Nevis Observatory, and no less facility as a computor and compiler from his long and laborious researches into the climate of Edinburgh and London, from more than a century of records. Consequently when Dr. Bruce secured the services of Mr. Mossman as his companion on the Antarctic voyage of the *Scotia* he made the meteorological side of his expedition an assured success from the outset.

In describing the instruments used, Mr. Mossman reports that very few thermometers were broken, an unusual and gratifying circumstance when observations were made, as in this case, every hour while the ship was south of 30° S. The thermometers were exposed in the ordinary small single-louvred screen usually employed at sea, but two of these were fitted, one on each side of the ship, projecting over the water. Both sets of thermometers were read on each occasion, but only the reading on the weather side was recorded; that on the lee side was affected by hot air from the engines or cabins, and sometimes was as much as 5° above the other. The muslin of the wet bulbs was changed monthly, and syringed with distilled water daily to obviate any accumulation of salt.

The observations taken at sea are printed *in extenso*, occupying 103 pp.; those taken at Laurie Island, South Orkneys, from April, 1903, to February, 1904, occupy 78 pp. The Meteorological Log of the *Scotia* from 1st January, 1903, to 5th May, 1904, by Mr. Mossman when on board and by Dr. Bruce during Mr. Mossman's land-work, extends to 23 pages of small type in double column. Detailed observations taken every four hours during 1903 and 1904 at Cape Pembroke, Falkland Islands, by the Lighthouse Staff for the Meteorological Office, occupy 26 pp.; and, finally, Mr. Mossman discusses all the results in 60 pages of text, illustrated by many photographs, diagrams, and charts.

In a region like the portion of the Antarctic including Weddell Sea where there were practically no observations prior to the expedition of the *Scotia*, the records obtained cannot go very far towards the determination of normal seasonal conditions; but they may throw extremely valuable light on the diurnal variations of the various elements observed. Diurnal variations have accordingly been discussed at considerable length. It is interesting to note that during the period spent near the farthest south point attained, off the coast of the newly-discovered Coats Land, the diurnal range of temperature showed a marked increase, which obviously suggested the proximity of continental land, or an unbroken ice-sheet of great extent.

The climate of the station on Laurie Island, in the South Orkneys, is discussed from a complete year's observations, the Argentine Meteorological Office having placed the results obtained during part

of their period of observations at the disposal of the author. It appears that, while the usual diurnal range of temperature is clearly marked in spring and summer, there is a double maximum and minimum in autumn and winter, which is probably due to the disturbing effects of cyclones; and in many instances the nights were notably warmer than the days. The observations showed that at no period of the year did the South Orkneys (in 60° 43′ S.) come within the system of prevailing easterly winds, which was so marked a feature of the climate at the wintering stations of other expedition, south of 63° S., and of Weddell Sea when visited by the *Scotia*.

The measurement of precipitation where so much of the annual fall took the form of snow during the prevalence of high wind proved too much even for Mr. Mossman, and though the actual measurements only indicated 10·50 in. per annum for the station on Laurie Island, he is inclined to believe that the annual fall is equivalent to between 15 and 17 inches. Rainfall observations do not seem to have been made systematically on board ship, nor do the kite observations appear to have met with success.

Philips' Meteorological Calendar for recording daily observations regarding the barometer, thermometer, rainfall, direction of wind, weather, etc., consisting of 52 weekly sheets. London: George Philips & Sons. Price 2s. net.

To meet the requirements of pamphlets on Rural Education and Nature Study recently issued by the Board of Education and Scottish Educational Department, Messrs. Philips have issued a calendar consisting of 52 weekly sheets upon which are ruled diagrams for recording graphically the variations of the barometer, thermometer and rainfall, together with a circular diagram marked with the points of the compass and concentric circles, one for every day of the week, so that the direction of the wind may also be noted.

We regret that we cannot approve this form of calendar for educational purposes. No space is provided for recording the actual readings of the observations, and, of course, from the educational point of view, the most important fact to impress upon the young mind is the absolute necessity of accurately reading and conscientiously recording the indications of each instrument. Again, the scale of temperature given in the diagram is absurdly long, from 10° to 100° F., with the result that the portion between 40° and 60°, in which the greatest frequency of temperature occurs, is much too contracted. The rainfall scale, on the other hand, is far too short, as it only allows for a fall of ·60 in. on any one day, so that the interest of a very heavy fall would be entirely lost as far as the diagram is concerned. If the sheets had been submitted to the revision of a practical meteorologist before publication, they could have been made more practical, and in any record having the week as its unit reference should be made to the *Weekly Weather Report*, which would prove very helpful to the teacher.

RAINFALL TABLE FOR MAY, 1908.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea.	RAINFALL OF MONTH.	
					Aver. 1870-99.	1908.
		° ′	° ′	ft.	in.	in.
Camden Square	*London*	51 32	0 8	111	1·72	1·95
Tenterden	*Kent*	51 4	*0 41	190	1·72	1·45
West Dean	*Hampshire*	51 3	1 38	137	1·86	2·84
Hartley Wintney	,,	51 18	0 53	222	1·79	1·58
Hitchin	*Hertfordshire*	51 57	0 17	238	1·87	1·40
Winslow (Addington)	*Buckinghamshr.*	51 58	0 53	309	2·06	1·49
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	1·85	1·49
Brundall	*Norfolk*	52 37	*1 26	66	1·74	2·02
Winterbourne Steepleton	*Dorset*	50 42	2 31	316	2·02	1·88
Torquay (Cary Green)	*Devon*	50 28	3 32	12	1·96	1·75
Polapit Tamar [Launceston]	,,	50 40	4 22	315	1·98	1·70
Bath	*Somerset*	51 23	2 21	67	2·09	1·15
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·10	1·48
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·62	2·83
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·11	2·01
Boston	*Lincolnshire*	52 58	0 1	25	1·73	1·70
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·01	1·99
Derby (Midland Railway)	*Derbyshire*	52 55	1 28	156	1·96	2·40
Bolton (Queen's Park)	*Lancashire*	53 35	2 28	390	2·46	2·91
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	1·90	2·84
Arncliffe Vicarage	,, ,,	54 8	2 6	732	3·36	4·53
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	1·95	1·10
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	1·89	1·83
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	7·26	7·98
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	2·55	1·93
Haverfordwest (High Street)	*Pembroke*	51 48	4 58	95	2·53	2·67
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	2·44	2·83
Llandudno	*Carnarvon*	53 20	3 50	72	1·85	2·06
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	2·60	3·93
Hawick (Branxholm)	*Roxburgh*	55 24	2 51	457	2·17	2·42
Edinburgh (Royal Observy.)	*Midlothian*	55 55	3 11	442	...	1·92
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	2·73	2·55
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·36	..
Tighnabruaich	*Argyll*	55 55	5 14	50	3·21	3·25
Mull (Quinish)	,,	56 36	6 13	35	2·91	2·77
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	1·88	1·82
Braemar	*Aberdeen*	57 0	3 24	1114	2·29	1·44
Aberdeen (Cranford)	,,	57 8	2 7	120	2·20	1·53
Cawdor	*Nairn*	57 31	3 57	250	2·03	1·43
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	2·32	2·36
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	5·05	3·27
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·02	2·33
Castletown	*Caithness*	58 35	3 23	100	...	2·69
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	2·95	3·52
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	2·11	2·27
Broadford (Hurdlestown)	*Clare*	52 48	8 38	167	2·09	3·36
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·27	2·58
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	1·94	1·37
Ballinasloe	*Galway*	53 20	8 15	160	2·49	3·43
Clifden (Kylemore House)	,,	53 32	9 52	105	4·61	5·47
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	2·93	3·45
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	2·61	3·62
Seaforde	*Down*	54 19	5 50	180	2·45	2·23
Londonderry (Creggan Res.)	*Londonderry*	54 59	7 19	320	2·48	2·09

RAINFALL TABLE FOR MAY, 1908—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1870-99. in.	1908. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1870-1899. in.	STATION.
+ ·23	113	·60	29	11	8·54	10·31	+1·77	121	25·16	Camden Square
— ·27	84	·44	29	12	9·59	8·35	—1·24	87	28·36	Tenterden
+ ·98	153	·65	11	14	10·59	11·40	+ ·81	108	29·93	West Dean
— ·21	88	·36	14	15	9·70	11·70	+2·00	121	27·10	Hartley Wintney
— ·47	75	·28	12	12	8·37	9·85	+1·48	118	24·66	Hitchin
— ·57	72	·43	2	13	9·29	11·56	+2·27	124	26·75	Addington
— ·36	80	·31	6	10	8·28	9·45	+1·17	114	25·39	Westley
+ ·28	116	·37	6	13	8·23	10·22	+1·99	124	25·40	Brundall
— ·14	93	·38	14	15	14·04	12·25	—1·79	87	39·00	Winterbourne Stpltn.
— ·21	89	·41	14	16	12·92	10·40	—2·52	81	35·00	Torquay
— ·28	86	·40	14	16	13·33	15·07	+1·74	113	38·85	Polapit Tamar
— ·94	55	·20	2	15	10·72	9·42	—1·30	88	30·75	Bath
— ·62	70	·24	14	18	10·60	10·06	— ·54	95	29·85	Stroud
+ ·21	108	·87	2	17	11·85	13·14	+1·29	111	33·04	Wolstaston
— ·10	95	·46	2	11	10·15	10·26	+ ·11	101	29·21	Coventry
— ·03	98	·55	13	10	7·82	8·84	+1·02	113	23·30	Boston
— ·02	99	·60	3	16	8·57	9·17	+ ·60	107	24·70	Hodsock Priory
+ ·44	122	·64	2	16	8·78	10·01	+1·23	114	26·18	Derby
+ ·45	118	·61	2	18	13·54	17·70	+4·16	131	42·43	Bolton
+ ·94	150	·60	6	17	9·25	12·58	+3·33	136	26·96	Ribston Hall
+1·17	135	·71	5	23	22·78	27·87	+5·09	122	60·96	Arncliffe Vic.
— ·85	56	·25	7	14	9·12	9·39	+ ·27	103	27·02	Hull
— ·06	97	·30	3	18	9·32	11·36	+2·04	122	27·99	Newcastle
+ ·72	110	1·60	8	21	50·39	50·28	— ·11	100	132·68	Seathwaite
— ·62	76	·29	4	21	14·66	13·00	—1·66	89	42·81	Cardiff
+ ·14	106	·50	14	15	17·06	15·78	—1·28	93	47·88	Haverfordwest.
+ ·39	116	·78	7	15	14·66	18·17	+3·51	124	45·41	Gogerddan
+ ·21	111	·68	2	19	10·18	13·02	+2·84	128	30·98	Llandudno
+1·33	151	·54	8	18	16·07	19·98	+3·91	124	43·43	Cargen
+ ·25	112	·40	5	20	12·45	14·04	+1·59	113	34·80	Branxholm
...	...	·43	30	16	...	9·99	...	...	...	Edinburgh
— ·18	93	·34	8, 16	23	17·57	20·00	+2·43	114	48·87	Girvan
...	...	...	...	...	12·24	...	...	...	35·80	Glasgow
+ ·04	101	·53	16	20	20·89	26·04	+5·15	125	57·90	Tighnabruaich
— ·14	95	·57	24	19	20·29	20·81	+ ·52	103	57·53	Quinish
— ·06	97	·45	8	20	9·94	8·73	—1·21	88	28·95	Dundee
— ·85	63	...	...	...	12·50	16·11	+3·61	129	36·07	Braemar
— ·67	70	·32	4	14	11·60	10·51	—1·09	91	33·01	Aberdeen
— ·60	70	·27	8	10	9·68	10·88	+1·20	112	29·37	Cawdor
+ ·04	102	·70	8	17	17·02	19·33	+2·31	114	43·71	Fort Augustus
—1·78	65	·63	24	21	31·26	41·78	+10·52	134	86·50	Bendamph
+ ·31	115	·65	8	14	11·31	17·40	+6·09	154	31·60	Dunrobin Castle
...	...	·52	8	18	...	15·30	...	...	...	Castletown
+ ·57	119	·64	22	21	22·70	19·87	—2·83	88	58·11	Killarney
+ ·16	108	·53	7	18	14·58	13·03	—1·55	89	39·30	Waterford
+1·27	161	·42	2	23	11·60	13·60	+2·00	117	33·47	Hurdlestown
+ ·31	114	·38	12	20	12·77	13·34	+ ·57	104	35·19	Abbey Leix
— ·57	71	·23	14	21	9·93	10·08	+ ·15	102	27·75	Dublin
+ ·94	138	·55	7	25	13·23	15·04	+1·81	114	37·04	Ballinasloe
+ ·86	119	·94	7	16	28·96	30·60	+1·64	106	80·23	Kylemore House
+ ·52	118	·40	23	19	18·79	23·79	+5·00	127	50·50	Enniscoe
+1·01	139	·75	2	21	14·35	21·12	+6·77	147	41·83	Markree Obsy.
— ·22	91	·28	21	19	14·20	16·58	+2·38	117	38·61	Seaforde
— ·39	84	·30	24	24	14·15	17·10	+2·95	121	41·20	Londonderry

SUPPLEMENTARY RAINFALL, MAY, 1908.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	2·24	XI.	Rhayader, Tyrmynydd	4·18
,,	Ramsgate	1·85	,,	Lake Vyrnwy	3·56
,,	Steyning	1·93	,,	Llangyhanfal, Plâs Draw	2·35
,,	Hailsham	1·34	,,	Criccieth, Talarvor	2·60
,,	Totland Bay, Aston House	1·49	,,	Llanberis, Pen-y-pass	12·42
,,	Emsworth, Redlands	1·57	,,	Lligwy	1·79
,,	Stockbridge, Ashley	2·08	,,	Douglas, Woodville	2·13
,,	Reading, Calcot Place	2·00	XII.	Stoneykirk, Ardwell House	1·78
III.	Harrow Weald, Hill House.	1·55	,,	Dalry, The Old Garroch	3·55
,,	Oxford, Magdalen College	1·25	,,	Langholm, Drove Road	3·85
,,	Pitsford, Sedgebrook	1·90	,,	Moniaive, Maxwelton House	3·19
,,	Huntingdon, Brampton	1·41	XIII.	N. Esk Reservoir [Penicuick]	2·65
,,	Woburn, Milton Bryant	1·69	XIV.	Maybole, Knockdon Farm	2·42
,,	Wisbech, Bank House	1·15	XV.	Campbeltown, Witchburn	1·86
IV.	Southend Water Works	1·61	,,	Inveraray, Newtown	4·28
,,	Colchester, Lexden	1·19	,,	Ballachulish House	5·59
,,	Newport, The Vicarage	1·03	,,	Islay, Eallabus	2·58
,,	Rendlesham	1·00	XVI.	Dollar Academy	2·97
,,	Swaffham	1·62	,,	Loch Leven Sluice	1·60
,,	Blakeney	1·17	,,	Balquhidder, Stronvar	3·38
V.	Bishops Cannings	1·92	,,	Perth, The Museum	1·86
,,	Ashburton, Druid House	2·88	,,	Coupar Angus Station	2·01
,,	Honiton, Combe Raleigh	2·77	,,	Blair Atholl	2·09
,,	Okehampton, Oaklands	2·87	,,	Montrose, Sunnyside Asylum	1·54
,,	Hartland Abbey	1·55	XVII.	Alford, Lynturk Manse	1·29
,,	Lynmouth, Rock House	1·53	,,	Keith Station	2·50
,,	Probus, Lamellyn	1·98	XVIII.	N. Uist, Lochmaddy	3·63
,,	North Cadbury Rectory	1·94	,,	Alvey Manse	1·45
VI.	Clifton, Pembroke Road	1·87	,,	Loch Ness, Drumnadrochit.	1·39
,,	Ross, The Graig	1·54	,,	Glencarron Lodge	3·84
,,	Shifnal, Hatton Grange	2·75	,,	Fearn, Lower Pitkerrie	2·02
,,	Blockley, Upton Wold	1·66	XIX.	Invershin	2·23
,,	Worcester, Boughton Park.	1·74	,,	Altnaharra	2·23
VII.	Market Overton	2·01	,,	Bettyhill	1·57
,,	Market Rasen	2·56	XX.	Dunmanway, The Rectory	3·15
,,	Bawtry, Hesley Hall	2·14	,,	Cork	2·28
,,	Buxton, Lismore House	4·12	,,	Darrynane Abbey	2·69
VIII.	Neston, Hinderton Lodge	2·56	,,	Glenam [Clonmel]	3·02
,,	Southport, Hesketh Park	2·72	,,	Ballingarry, Gurteen	3·28
,,	Chatburn, Middlewood	3·68	,,	Miltown Malbay	3·77
,,	Cartmel, Flookburgh	3·92	XXI.	Gorey, Courtown House	1·93
IX.	Langsett Moor, Up. Midhope	3·48	,,	Moynalty, Westland	2·86
,,	Scarborough, Scalby	1·53	,,	Athlone, Twyford	2·67
,,	Ingleby Greenhow	2·41	,,	Mullingar, Belvedere	2·52
,,	Mickleton	2·33	XXII.	Woodlawn	4·32
X.	Bardon Mill, Beltingham	2·34	,,	Westport, St. Helens	3·52
,,	Ewesley, Fallowlees	2·55	,,	Mohill	3·70
,,	Ilderton, Lilburn Cottage	1·43	XXIII.	Enniskillen, Portora	2·96
,,	Keswick, York Bank	3·14	,,	Dartrey [Cootehill]	2·36
XI.	Llanfrechfa Grange	2·12	,,	Warrenpoint, Manor House	2·36
,,	Treherbert, Tyn-y-waun	6·74	,,	Banbridge, Milltown	1·55
,,	Carmarthen, The Friary	5·82	,,	Belfast, Springfield	2·48
,,	Castle Malgwyn [Llechryd].	3·36	,,	Bushmills, Dundarave	2·45
,,	Plynlimon	6·90	,,	Stewartstown, Ballyclog	2·83
,,	Crickhowell, Ffordlas	2·10	,,	Killybegs	4·26
,,	New Radnor, Ednol	2·85	,,	Horn Head	2·26

METEOROLOGICAL NOTES ON MAY, 1908.

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

LONDON, CAMDEN SQUARE.—Sunny and very warm, the mean temp. being 57° 4 or 3°·4 above the average. On 3rd, at 8.40 a.m., ·24 in of R fell in 7 minutes. Duration of sunshine, 173·7* hours and of R 29·8 hours. Shade max. 77°·9 on 27th; min. 42°·2 on 23rd. F 0, f 0.

TENTERDEN.—Duration of sunshine, 211† hours. Max. temp. 75°·0 on 31st; min. 39°·0 on 22nd. F 0, f 0.

TOTLAND BAY.—Max. temp. 70°·6 on 29th; min. 43°·2 on 11th. The mean min. was 47°·9, the highest in May during 12 years. Duration of sunshine 221·5* hours.

PITSFORD.—Mean temp. 55°·2. Max. 77°·5 on 31st; min. 34°·6 on 11th.

TORQUAY.—Duration of sunshine 213·4* hours, or 11·5 hours below the average. Mean temp. 55°·0 or 2°·0 above the average. Max. 71°·7 on 29th; min. 41°·9 on 7th. F 0, f 0. Mean amount of ozone 5·4.

NORTH CADBURY.—The warmest May in 12 years, following the coldest April. Max. temp. 81·0 on 1st; min. 38°·0 on 11th. F 0, f 0.

BATH.—Max. temp. 74·5 on 2nd and 31st; min. 35°·8 on 11th. F 0.

ROSS.—Mean temp. 56°·0 or 2°·8 above the average. Max. 78°·8 on 31st; min. 36°·6 on 11th.

WOLSTASTON.—The first half was exceedingly wet and bad for tilling, but the latter half dry and warm so that vegetation made great progress.

HODSOCK.—Max. temp. 76°·5 on 27th; min. 35°·4 on 24th. F 0, f 4.

BUXTON.—Mean temp. 52°·3 or 4°·3 above the average of 35 years. Max. 73°·2 on 31st; min. 37°·2 on 24th. F 0, f 1. Duration of sunshine 198* hours, or 40·9 hours above the average

BOLTON. The mean temp., 52°·1, was 2°·6 above the average. Max. 72°·1 on 31st; min. 39°·4 on 11th. F 0, f 0. Duration of sunshine 146·8* hours, being equal to the average.

SOUTHPORT.—Exceptionally warm throughout, especially towards the close. Mean temp. 54° 0 or 3°·5 above the average. Max. 74°·6 on 28th; min. 37°·1 on 24th. F 0, f 1. Duration of sunshine 226* hours or 13 hours above the average; duration of R 44·0 hours.

HULL. Max. temp. 71°·0 on 19th and 27th; min. 38°·0 on 23rd. F 0, f 1. Duration of sunshine 123·1* hours.

HAVERFORDWEST.—Max. temp. 73°·4 on 31st; min. 40°·2 on 23rd. F 0, f 0. Duration of sunshine 164·3* hours.

LLANDUDNO.—Max. temp. 73°·8 on 28th, min. 43°·2 on 7th. F 0, f 0.

DOUGLAS.—A wonderful contrast to the Arctic weather of April, as well as to the Mays in 1906 and 1907, of evil memory. The last week was brilliantly fine and warm. The backward vegetation responded as if by magic.

DUMFRIES.—Max. temp. 78°·0 on 28th; min. 39°·0 on 16th and 23rd. F 0. Cold and unpleasant till 26th, but sudden rise of temp. on 27th.

EDINBURGH. Max. temp. 74°·3 on 28th; min. 38°·6 on 22nd. F 0, f 0.

DUNDEE.—Max. temp. 75°·4 on 27th; min 38°·0 on 22nd. F 0

FORT AUGUSTUS. Max. temp. 65°·9 on 30th; min. 31°·0 on 22nd. F 1.

WATERFORD.—Max. temp. 71°·5 on 28th; min. 36°·0 on 7th. F 0.

HURDLESTOWN.—Max. temp. 76°·0 on 16th and 17th; min. 36°·0 on 9th.

MILTOWN MALBAY.—The first week was mild with a spurt of vegetation, the second week stormy, rainy and cold, the third very cold with mist, H and R, and the last changing from fog to sunshine and heat.

DUBLIN.—Mean temp. 55°·2, being 3°·0 above the average and as much as 10°·5 above the mean temp. of April, 1908. Max. 68°·0 on 17th; min. 41°·0 on 7th. F 0, f 0.

WARRENPOINT.—Max. temp. 72°·0 on 31st; min. 35°·0 on 23rd. F 0, f 0.

MARKREE.—Max. temp. 75°·4 on 28th; min. 35°·3 on 25th. F 0, f 0.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, December, 1907.

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	57·0	8	29·9	16	46·0	37·6	39·6	90	66·1	27·3	3·79	16	7·8
Malta	70·5	2	47·0	19	63·2	54·7	52·0	76	133·0	...	·51	7	5·8
Lagos	94·0	19	71·0	29	88·6	73·9	74·8	76	143·0	68·0	1·03	2	7·3
Cape Town	90·1	22	51·1	7	75·6	58·0	53·7	64	...	...	1·43	7	3·2
Durban, Natal ...	89·3	7	59·6	9	80·0	65·8	...	...	150·0	...	3·97	18	6·7
Johannesburg	79·3	21	45·8	9	72·6	54·1	56·8	82	158·0	45·1	4·24	14	5·6
Mauritius	90·3	12	69·2	5	86·3	72·8	71·1	78	151·6	64·3	12·08	23	6·8
Calcutta...	82·8	10	48·2	26	77·5	55·8	53·8	67	143·7	41·3	·53	2	2·1
Bombay	90·2	18	67·2	21	85·6	69·8	62·6	62	137·0	55·4	·00	0	0·4
Madras	...	...	...	...	...	...	...	...	...	...	...	...	...
Kodaikanal	67·7	29	40·8	25	61·6	46·9	42·8	68	129·6	26·5	1·97	8	4·9
Colombo, Ceylon ...	90·4	14	67·6	7	86·8	71·8	69·7	74	153·9	60·6	1·29	5	3·7
Hongkong	76·1	14	49·5	20	67·0	57·2	49·3	63	128·4	...	1·46	10	5·9
Melbourne	105·3	25	45·5	20	73·2	53·1	47·3	67	160·0	36·7	5·10	8	5·1
Adelaide	104·5	25	46·7	17	80·9	55·3	49·9	51	151·0	39·8	·80	7	3·5
Coolgardie	106·6	24	45·0	16	87·4	56·6	45·4	40	174·0	42·0	·43	2	1·9
Sydney	91·3	16	55·3	6	78·8	63·1	59·8	68	137·0	45·0	1·80	16	5·3
Wellington ...	74·8	24	51·0	21,27	68·4	57·3	54·0	74	125·0	40·0	1·38	5	5·8
Auckland	79·0	19	53·0	1	72·7	60·8	57·6	74	138·0	45·0	5·15	11	5·5
Jamaica, Negril Point.	88·0	21	66·2	28	86·4	69·8	70·2	86	...	...	6·37	11	4·1
Trinidad	91·0	27	65·0	17	86·5	68·9	74·4	88	156·0	62·0	4·10	13	...
Grenada	89·2	9	71·0	9	83·4	73·5	76·6	85	138·4	...	5·37	26	5·0
Toronto	47·1	10	7·0	4	34·8	24·8	...	...	72·0	4·4	5·01	16	...
Fredericton	53·0	11	2·6	4	33·8	16·9	...	84	...	.	4·13	6	7·0
St. John's, N.B. ...	50·8	10	10·0	14	36·8	24·3	...	...	...	...	4·66	12	6·7
Victoria, B.C.	56·1	4	30·4	16	46·0	39·1	...	...	...	...	4·78	21	9·0
Dawson	...	...	...	...	...	...	...	...	...	...	...	...	...

MALTA.—Mean temp. of air 58°·0. Average hours of bright sunshine 5·7.

Natal.—R ·77 in. below 30 years average.

Johannesburg.—Bright sunshine 257·3 hours.

Mauritius.—Mean temp. of air 0°·7, of dew point 3°·5, relative humidity 6·9 per cent., and R 6·90 in., above averages. Mean hourly velocity of wind 7·6 miles, or 3·2 above average.

KODAIKANAL.—Bright sunshine 219 hours. Hoar frost on 10 days.

COLOMBO.—Mean temp. of air 79°·7 or 0°·5 above, of dew point 1°·1 below, and R 4·36 in. below, averages. Mean hourly velocity of wind 7·9 miles. T88 on 2 days.

HONGKONG.—Mean temp. of air 61°·9. Bright sunshine 165·5 hours. Mean hourly velocity of wind 12·4 miles.

Adelaide.—Mean temp. of air 3°·3 below average.

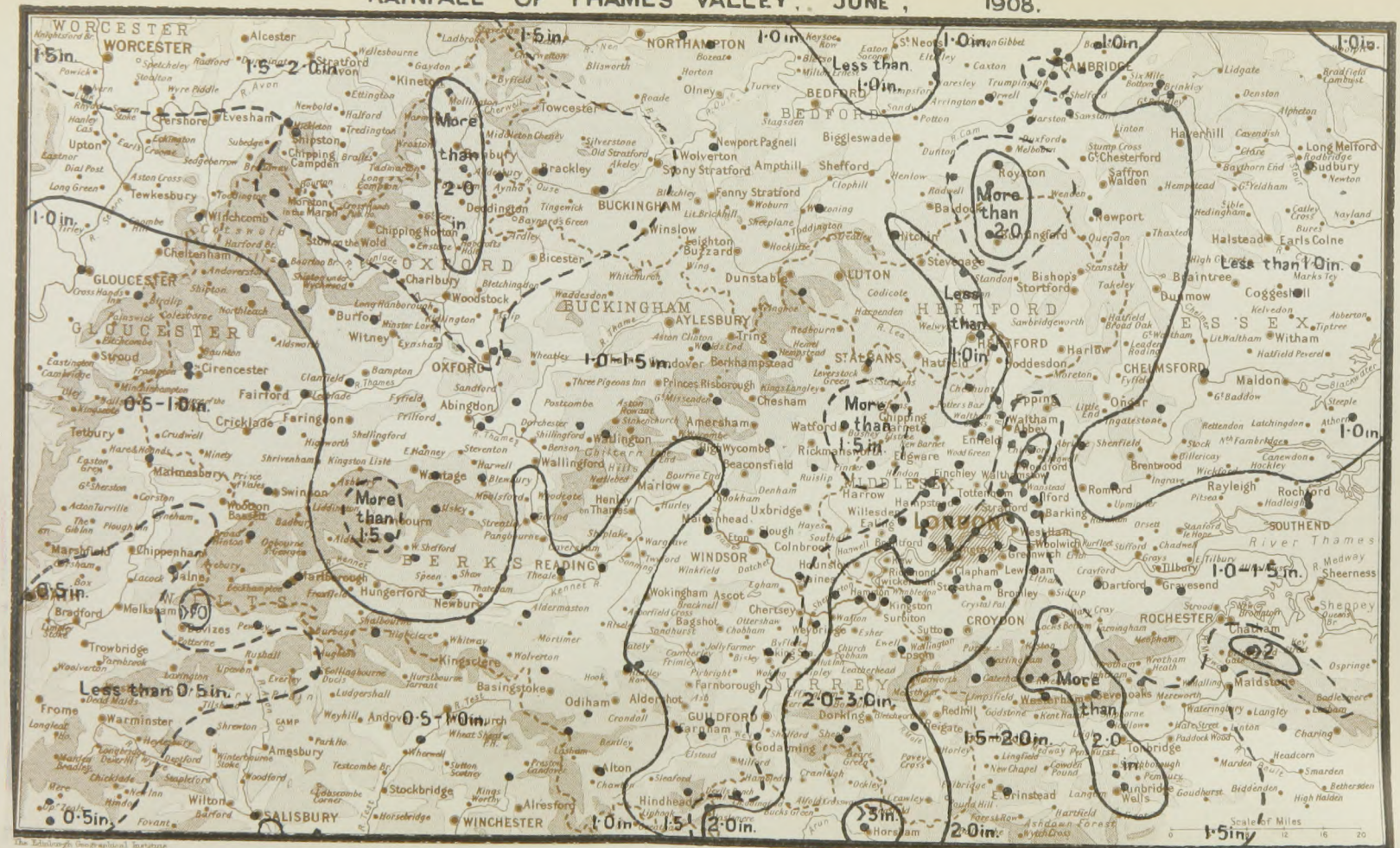
Sydney.—Mean temp. of air 1°·0 above, and R ·68 in. below, averages.

Wellington.—Mean temp. of air 2°·3 above, and R 1·88 in. below, averages. Bright sunshine 232·2 hours.

Auckland.—R nearly double 40 years' average.

TRINIDAD.—R ·63 in. below 43 years' average.

RAINFALL OF THAMES VALLEY, JUNE, 1908.



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DINNER OF THE ROYAL METEOROLOGICAL SOCIETY.

The annual dinner of the Royal Meteorological Society took place on the evening of Tuesday, June 16th, in the Balmoral Rooms of the Trocadero Restaurant. The President of the Society, Dr. H. R. Mill, was in the chair, and a small but representative gathering of the Fellows supported him on the occasion, Such dinners furnish a double opportunity; they enable Fellows who reside in distant parts of the country, and have few points of contact, to become personally acquainted, and they allow the public to see not only what are the objects pursued by the Society, but also who are the people, whether Fellows or guests, whose interest is attracted by the subject. Bearing these points in mind the President and Council of the Society invited a certain number of guests, and while deferring so far to convention as to seat a few of these alternately with Fellows, along one side of a long table, they arranged the rest of the company at numerous small tables, so that instead of one being limited to conversation with one of two neighbours, general conversation was possible between groups of four. Judging from the uniform hum of voices which rose over the whole room during dinner, the experiment was successful. The following Fellows of the Society and guests of the President and Council were present, the order of the names being alphabetical and the guests distinguished by small capitals.

Mr. E. B. Barnard, M.P. (Chairman Metropolitan Water Board), Mr. F. Campbell Bayard (Secretary), Mr. Clayton Beadle, Mr. F. J. Brodie, Mr. Eric Stuart Bruce, Captain Caborne, C.B., Mr. C. J. P. Cave, Captain M. H. Clarke and guest, Mr. J. E. Clark, Captain Muirhead Collins, C.M.G., Mr. R. Cooke, Mr. J. A. Curtis, Dr. G. F. Deacon, Mr. F. Druce and 3 guests, Mr. F. B. Edmonds, Rev. W. Esdaile, Mr. H. N. ffarington, Rev. J. C. Fox, Mr. Vaux Graham, Mr. C. Hawksley, Colonel Hellard, R.E., C.B. (Director General of the Ordnance Survey), Dr. A. J. Herbertson (Reader of Geography in the University of Oxford), Rev. H. N. Hutchinson,, Mr. R. Inwards, Mr. J. P. Jenkin, Dr. J. Scott Keltie, Sec. R.G.S., Mr. Baldwin Latham and guest, Mr. R. G. K. Lempfert, Dr. Lewys-Lloyd, Captain H. G. Lyons, F.R.S. (Director General of Survey Department, Egypt), Dr. J. D. McClure, Mr. W. Marriott, Mr. W. J. Marriott, Dr. H. R. Mill (President), Mr. R. Mond, Mr. R. W. Munro, Mr. P. P. Pennant,

Mr. C. Salter, SIR BENJAMIN STONE, M.P., DR. A. STRAHAN, F.R.S., DR. J. J. H. TEALL, F.R.S. (Director of the Geological Survey), MR. A. WATT (Secretary of the Scottish Meteorological Society), Dr. C. Theodore Williams (Treasurer).

The loyal toasts having been duly honoured, Dr. Theodore Williams proposed "The Visitors" expressing his regret that owing to indisposition Lord Strathcona had been obliged to telegraph at the last moment that he was unable to come, but paying a tribute to Canada for initiating the Conference of Imperial and Colonial Meteorologists which was about to meet, and to Australia for taking part in that gathering. He welcomed all who were present, and coupled with the toast the names of Captain Muirhead Collins, representing the Commonwealth of Australia, and Dr. J. D. McClure, Headmaster of Mill Hill School. Captain Collins, in replying, said that one of the first acts of the Federal government of Australia had been to establish a Federal Meteorological Service, the only one in the world, he believed, which produced a daily weather map of a whole continent. Dr. McClure, in a humorous speech which produced an atmosphere of genial hilarity, also responded.

Mr. E. B. Barnard, M.P., proposed the toast of The Royal Meteorological Society, wishing success and permanence to its work, the practical results of which, he confessed, appealed more powerfully to him than did its learned researches. The President, in replying, thanked the proposer for his kind words and for the stress he laid on the useful applications of meteorology, an aspect that was perhaps, not so often dealt with as it deserved to be. Since the last annual dinner the Society had been prospering and growing in numbers. They had delighted to honour the eminent French meteorologist, M. Teisserenc de Bort with their gold medal, and they had in turn been honoured and delighted by the lecture of their eminent German colleague, Dr. Hellmann, on "The Dawn of Meteorology." The aim of the Society was to advance meteorology as a science by their meetings and discussions, and to spread a knowledge of meteorological facts by influencing the teaching in schools and in some measure by endeavouring to influence the press, which, he feared, was still somewhat credulous and uncritical in the matter of long-period weather forecasts. The Society was not limited by any territorial restriction; nearly one quarter of its Fellows resided out of England, and papers were read at its meetings dealing with the phenomena of all parts of the atmosphere, from the poles to the equator. He sometimes thought that the complexity of the problem they studied and the importance of endeavouring to grasp it as a whole, were not adequately considered by men of science trained in the methods of the laboratory, but he was sure that the phenomena of nature in the open must be studied as a whole and in their natural environment, before the best results could be obtained. The modest candle of the Society was, perhaps, not set on so high or so ornate a candlestick as its light deserved, and although the Society went quietly on its way

without complaint, he doubted whether there was another scientific Society in London of equal age, equal numbers, and equal deserts, which was not either housed free of charge by Government, or at least aided by a substantial subsidy.

Mr. Baldwin Latham proposed "Kindred Institutions," dwelling on the close connection between the work of the Royal Meteorological Society, and that of other societies and institutions devoted to science and its applications, and Dr. Teall, Captain Lyons, and Mr. Watt responded in short and apposite speeches. Mr. F. Campbell Bayard proposed "The Chairman," and on the toast being responded to the meeting came to an end.

Several part-songs of an appropriate character were given at intervals by Mr. H. Shartau's quartette party, and these added much to the enjoyment of the evening.

REPORT UPON DRY PERIOD AND RAIN-MAKING EXPERIMENTS AT OAMARU, NEW ZEALAND.

By Rev. D. C. Bates, F.R.Met.Soc.

The district of North Otago, often called after its chief town, the Oamaru district, is sheltered on the west, north and south by mountainous ranges, which condense and precipitate on their windward slopes much of the moisture borne by the winds from these directions, and it must therefore depend chiefly on easterly weather for its rains. The north-easterly and south-easterly winds which accompany cyclonic disturbances, and are usually laden with water-vapour, sweep up the Kakanui and Waitaki valleys, causing the most abundant rains to fall over the district. In some seasons, however, these atmospheric movements do not extend their influences so far south, and then, while the North Island gets more than the usual amount of rain, those parts of the South Island depending upon them are liable to experience droughts. A prolonged dry period of an unusually severe character for any part of New Zealand, extended over the Oamaru district during the years 1889, 1890, and 1891. The years 1897 and 1898 were also very dry, and the last period of deficient rainfall, from January, 1906, to August, 1907, was 45·7 per cent. below the sum of the average monthly rainfalls for the eighteen months included.

The annual rainfall for Oamaru varied from a minimum of 13·47 in. in 1881 to a maximum of 32·82 in. in 1870, the average for 40 years —from 1867 to 1906—being 21·87 in.

The continuous and unbroken record for this period gives the following monthly averages :—

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
2·24	1·88	1·32	1·73	1·62	1·78	1·67	1·47	1·89	1·55	1·98	2·30

The average number of days with rain (·01 in. or over) from the Windsor Park, Oamaru, record of 15 years are :—

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
12	11·6	9·7	9	8	7·4	8	8	9	10	11	13

showing that the expectancy of rain is greater in summer than in winter.

The Windsor Park records of the recent dry period are as follows :—

	Jan. in.	Feb. in.	Mar. in.	Apr. in.	May. in.	June. in.	July. in.	Aug. in.	Sept. in.	Oct. in.	Nov. in.	Dec. in.
1906...	—	1·25	·52	1·16	·73	1·42	·59	·59	1·46	·62	·95	2·46
1907...	·43	1·39	1·41	·58	·71	·24	·56	—	—	—	—	—

Only one month (December, 1906) had rainfall above the average of 15 years, and that by merely ·16 in.

The days with rain (·005 in. or over) during this time were :—

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1906.....	—	13	10	5	4	5	6	4	8	7	5	10
1907.....	5	9	11	7	2	4	7	—	—	—	—	—

As might be expected in that undulating country, the records from Kauroo Hill, near Maheno, differ from the above very considerably at times. The averages from the 17 years' records at Kauroo Hill are :—

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Ins...	2·61	2·19	1·68	1·24	·94	1·18	1·28	·69	1·97	1·42	2·08	2·31
Days	9·8	7·8	6·6	6·3	4·5	4·4	5	4·6	8·2	8	9·4	10·9

and the quantity during the 18 months dry period :—

	Jan. in.	Feb. in.	Mar. in.	Apr. in.	May. in.	June. in.	July. in.	Aug. in.	Sept. in.	Oct. in.	Nov.* in.
1906.....	—	1·42	·49	·99	·71	1·19	·48	·50	2·29	·45	·98
1907.....	·46	1·95	1·63	·78	·80	·23	·50	—	—	—	—

which shows the total fall for this period as 39·1 per cent. below the average.

The results of this small rainfall, though by no means comparable with the effects of droughts I have experienced in the heat of Australia, were more severe than I had imagined possible in this country. The fields were very bare, especially new pastures, which had been sown with English grasses in the past few years. The fields which were being ploughed showed a dry subsoil which had apparently not been moistened by a good rain for a long time. I was driven over a great part of the district and only saw one small field of fair-sized turnips, while on an average between 50 and 60 truckloads of these roots were being brought from Southland every day for Northern and Central Otago The stacks of straw which the farmers have at

* No value for December is given in the MS.—[ED. *S.M.M.*]

last learned to save at harvest time were commanding high prices, and in addition quite 9,300 tons of fodder had to be imported by the settlers to keep their starving stock alive. This food was carried free for the purchasers from the south, who were thus relieved of a great stress and encouraged to save their stock. Much of the stock had to be removed elsewhere for pasture and sold off or killed, and nearly all left were in very poor condition.

The acreage and yields for the Waitaki agricultural district for the past ten seasons as published by the Agricultural Department show a lower yield for wheat for 1906-7 than any since 1897-8, while the yield per acre in oats was the lowest recorded.

To sum up this aspect of affairs I would like to quote a concise statement of the Oamaru correspondent of the Wellington *Evening Post* (12th August, 1907), who estimated that "The eighteen months drought at Oamaru has cost the district not far short of a million sterling. On the last grain harvest, as compared with previous averages, there was a loss of £200,000, and loss on the decreased output of butter ran into nearly another £50,000. It has been computed that about 75 per cent. of cattle and 50 per cent. of sheep that were in the district twelve months ago have been potted or exported to more favoured districts."

Under such trying circumstances it was tantalising to the farmers to hear of good rains falling in other parts of the country, and to see the clouds at such times hang over the mountains or watch them passing high up in the air away to the ocean. Such disappointment as they so frequently experienced led many inhabitants of the district to regard favourably the project of experimenting for the purpose of inducing the clouds to yield their moisture. The promoters were men who commanded the respect and sympathy of the public, and a large sum of money was readily subscribed. This amount, through the efforts of Mr. J. Macpherson, M.H.R., was also supplemented by the Government, and given its greatest power of purchase through the supply of explosives at cost price from the Defence Department of New Zealand. I was ordered to proceed to Oamaru simply to watch and report upon the proposed experiments.

On my arrival I was met by the members of the Committee who had the matter in hand, and, while disclaiming all responsibility for the experiments, I discussed the project freely with them, finding their idea was to seek favourable opportunities to cause the passing clouds to precipitate. They desired me to advise them especially as to these and to indicate times when the air would be saturated with moisture, or, to adopt a phrase of the late meteorologist, Rev. Clement Ley, such a state of "unstable equilibrium" that might possibly be disturbed and the "water-dust" of the clouds be made to coalesce and precipitation ensue. They did not hold that they were able to produce rain at any time, but firmly believed that they could only operate successfully in a cloudy and saturated atmosphere. Though I could not share their very sanguine hopes for such results

as desired, I yet tried my best to meet their views, and to the utmost of my abilities heartily co-operated with the Committee. As is well-known rainfall is one of the most uncertain elements in meteorological prognostication for such a district, and the "probability of rain" with certain disturbances rarely amounts to absolute certainty; but events were moving in such a manner that I could forecast periods of saturation in the near future. The times thought most favourable for rain, fortunately for the district, coincided very nearly with such widespread and abundant rainfalls as had not occurred for years, and on this account, unfortunately for my task of giving conclusive evidence as to cause and effect in the experiments, was thereby rendered more difficult. While admitting this I desire most clearly to maintain that in no case was I able to trace such effect or success in rain-making due to the explosions, as some local residents at the time, claimed with considerable assurance. I have, moreover, read the records of similar experiments made on 27th November, 1891, on Raki's Table, and referred to with even greater confidence. Rain fell at that time, but I find from our records that the fall was heavy and general between Cape Campbell and Dunedin, and the claim made in the contemporary press that the barometer fell after the explosion, from 28·92 to 27·75 in. in ten minutes, was of course absurd.*

The sites chosen for the new experiments were lonely hills which commanded views of the whole district, and on that account had all been used as trigonometrical stations for the survey of the district. Raki's Table, the chief site, is a flat-topped hill, 1,059 feet above sea level and 14 miles inland, as the crow flies N.N.W. from Oamaru; Round Hill, on the Totara Estate, is a remarkable cone with an elevation of 501 feet above mean sea level, and about 6 miles S.W. from Oamaru. Dalgetty's Hill, near Duntroon, is in the Waitaki watershed, and about 811 feet above mean sea level, and 15 miles N.W. from Oamaru. The positions had been carefully chosen by the Committee, and both the situations and elevations were admirable for the purpose. The aim was to work with the wind rather than against it, and it was hoped that we should be able to trace the effects of the explosions on the clouds over the area affected.

On the afternoon of the 16th August, 1907, the skies were dull, strato-cumulus clouds hung round the hills and were scattered overhead. It appeared even to be raining at a distance away to the south, but the weather was quite fine for us on the way to Arnmore station near Raki's Table. We arrived at Mr. P. I. Shand's residence about sunset, and although heavy misty clouds were falling on the Table, and residents thought rain imminent, there did not seem to be sufficient density about the clouds. The air showed a relative humidity of 92 per cent. of saturation, and only needed a fall of 2°·4 to the dew point. The cool of evening was approaching, and the wind, though light was in the rainy quarter, the S.E. On the whole

* Surely due to a printer's error, giving 27·75 for 28·75.—Ed. *S.M.M.*

the conditions were regarded as fairly favourable. It was regarded chiefly as a trial of the bombs, and for working the men together under Corporal Meikle, prior to using the other stations.

The explosives used on this occasion were:—

5.15 p.m.....	(1)	17½ lbs. dynamite,	12½ lbs. powder,	in keg.
5.30 ,, ...	(2)	17½ ,,	,,	12½ ,,	,, ,,
5.45 ,, ...	(3)	40 ,,	,,	25 ,,	,, in case.

These behaved differently. The first shot gave off a good report, and the smoke rose and drifted gently away to the N.W. The second did not explode well, for the powder seemed to burn in the air without detonation. The third shot, which had a weight of 65 lbs., gave a great concussion to the air, and vibrations were felt over a wide area. As far, however, as we could see there were no other than normal changes going on in the atmosphere. We left for Oamaru at 10 p.m., and the evening was quite fine. In the *Oamaru Mail*, however, next day, the following paragraph appeared: "As showing that the explosions, which took place last evening, although modest compared with what are to follow, were not altogether unaccompanied by that practical result which farmers look for as the outcome of the experiments, it may be mentioned that Mr. George White and several other farmers were conversing on the probability of rain descending from a certain cloud, which appeared to be hanging on Tokaraki if unsettled by concussion, at the times the bombs were, although unknown to Mr. White and his friends, being tested on Raki's Table; and as they conversed they were surprised to hear the boom of the explosions, and immediately afterwards a shower of rain, lasting for half-an-hour, fell in the vicinity of Hilderthorpe. This may have been a coincidence, but as a coincidence it is remarkable."

As a result of this trial it was decided that the explosions should be given more resistance, fired off rocks, and at the next opportunity detonated almost similtaneously from the other stations.

(*To be continued.*)

THE WEATHER OF JUNE, 1908.

By Fred. J. Brodie.

The opening days of June were marked by warm thundery weather, the chief source of disturbance being seen in a shallow barometical depression which moved very slowly northwards over the western portions of the United Kingdom. In most places the highest temperatures were recorded either on the 3rd or 4th, when the shade maxima were above 75° in the West of Scotland, and above 80° in many parts of England, the thermometer at Southampton on the 4th

touching 85°. In Ireland and the North and East of Scotland the readings at the time were mostly below 75°, and in the North of Ireland they were nearly all below 70°. After the 4th an anticyclone appeared off our Atlantic seaboard, and a cold wind from north and north-west spread over the entire country, the maximum temperatures of the 6th being in many places quite 20° lower than those observed 48 hours earlier. On the night of the 6th or early on the following day (Whit Sunday), the sheltered thermometer in many inland parts of Great Britain fell to within a degree or two of the freezing point, while on the surface of the ground it went below that level. At Balmoral and Morpeth (Cockle Park) the grass minimum was as low as 29°, and at Crathes (Kincardineshire) it was as low as 27°, while at Llangammarch Wells (a situation famous for extremes of temperature) the exposed thermometer fell to a minimum of 25°.

The second and third weeks in the month were marked by a long spell of cool and rather changeable weather, but over a large portion of England the only rain of any appreciable weight occurred on the 16th and 17th, the remainder of the time being mostly fair and dry. The temperatures recorded during this fortnight were seldom much above 70° in any part of the country, and in many cases they were considerably below that level, especially in the northern and eastern districts, where maximum readings varying a little on either side of 60° were common. In comparison with the average the nights were, as a rule, warmer than the days, but between the 14th and 18th, and again between the 21st and 23rd, ground frosts were again experienced in several parts of Great Britain. On the night of the 14th the exposed thermometer fell to 28° at Crathes and at Cambridge, to 27° at Birmingham, and to 25° at Llangammarch Wells; while on the night either of the 20th or 21st it sank to 28° at Harrogate and again to 25° at Llangammarch Wells, a reading of 29° being recorded on the latter occasion as far south as Greenwich, and Wisley, in Surrey.

Towards the close of the month the weather became more summer-like, the highest temperatures being recorded in the western parts of the Kingdom, where the amount of bright sunshine was unusually large. At some few stations in Wales and the West of England the thermometer on the 28th and 29th rose to 80°, or even slightly above.

The mean temperature of the month differed but little from the average, a slight excess being reported over Eastern, Central, and Southern England, but a slight deficit in most other localities. In the southern districts the excess was due mainly to nocturnal warmth, the day temperatures showing a very close agreement with the normal. In the north an excess of heat at night was more than counterbalanced by a deficiency of seasonable warmth in the daytime.

THE WHIRLWIND IN NORTH HERTFORDSHIRE ON 4th JUNE, 1908.

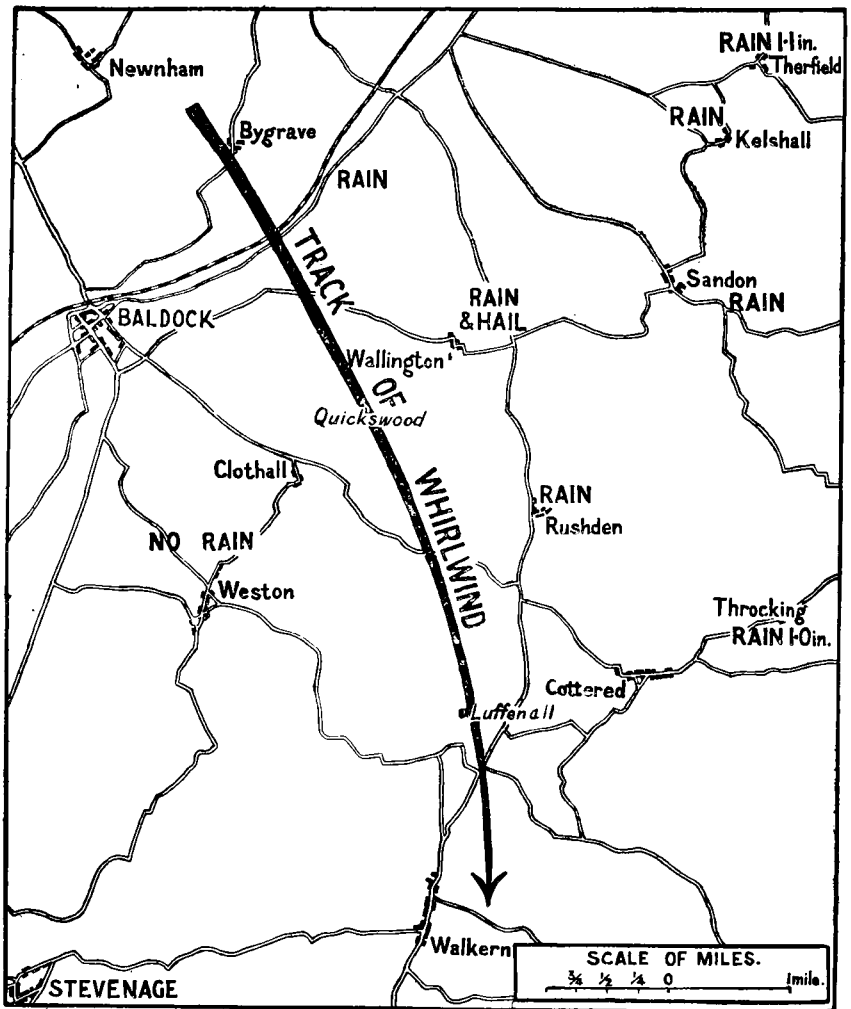
By William Hill.

On Thursday, 4th June, the weather of North Herts was in a very unsettled condition. The height of the barometer at 9 a.m. was 30·15 in. (cor. for sea level), the maximum temperature for the day was 82°, the air was close and muggy, the wind W.N.W., light. A thunderstorm to the south of Hitchin between 10 and 11 a.m. drifted slowly towards the south-east, the rumbling of distant thunder was heard at frequent intervals during the day. At 3.45 p.m. I watched a fine mass of cumulus rise from the north-west and drift slowly to the north-east quadrant of the heavens, it had all the appearance of a gathering thunderstorm; at 4.15 p.m. fragments of misty stratus, below the main body of the cumulus cloud, were noticed driving rapidly from the north-east. During the passage of this cloud the wind came from the north-west in fitful, but strong, gusts, alternating with periods of flat calm.

Between 4 and 4.30 p.m. some gentlemen playing at golf on Royston Heath became interested in a thunderstorm lying to the east of that town, which appeared to be either drifting or extending itself in a southerly direction. A second thundercloud was then seen rising from the north and spread or drifted rapidly towards the first storm, which it ultimately joined. One observer says:—"At the moment when these two clouds approached each other, and while there was yet an interval between them, I saw, formed in this space, a funnel-shaped mass of vapour." When the clouds joined the cone-shaped mass of vapour was still apparent. The point of the cone repeatedly altered in appearance, at one time extending its apex towards the earth, and at another becoming suddenly truncated, the point ending off squarely. Small patches of greyish white vapour were seen on the periphery of the cone, apparently revolving rapidly with an upward movement. In general shape it resembled that of a water-spout. In the course of the next few minutes a second cone appeared in advance of the first (*i.e.*, in its front, according to the direction in which the first cone appeared to be moving, viz, N.N.W. to S.S.E.) Its diameter was much less than that of the first, and it had a distinct curve near the apex. From the larger cone as well as from a cloud in its rear, heavy rain appeared to be falling.

The phenomena described above, which lasted some 15 or 20 minutes, appear to have accompanied the passage of a storm of rain and wind, both of considerable intensity locally, separate from each other, but apparently moving in the same direction along parallel lines. The wind storm was the more remarkable. It was a violent whirlwind, varying somewhat in diameter, but generally of about 40 to 50 yards, in fact a miniature tornado.. It appears to have commenced between Bygrave and Newnham, villages some 2 or 3 miles north and north-east of Baldock, and passing just south of the Bygrave farm homestead, travelled rapidly in a southerly direction to

Quickswood, and from thence to Luffenall and Walkern, a distance of about 6 miles, as shown on the accompanying map.



WHIRLWIND OF JUNE 4TH, 1908.

The power of the wind within the whirl was great and in its track large branches of trees were broken, or rather twisted off. It upset a Hertfordshire farm cart laden with artificial manure and ashes, the weight of which could not have been less than 20-25 cwt., overturned two ricks, estimated together to have contained 30 tons of hay, a considerable portion of which was taken up in the whirl and distributed over the surrounding country. An oat stack 250 yards further on shared the same fate, the sheaves and straw being scattered far and wide. I saw two sheaves, but with the oats cut off as with a knife, lying at least 400 yards from the stack. At Bygrave, besides

damage to trees, a small moveable hen house was destroyed, portions of it were picked up at Quickswood, 2 miles away. The passage of the whirlwind through the small woods at Quickswood could readily be seen in a track about 50 yards broad, by the many white ends of the broken branches. Trees which had stiff branches like the oak, suffered most, young trees and those of more elastic nature coming off best. A fine large hawthorn standing alone in a meadow seemed to have been twisted round and torn away from the ground at the base

FIG. 2.—HAWTHORN TREE BROKEN AND TWISTED BY WHIRLWIND NEAR QUICKSWOOD.

of the trunk, all branches, indeed, gave evidence of twisting rather than of simple fracture. Beyond Quickswood the whirl seems to have gradually lost its energy, though at Luffenall it partly unroofed and damaged a barn, but beyond this no serious harm seems to have been done. A strong wind with whirling motion was recognised at Walkern.

No rain accompanied this storm, and none fell to the westward of its track ; but to the north and east heavy rain fell less than a mile away, while at Wallingford and neighbourhood very large jagged hailstones were reported. The great fall of rain which I imagine came from the cone and following cloud which was seen from Royston, fell still further away along a line indicated by Odsey (just south-east of Ashwell Station) Kelshall, Gannock, and Sandon. South of this the whole storm, including that from Royston, seems to have merged into one disturbance, and after hanging around for some hours moved off in a south-easterly direction. Very heavy rain with hail is reported from Newsells and Barkway,

An observer at Hinxworth (just north of Newnham) says :—" I saw a storm about 4 o'clock coming up from the direction of Royston, and

another from the northward; just as these two storms seemed to meet above me I noticed a whirlwind in the direction of Bygrave, (possibly this cloud from the north was the one I was watching.)

Bygrave and Quickswood are each on a hill, two miles apart, a broad valley separates them, the ground on either side rising in gentle slopes. The fields are large and open, almost without hedge-rows; there are no trees at all, but along the balks which separate the areas of cultivated land are large whitethorn bushes. Two men at the bottom of this valley, in charge of the cart already mentioned, say:—"We saw over Bygrave a tall column, which we took to be smoke, and thinking the farm was on fire we looked along the road for a mounted messenger going to Baldock for the fire engine. But as we looked we saw that the column was moving, and moving in our direction. As it passed over ploughed land it raised a thick column of dust, when over a field of growing corn the dust nearly ceased. As it seemed about to pass over where we were we unharnessed our horse and went to one side for 200 yards. The storm passed with a rush like escaping steam; as the whirlwind was now on ploughed land we could not see much for dust: the wind where we were was strong. On returning to our cart we found it turned upside down; it was about two thirds full of ashes. The whirlwind was about 50 yards across."

Another man, working in a field near Quickswood, about half a mile from the track of the whirlwind, says:—"I saw the storm near Bygrave, and watched it until it was hidden behind the shoulder of the hill; I do not think the column of dust was more than 150 ft. high, for when it passed the hill it became completely hidden from me. I think it was about 5 minutes or a little longer from the time I saw it till it disappeared behind the hill."

Correspondence.

To the Editor of Symons's Meteorological Magazine.

HIGH MAY TEMPERATURE IN DERBYSHIRE.

For thirty years thermometers have been read by my sister, Miss Hunter, or myself at Field Head House, Belper, under exactly similar conditions, and I may add, in passing, that the monthly summary has been published in the "Meteorological Record of the Royal Meteorological Society" since the commencement.

The following figures for May are those for the only three years when the mean monthly temp. exceeded 53°·0 (corrected).

	TEMPERATURE.				RAIN.	Days.	TOTAL from Jan. 1.
Year.	9 a.m.	Max.	Min.	*Mean.*	in.		in.
May, 1895.....	53°·4	62°·9	44°·1	53°·5	·61	8	..... 9·96
,, 1893 ...	54°·9	62°·7	45°·2	53°·9	2·80	10	..... 9·48
,, 1889.....	53°·2	62°·3	46°·8	54°·5	4·22	16	..... 8·27
,, 1908.....	53°·9	62°·5	46°·5	54°·5	3·22	16	..... 11·83

Belper, June 21st, 1908. JOHN HUNTER.

THE COLD SPRING.

IN my letter (p. 92), fifth line from end, there should be a semicolon after "reached." The point is that 51 is the highest figure previously reached in the whole series (*c*); not merely in those two columns.

I may note that while March was cold and April very cold, the warmth of May seems to have brought up the mean temperature of the three months close to the average. A.B.M.

I HAVE been puzzling over A. B. M.'s letter on the above subject. It may be that the clouded state of my intellect makes me fail to grasp his meaning, but certainly I, for one, am unable to see the point of his contention. If he is a new weather prophet perhaps he will, in future, be kind enough to prophesy before instead of after the event, and then we shall be able to test his predictions.

A PUZZLED METEOROLOGIST.

30th June, 1908.

COMING METEORS.

METEOROLOGICAL observers are often casual meteoric observers as well; everyone, indeed, accustomed to watching atmospheric phenomena must have noticed many of those celestial visitants known as meteors, appearing under every gradation of magnitude from the tiny shooting star to the sky-illuminating fireball.

During the last half of July there is a great increase in the number of these cosmic meteors as compared with the earlier months, and a further development occurs in August, for there is a very rich and durable shower of Perseids presented during the first fortnight, and reaching a maximum on about the 11th. This year a nearly full moon will interfere with satisfactory observations during the second week of August, but over the period, July 25th to August 5th, meteors will be pretty abundant in the dark sky, and even in the presence of bright moonlight; on later nights many of the more conspicuous ones appearing near the time of maximum will be seen. Observers will do useful work in counting the numbers visible on different nights, and in recording the apparent paths of the brighter objects amongst the stars. This may be done either by giving the positions relatively to stars near, or by plotting the flights on a celestial globe or star map, and reading off the Right Ascensions and Declinations of the beginning and end points. Data of this kind will be valuable to those engaged in investigating this branch, as such materials afford the means of determining pretty accurately the heights, velocities and radiant points of those meteors which may fortunately have been observed at more than one station with the necessary fulness and precision. W. F. DENNING.

Bristol, June 17th, 1908.

IONS AS NUCLEI OF CONDENSATION.

I HAVE just been reading the abstract of lectures on the Geographical Distribution of Rainfall in the British Isles in the April number of your Magazine, and note that Dr. Mill, like other writers on the formation of rain drops, looks on ions as possible nuclei of condensation. That view has become stereotyped in all books dealing with the subject – as might be expected, having the stamp of high authority on it. When Mr. Wilson published his paper on the action of these ions on condensation, I at once wrote a letter to *Nature* (29th March, 1900) pointing out many objections to the suggestion. I would like to refer your readers to that letter; but I may restate some of the physics here. Condensation takes place on ions only when the air is extremely highly supersaturated. Air while there is dust in it cannot become supersaturated. We have never yet found any air free from dust; even at a height of many thousand feet there is generally over 100 particles per cubic centimetre. As a matter of fact the air with the lowest number of dust particles has been observed at low level, in an area where the air was well washed by frequent showers of rain. If there is such a thing as dustless air there does not seem to be any chance of ions enabling it to make a cloud, though they might cause rain. No doubt clouds can be produced on ions, but in the artificial conditions the cooling by expansion is instantaneous, whereas in nature it is slow, and whenever a nucleus was formed it would grow at such a rate in the supersaturated air that it would rapidly attain the size of a raindrop and fall, and in so doing relieve the tension all round it, and another centre of condensation could not form near the path of its fall. This cannot be shown experimentally, because if you expand the air slowly you cannot get the necessary supersaturation owing to air receiving heat from the containing vessel.

I hope your readers will reconsider the matter, and withhold their judgment till they get evidence of the existence of dustless air. For the reason given, the existence of clouds at great elevations, such as the higher cirrus, indicates the presence of dust even at these elevations.

JOHN AITKEN.

Ardenlea, Falkirk, 15th June, 1908.

SCOTTISH METEOROLOGICAL SOCIETY.

A BUSINESS meeting of this Society was held on July 9th, at 4 p.m., at 5, St. Andrew Square, Edinburgh, Sir Arthur Mitchell, K.C.B., Vice-President, in the chair.

The Council had prepared a revised form of Constitution, which had been previously circulated amongst the members, and on the motion of Mr. G. Williamson, seconded by Mr. J. Anderson, was unanimously adopted.

The Council also submitted a statement regarding the work and the financial position of the Society. It was explained that when the Ben Nevis Observatories were closed in 1904, and their affairs wound

up, they were found to be about £470 in debt. This absorbed the Society's reserve fund of £300 which had been lent to the Observatories, and left a bank overdraft of £170, for which the Society had to assume responsibility. Mr. W. B. Wilson, the Honorary Treasurer, stated that this overdraft had been slightly reduced out of the ordinary income of the Society, and that it would be a relief to the Council if some special means of liquidating this obligation could be found. A useful discussion took place as to various fields of activity in which the Society might engage, the speakers including Professor Dyson, Astromoner Royal for Scotland, Professor Crum Brown, Professor Knott, Mr. Macdonald, Secretary of the Highland and Agricultural Society, Mr. T. S. Muir, of the Royal High School, Edinburgh, Mr. J. Anderson, and Mr. A. Watt.

METEOROLOGICAL NEWS AND NOTES.

EDITORIAL NOTE.—It has been necessary to prepare the present number of the Magazine for press a week earlier than usual, and it has consequently been found impossible to do justice to a large amount of interesting correspondence dealing mainly with the thunderstorms of June 4th, and with the remarkable prolongation of twilight which occurred in all parts of Great Britain on June 30th, July 1st, and other nights. The effect as observed at Mill Hill was similar to that of an ordinary June night in the extreme North of Scotland, where high cirrus always reflects some sunlight at that season, and though the sky was clear, the reflection may have been from dust. Reference should also have been made to the absolute drought which prevailed over the greater part of England from June 18th to July 2nd or 8th, to the thunderstorms which brought the drought to a close, and to the extraordinarily low rainfall of June in the West of England. We hope next month to begin the publication of a series of three articles on the meteorological exhibits at the Franco-British Exhibition, and have arranged with a meteorologist who is not himself an exhibitor to write them.

THE CONFERENCE OF METEOROLOGISTS IN CANADA has been postponed to next year, when it will be held at Winnipeg. The programme for a meeting at Quebec, including a dinner at the Hotel Frontenac, had been issued, the representatives from Great Britain had taken their passage to sail on July 9th, and had made all other arrangements, when a notice of postponement was received by cable on June 27th. The wisdom of postponing the meeting until next year was pointed out in our February number (p. 19), and we cannot help regretting that the suggestion was not adopted then.

"BRITISH RAINFALL, 1907," will probably not be published until September, as Dr. H. R. Mill's engagement to leave for Canada on July 9th involved an arrangement of the work of the Rainfall Organization, which could not be altered at the short notice given of the postponement of the Quebec Conference, and he was obliged, with much regret, to break a rule which should always be observed—no holiday before publication.

RAINFALL TABLE FOR JUNE, 1908.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1870-99.	1908.
		° ′	° ′		in.	in.
Camden Square	*London*	51 32	0 8	111	2·09	1·26
Tenterden	*Kent*	51 4	*0 41	190	1·96	1·32
West Dean	*Hampshire*	51 3	1 38	137	2·02	·75
Hartley Wintney	,,	51 18	0 53	222	1·89	·98
Hitchin	*Hertfordshire*	51 57	0 17	238	1·89	·86
Winslow (Addington)	*Buckinghamshr.*	51 58	0 53	309	1·99	1·60
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·04	·95
Brundall	*Norfolk*	52 37	*1 26	66	1·89	·83
Winterbourne Steepleton	*Dorset*	50 42	2 31	316	2·32	·32
Torquay (Cary Green)	*Devon*	50 28	3 32	12	2·13	·31
Polapit Tamar [Launceston]	,,	50 40	4 22	315	2·12	·97
Bath	*Somerset*	51 23	2 21	67	2·31	·51
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·23	·69
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·46	1·86
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·41	1·62
Boston	*Lincolnshire*	52 58	0 1	25	1·94	1·55
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·24	1·60
Derby (Midland Railway)	*Derbyshire*	52 55	1 28	156	2·70	1·53
Bolton (Queen's Park)	*Lancashire*	53 35	2 28	390	3·21	2·83
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	2·38	1·27
Arncliffe Vicarage	,, ,,	54 8	2 6	732	3·69	2·44
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·12	·91
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·03	·37
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	6·97	8·01
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	2·53	·36
Haverfordwest (High Street)	*Pembroke*	51 48	4 58	95	2·61	1·27
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	2·93	1·94
Llandudno	*Carnarvon*	53 20	3 50	72	2·00	2·39
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	2·68	3·23
Hawick (Branxholm)	*Roxburgh*	55 24	2 51	457	2·21	1·62
Edinburgh (Royal Observy.)	*Midlothian*	55 55	3 11	442	...	·96
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	2·95	3·25
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	2·70	2·52
Tighnabruaich	*Argyll*	55 55	5 14	50	3·76	3·84
Mull (Quinish)	,,	56 36	6 13	35	3·55	3·70
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·15	1·06
Braemar	*Aberdeen*	57 0	3 24	1114	2·44	1·00
Aberdeen (Cranford)	,,	57 8	2 7	120	2·09	1·64
Cawdor	*Nairn*	57 31	3 57	250	2·24	1·04
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	2·28	2·91
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	4·78	6·67
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·14	2·25
Castletown	*Caithness*	58 35	3 23	100	...	2·25
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	3·29	1·24
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	2·61	1·15
Broadford (Hurdlestown)	*Clare*	52 48	8 38	167	2·52	2·19
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·43	1·63
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	1·95	1·65
Ballinasloe	*Galway*	53 20	8 15	160	2·69	1·76
Clifden (Kylemore House)	,,	53 32	9 52	105	5·33	..
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	2·95	4·19
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·16	3·19
Seaforde	*Down*	54 19	5 50	180	2·72	2·94
Londonderry (Creggan Res.)	*Londonderry*	54 59	7 19	320	2·92	2·88

RAINFALL TABLE FOR JUNE, 1908—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.				Mean Annual 1870-1899.	STATION.
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1870-99. in.	1908. in.	Diff. from Aver. in.	% of Av.	in.	
— ·83	60	·47	1	8	10·63	11·57	+ ·94	109	25·16	Camden Square
— ·64	67	·61	1	7	11·55	9·67	—1·88	84	28·36	Tenterden
—1·27	37	·25	16	6	12·61	12·15	— ·46	96	29·93	West Dean
— ·91	52	·60	1	5	11·59	12·68	+1·09	109	27·10	HartleyWintney
—1·03	46	·33	16	7	10·26	10·71	+ ·45	104	24·66	Hitchin
— ·39	80	·74	1	7	11·28	13·16	+1·88	117	26·75	Addington
—1·09	47	·44	16	6	10·32	10·40	+ ·08	101	25·39	Westley
—1·06	44	·22	17	10	10·12	11·05	+ ·93	109	25·40	Brundall
—2·00	14	·15	1	5	16·36	12·57	—3·79	77	39·00	Winterbourne Stpltn
—1·82	15	·14	1	6	15·05	10·71	—4·34	71	35·00	Torquay
—1·15	46	·32	30	8	15·45	16·04	+ ·59	104	38·85	Polapit Tamar
—1·80	22	·35	1	4	13·03	9·93	—3·10	76	30·75	Bath
—1·54	31	·23	1	11	12·83	10·75	—2·08	84	29·85	Stroud
— ·60	76	·91	17	7	14·31	15·00	+ ·69	105	33·04	Wolstaston
— ·79	67	·59	17	9	12·56	11·88	— ·68	95	29·21	Coventry
— ·39	80	·50	1	10	9·76	10·39	+ ·63	106	23·30	Boston
— ·64	71	·51	3	8	10·81	10·77	— ·04	100	24·70	Hodsock Priory
—1·17	57	·54	1	8	11·48	11·54	+ ·06	101	26·18	Derby
— ·38	88	·82	1	12	16·75	20·53	+3·78	123	42·43	Bolton
—1·11	53	·45	1	7	11·63	13·85	+2·22	119	26·96	Ribston Hall
—1·25	66	1·28	13	12	26·47	30·31	+3·84	114	60·96	Arncliffe Vic.
—1·21	43	·41	17	9	11·24	10·30	— ·94	92	27·02	Hull
—1·66	18	·17	13	12	11·35	11·73	+ ·38	103	27·99	Newcastle
+1·04	115	4·55	13	13	57·36	58·29	+ ·93	102	132·68	Seathwaite
—2·17	14	·10	11, 15	4	17·19	13·36	—3·83	78	42·81	Cardiff
—1·34	49	·48	1	10	19·67	17·05	—2·62	87	47·88	Haverfordwest
— ·99	66	·65	1	10	17·59	20·11	+2·52	114	45·41	Gogerddan
+ ·39	120	·63	17	12	12·18	15·41	+3·23	127	30·98	Llandudno
+ ·55	120	1·21	13	10	18·75	23·21	+4·46	124	43·43	Cargen
— ·59	73	·79	13	11	14·66	15·66	+1·00	107	34·80	Branxholm
...	...	·40	13	12	...	10·95	...	...	...	Edinburgh
+ ·30	110	·68	13	19	20·52	23·25	+2·73	113	48·87	Girvan
— ·18	93	·60	2, 11	14	14·94	...	...	...	35·80	Glasgow
+ ·08	102	·66	13	14	24·65	29·88	+5·23	121	57·90	Tighnabruaich
+ ·15	104	·69	10	17	23·84	24·51	+ ·67	103	57·53	Quinish
—1·09	49	·23	19	11	12·09	9·79	—2·30	81	28·95	Dundee
—1·44	41	...	...	...	14·94	17·11	+2·17	115	36·07	Braemar
— ·45	78	·60	11	15	13·69	12·15	—1·54	89	33·01	Aberdeen
—1·20	46	·35	14	7	11·92	11·92	·00	100	29·37	Cawdor
+ ·63	128	·75	13	15	19·30	22·24	+2·94	115	43·71	Fort Augustus
+1·89	139	1·04	9	20	36·04	48·45	+12·41	135	86·50	Bendamph
+ ·11	105	·60	13	17	13·45	19·65	+6·20	146	31·60	Dunrobin Castle
...	...	·40	12	20	...	17·55	...	...	...	Castletown
—2·05	38	·48	16	12	25·99	21·11	—4·88	81	58·11	Killarney
—1·46	44	·32	17	8	17·19	14·18	—3·01	82	39·30	Waterford
— ·33	87	·35	13	18	14·12	15·79	+1·67	112	33·47	Hurdlestown
— ·80	67	·44	17	15	15·20	14·97	— ·23	98	35·19	Abbey Leix
— ·30	85	·35	16	12	11·88	11·73	— ·15	99	27·75	Dublin
— ·93	65	·68	16	15	15·92	16·80	+ ·88	106	37·04	Ballinasloe
...	...	...	...	...	34·29	...	...	...	80·23	Kylemore House
+1·24	142	·90	10	17	21·74	27·98	+6·24	129	50·50	Enniscoe
+ ·03	101	·63	1	16	17·51	24·31	+6·80	139	41·83	Markree Obsy.
+ ·22	108	1·21	2	12	16·92	19·52	+2·60	115	38·61	Seaforde
— ·04	99	·68	13	18	17·07	19·98	+2·91	117	41·20	Londonderry

SUPPLEMENTARY RAINFALL, JUNE, 1908.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	1·85	XI.	Rhayader, Tyrmynydd	1·60
,,	Ramsgate	1·67	,,	Lake Vyrnwy	4·01
,,	Steyning	1·17	,,	Llangyhanfal, Plâs Draw	2·14
,,	Hailsham	1·37	,,	Criccieth, Talarvor	2·38
,,	Totland Bay, Aston House	·54	,,	Llanberis, Pen-y-pass	5·50
,,	Emsworth, Redlands	1·26	,,	Lligwy	2·92
,,	Stockbridge, Ashley	·60	,,	Douglas, Woodville	2·29
,,	Reading, Calcot Place	·95	XII.	Stoneykirk, Ardwell House	2·83
III.	Harrow Weald, Hill House.	1·77	,,	Dalry, The Old Garroch	3·31
,,	Oxford, Magdalen College	1·51	,,	Langholm, Drove Road	3·52
,,	Pitsford, Sedgebrook	1·11	,,	Moniaive, Maxwelton House	4·06
,,	Huntingdon, Brampton	·91	XIII.	N. Esk Reservoir [Penicuick]	1·75
,,	Woburn, Milton Bryant	1·47	XIV.	Maybole, Knockdon Farm	2·38
,,	Wisbech, Bank House	1·08	XV.	Campbeltown, Witchburn	2·82
IV.	Southend Water Works	1·21	,,	Inveraray, Newtown	4·13
,,	Colchester, Lexden	·60	,,	Ballachulish House	5·59
,,	Newport, The Vicarage	1·41	,,	Islay, Eallabus	3·27
,,	Rendlesham	·63	XVI.	Dollar Academy	1·76
,,	Swaffham	1·14	,,	Loch Leven Sluice	1·67
,,	Blakeney	1·03	,,	Balquhidder, Stronvar	3·98
V.	Bishops Cannings	1·32	,,	Perth, The Museum	1·68
,,	Ashburton, Druid House	·89	,,	Coupar Angus Station	1·74
,,	Honiton, Combe Raleigh	·59	,,	Blair Atholl	1·67
,,	Okehampton, Oaklands	1·62	,,	Montrose, Sunnyside Asylum	1·04
,,	Hartland Abbey	·81	XVII.	Alford, Lynturk Manse	1·21
,,	Lynmouth, Rock House	·81	,,	Keith Station	1·61
,,	Probus, Lamellyn	1·51	XVIII.	N. Uist, Lochmaddy	2·94
,,	North Cadbury Rectory	·29	,,	Alvey Manse	1·94
VI.	Clifton, Pembroke Road	·71	,,	Loch Ness, Drumnadrochit.	1·44
,,	Ross, The Graig	1·15	,,	Glencarron Lodge	6·03
,,	Shifnal, Hatton Grange	2·60	,,	Fearn, Lower Pitkerrie	·71
,,	Blockley, Upton Wold	1·82	XIX.	Invershin	1·54
,,	Worcester, Boughton Park	2·40	,,	Altnaharra	2·37
VII.	Market Overton	·95	,,	Bettyhill	1·88
,,	Market Rasen	1·42	XX.	Dunmanway, The Rectory	1·19
,,	Bawtry, Hesley Hall	1·16	,,	Cork	·73
,,	Buxton	2·33	,,	Darrynane Abbey	1·20
VIII.	Neston, Hinderton Lodge	1·99	,,	Glenam [Clonmel]	1·58
,,	Southport, Hesketh Park	1·93	,,	Ballingarry, Gurteen	1·20
,,	Chatburn, Middlewood	2·52	,,	Miltown Malbay	1·84
,,	Cartmel, Flookburgh	2·65	XXI.	Gorey, Courtown House	2·13
IX.	Langsett Moor, Up. Midhope	2·71	,,	Moynalty, Westland	1·70
,,	Scarborough, Scalby	1·52	,,	Athlone, Twyford	1·17
,,	Ingleby Greenhow	·74	,,	Mullingar, Belvedere	·97
,,	Mickleton	·90	XXII.	Woodlawn	2·40
X.	Bardon Mill, Beltingham	·87	,,	Westport, St. Helens	2·49
,,	Ewesley, Fallowlees	·43	,,	Mohill	1·95
,,	Ilderton, Lilburn Cottage	·35	XXIII.	Enniskillen, Portora	2·27
,,	Keswick, York Bank	2·95	,,	Dartrey [Cootehill]	2·39
XI.	Llanfrechfa Grange	1·15	,,	Warrenpoint, Manor House	1·71
,,	Treherbert, Tyn-y-waun	1·75	,,	Banbridge, Milltown	2·04
,,	Carmarthen, The Friary	1·66	,,	Belfast, Springfield	3·89
,,	Castle Malgwyn [Llechryd]	1·47	,,	Bushmills, Dundarave	4·07
,,	Plynlimon	5·30	,,	Stewartstown	2·15
,,	Crickhowell, Ffordlas	1·60	,,	Killybegs	4·31
,,	New Radnor, Ednol	1·97	,,	Horn Head	2·79

METEOROLOGICAL NOTES ON JUNE, 1908.

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

LONDON, CAMDEN SQUARE.—Warm weather with many TSS characterised the first week and the remainder of the month was bright and sunny. Mean temp. 61°·8 or 1°·4 above the average. Duration of sunshine, 240·0* hours, and of R 20·8 hours. Shade max. 86°·0 on 4th; min. 41°·1 on 7th. F 0, f 0.

TENTERDEN.—Duration of sunshine, 245·4† hours. Shade max. 85°·0 on 4th; min. 40°·0 on 7th. F 0, f 0.

TOTLAND BAY.—The driest June during 22 years. Duration of sunshine, 297·6* hours. Shade max. 82°·3 on 4th; this was the hottest day recorded since July, 1900; min. 45°·0 on 26th. F 0, f 0.

PITSFORD.—Mean temp. 58°·5. Shade max. 82°·3 on 3rd; min. 34°·2 on 15th.

TORQUAY.—Duration of sunshine, 280·2* hours, or 54·2 above the average. Mean temp. 59°·3 or 0°·7 above the average. Shade max. 77°·9 on 4th; min. 43°·9 on 19th. F 0, f 0.

NORTH CADBURY.—Extremely dry, beginning and ending with hot days and warm nights, but with low max. temps. from 5th to 21st. Shade max. 86°·3 on 3rd; min. 37°·0 on 19th. F 0, f 0.

BATH.—Shade max. 81°·3 on 3rd; min. 37°·5 on 19th. F 0. f 0.

ROSS.—Shade max. 83°·3 on 26th; min. 37°·5 on 25th. F 0, f 0.

HODSOCK.—Shade max. 80°·4 on 3rd; min. 34°·2 on 21st. F 0, f 4.

BUXTON.—Mean temp. 54°·0 or 0°·6 below the average. Duration of sunshine, 204·1* hours. Shade max. 76·7 on 3rd; min. 33° 9 on 21st. F 0, f 0.

BOLTON.—Mean temp. 55°·3, or 0°·2 below the average. Duration of sunshine, 158·3* hours, or 3·3 hours above the average. Shade max. 82°·8 on 3rd; min. 41°·1 on 15th. F 0, f 0.

SOUTHPORT.—Mean temp. 56°·8, or 0°·1 below the average. Duration of sunshine, 215·7* hours, or 9 hours above the average; duration of R, 36·4 hours. Shade max. 77°·1 on 30th; min. 40°·2 on 21st. F 0, f 0.

HULL.—Duration of sunshine 165·3* hours. Shade max. 78°·0 on 4th; min. 38°·0 on 7th. F 0, f 0.

HAVERFORDWEST.—Duration of sunshine 273·2* hours.

LLANDUDNO.—Shade max. 80°·0 on 28th; min. 45°·4 on 17th. F 0, f 0.

DOUGLAS.—Wretched weather with low temp. prevailed until 24th but the last six days were brilliantly fine and warm.

DUMFRIES.—The first half was cold and unsettled but from 19th to 30th warm and dry. The remarkable light on the night of 30th made it possible to read a watch face in the open between midnight and 1 a.m. Shade max. 84°·0 on 28th; min. 40°·0 on 12th, 17th and 21st.

MAXWELTON.—A TS occurred on 2nd of a severity not equalled for years. Shade max. 86°·0 on 28th; min. 34°·0 on 12th.

EDINBURGH.—Shade max. 76°·1 on 27th; min. 42°·7 on 5th. F 0, f 0.

DUNDEE.—Shade max. 81°·9 on 25th: min. 40°·9 on 20th.

FORT AUGUSTUS.—Shade max. 78°·9 on 27th; min. 40°·0 on 14th, 20th, and 24th.

WATERFORD.—The driest June for 19 years. Shade max. 76°·5 on 27th; min. 38°·0 on 16th.

DUBLIN.—Mean temp. 57°·0 or 0°·9 below the average. A splendid solar halo with prismatic colours was seen at noon on 8th. Shade max. 71°·3 on 29th; min. 44°·6 on 7th. F 0, f 0.

WARRENPOINT.—A most favourable month for farmers, the crops looking and promising well. Shade max. 71°·0 on 25th, 26th and 29th; min. 40°·0 on 11th. F 0, f 0.

MARKREE.—Shade max. 78°·3 on 29th; min. 38°·0 on 25th. F 0, f 2.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, January, 1908.

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	53·8	27	17·1	12	41·9	31·3	35·7	92	70·7	17·0	1·93	10	7·3
Malta	67·5	1	48·0	26	59·8	51·7	46·9	78	131·9	...	·70	6	5·7
Lagos	91·0	25	69·0	29	87·4	76·4	74·1	75	145·0	66·0	·05	2	7·9
Cape Town	93·3	7	48·3	1	77·0	58·3	56·0	66	...	...	·98	7	3·7
Durban, Natal ...	96·5	14	58·5	2	83·0	66·9	...	...	150·9	...	1·94	17	4·5
Johannesburg	86·1	20	43·8	2	77·0	55·0	54·2	70	155·0	41·6	2·08	15	5·0
Mauritius	88·1	22	68·1	17	84·5	73·8	72·5	82	153·4	63·6	10·32	22	7·1
Calcutta...	83·4	26	47·4	9	76·4	53·5	53·8	69	138·6	41·1	·86	4	2·0
Bombay...	87·4	7	62·3	13	83·4	68·7	63·9	68	134·3	52·9	·10	3	1·2
Madras	87·9	29	60·8	20	84·4	68·3	68·2	79	137·9	57·1	·02	1	2·9
Kodaikanal	73·2	25	42·4	21	63·9	47·6	43·8	67	124·0	19·2	1·12	10	4·1
Colombo, Ceylon ...	90·1	18	65·8	20	87·8	72·5	70·9	75	156·7	61·0	4·20	11	3·7
Hongkong	75·2	20	48·9	8	66·8	58·1	55·6	78	124·0	...	2·64	7	7·6
Melbourne	...	...	...	...	...	...	...	...	...	...	...	...	...
Adelaide	111·5	15	56·3	24	94·7	67·9	53·7	38	156·9	48·2	·33	1	2·6
Coolgardie	112·0	4	49·6	20	92·4	61·5	49·9	39	180·0	48·0	·05	2	1·5
Perth	100·0	23	52·9	8	81·8	60·7	54·0	54	166·0	50·3	·14	4	4·2
Sydney	93·9	28	60·2	2	81·4	66·3	62·0	62	129·4	52·0	1·80	12	4·7
Wellington	75·0	*a* 3	45·0	18	68·6	55·7	54·0	75	127·0	31·0	·64	5	5·8
Auckland	81·5	16	50·0	18	74·7	60·1	49·7	52	147·0	44·0	·45	3	3·8
Jamaica, Kingston ...	90·4	3	65·2	31	86·2	68·1	66·0	73	...	...	·92	8	4·8
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	83·8	22	70·0	12	81·7	72·5	68·7	74	145·2	...	2·72	18	3·7
Toronto	41·5	21	-13·8	30	31·9	16·9	...	91	...	...	2·51	14	7·9
Fredericton	49·0	8	-12·0	31	28·2	5·4	...	82	...	...	5·01	13	5·6
St. John's, N.B. ...	49·8	8	-9·4	31	33·3	13·9	...	...	...	...	4·76	14	5·6
Victoria, B.C.	49·3	5	26·2	30	44·7	38·4	...	85	...	...	3·22	19	8·0

a and 14, 15, 21.

MALTA.—Mean temp. of air 54°·8. Average hours of bright sunshine 5·7.

Johannesburg.—Bright sunshine 272·4 hours.

Mauritius.—Mean temp. of air 0°·3 below, of dew point 2°·3, relative humidity 6·7 per cent., and R 2·98 in. above, averages. Mean hourly velocity of wind 9·5 miles, or 1·6 below average.

KODAIKANAL.—Bright sunshine 235 hours. Hoar frost on 11 days.

COLOMBO.—Mean temp. of air 79°·5, or 0°·4 above, of dew point 0°·8 above, and R ·63 in. above, averages. Mean hourly velocity of wind 7·1 miles. TS8 on 2 days.

HONGKONG.—Mean temp. of air 62°·0, or 1°·9 above, and R 1·18 in. above, averages. Bright sunshine 143·2 hours. Mean hourly velocity of wind 11·3 miles.

Adelaide.—The hottest January on record. Mean max. temp. 8°·2 above, and mean min. temp. 6°·3 above, averages. There were 12 days over 105°, and 14 days over 100°, and the temp. did not fall below 70° on 12 nights.

Sydney.—Mean temp. of air 2°·0 above, and R 1·65 in. below, averages.

Wellington.—Mean temp. of air 0°·6 below, and R 2·82 in. below, averages.

RAINFALL OF THAMES VALLEY JULY. 1908.

Symons's
Meteorological Magazine.

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THE RAINFALL OF JULY, 1908.

The summer months, and July in particular, are liable to very irregular rainfall, on account of the frequency of thunderstorms which bring heavy falls to small areas. Consequently we notice without surprise, the characteristic "patchiness" of the rainfall map of the region shown in our frontispiece. The irregularity appears to culminate in the neighbourhood of London, but that is probably due, in some degree, to the very numerous stations in that area allowing us to draw the lines with greater precision. It will be noticed that a tongue of comparatively low rainfall (less than 3 inches) followed the river Thames from the west to the east of London, while both to the north, the south and the east there were areas with more than 4 inches in the immediate vicinity. A large area with less than 2 inches occupied the centre of the Thames valley, and similar dry patches occurred at intervals along the south and east coasts, and over practically the whole of Sutherland and Caithness, as well as in the west of Ireland. For the rest there were areas of excessive rainfall in the naturally wet high ground of the west of Great Britain, but Wales and the Lake District were on the whole more liberally watered than the Highlands or the Irish mountains.

Taken as a whole, England and Wales had 2 per cent. less than the average rainfall for the month, in Scotland there was a deficiency of about 6 per cent., and in Ireland a deficiency of about 9 per cent, for although the first fortnight proved wet at almost all stations, and very wet indeed at some, there was an absolute drought curiously similar to that of June in the second half of the month.

As regards the rainfall for the first seven months of 1908, it appears that in England and Wales there was on the whole exactly the average, in Scotland an excess of about 8 per cent., and in Ireland an excess of about 5 per cent.; the general rainfall of the British Isles showing an excess of 3 per cent. above the average.

METEOROLOGY AT THE FRANCO-BRITISH EXHIBITION.

By L. C. W. BONACINA, F.R.Met.Soc.

I.

IN an exhibition of the produce—taking that word in a wide sense—of two such great nations as Great Britain and France, well to the fore in almost every branch of intellectual and commercial activity, the various branches of modern science, pure as well as applied, will naturally to a greater or less extent be represented. The science of chemistry with its innumerable and extensive practical applications and enormous mercantile importance, must, of course, take a prominent place in one direction or another in such an exhibition, but even meteorology plays an important part in the life of a nation—to wit, in the forecasting of weather, the warning of storms dangerous to shipping, etc., and in supplying an industry for the manufacture of those delicate instruments of precision which furnish the data upon which weather forecasts and storm warnings are based. Now the difficult question which each science must answer for itself is not *what* to exhibit but *how* to exhibit it. In the first place, it is clear that since it is not the province of a great exhibition to provide instruction in the rudiments of the various sciences to the uneducated or unscientific sections of the public, labour and pains need not be spent by scientific exhibitors in serving up their exhibits, whatever form these may take, in a form such as might be palatable to, or easily understood by, elementary students in a class-room. Thus the chemist in exhibiting a series of difficultly produced organic compounds will not attempt to explain what is meant by the "structural formula" which he indicates of each compound; whilst the meteorologist will take it for granted that all well-educated men, especially all scientific men, have an intelligent notion as to the meaning, for instance, of an isobaric chart. It is obvious, therefore, that scientific exhibitors should so arrange their material as on the one hand to be intelligible to persons of broad general education, and on the other hand to present in sufficient detail the most recent progress in any particular branch of science to specialists in that branch as well as to those who might be disposed to assist it financially or advance it commercially. In the present series of articles it is proposed to offer a criticism of the meteorological department of the British Science section of the Franco-British Exhibition, and an opinion as to what extent it is fulfilling its proper function as above outlined. The exhibits, with the names of the exhibitors, are catalogued in a number of sections representing more or less all branches, or all representable branches, of meteorology, but it will be convenient for the present purpose to divide them into (1) instrumental, (2) cartographical and photographic, (3) tabular and statistical.

Division (1), to which this first article will be confined, includes the various types of instruments in general use on land and sea, specimens of kites and *ballons-sondes* employed by Mr. Dines in the investigation of the upper air, and complicated instruments of special construction. There is a Dines' Pressure-Tube Anemometer in the actual working, and there is no reason why anyone interested should fail from a study of it, and its records upon a revolving drum, to comprehend the theoretical and mechanical principles upon which this valuable type of anemometer is based. An instrument known as the "Callendar Bolometric Sunshine Receiver," whose function is to record the total quantity of the vertical components of the radiation from the whole sky as well as from the sun, by means of the differential action of that radiation upon two flat platinum thermometers, one blackened and the other bright, placed in an hermetically-sealed glass vessel, is peculiarly pleasing from a purely physical point of view ;* one would relish, however, a few more details as to its uses upon a meteorological scale, together with some typical results in different types of weather. The fiercest total radiations in summer probably occur not so much when the sky is absolutely cloudless, as when there are numerous clouds so situated as to leave the sun unobscured for practically the whole day, and to reflect or radiate excessive quantities of energy to the earth.

In connection with the exhibition of a small model of a "climatological station," I think that a note should be appended as to the purport of that much maligned instrument—or "*bête noir*" as it has been styled in a recent number of this Magazine—the black and bright thermometer bulbs in vacuo.

Meteorologists, of course, know what they *are* measuring, or *trying* to measure, with this instrument ; but the whole difficulty respecting its use arises in my opinion from an insufficiently clear notion or close agreement as to what they *ought* to be measuring. Taking up Dr. Dickson's "Meteorology," I find that the "maximum recorded by the black-bulb, minus the maximum temperature of the air, is taken as a measure of the maximum heating intensity of the sun's rays for the day." From this it may be concluded that the function of the "bulb-in-vacuo," assigned to it by meteorologists, is to afford a comparison from day to day of the *absolute* or *potential* heating intensity of the sun's rays, that is to say, of the amount of radiant energy received in unit time by bodies upon the surface of the Earth, and not, apparently, the *effective* heating intensity of the sun's rays, or their ability to raise in unit time the surface temperature of such bodies a certain amount. But what is the *natural* function of the instrument? This surely (as, indeed, the words *heating intensity* would seem to imply) is to afford a comparative measure of the diathermancy of the atmosphere from day to day. Now, if this natural function be

* As well as from the point of view of enthusiastic professors of chemistry, who are never so happy as when discoursing upon the uses to which the precious metals may be put.

not the assigned function, I fail to see of what use the indications of the black or bright bulb-in-vacuo thermometers are.

If we want, as it seems that we ought, to compare the relative heating effect of the sun's rays from day to day—in other words, to determine the temperature "in the sun"—it is quite clear that bulbs-in-vacuo should be discarded altogether, and that in their stead thermometers should be employed with their bulbs freely exposed to both sun and air. For the heating effect upon objects, including, of course, thermometer bulbs or the surface of the human body, of the sun at a given altitude above the horizon, depends upon two conditions (1) the diathermancy or transparency of the whole atmosphere, (2) the windiness of the lower atmosphere in contact with the objects, when, as is always the case, the temperature of the air at the time the sun is shining is far below that to which the given sun would raise the exposed surfaces of the objects if placed in vacuo, or even in a dead calm. Everyone knows that leaving out of consideration, or making allowance for, that part of the temperature of a wind that may be due to transported heat, it is always cooler in sunny weather, the sun's rays being felt far less on a breezy day than on a calm day, for the simple reason that on a windy day the different layers of air are always equalising the temperature by intermingling one with another, and by taking up the temperature of those surfaces over which they flow which get hotter by direct solar radiation than the air.

To put it briefly: if with a given atmospheric diathermancy, the sun's rays are to raise the surface of an object on the ground to a given temperature, the time required will be longer in wind than in calm, it being supposed that the wind has been blowing long enough to impart its temperature to that surface.

This subject has been discussed at some length in the hope that readers of the Magazine will give their views as to the significance to be attached to the readings of the black bulb thermometer, and its companion in adversity the bright bulb. I have never yet come across an intelligent person who received the ordinary instructions about the black or bright bulb with contentment, and think that in a great national Exhibition these instruments should be allowed to hold their own ground, or else that they should be withheld from view altogether.

The next article will treat of some subjects connected with the cartographical and photographic exhibits.

(*To be continued.*)

ROYAL METEOROLOGICAL SOCIETY.

THE last meeting for the present session was held at the Society's rooms, 70, Victoria Street, Westminster, on Wednesday afternoon, June 17th, Dr. H. R. Mill, President, in the Chair.

Mr. R. H. Hooker read a paper on "An elementary explanation of Correlation." This was an account of an important method of dealing with statistics, which the author illustrated by records of rainfall, and the depth of water in a well at Cirencester.

Put into simple language correlation is simply the measure of the similarity of two curves representing the variation, with time, of two different phenomena. The eye can usually tell whether the curves are, on the whole, like or unlike, but an exact method is required to show just how like they are, and consequently what the probability is that the two phenomena are related, either by cause and effect, or as effects of a common cause. The first essential is to find the average, but this, so far from being the end, is only the beginning of the discussion of the figures. The second essential is to find the variability of the observations in the series from the average, and this may be expressed by the *mean deviation* which is simply the mean of the deviations from the average, irrespective of sign; but a better test is the *standard deviation* which is the square root of the mean of the sum of the squares of all the deviations in the series, and is represented by σ. It is a fact in statistics that practically half the number of observations in any series, differ from the average by less than two-thirds of the standard deviation, and it is also the case that values differing from the average by more than three times the standard deviation, very rarely occur. To measure the degree of correlation between two curves, we multiply the deviation of one curve from its mean at certain points, by the deviation of the other curve from its mean at the same points, say of time; then, when both deviations are positive or both negative, the product will necessarily be positive, but when one is positive and the other negative (*i.e.* when the curves at the point are strikingly divergent) the product is negative. The more coincidences either above or below the mean, the larger is the total sum, and the more divergences, the smaller is the total sum, so that a large positive figure means that there is a high degree of resemblance between the two curves. Denoting deviations from the mean in one curve by x, and deviations in the other curve by y, then the sum of the products obtained is $x_1y_1 + x_2y_2 + x_3y_3 + \ldots + x_ny_n$, there being n values of each of the two variables measured. Or, generally, this may be expressed as $\Sigma(xy)$, *i.e.*, the sum of all quantities like x multiplied by y. So the more our curves are alike the bigger is $\Sigma(xy)$. The greatest possible value of this quantity is $n\sigma_x\sigma_y$, and accordingly the *correlation coefficient*, as it is called, is obtained by dividing $\Sigma(xy)$ by n times the product of the standard deviations (σ_x and σ_y) of the two curves, *i e.*,

the correlation coefficient $r = \frac{\Sigma(xy)}{n\sigma_x\sigma_y}$. It can be proved mathematically that:—(1) r always lies between the limits $\pm$ 1. (2) If the two curves are so alike that they both rise and fall together, and always in the same proportion, $r = +1$ exactly. (3) If when one goes up the other always goes down, and also always in the same proportion, $r = -1$ exactly. (4) If there is no correspondence whatever between the two curves, *i.e.*, if a big positive deviation in one is accompanied sometimes by a big positive deviation in the other, sometimes by a negative, and sometimes by no deviation, then $r = 0$. Hence the more one curve is dependent upon the other and resembles it, the greater is r, positive if an increase in the one causes an increase in the other, and negative if an increase in the one causes a decrease in the other.

A paper on the "Hongkong Typhoon of September 18th, 1906" by Mr. Lawrence Gibbs, was, in the absence of the author, read by the Secretary. The fact which brought this typhoon into prominence was the failure of the Hongkong, Manila, and Zikawei observatories to give adequate warning, and the consequent heavy damage to shipping in Hongkong harbour which was accentuated by the fact that the typhoon centre passed to the north of the harbour, thus causing a north-westerly gale backing to southerly The harbour is much less sheltered from the west than from any other quarter, and consequently, 45 merchant vessels were either badly injured, stranded, or foundered, 80 steam launches out of a total of 256 were permanently or temporarily disabled, and a great number of lighters, junks, and small craft broken up. Sixteen Europeans lost their lives; 2,385 Chinese were reported missing, but it is probable that this figure was considerably exceeded. Judged by anemometer records the typhoon was by no means severe, the highest average hourly wind velocity being 70 miles. The Observatory of Zikawei came more nearly than any other to an adequate forecast. The Hongkong Observatory did not consider the observations available on the 16th and 17th justified the issue of any typhoon warnings, but as at 8 a.m. on the 18th it was found that the barometer was falling rapidly, and the weather appearing threatening, orders were given to hoist the Black Drum—the weather signal indicating that a typhoon was within 300 miles to the eastward of the Colony, and at 8 a.m. the typhoon gun was fired, indicating that a strong gale of wind was expected to blow. This was only about an hour before the storm was at its worst. The author says that there is no doubt that it was the small area covered by this typhoon which caused the failure of the forecast. We dealt with the question of the forecast in our January number (vol. **42**, p. 240).

Mr. H. C. V. Baines, Mr. J. N. Hood, Mr. B. F. E. Keeling, M.A., Mr. V. C. Large, the Hon. C. S. Rolls, M.A., and Capt. T. S. Weston were elected Fellows of the Society.

At the Royal Agricultural Society's Show recently held at Newcastle-on-Tyne, the Royal Meteorological Society had a very interesting and attractive exhibit presenting information which is useful not only to those engaged in agricultural pursuits, but also to the general public.

There were a large number of diagrams relating to rainfall, temperature, sunshine, the influence of weather on crops, health, etc., and also a very fine collection of photographs illustrating meteorological phenomena. Various patterns of self-recording and other meteorological instruments were shown, and as some of these were at work, the visitors saw the weather changes which were taking place.

The methods adopted for obtaining information on the meteorological conditions prevailing in the upper regions of the atmosphere were fully illustrated. A large kite with a meteorograph, and also a *ballon-sonde* carrying a small meteorograph, were suspended from the roof of the building.

In a railed off enclosure, on the ground adjoining the Agricultural Education and Forestry Exhibition, a fully-equipped climatological station was arranged, with the various instruments in position, and at this station an address was given each day by Mr. W. Marriott on "Meteorology in Relation to Agriculture."

The Prince and Princess of Wales, when they visited the Show, spent some time in this exhibit, and were much interested in the upper air investigation.

THE WEATHER OF JULY, 1908.

By Fred. J. Brodie.

The fine dry weather experienced over a large portion of the country in the latter half of June continued through the opening days of July. On the 2nd or 3rd of the month the thermometer in the shade rose to between 80° and 85° in nearly all the inland districts, and as far north even as the northern highlands of Scotland. At Camden Square, Poltalloch (Argyllshire) and Clifton it reached 87°, and at Barnet 88°, while at Dumfries it touched 91°; the weather over the country as a whole being warmer than at any other time during the present summer.

On the 3rd and 4th a change was heralded by the appearance in many places of thunderstorms and heavy rains, followed by a rapid decrease in temperature. Thenceforward to about the middle of the month or a little later a very disturbed condition of the atmosphere was produced by numerous cyclonic areas which advanced over the kingdom, mostly from the westward or southward. Rain was frequent, and in all the northern, eastern and central parts of England it was often very heavy, and temperature was, as a rule, below the average, the coolest weather occurring with a brisk northerly breeze which swept over the country on the 16th and 17th. On those days the shade maxima were below 60° in many districts, and slightly below 55° at some northern stations. Ground frost was experienced

at several places in the western and northern parts of Great Britain between the nights of the 5th and 7th, the exposed thermometer falling to 25° at Crathes, 28° at Balmoral and 29° at Llangammarch Wells.

On the 12th, when a shallow cyclonic system advanced from the west of France to the south-east of England, some remarkable oscillations in barometrical pressure were observed at our south-eastern stations and in many neighbouring parts of the Continent.*

After the 18th of the month the weather in all but the extreme northern and north-western parts of the United Kingdom was influenced mainly by anticyclonic systems, and was therefore again fair and dry, the only important interruption occurring on the 24th and 25th, when a "V-shaped" depression came in from the Atlantic and produced a little rain in the western and northern districts generally. The brilliant sunshine which prevailed so widely was accompanied as a rule by cool breezes, and it was only in the eastern, central and southern parts of England that the thermometer ever touched 80°, readings slightly above that level being recorded locally at various times between the 21st and 25th, and again on the 29th and 30th. On the 30th the shade maxima were as high as 86° at Barnet and 84° at Camden Square and Epsom.

The effect of the summer heat which prevailed at the beginning and end of the month was counterbalanced by the coolness of the intervening period, and over the country generally the mean temperature of the month was slightly below the average. The deficiency of warmth was greater in the daytime than at night. At the official London station in connection with the Meteorological Office the thermometer did not once fall below 50°, an event that has occurred in only two other Julys of the past 36 years, viz., in 1899 and 1904.

REVIEWS.

The Observer's Handbook. Meteorological Office. A new and revised edition of Dr. R. H. Scott's Instructions in the Use of Meteorological Instruments. Published by the Authority of the Meteorological Committee. London. Printed for H.M. Stationery Office. 1908. Price 3s. Size 9½ × 6. Pp. 134.

THE book though dull and official in its appearance, and high in price, is a clear and trustworthy compendium of the whole duty of the meteorological observer. Dr. Shaw explains in the preface that in preparing this new edition Mr. Lempfert has revised the tables to bring them into harmony with the decisions of the International Meteorological Conference. The book has been rendered more serviceable to the observer throughout by eliminating many theoretical details and laying greater stress on matters of more direct interest. The earnest desire for uniformity animates the whole work, which we

* See p. 135.

cannot recommend too strongly to the attention of our readers; and Dr. Shaw carries this laudable feeling so far as to expound his proposed system of absolute units the adoption of which would have the great merit of imposing an equal change on all countries.

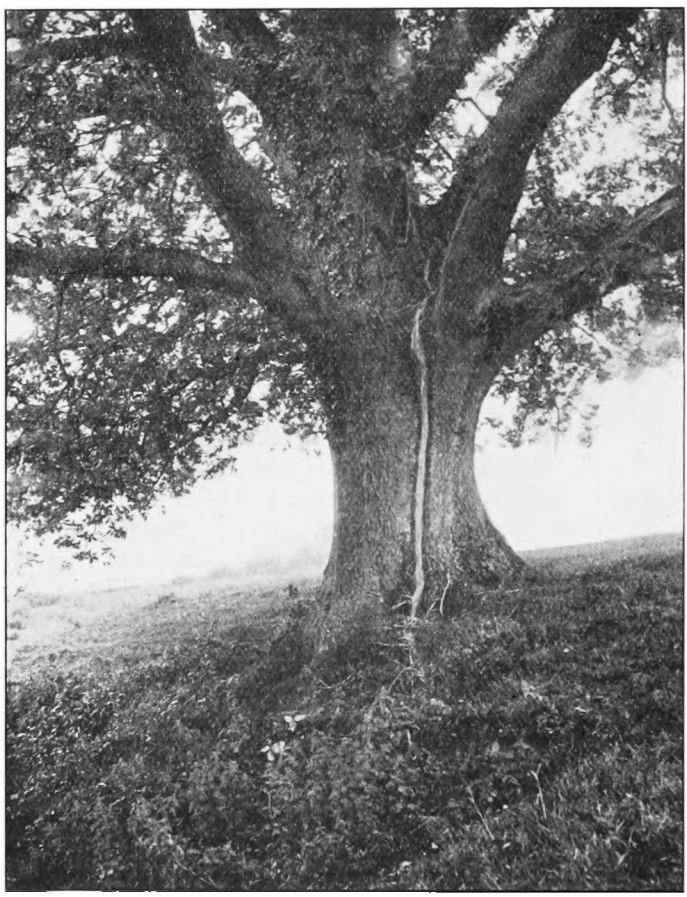
La Foudre et les Arbres. Etudes sur les Foudroiements d'Arbres constatés en Belgiques pendant les années [Lightning and Trees, a study of the cases of trees being struck by lightning in Belgium during the years] 1884-1906. Par E. VANDERLINDEN. Bruxelles. Service Metéorologique de Belgique. 1907.

THE results of the discussion as summarised in the original paper are as follows: In Belgium the trees most subject to lightning-stroke are the several species of poplar, the oaks and conifers. It cannot be asserted that any species is entirely spared. The species which in a given region furnishes the most victims is not always that which is most widely distributed, but that which attains the greatest height and grows habitually in an open situation. There is nothing to prove that shape, anatomical features, chemical composition and electric conductivity of wood, nature of soil or proximity to a sheet of water are main factors in conducting lightning *towards* a tree. Proportionally to the number of individuals present lightning is least destructive to trees in forests, woods, copses and compact groups generally. Isolated trees in plains are most susceptible to lightning stroke. The form and dimensions of the wounds are determined not only by the intensity of the discharge but also by the resistance and anatomical properties of the wood. In a series of trees lightning chooses the most elevated. It is probable that the passage of lightning does not always leave visible traces, notably in the case of trees with a smooth bark. The use of trees as lightning conductors is not advisable, for the proximity of elevated and isolated trees augments the risks of injury to buildings. Complete or partial combustion of a tree by lightning is exceptional.

It will be seen that M. Vanderlinden arrives at the conclusion that certain species of trees are more frequently damaged than others by reason of accidental circumstances such as their predominance in a given region, their habit of growing in exposed situations, and their greater height and size, but not by reason of specific qualities of wood or foliage. Thus the great frequency with which poplars are struck in Belgium is attributable to their abundance. On the other hand, alder, service and fruit trees being relatively uncommon and of small stature, are seldom struck. In England there is a widespread belief that the oak is more often struck than other forest trees, and this belief would seem to figure in English literature (King Lear's "*oak*-cleaving thunderbolts," to wit).* But here again the apparent

* We reproduce here an excellent photograph of an oak struck by lightning at Ambersham, near Midhurst, on June 1st or 2nd, 1906, for which we are indebted to Mr. G. H. M. Whish.

susceptibility of the oak is very probably entirely due to the fact that the oak is par excellence *the* tree of England, being found in abundance everywhere except the uplands, where in these latitudes trees hardly grow at all, and the smoke-laden town and manufacturing areas where curiously enough planes and other imported species will endure conditions which the native or long-naturalised forest trees will not. In England also (and this supports the Belgian results) one seldom finds damage done to oaks in wood or coppice, but very



Oak struck by Lightning.

often to isolated ones in pasture—those creatures perfect in form and beauty, which may be seen dominating a meadow in almost any county, and give so much of character to English scenery.

We have not space here to notice the many interesting questions discussed or opened out by M. Vanderlinden, but quote for the years 1881-1906 the number of cases of lightning-stroke, expressed in percentage of the general total, for the following species of trees :—

Poplar	55·6	Ash	1·3	French Chestnut..	0·5
Oak	13·9	Lime.....	1·2	Service.....	0·5
Elm	7·0	Apple	1·1	Plum	0·4
Conifers	6·8	Acacia	1·1	Sweet or Spanish Chestnut.....	0·3
Beech	3·8	Cherry	1·0	Alder	0·1
Pear	2·7	Walnut	0.7		
Willow.....	1·5	Birch	0·5		

L.C.W.B.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

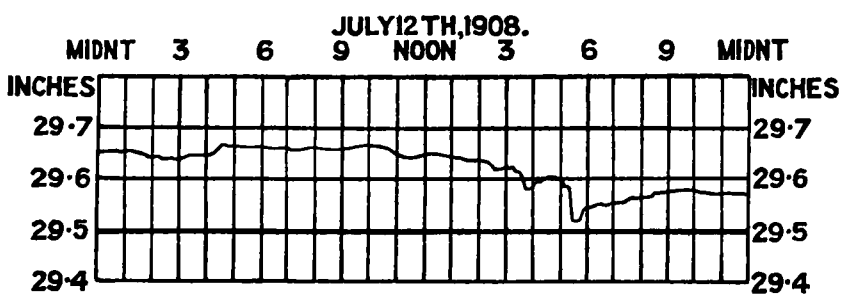
BAROMETRIC OSCILLATIONS, JULY 12th.

SOME remarkable barometric oscillations occurring here on July 12th, a tracing from the record is sent herewith. They would appear to have been attributable to the formation of thunder-bearing disturbances, as the atmospheric conditions prevailing on the day in question were in a very unstable condition, a marked diversity both of velocity and direction being noticed in the upper and lower currents.

The early morning was overcast, the sky being covered with stratus cloud, a dead calm prevailing with a humid atmosphere. At noon, stratus was visible at a low elevation, moving slowly from N.W., with cumulus clouds at distant levels above, the upper moving from S.W., the lower from N.E., currents in direct opposition therefore prevailing. Thunder-clouds moved up from S. at 1 p.m., but passed over. There was a sharp shower at 2 p.m., followed by heavy rain of a thunder type between 2.55 p.m. and 3.25 p.m., and a further fall from 3.45 p.m. to 5 p.m. At 6 p.m., thunder-clouds were visible in N.W., N. and N.E., with a blue black thunder pall lying to S. and S.E. Heavy distant rolling thunder was heard in S. and S.E., between 6.20 p.m. and 6.45 p.m. The surface winds were calm and light variable airs N. to N.E. to 2 p.m., then veering through E. to S. and S.W.

SPENCER C. RUSSELL, F.R.Met.Soc.

Epsom, Aug. 1st, 1908.



[We do not reproduce Mr. Russell's barograph, or a very similar one kindly forwarded by Mr. J. H. Tritton, of Lyons Hall, Great

Leigh, Essex, on account of their small size; but give instead a facsimile of the trace of the Redier barograph at Camden Square, which shows the remarkable oscillations referred to with great distinctness. We do not remember to have seen a similar curve on any previous occasion.—ED. *S.M.M.*]

HEAVY RAINFALL AT HERNE BAY.

A REMARKABLE rainstorm visited Herne Bay early on July 13th, when in about 3½ hours 2·65 in. fell. The downfall started about 5 o'clock in the morning, and is described by the local press as having the appearance of a cloudburst. The torrential downpour continued without any appreciable abatement till nearly 8 o'clock, when it became less steady, and finally at 8.30 ceased for a time. A fresh breeze from the N. blew for an hour or so, the sky continuing very lowering. The wind then gradually backed to W., and light rain fell at intervals till the evening—the measurement, however, since the cessation of the deluge was only a few hundredths of an inch. Everything possible was done to cope with the enormous amount of water, but in spite of the efforts of the engineer at the pumping station many low-lying streets, fields and cellars were flooded. The rains of that week were altogether a record for Herne Bay, as this storm was followed by further heavy downpours on the Thursday, Friday and Saturday, July 16th—18th; thus, from Sunday, 12th, to Saturday, 18th, inclusive, over 4½ inches were measured.

A. IZZARD.

HEAVY RAINFALL ON JUNE 13th IN SNOWDONIA.

AT Cwm Dyli, rain began to fall on this date at 4.30 a.m., and continued gently all the morning with occasional dry intervals. Up to noon, ·45 in. had fallen. The downpour in the afternoon was much heavier, and from noon to 6 p.m. ·93 in. fell. Afterwards a sleety driving rain continued all the evening until nearly midnight, when it cleared up and the moon was visible. The total rainfall for the 24 hours was 2·02 in.

At Llyn Llydaw rain gauge, a still heavier rainfall was measured. From 9 a.m. to 8 p.m. 5·50 in. fell.

A. LOCKWOOD.

Cwm Dyli, Beddgelert.

ERRATUM in July number, p. 122 :—Llanberis, Pen-y-pass, *for* 5·50 *read* 7·34.

REPORT UPON DRY PERIOD AND RAIN-MAKING EXPERIMENTS AT OAMARU, NEW ZEALAND.

By Rev. D. C. Bates, F.R.Met.Soc.

(*Continued from p.* 111.)

On Sunday, August 18th, the coming of what appeared to be merely a westerly area of low pressure developed into a cyclone, which promised greater rain and sooner than it would have come from the ordinary type, which would have culminated between 19th and 20th. There was a drizzle falling on Sunday morning at Omaru at 4 a.m., and at 9 a.m. ·04 in. was recorded. The day was dull and threatening, and rain set in again at night; ·40 in. was recorded in the morning. At Totara Station in the Kakanui Basin Mr. Macpherson recorded ·73 in. The rain was mostly confined to the sea coast while the barometer was falling. It was 29·99 in. on Saturday and 29·47 in. on Monday at 9 a.m. I expected much more rain would come with the rise of the barometer and the shift of the wind to the south, but as yet hardly any rain had fallen inland. The rain held off, but the skies continued cloudy. The Committee decided to experiment at Raki's Table when they heard no rain had fallen there. We left Oamaru at 12.30 p.m. on the 19th, and as we got out into the country found the roads dry, but "bad" weather was evidently working inland, and there was a very slight drizzle falling as we arrived at Arnmore about 1.45 p.m. Corporal Meikle was then making an explosion, which had apparently no effect, though the hygrometer showed that the air was saturated with moisture. Earlier, at 12.30, another shot had been fired, and artillerymen and others affirmed that it drew rain in fifteen minutes, and brought the clouds down on the Table, insomuch that the view of the surrounding country was obscured. We missed the artillerymen on the road, but, in company with Mr. Shand, I at once visited the top of the Table. We found the wind strong and gusty from the S.E. Thy sky was dark and lowering, and two showers fell before the artillerists returned. Raki's Table was then enveloped in a thick Scotch mist, spitting with rain, but heavy showers soon set in and continued to fall at intervals. I regarded these as perfectly natural, and was confirmed in my opinion when I learned that the rain squalls had the same intermittent character long before they reached us. It could hardly be maintained that the explosions would have so marked an effect as this on the rain, 14 miles away and against the sweep of a wind at the Table averaging about 25 miles an hour. While I saw no perceptible difference made in the showers sweeping down upon us and progressing over the country, others were quite as decided in their opinions that the rain thickened heavily after each successive shot.

The barometer continued to rise, and those who watched the instrument agreed there was no fall after the several shots. The

weather continued very raw and wet, but the hygrometer showed the same dew point as before.

The explosions were as follows:—

	Time.	Guncotton. lbs.	Dynamite. lbs.	Gunpowder. lbs.	Weight of Charge. lbs.	How made up.
(4)	12.30 p.m.	...	50	...	50	In 5 gall. oil drum
(5)	1.45 p.m.	...	...	50	50	do.
(6)	3.56 p.m.	...	50	...	50	do.
(7)	4.5 p.m.	...	65	...	65	In case.
(8)	4.17 p.m.	50	60	...	110	do.
(9)	4.30 p.m.	50	100	...	150	do.
		100	325	50	475	

Rain fell on the 19th and 20th over a very wide area in the South Island, and the falls at this time recorded by the observers of the Meteorological Office are as follows:—

	Windsor Park.	Otekaike.	Livingstone.	Armmore.	Kurow.	Waimate.	Oamaru.	Totara.	Kauroo Hill.
18th ...	·16	...	...	·03	...	...	·40	·73	...
19th ...	·53	1·15	·70	·52	1·17	·03	·36	·40	·10
20th ...	...	·15	·53	·09	·12	·50	...	·06	·70

The falls were very different at the various places, but such widespread and heavy rains could hardly be attributed to artificial means.

On the 22nd everything was ready for a trial upon a larger scale. There was a cloudy sky, a rapidly falling barometer, following a frosty night, and local indications fell in with the wider aspect of affairs—rain before long.

The explosions were as follows:—

RAKI'S TABLE.

	Time.	Guncotton. lbs.	Dynamite. lbs.	Gunpowder. lbs.	Weight of Charge. lbs.	How made up.
(10)	3.30 p.m.	...	100	...	100	In 10 gall. oil drum.
(11)	3.40 p.m.	...	100	...	100	do.
(12)	3.50 p.m.	50	150	...	200	do.
(13)	6 p.m.	...	150	50	200	In case and keg.
	DALGETY'S HILL, DUNTROON.					
(14)	3.30 p.m.	33	67	...	100	In 10 gall. oil drum.
(15)	3.39 p.m.	33	67	...	100	do.
(16)	3.49 p.m.	33	67	...	100	do.
	ROUND HILL, TOTARA.					
(17)	3.30 p.m.	25	25	...	50	In gun-cotton case.
(18)	3.40 p.m.	25	25	...	50	do.
(19)	3.50 p.m.	25	25	...	50	do.
(20)	3.55 p.m.	25	25	...	50	do.

The charges were primed with dry guncotton and fired by a dynamite detonator attached to a slow-burning fuse. In nearly all cases complete detonation took place, but it would have been much more satisfactory had each case of explosives been connected and the explosions made by electric current. In one instance it was noticed that three cases of dynamite exploded, one upwards and two others sideways, and not quite simultaneously, so that it appeared as if a single cap was not sufficient for complete detonation.

(*To be continued.*)

METEOROLOGICAL NEWS AND NOTES.

METEOROLOGY AT THE BRITISH ASSOCIATION promises to be well represented, as the President of Section A for the year is Dr. W. N. Shaw, Director of the Meteorological Office. We understand that M. Teisserenc de Bort will open a discussion on the Isothermal Layer of the Atmosphere, that Sir John Moore will discuss the question of change of climate, and that Captain Campbell Hepworth will deal with the relation between the surface water of the Atlantic and the strength of the trade winds. The meeting takes place at Dublin from September 3rd to 10th.

THE ANNUAL METEOROLOGICAL BREAKFAST, which is one of the unofficial features of the meeting of the British Association, will be held this year in Dublin, on Tuesday, 8th September, at 9 a.m. The place of meeting will be the Hall of the Royal College of Physicians of Ireland, by kind permission of the President and Fellows of the College, and Sir John Moore, M.D., will preside. The charge for the breakfast will be 3s. 6d. per head, and to facilitate arrangements it would be a great help if all meteorologists and observers who would like to take advantage of the opportunity of meeting, would intimate their intention to Dr. H. R. Mill, Reception Room, British Association, Dublin, not earlier than September 2nd, and not later than September 5th.

DR. H. R. MILL IS TO LECTURE on "Rain," at Thetford, for the Gilchrist Trust, on Thursday, 24th September.

THE EGYPTIAN DAILY WEATHER REPORT, some copies of which have been sent us by Captain Lyons, by whose Department it is published, contains an isobaric chart for 8 a.m. of the day of issue and of the day before, taking in the South of Europe as far west as Italy, and the country between the Nile and the Red Sea as far south as Mongalla on the confines of the Sudan and Uganda. The fact of daily weather reports being received at Cairo from the immediate neighbourhood of the equator is an impressive mark of progress.

EFFECTS OF THE DROUGHT.—Worried because he could not get the gardens to the perfection he desired, owing to the prolonged spell of dry weather, George Walker, the gardener of Sir George Doughty, committed suicide by taking prussic acid at Waltham. At the inquest yesterday a verdict of Suicide while temporarily insane was returned.—*Daily Mail, 8th July*, 1908.

LOCAL RAINFALL RECORDS IN NEWSPAPERS are fortunately very common and usually remarkably accurate; but the correspondents who have written us eager to vindicate their local paper have missed the point of our note on p. 97. We said that the *Norfolk Chronicle* was distinguished from other papers by printing monthly *records of daily rainfall*, and we are still without evidence that any other paper does so.

RAINFALL TABLE FOR JULY, 1908.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea.	RAINFALL OF MONTH.	
					Aver. 1870-99.	1908.
		° ′	° ′	ft.	in.	in.
Camden Square	*London*	51 32	0 8	111	2·49	3·36
Tenterden	*Kent*	51 4	*0 41	190	2·26	2·86
West Dean	*Hampshire*	51 3	1 38	137	2·62	1·34
Hartley Wintney	,,	51 18	0 53	222	2·38	1·60
Hitchin	*Hertfordshire*	51 57	0 17	238	2·55	2·91
Winslow (Addington)	*Buckinghamshr.*	51 58	0 53	309	2·77	2·07
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·91	3·42
Brundall	*Norfolk*	52 37	*1 26	66	2·70	3·29
Winterbourne Steepleton	*Dorset*	50 42	2 31	316	2·78	2·20
Torquay (Cary Green)	*Devon*	50 28	3 32	12	2·73	1·28
Polapit Tamar [Launceston]	,,	50 40	4 22	315	2·93	2·55
Bath	*Somerset*	51 23	2 21	67	2·83	2·53
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·90	1·83
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·66	3·20
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·75	2·39
Boston	*Lincolnshire*	52 58	0 1	25	2·44	3·23
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·51	2·44
Derby (Midland Railway)	*Derbyshire*	52 55	1 28	156	2·63	2·45
Bolton (Queen's Park)	*Lancashire*	53 35	2 28	390	4·12	5·85
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	2·61	2·72
Arncliffe Vicarage	,, ,,	54 8	2 6	732	4·97	6·45
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·50	2·44
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·91	2·85
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	9·37	8·20
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	3·52	3·02
Haverfordwest (High Street)	*Pembroke*	51 48	4 58	95	3·70	4·82
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·27	4·87
Llandudno	*Carnarvon*	53 20	3 50	72	2·61	2·54
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	3·30	4·26
Hawick (Branxholm)	*Roxburgh*	55 24	2 51	457	3·34	2·69
Edinburgh (Royal Observy.)	*Midlothian*	55 55	3 11	442	...	3·32
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	3·60	4·58
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·36	2·03
Tighnabruaich	*Argyll*	55 55	5 14	50	4·33	6·11
Mull (Quinish)	,,	56 36	6 13	35	4·38	4·36
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	3·03	1·95
Braemar	*Aberdeen*	57 0	3 24	1114	2·89	2·82
Aberdeen (Cranford)	,,	57 8	2 7	120	3·02	2·31
Cawdor	*Nairn*	57 31	3 57	250	3·34	1·42
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	3·10	2·01
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	6·46	2·43
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·82	1·95
Castletown	*Caithness*	58 35	3 23	100	...	1·47
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	3·99	3·56
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·10	3·86
Broadford (Hurdlestown)	*Clare*	52 48	8 38	167	2·94	3·81
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·05	2·35
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·63	2·08
Ballinasloe	*Galway*	53 20	8 15	160	3·31	1·46
Clifden (Kylemore House)	,,	53 32	9 52	105	6·15	...
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	3·59	2·27
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·65	2·47
Seaforde	*Down*	54 19	5 50	180	3·40	3·87
Londonderry (Creggan Res.)	*Londonderry*	54 59	7 19	320	3·47	4·18

RAINFALL TABLE FOR JULY, 1908—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1870-99. in.	1908. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1870–1899. in.	STATION.
+ ·87	135	·81	16	12	13·12	14·93	+1·81	114	25·16	Camden Square
+ ·60	126	·57	16	12	13·81	12·53	—1·28	91	28·36	Tenterden
—1·28	51	·54	16	10	15·23	13·49	—1·74	89	29·93	West Dean
— ·78	67	·60	16	9	13·97	14·28	+ ·31	102	27·10	HartleyWintney
+ ·36	114	·57	14	16	12·81	13·62	+ ·81	106	24·66	Hitchin
— ·70	75	·48	14	13	14·05	15·23	+1·18	109	26·75	Addington
+ ·51	118	·72	13	12	13·23	13·82	+ ·59	104	25·39	Westley
+ ·59	122	1·18	13	14	12·82	14·34	+1·52	112	25·40	Brundall
— ·58	79	·90	16	11	19·14	14·77	—4·37	77	39·00	Winterbourne Stpltn
—1·45	47	·30	16	10	17·78	11·99	—5·79	67	35·00	Torquay
— ·38	87	·79	16	14	18·38	18·59	+ ·21	101	38·85	Polapit Tamar
— ·30	89	·94	8	12	15·86	12·46	—3·40	79	30·75	Bath
—1·07	63	·65	16	13	15·73	12·58	—3·15	80	29·85	Stroud
+ ·54	120	·66	16	13	16·97	18·20	+1·23	107	33·04	Wolstaston
— ·36	87	·53	9	10	15·31	14·27	—1·04	93	29·21	Coventry
+ ·79	132	·73	8	17	12·20	13·62	+1·42	112	23·30	Boston
— ·07	97	·64	8	13	13·32	13·21	— ·11	99	24·70	Hodsock Priory
— ·18	93	·55	9	11	14·11	13·99	— ·12	99	26·18	Derby
+1·73	142	1·55	16	15	20·87	26·38	+5·51	126	42·43	Bolton
+ ·11	104	·71	8	12	14·24	16·57	+2·33	116	26·96	Ribston Hall
+1·48	130	1·48	16	18	31·44	36·76	+5·32	117	60·96	Arncliffe Vic.
— ·06	97	·76	8	14	13·74	12·74	—1·00	93	27·02	Hull
— ·06	98	·82	8	15	14·26	14·58	+ ·32	102	27·99	Newcastle
—1·17	88	2·30	16	20	66·73	66·49	— ·24	100	132·68	Seathwaite
— ·50	86	1·02	16	10	20·71	16·38	—4·33	79	42·81	Cardiff
+1·12	130	1·41	9	13	23·37	21·87	—1·50	94	47·88	Haverfordwest
+ ·60	114	1·08	9	16	21·86	24·98	+3·12	114	45·41	Gogerddan
— ·07	97	·65	9	12	14·79	17·95	+3·16	122	30·98	Llandudno
+ ·96	129	·76	8	16	22·05	27·47	+5·42	125	43·43	Cargen
— ·65	81	·62	8	12	18·00	18·35	+ ·35	102	34·80	Branxholm
...	...	·68	12	12	...	14·27	...	...	...	Edinburgh
+ ·98	127	·81	16	23	24·12	27·83	+3·71	115	48·87	Girvan
—1·33	60	·74	8	13	18·30	19·64	+1·34	107	35·80	Glasgow
+1·78	141	1·08	22	15	28·98	35·99	+7·01	124	57·90	Tighnabruaich
— ·02	100	·93	29	17	28·22	28·87	+ ·65	102	57·53	Quinish
—1·08	64	·37	8	14	15·12	11·74	—3·38	78	28·95	Dundee
— ·07	98	...	...	...	17·83	19·93	+2·10	112	36·07	Braemar
— ·71	77	·60	16	14	16·71	14·46	—2·25	87	33·01	Aberdeen
—1·92	42	·48	17	8	15·26	13·34	—1·92	87	29·37	Cawdor
—1·09	65	·52	11	15	22·40	24·25	+1·85	108	43·71	Fort Augustus
—4·03	38	·41	16, 21	15	42·50	50·88	+8·38	120	86·50	Bendamph
— ·87	69	·70	10	10	16·27	21·60	+5·33	133	31·60	Dunrobin Castle
...	...	·31	10	20	...	19·02	...	...	...	Castletown
— ·43	89	·61	15	23	29·98	24·67	—5·31	82	58·11	Killarney
+ ·76	124	1·08	7	13	20·29	18·04	—2·25	89	39·30	Waterford
+ ·87	130	·75	12	15	17·06	19·60	+2·54	115	33·47	Hurdlestown
— ·70	77	·50	16	16	18·25	17·32	— ·93	95	35·19	Abbey Leix
— ·55	79	·52	7	13	14·51	13·81	— ·70	95	27·75	Dublin
—1·85	44	·42	16	16	19·23	18·26	— ·97	95	37·04	Ballinasloe
...	...	...	...	...	40·44	...	...	...	80·23	KylemoreHouse
—1·32	63	·34	16	21	25·33	30·25	+4·92	120	50·50	Enniscoe
—1·18	68	·42	11	19	21·16	26·78	+5·62	127	41·83	Markree Obsy.
+ ·47	114	·82	12	14	20·32	23·39	+3·07	115	38·61	Seaforde
+ ·71	120	·78	13	21	20·54	24·16	+3·62	118	41·20	Londonderry

SUPPLEMENTARY RAINFALL, JULY, 1908.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	3·82	XI.	Rhayader, Tyrmynydd	5·93
,,	Ramsgate	3·27	,,	Lake Vyrnwy	5·06
,,	Steyning	3·48	,,	Llangyhanfal, Plâs Draw	2·48
,,	Hailsham	3·17	,,	Criccieth, Talarvor	3·87
,,	Totland Bay, Aston House	1·55	,,	Llanberis, Pen-y-pass	13·88
,,	Emsworth, Redlands	1·87	,,	Lligwy	3·77
,,	Stockbridge, Ashley	1·51	,,	Douglas, Woodville	3·74
,,	Reading, Calcot Place	1·71	XII.	Stoneykirk, Ardwell House	2·83
III.	Harrow Weald, Hill House.	3·71	,,	Dalry, The Old Garroch	4·55
,,	Oxford, Magdalen College	1·97	,,	Langholm, Drove Road	4·01
,,	Pitsford, Sedgebrook	3·78	,,	Moniaive, Maxwelton House	3·89
,,	Huntingdon, Brampton	2·56	XIII.	N. Esk Reservoir [Penicuick]	2·75
,,	Woburn, Milton Bryant	2·07	XIV.	Maybole, Knockdon Farm	2·87
,,	Wisbech, Bank House	2·42	XV.	Campbeltown, Witchburn	3·75
IV.	Southend Water Works	3·44	,,	Inveraray, Newtown	5·79
,,	Colchester, Lexden	3·08	,,	Ballachulish House	4·75
,,	Newport, The Vicarage	2·75	,,	Islay, Eallabus	4·20
,,	Rendlesham	4·31	XVI.	Dollar Academy	3·74
,,	Swaffham	3·38	,,	Loch Leven Sluice	3·28
,,	Blakeney	2·75	,,	Balquhidder, Stronvar	5·53
V.	Bishops Cannings	2·09	,,	Perth, The Museum	2·11
,,	Ashburton, Druid House	2·83	,,	Coupar Angus Station	2·05
,,	Honiton, Combe Raleigh	2·12	,,	Blair Atholl	2·57
,,	Okehampton, Oaklands	2·83	,,	Montrose, Sunnyside Asylum	1·65
,,	Hartland Abbey	2·71	XVII.	Alford, Lynturk Manse	4·58
,,	Lynmouth, Rock House	2·77	,,	Keith Station	4·39
,,	Probus, Lamellyn	2·09	XVIII.	N. Uist, Lochmaddy	3·33
,,	North Cadbury Rectory	1·64	,,	Alvey Manse	2·49
VI.	Clifton, Pembroke Road	2·18	,,	Loch Ness, Drumnadrochit.	1·70
,,	Ross, The Graig	1·64	,,	Glencarron Lodge	2·16
,,	Shifnal, Hatton Grange	2·45	,,	Fearn, Lower Pitkerrie	1·16
,,	Blockley, Upton Wold	3·12	XIX.	Invershin	1·56
,,	Worcester, Boughton Park.	1·80	,,	Altnaharra	1·30
VII.	Market Overton	2·81	,,	Bettyhill	1·79
,,	Market Rasen	3·27	XX.	Dunmanway, The Rectory	5·64
,,	Bawtry, Hesley Hall	2·81	,,	Cork	2·49
,,	Buxton	3·89	,,	Darrynane Abbey	4·17
VIII.	Neston, Hinderton Lodge	2·49	,,	Glenam [Clonmel]	3·10
,,	Southport, Hesketh Park	3·49	,,	Ballingarry, Gurteen	2·51
,,	Chatburn, Middlewood	5·21	,,	Miltown Malbay	3·01
,,	Cartmel, Flookburgh	4·01	XXI.	Gorey, Courtown House	3·47
IX.	Langsett Moor, Up. Midhope	3·40	,,	Moynalty, Westland	2·64
,,	Scarborough, Scalby	1·50	,,	Athlone, Twyford	2·28
,,	Ingleby Greenhow	2·51	,,	Mullingar, Belvedere	2·48
,,	Mickleton	2·10	XXII.	Woodlawn	1·89
X.	Bardon Mill, Beltingham	2·48	,,	Westport, St. Helens	1·94
,,	Ewesley, Fallowlees	2·61	,,	Mohill	2·44
,,	Ilderton, Lilburn Cottage	2·14	XXIII.	Enniskillen, Portora	2·27
,,	Keswick, York Bank	3·88	,,	Dartrey [Cootehill]	2·36
XI.	Llanfrechfa Grange	3·58	,,	Warrenpoint, Manor House	4·26
,,	Treherbert, Tyn-y-waun	8·41	,,	Banbridge, Milltown	3·94
,,	Carmarthen, The Friary	5·94	,,	Belfast, Springfield	3·77
,,	Castle Malgwyn [Llechryd].	3·79	,,	Bushmills, Dundarave	3·01
,,	Plynlimon	10·00	,,	Stewartstown	...
,,	Crickhowell, Ffordlas	4·20	,,	Killybegs	3·99
,,	New Radnor, Ednol	4·16	,,	Horn Head	3·46

METEOROLOGICAL NOTES ON JULY, 1908.

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

LONDON, CAMDEN SQUARE.—Hot, dry conditions prevailed at the beginning, the mean max temp. for the first three days being 85°·9. On 4th three TSS occurred with heavy R, ·43 in. falling between 2 and 2.30 p.m., and ·29 in. falling in 8 min. at 8.20 p.m. Dull and rainy weather continued to 18th, but the remainder was fine, bright and rainless. Duration of sunshine, 161·5* hours, and of R 44·8 hours. Shade max. 87°·3 on 3rd; min. 47°·2 on 20th. F 0, f 0.

TENTERDEN.—Duration of sunshine, 217·6† hours. Shade max. 79°·0 on 30th; min. 48°·0 on 6th, 20th and 21st. F 0, f 0.

TOTLAND BAY.—Duration of sunshine, 254·3* hours. Shade max. 80°·7 on 2nd; min. 51°·0 on 12th. F 0, f 0.

PITSFORD.—Mean temp. 61°·3. Shade max. 82°·4 on 2nd; min. 44°·0 on 8th.

TORQUAY.—Duration of sunshine, 224·9* hours, or 1·2 hours below the average. Mean temp. 62°·4 or 0°·6 above the average. Shade max. 78°·2 on 30th; min. 51°·3 on 13th. F 0, f 0.

NORTH CADBURY.—A hot, dry beginning, a cool, cloudy and showery spell following, with a brilliant fortnight at the end. Shade max. 89°·2 on 3rd; min. 47°·5 on 7th. F 0, f 0.

BATH.—Shade max. 84°·8 on 3rd; min. 49°·8 on 12th. F 0, f 0.

ROSS.—Shade max. 86°·8 on 3rd; min. 44°·8 on 29th. F 0, f 0.

HODSOCK.—Shade max. 83°·1 on 2nd; min. 39°·5 on 8th. F 0, f 1.

BOLTON.—Mean temp. 57°·6, or 0°·1 above the average. Duration of sunshine, 121·4* hours, or 25·6 hours below the average. Shade max. 81°·9 on 2nd; min. 44°·2 on 8th. F 0, f 0.

SOUTHPORT.—The first July in 12 years with excessive R, the total fall being ·50 above the average of 35 years. The duration of sunshine, 199·4* hours, was normal; duration of R, 55·3 hours. Mean temp 59°·5, or 0°·2 below the average. Shade max. 80°·8 on 3rd; min. 44°·1 on 8th. F 0, f 0.

HULL.—Shade max. 81°·0 on 22nd; min. 40°·0 on 8th. F 0, f 0.

HAVERFORDWEST.—Fine and warm, but with heavy R. A very unusual afterglow on 1st, 2nd and 3rd. Duration of sunshine 206·1* hours. Shade max. 83°·6 on 3rd; min. 43°·4 on 30th. F 0, f 0.

LLANDUDNO.—Shade max. 78°·8 on 3rd; min. 48°·2 on 29th. F 0, f 0.

DOUGLAS.—Apart from the first six days, which were warm and summer-like, the month was gloomy with low temp., and a good deal of R and fog.

DUMFRIES.—Shade max. 87°·0 on 2nd; min. 40°·0 on 29th.

MAXWELTON.—R ·60 in. above the average. Shade max. 90°·0 on 2nd; min. 35°·0 on 8th.

EDINBURGH.—Shade max. 74°·7 on 2nd; min. 45°·7 on 6th. F 0, f 0.

COUPAR ANGUS.—The weather was all that could be desired, and all crops give great promise of abundance. Remarkable refraction of sunlight on 1st and 2nd, when a newspaper was read at midnight, and artificial light was unnecessary for railway signalling. Shade max. 83°·5 on 2nd; min. 37°·0 on 19th.

FORT AUGUSTUS.—Shade max. 72°·2 on 2nd; min. 44°·0 on 26th.

WATERFORD.—Shade max. 82°·0 on 4th; min. 43°·0 on 12th.

DUBLIN.—Shade max. 74°·7 on 4th: min. 49°·0 on 15th and 19th. F 0, f 0.

MARKREE.—Shade max. 78°·8 on 1st; min. 39°·0 on 21st. F 0, f 1.

WARRENPOINT.—Shade max. 75°·0 on 4th; min. 39°·0 on 24th. F 0, f 0.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, February, 1908.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Maximum. Date.	Minimum. Temp.	Minimum. 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	54·5	17	28·0	13	47·9	35·8	38·1	88	84·9	24·2	1·68	15	6·5
Malta	63·5	29	41·5	4	57·5	49·8	43·5	74	128·0	...	2·44	10	5·2
Lagos	92·0	3	72·0	3	89·6	75·8	74·9	75	154·0	67·0	·15	1	7·6
Cape Town	87·4	6	51·5	9	77·2	59·1	56·5	67	...	...	·33	4	2·6
Durban, Natal ...	90·9	20	63·0	6	83·6	68·8	...	...	154·6	...	3·27	15	5·0
Johannesburg	81·9	15	51·0	7	77·5	56·5	54·7	72	155·2	49·3	1·98	10	4·1
Mauritius	87·9	6	65·5	14	84·6	71·5	69·5	76	147·2	59·0	8·12	15	5·8
Calcutta...	94·1	28	51·3	9	85·2	61·1	57·8	62	146·4	42·7	·00	0	1·6
Bombay...	90·2	8	60·4	5	83·6	68·3	62·9	66	138·7	52·4	·06	1	0·6
Madras	92·3	16	63·9	12	86·5	68·2	69·1	79	141·2	59·3	·48	4	2·6
Kodaikanal	72·6	4	42·8	9	65·2	46·3	42·7	55	133·8	20·7	4·99	3	3·7
Colombo, Ceylon ...	93·0	8	67·0	16	87·7	72·6	70·8	71	161·1	63·8	1·57	3	4·0
Hongkong	75·2	29	43·7	19	62·3	54·9	51·6	76	129·1	...	2·83	12	8·3
Melbourne	...	...	...	...	...	...	...	...	...	...	...	...	...
Adelaide	104·0	7	49·9	16	87·2	62·5	53·1	47	156·0	42·6	·48	5	4·3
Coolgardie	101·0	11	49·9	8, 14	86·0	59·2	51·1	46	173·9	47·0	·94	5	3·0
Perth	100·0	21	50·5	7	83·8	61·8	55·1	54	157·2	47·9	·39	2	3·0
Sydney	91·3	8	60·0	29	76·9	65·8	63·3	76	130·9	54·5	6·90	22	6·7
Wellington	79·0	16	49·0	1, 27	68·8	55·2	52·5	71	129·0	36·0	·03	1	5·0
Auckland	82·0	16	56·0	1	74·3	60·8	57·3	65	143·0	50·0	·54	5	4·5
Jamaica, Kingston ...	89·1	4	64·6	16	86·7	67·9	66·4	74	...	...	1·29	5	4·3
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	85·4	17	76·0	4	82·6	72·4	66·3	70	152·4	...	1·18	11	3·4
Toronto	44·3	13	-17·5	4	27·3	...	...	85	...	...	3·77	15	6·0
Fredericton	49·2	15	-29·0	4	26·0	3·0	...	79	...	...	2·87	5	5·4
St. John's, N.B. ...	50·0	16	-13·2	5	29·7	12·2	...	...	...	...	3·49	14	4·9
Victoria, B.C.	51·2	23	23·7	2	45·9	36·1	...	84	...	...	4·32	16	7·0

MALTA.—Mean temp. of air, 53°·3. Average hours of bright sunshine, 5·9.

Johannesburg.—Rainfall very deficient. Bright sunshine, 238·4 hours.

Mauritius.—Mean temp. of air 0°·9, dew point 1°·4, and relative humidity 1·3 per cent., below, and R 1·43 in. above, averages. Mean hourly velocity of wind, 11·0 miles, or equal average, L on 3 days.

MADRAS.—Mean temp. of air slightly above average. Bright sunshine, 235·9 hours.

KODAIKANAL.—Bright sunshine, 225 hours, TS one day and hoar frost on 3 days.

COLOMBO.—Mean temp. of air, 79°·8 or 0°·4 below, of dew point, 0°·3 above, and R ·53 in. below averages. Mean hourly velocity of wind, 6·1 miles.

HONGKONG.—Mean temp. of air, 58°·3. R 1·08 in. above average. Bright sunshine, 87·4 hours, mean hourly velocity of wind, 14·8 miles.

Adelaide.—Mean temp. of air 0°·8 above average, and R about the average.

Sydney.—Mean temp. of air 0°·3, and R 2·18 in., above average.

Wellington.—Mean temp. of air 0°·3, and R 3·33 in., below average.

Auckland.—Unusually dry; R one seventh of the average for 42 years.

RAINFALL OF THAMES VALLEY AUGUST, 1908.

Symons's
Meteorological Magazine.

No. 512. SEPTEMBER, 1908. Vol. XLIII.

THE BRITISH ASSOCIATION AT DUBLIN.

The British Association met at Dublin from September 2nd to 9th; and though the weather was uncertain there is no doubt that the meeting was the most successful of recent years. From the point of view of Meteorology it was certainly the best since the Southport meeting in 1903; but even so it was none the less clear that the position of Meteorology is far from satisfactory in the framework of the Sections. With Dr. W. N. Shaw as President of Section A. our science was more favourably circumstanced than in any previous year; but despite the efforts of the President, ably seconded as they were by the Secretaries, no meeting ever showed more plainly the inferior position of Meteorology, even as compared with other observational sciences. Section A., on this occasion, was divided into three sub-sections—Mathematics, General Physics, and Cosmical Physics; but there were also general meetings of the whole section, of indeterminate length, so that it was sometimes impossible to know at what hour the sub-sections would meet. Again, in the sub-section of Cosmical Physics, Meteorology and Astronomy were mixed together in a way that was satisfactory neither to the astronomer nor to the meteorologist. We have long felt that many physicists and more mathematicians view meteorology with scant respect and less affection; yet every effort that has been made to secure for the humble observational science a position of independence, has resulted in a hardening of their hearts, and a determination not to let it go. We regret this the more, because we are of opinion that meteorological observers require to have their efforts reinforced by the sympathetic assistance of physicists trained in the more rigid discipline of the laboratory, and that these in turn are in need of being brought to a realizing sense of the manner in which physical problems are presented in Nature, subject to the play of interacting forces, which cannot always be disentangled and dealt with in detail. The British Association, of all the scientific bodies in this country, is the one least suited for bringing the observer and the theoretical investigator into touch, and enabling each to understand the standpoint and the aims of the other. We regret to be obliged to record the opinion that this is not the result of the actual arrangement, and we do not

believe that meteorology will ever be properly respected, or its true position understood in the British Association, unless it is made a separate section, or at least a sub-section, meeting, it may be, only on two or three days, but with a chairman of its own, and meetings, the hour of commencement of which can be definitely announced.

No doubt the same thing may be said for several other branches of science, and indeed the experience of nearly a quarter of a century of unbroken attendance at the annual meetings of the Association has convinced us that a radical reform is necessary in the constitution of the British Association if it is to regain the high place it formerly held, or retain the prestige which still remains as a tradition of earlier and healthier years.

In a later issue we hope to present a summary of Dr. Shaw's brilliant and characteristic address, and abstracts of some of the papers which were read. Meanwhile we have pleasure in reporting that the annual meteorological breakfast, founded by Mr. Symons and revived in 1901, took place in exceptionally favourable surroundings. Thanks to the initiative of Sir John Moore, the leading meteorologist in Ireland, the Royal College of Physicians of Ireland placed their fine hall at the disposal of the meteorologists and rainfall observers present at the meeting, and no less than 48 sat down to breakfast at 9 a.m. on Tuesday, 8th September. Sir John Moore presided, and in addition to the meteorologists and observers noted below a number of their friends joined the party.

J. S. Amery, Ashburton, Devon.
Dr. J. R. Ashworth, Rochdale.
R. M. Barrington, Bray.
C. O. Bartrum, London.
L. C. Bernacchi, London.
J. Bolton, London.
Dr. W. S. Bruce, Edinburgh.
C. J. P. Cave, Ditcham Pk., Sussex.
J. E. Cullum, Cahirciveen.
J. S. Dines, London.
W. H. Dines, F.R.S., Pyrton Hill, Oxon.
Paul Durandin, Paris.
R. O'B. Furlong, C.B., Killiney.
E. Gold, Cambridge.
A. P. Jenkin, Redruth.
Capt. Campbell Hepworth, C.B.
Dr. A. J. Herbertson, Oxford.
John Hopkinson, Watford.
R. G. K. Lempfert, London.
Dr. W. J. Lockyer, London.
Capt. H. G. Lyons, F.R.S., Cairo.
Mrs. D. D. MacKinnon, Speldhurst, Kent.
Dr. H. R. Mill, London.
Mrs. H. R. Mill, London.
Sir John Moore, Dublin.
Maurice P. Moore, Dublin.
Miss Constance Pim, Blackrock.
W. E. Plummer, Liverpool.
Colonel Rawson, C.B., York.
Prof. A. Lawrence Rotch, Harvard.
Dr. W. N. Shaw, F.R.S., London.
J. Smith, Crathes.
J. Smyth, Banbridge.
Miss C. O. Stevens, Oxford.
M. Teisserenc de Bort, Paris.
Prof. W. E. Thrift, Dublin.
Dr. Gilbert Walker, F.R.S., Simla.
R. S. Whipple, Cambridge.

Sir John Moore said a few words of welcome to the meteorologists visiting Dublin, and thanked the President of the Royal College of Physicians of Ireland for the kindness of the College in granting the use of their Hall for the occasion. He congratulated Section A on having as its President Dr. Shaw, who combined the highest mathematical powers with profound meteorological knowledge, and referred to the foreign and imperial meteorologists who were present.

Appropriate replies were made by M. Teisserenc de Bort, who spoke in French and was very heartily received, Prof. A. Lawrence Rotch of Harvard University, Dr. W. N. Shaw, President of Section A, Dr. Gilbert Walker, the head of the Meteorological Service in India, and Captain Lyons, Director of Surveys in Egypt. The proceedings, which were over before 10 o'clock, were characterised by the spirit of friendly cordiality usual on such occasions.

METEOROLOGY AT THE FRANCO-BRITISH EXHIBITION.

By L. C. W. Bonacina, F.R.Met.Soc.

II.

In this article I purpose to open out one or two subjects for discussion, concerning division (*b*) in the last article, the photographic and cartographical exhibits. The splendid series of lightning and cloud photographs is particularly to be noted. As regards lightning photographs, it is scarcely necessary to remark that they provide our only means of ascertaining anything with certainty about the shape and structure of a discharge, as well as the position of the spark-gap or line of discharge.

The excellent cloud photographs shown at the Exhibition bring out the structures, as well as the general forms of the various types of cloud in a very clear manner. I venture, however, to express the opinion that it would have been better if no systematic nomenclature had been adopted, and that, save where such general or familiar names as "cumulus," "stratus," "cirrus," "mackerel-sky," &c., could be applied, the clouds would have been better left unnamed—or as a descriptive exercise to the spectators. It is to be regretted that in the cloud-study series of exhibits of Clayden, such names should have been affixed to the photographs as the following:—Cirrus ventosus (windy cirrus); Cirrus communis (common cirrus); Cirrus inconstans (change cirrus); Alto-cumulus castellatus (high-turretted cloud); Alto-stratus maculosus (mackerel sky); Alto-cumulus informis; Cirro-stratus undatus (cirrus ripples), &c. This type of nomenclature is dangerously akin to that adopted in the classification of living creatures, and is not for reasons which will shortly be discussed, to be recommended. Whatever justification there may be for classifying and designating living individuals according to a generic and a specific title, there is certainly none in the case of the clouds. Thus, while it may be very convenient and useful, for instance, to designate one owl as a *strix flammea*, and another owl, uniting with well-marked individual characteristics various distinctive *specific* qualities such as a weird nocturnal howling propensity, as a *strix stridea*, it is neither necessary nor practicable to label and typify one cirrus cloud as

cirrus communis, and another as *cirrus ventosus*; for it may be said in a general way, that the only attributes which one cirrus cloud has in common with another are expressed by the generic word *cirrus*, and that the various forms which cirrus may assume are not sufficiently definite and constant as to warrant the subdivision of these clouds into species—in other words, every true cirrus cloud must be *described* on its own individual merits.

A great amount of time and labour has been spent in attempts to frame detailed cloud classifications,* which (so far as I know) have never proved of any practical use, except, perhaps, to their respective originators. It may be well doubted whether a number of persons possessed of enough patience and perseverance to master one of these detailed and cumbersome classification schemes, would, on being put to the test, agree anywhere near sufficiently closely as to sanction its general adoption. Indeed, I would say that beyond the single terms cumulus, cirrus, stratus, and occasionally some of the more convenient double-names used to denote common and well-known forms of cloud and sky, such as cirro-stratus, cirro-cumulus, description should invariably take the place of classification. I would, therefore, briefly suggest the following rule for carrying out cloud observations:—First relegate, if possible, every cloud which is not absolutely amorphous to one of four primary types, cirrus, cumulus, stratus and nimbus (*amorphous rain-cloud*); secondly, if a cloud is clearly of some form intermediate between any two of these main types, denote the fact, specifying, if advisable, this secondary form by one of the more familiar double or compound names; then proceed to *describe* all further features of the cloud. By their very nature the clouds should be word-painted, not scheduled. Now in dealing with the manifold tribes of living creatures which possess organic unity and true individuality, it has been found absolutely necessary to resort to more or less comprehensive systems of classification; and though there are many intermediate types in both the animal and vegetable kingdoms, these are relatively so infrequent, whilst the "missing links" are so numerous, as not materially to render cumbersome the adopted classifications. But when we enter the mineral kingdom, and come across a great variety of wonderful and interesting things like agates and garnets, marbles, serpentines, and ophi-calcites, it is not found expedient to indicate them by generic and specific appellations; for this reason, that minerals and rocks, however marvellous and fascinating may be the crystalline structure exhibited by many of them, unlike animals and plants are devoid of

* Amongst which that in Ley's "Cloud-land"—an excellent book, but marred by the nomenclature adopted. Apart from the large amount of unprofitable trouble and experience required to distinguish between *genuine* cases of "stratus quietus"; "stratus maculosis"; "stratus castellatus"; "stratus lenticularis," I question whether in the conjoint estimation of two independent observers fifty per cent. of true stratus cloud could be classed under any of these four "species."

organic unity, that is to say they are without true individuality. A crystal of galena is not an individual in the sense as is a man, an oak, a mouse, or a primrose-plant.

How much more futile then must be any attempt to bring an exhaustive system of classification to bear upon such objects as the clouds, which lack not only organic unity but even permanent endurance, and appear, vanish, unite and melt away almost before one has time to wonder how. Moreover, the number of intermediate forms of common occurrence is practically infinite, and this exposes the necessity of what I emphasized above, that the only satisfactory scheme of classification for the wayward clouds is a descriptive one.

Before concluding this article I should like to make a few remarks upon the cartographical exhibits. Synoptic charts and rainfall maps of course figure prominently. Amongst the rainfall maps two call for special comment, the one relating to sixty hours of incessant rainfall in the Lower Thames valley in the June of 1903, the other to a heavy snowstorm which affected the greater part of England on the night of Christmas, 1906. Concerning the former it may be said that records of abnormal weather occurrence sshould always on suitable occasions be brought before the public notice, because they bring home to those who reflect upon meteorological matters and remember them accurately, in a way that ordinary weather which excites less interest fails to do, that the number of combinations which the various elements of weather with respect to time and space may assume is unlimited. There will occur other June deluges in the Lower Thames Valley of type, intensity, duration and area affected perhaps not very dissimilar to that of 1903, but *when* will there be a facsimile or even an approach to one, of that phase of wet weather which attracted so much attention five years ago?

The snowfall map gives the hour of commencement of snow over the area affected by the great storm of December 25th, 1906. The east of Scotland, where a terrific and disastrous blizzard far worse than the one under discussion which mostly affected England raged on the following day, is marked as having "no snow." In exhibiting a map like this to the public I think it would have been desirable, in default of producing a map of the second snowstorm, to have appended a few notes concerning it to the map of the first snowstorm; both storms were clearly part and parcel of the same snowy phase of weather, and the interesting fact is not only the isolated snowstorm travelling from north-west to south-east over a more or less well defined area in a certain time, but also the incidence of one of those extremely snowy periods which are liable to prevail over the British Islands, especially the northern portion, at any time during at least six months of the year.

THE WEATHER OF AUGUST, 1908.

By FRED. J. BRODIE.

THE almost entire absence of extreme heat, which formed so prominent a feature in the weather of last summer, was as strongly marked in August as in the earlier part of the season. Up to about the 19th of the month the pressure conditions were almost continuously anticyclonic, the only material interruptions occurring about the 4th and 5th, and between the 10th and 12th, when barometrical depressions spread from the westward over a large portion of the country. The weather was therefore fine and very dry, and at several places in the south of England the drought which had commenced shortly after the middle of July remained unbroken, an entire absence of rain being reported over periods varying between 30 and 35 days. With a current of air drifting in from the ocean, mainly from the north-westerly quadrant, *i.e.*, from points between west and north, the air was usually cool and pleasant, the only instances of anything in the way of hot summer weather occurring between the 2nd and 4th of the month, or on the 7th. On the earlier occasion, chiefly on the 3rd, the thermometer in the shade rose above 80° in several parts of England, and reached 83° at Epsom and Greenwich, 84° at Raunds (Northamptonshire), and Cullompton, and 88° at Maidenhead, while on the 7th readings of 80°, or slightly above it, were recorded in a few scattered portions of our southern and south-eastern counties. The nights were usually mild, but on that of the 11th—12th a sharp ground frost was experienced in many parts of North Britain, while on that of the 16th—17th a similar touch of cold occurred over an area extending as far south as the English midlands. On the former night the exposed thermometer fell to 24° at Crathes and Balmoral, to 27° at Llangammarch Wells, to 28° at Morpeth (Cockle Park), and to 29° at West Linton; on the latter occasion it sank to 25° at Llangammarch Wells, to 26° at Birmingham (Edgbaston), and to 31° at Balmoral.

After about the 19th a radical change in the weather set in, and for the remainder of the month the country was exposed to the influence of numerous cyclonic systems, the majority of which came over from the Atlantic. With such conditions rain was frequent and often very heavy, the most widespread of such visitations occurring on the 26th and 27th, and on the 31st. In the intervals between the departure of one disturbance and the arrival of the next, there were, however, substantial spells of fine weather, and over England the thermometer was, as a rule, a trifle above its normal level. The highest readings were recorded on the 24th, when the thermometer touched 75° in several parts of our eastern, midland and south-eastern counties, and reached 77° at Greenwich.

For the month, as a whole, the mean temperature was below the average; but round our extreme west and south-west coasts the deficiency was very small. In comparison with the normal, the day temperatures were, in all districts, lower than the night readings; the days and nights were, however, both warmer than in the August of last year.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

A CONTRAST IN RAINFALL.

I SEND a note of the great contrast in rainfall from July 18th to August 18th and August 19th to 31st. No doubt you will receive many such records and may care to compare them.

From July 18th to August 18th we measured no rain at all, except ·01 on July 27th and ·01 on August 10th. From August 19th to 31st we have measured :—

August	19	.....	·01	August	26	.....	·93
,,	20	.....	·24	,,	27	.....	·26
,,	21	.....	·08	,,	28	.....	·24
,,	22	.....	·70	,,	29	.....	·29
,,	23	.....	1·94	,,	30	.....	·09
,,	24	.....	·10	,,	31	.....	1·32
,,	25	.....	·21				
							6·41

Chewton Priory, Bath, Sept. 1st, 1908. WALDEGRAVE.

THE BLACK BULB.

WITH reference to Dr. Shaw's letter in your February number and Captain Hepworth's subsequent communication, the following extract from Webster's account of Captain Foster's Antarctic Voyage* may be of interest. Writing of the visit of this expedition to Deception Island, South Shetlands, in the year 1829, the following appears (Vol I., p. 163) :—"During the months of January and February in which we were here, the warmest months of the year, we had frequent heavy falls of snow. A black-bulbed thermometer was exposed to the sun at every opportunity, and the greatest height of the mercury, under the most favourable circumstances of an unclouded meridian sun, was 77°. The general range and average of the intensity of the sun's heat was only 66°." From the mode of expression it is not unreasonable to assume that at the time indicated black bulb thermometers were accredited instruments for meteorological purposes.

R. C. MOSSMAN.

Oficina Meteorológica Argentina, Viamonte 640, Buenos Aires, July 21st, 1908.

IN his letter to you in your last issue, Mr. L. C. W. Bonacina says, *in re* black-bulb thermometers in vacuo, "Meteorologists, of course know what they are measuring." There is no "of course" in the matter, for as a rule they do not know in the least *what* they are measuring in that respect. I have known of thermometers duly

*Narrative of a Voyage to the Southern Atlantic Ocean in the years 1828' 1829, 1830, Performed in H.M. Sloop Chanticleer, under the command of the late Captain Henry Foster, F.R.S., from the Private Journal of W. H. B. Webster, Surgeon of the Sloop. 2 vols., London, 1834.

verified at Kew, being enclosed in vacuum jackets and yet when so enclosed indicating values differing as much as 15° one from the other, simply on the ground of non-uniformity in the vacuum. This came out strongly in some investigations made at the Meteorological Office several years ago.

FREDK. GASTER, F.R.Met.Soc.

The Homestead, Tankerton, Kent, 19th August, 1908.

THE METEORS.

THE last three months have furnished an unusual number of excellent opportunities for astronomical work. From June 2nd to August 17th (including 77 nights) there were 57 more or less suitable for observation.

From July 18th to August 8th, watching the sky for 20½ hours in the aggregate, I saw 204 meteors. The first Perseid I noted on July 21st, and quite an active shower of them had developed on July 26th.

The full moon on about August 11th and 12th, when the maximum display was expected, prevented many meteors being observed, but some brilliant specimens of Perseids appeared now and then, and sufficiently attested the fairly active return of the shower. Before midnight on August 10th I saw about 12 meteors per hour, but this number was probably doubled between midnight and 3 a.m. One of the most conspicuous Perseids seen was at 10.30 p.m. on August 2nd, and duplicate observations were made of it by Miss Irene Warner, at Bristol, and Mr. G. Powell, at Aberdare. The real heights of the object, which shone quite as brightly as Jupiter, were from 77 to 47 miles over Radnor and Carmarthen, the length of path being 57 miles, and velocity 38 miles per second.

But the finest meteor of all made its apparition on July 28th, at 11.6 p.m., lighting up the heavens with a flash more vivid and prolonged than lightning. It was seen from Bristol and South Wales, and from many places in Ireland, over the S.E. part of which (Kildare) the fireball exhibited its chief splendour, falling from 82 to 40 miles along a visible flight of 50 miles. It was not a Perseid, but a member of one of the minor showers of the epoch situated in Vulpecula. Many observers in Ireland describe the outburst of the fireball as one of startling brilliancy, the whole country being lit up as in the daytime for about two seconds.

The writer, at Bristol, observed 12 other meteors belonging to the same stream as that which furnished the fireball, but they were small, about half of them being faint shooting stars only just perceptible to the eye. This clearly proves that the most diminutive of these objects are indiscriminately distributed with the most magnificent fireballs from the same parent systems.

Of the summer meteors of 1908 it may be, generally, said that though not very abundant they were bright, interesting and well observed in the beautiful skies which prevailed.

Bristol, 18th August, 1908. W. F. DENNING, F.R.A.S.

TORNADO IN BUSHEY PARK, JUNE 1st, 1908.

I HAVE gathered what particulars I could from the gatekeeper at Teddington Gate, Bushey, regarding a recent tornado in the park. On the evening of June 1st a thunderstorm was in progress, and a little before 10 p.m. a cold blast sprang up, when at 9.55 a hurricane of warm air from the S.E. struck the north end of the avenue of Bushey Park on the east side, where it is composed of five lines of trees, the inner row the famous chestnuts and four more of limes. The wind came from the S.E., with a noise like a train, and in a few moments 115 trees were destroyed, 28 being hawthorns in the open, the other side of the Avenue, the west side, escaping. The area of destruction was about 300 yards wide, in which 75 % of standing timber trees were destroyed, all lying from S.E. to N.W., with two to 3 tons of earth at the root of each. One (130 feet high) fell on Gate Lodge, and destroyed the roof and upper walls, but so great was the roar of the wind that the inhabitants of the Lodge heard nothing but the wind. At this point the path of the storm changed from N.W. to N.E., and destroyed 11 trees in private grounds. Another thunderstorm raged at 2 a.m. on June 3rd, and on June 4th, about 6 p.m., 3 trees were struck on the same unlucky spot. All the trees lie from S.E. to N.W., so it hardly seems as if the wind were of a rotatory nature. It is supposed to have originated east of Epsom, and done damage at Surbiton, but I cannot trace the storm beyond the north side of Bushey Park, as similar damage at Fulwell station, to N.E., occurred one hour earlier apparently. It therefore seems that either the trees exhausted the force of the cyclone, or it rebounded into the air. Little rain fell. Only two men were on the spot, one of whom gave me the particulars.

STANLEY SINGLE.

Park View, Leopold Road, Wimbledon, S.W.
July 23rd, 1908.

LOW SEPTEMBER TEMPERATURE.

THE readings of the thermometers in the screen, taken at 9 a.m., to-day, showed the following extremely low temperatures for the preceding 24 hours :—

Maximum 53°·2. Minimum 37°·2. Approximate Mean 45°·2.

No records for a long period are available for Weybridge, but those for Greenwich Observatory for 1841-1905 give the following as the lowest for September 5th for that period, viz. :—

Lowest Maximum.....	57°·9 in 1841.
Lowest Minimum.....	38°·4 in 1892.
Lowest Mean	49°·3 in 1841.

My readings for this morning are therefore very remarkable for this time of year.

H. K. G. ROGERS.

Glenart, Weybridge, 5th September, 1908.

THE GREEN FLASH.

I OBSERVE that the correspondence on the subject of "the Green Flash" has been re-opened in *Symons's Meteorological Magazine* for last month.

I hope, therefore, that you will allow me to reply to your editorial criticism (Vol. **41**, pp. 236–7) of the attempt I made to explain the phenomenon in the letters you were good enough to publish in Vol. **41**, pp. 11, 29, 92, 190 and 234.

I beg to observe that I by no means "confused the phenomenon of 'the green flash' with the familiar effects of complementary colours." On the contrary, I endeavoured constantly to find the fundamental principle of the physiological contrast of colour amid the various details and modifications of the phenomena described by your correspondents.

I am convinced that the so-called "green flash" is the after-image or visionary image of the impression produced on the retina by the last rays of the setting, or by the first rays of the rising sun, seen in the complementary blue-green colour. The letters of your correspondents, Mr. W. L. Fox and Mr. M. Hall, on p. 234 of Vol. **41** and p. 235 of Vol. **42**, further confirmed this conviction.

I hope as soon as an opportunity occurs to repeat, so far as I am able to do so, the experiments described by your correspondents, and will then write again giving some account of the results of my experiments.

R. C. CANN LIPPINCOTT.

Over Court, Almondsbury, Bristol, 10th February, 1908.

[We admire the firm convictions of our correspondent to whom we have given generously of our space. We should almost regret his conversion to the equally definite, though opposed view, which we, in common with all the physicists and physiologists who have written on the subject, feel constrained to hold.—ED., *S.M.M.*]

LARGE HAIL IN SUNSHINE.

ABOUT 2 p.m. on July 2nd, while thunder was rumbling all round about, but none overhead, all at once there began to drop large particles of ice, and then broad pieces about half-an inch across and about a quarter of an inch thick in the centre. The centre was very white sharp out to the edge and clear. About five minutes later down came large round pieces of ice about the size of marbles, an inch in diameter and very clear. These continued to fall for a few minutes, the whole occurrence not lasting more than from 10 to 15 minutes, during which time the sun was shining brightly and the day very hot. The fall of ice came while the thunder was in a north-east direction; the thunder went right round from north-east, through the east to south-west, and finished in the north-west. We had no rain. I have never seen anything of the kind a quarter of the size of the ice-balls.

D. A. FRASER.

Derry Lodge, Braemar, July 6th, 1908.

GREAT RANGE OF TEMPERATURE.

THE remarkable change in temperature during the last few days may be of interest.

Temp at 2.30 p.m., Thursday, June 4th ..... 83°·3
,, 2·30 a.m., Sunday, ,, 7th ..... 37°·3

showing a difference of 46°·0 in 60 hours. Surely this must be unusual in the south of England.

E. L. HAWKE.

2, Akenside Road, Fitzjohn's Avenue, Hampstead, N.W. 7th June, '08.

REVIEW.

Third Annual Report of the Meteorological Committee to the Lords Commissioners of His Majesty's Treasury. For the year ended 31st March, 1908 [Cd. 4239]. London: Printed for H.M. Stationery Office. 1908. Size 9½ × 6, pp. 164. Price 1s. 5d.

THE Meteorological Office is rapidly becoming one of the promptest in the world in the matter of publication. The Hourly Readings at the four Observatories, and the Observations at Second Order Stations, are now being published monthly in time to be utilized in many weather discussions, and the Annual Report is now before us. These are by no means spasmodic efforts. Dr. Shaw says in his Report:—

"These changes are all based upon the general principle that the value of observations collected by the Office is largely enhanced, and the greatest practical economy is secured, by prompt publication in sufficient detail to serve at least as a full index of all the available material. This principle is equally applicable as regards the immediate practical use of the observations, and as regards meteorological research. It leads to the organization of the Office on such lines that all observations reported to it are forthwith examined, tabulated and made ready for use, and not merely stored for possible use in the future. The principle is now generally applied to all branches of the work of the Office."

The Meteorological Office now enjoys the privilege of Government Offices in having an account with the Post Office, which enables them to dispense with stamping publications sent out, and relieves the correspondents of the Office from prepaying their communications.

The Report describes the steps which have been taken, so far without complete success, to provide against the overlapping of publications by the various meteorological authorities.

The reasons which have led to the change of hour of morning observations at telegraphic reporting stations from 8 a.m. to 7 a.m. are set out in full. They are concerned chiefly with the improvement of international co-operation in preparing synoptic charts, and so may be expected to improve the prevision of the weather; but

from the climatological, and especially from the rainfall point of view, we earnestly hope that whenever it is possible observations will also be taken at 9 a.m.

We have not space to follow all the activities of the Meteorological Office as set forth in this Report; but the Office is evidently very much alive, and its work in all directions is growing in efficiency and gaining public recognition. The success of the hay-harvest forecasts appears to have been unusually striking, and the letter of gratitude quoted from a Cornish farmer has a warmth rare in the history of any predictor.

REPORT UPON DRY PERIOD AND RAIN-MAKING EXPERIMENTS AT OAMARU, NEW ZEALAND.

By Rev. D. C. Bates, F.R.Met.Soc.

(Continued from p. 138.)

From Raki's Table I watched the experiments at Dalgety's Hill, 5¼ miles to the N.E., and those at Round Hill, 9½ miles to the S.E. The skies were again very heavy—stratus clouds were between 800 and 1,000 ft. above the Table most of the time, and hung low, but well defined underneath all round, excepting in one bright patch away to S.W., where there was an arch over a mountain range. The wind at first was a light N.W., and later shifted to S.W. without much change in the clouds, except, perhaps, they lowered as the evening advanced. This time so far as we could see everywhere, there was no apparent change made by the explosions, and the smoke drifted upwards, and then gently away on the breeze. The barometer falling slowly all the time, the high relative humidity approached saturation at sundown, but though the mist looked heavy all about, the rain was not quite ready, and explosions did not seem to expedite matters. Up to that time the experiments certainly were ineffective in the precipitation of rain. It did, however, come some hours afterwards, and some people in the locality might possibly attribute this result to the experiments, but those who were actual eye witnesses on those lonely heights could, I imagine, hardly entertain such ideas. Those efforts were puny in comparison with the mighty forces which were at that moment developing independently over thousands of square miles in a cyclone similar to, but more intense than, the one which had brought rain only a few days before. Rain commenced at Oamaru about midnight on a N.E. wind, and was general throughout the district of North Otago, and through Central Otago did not benefit as much as expected, yet so far as the Oamaru district was concerned, the dry period was at an end, and there was great rejoicing everywhere.

The rainfalls of the locality were as follows:—

	Windsor Park.	Otokaike	Living-stone.	Arn-more.	Kurow.	Wai-mate.	Oamaru	Totara.	Kauroo Hill.
22nd...	·47	·19	·41	·35	·23	·43	·39	·30	·31
23rd...	1·44	·88	1·12	1·65	·44	2·10	2·02	2·24	1·88

General Observations.

An increased interest in meteorology has, I trust, been a direct outcome of these experiments in the district. Though science may not yet be able to forecast drought periods, yet they may be promptly recognised, and then with the aid of experience to be gained from other lands, combatted on scientific lines, and, by turning adverse circumstances to good account, success wrested even from apparent failure. These costly efforts in rain-making are regarded at present as misguided and vain by all scientific meteorologists, while to their chagrin really valuable work is often neglected for want of public interest. On this visit I have established four new third-class stations for the observation of rainfall in the Oamaru district, and I would earnestly recommend the establishment of one second-class station at Oamaru.

One argument used in favour of the experiments is that rain generally followed great battles, explosions and disturbances of the air as by reverberations of thunder—nay even the passage of a train through a moisture-laden atmosphere. I was informed that in parts of Wales where slate quarrying is carried on, it usually rains every day while blasting is done, but that the Sundays will be fine because operations cease. Reviews of troops and sham fights have been followed by rain, and this has been attributed to the firing. The coincidence of rain with reviews has often been unduly impressed upon the minds of people by its effect on smart dresses and uniforms, for the display of which, and for convenience in marching, cumbersome overcoats have been discarded, and this fact discounts such evidence. Prof. T. Russell, in his "Meteorology," says: "It has been supposed that concussion of artillery fire in battles produces rain, and that great battles are followed by heavy rain. There is no reason why this should be so. No physical relation has ever been traced between concussion of air and formation of water-drops. The belief is very ancient that battles are followed by rain. In Plutarch's Lives it is related that after the battle of Marsalia, in France, a great rainfall followed, and it is mentioned as being a well-known fact that all great battles are followed by heavy rain. This was certainly a case when rain was not due to artillery fire."

Globules of water are formed on particles of dust, and there is no reason to suppose that these droplets are hollow vesicles which could be burst by explosions. Condensation is induced in a supersaturated atmosphere by the presence of dust, the fumes of ammonia, phosphorus, sulphur, &c., as these particles from nuclei for the minute spherical drops of water. The passage of a train might bring such in smoke, but the results would only be insignificant. Fog from smoke may hang over London, but the rain is no greater than in the country. Thunder and lightning again are effects of electrical disturbance, which is also a result of the usual cause of precipitation, viz., a cooling of a vapour-laden atmosphere. A thunderstorm is caused by the meeting of winds from different sources, one warm and

moist and the other dry and cold. These may meet laterally, or there may be an overturning of the atmosphere when they suddenly meet above. The latter idea is theoretically the nearest approach to what is sought by advocates of explosions as a means of causing rain to fall. The sudden conversion of a solid explosive substance into gases perhaps 1,500 times greater in volume is accompanied by tremendous expansion, force and heat. This would drive the air about in every direction, and until diffusion of the gases took place would create a state of atmospheric instability. Condensation first taking place aloft, then possibly drops falling and introducing a cooler current around, which might cause local showers, such as a fall from thunderstorm from the cumulus or anvil-shaped clouds caused by "unstable equilibrium." For such effects I watched most carefully, but in this direction the explosions had apparently no more effect on the vast expanse of the air than would the striking of a match in a room.

The forces arrayed against artificial changes in the atmosphere are tremendous—almost beyond conception. Defining a unit of heat as the amount needed to raise the temperature of a pound of water one degree Fahr., about a thousand units are needed to transform a pound of water into vapour. When vapour turns to water, latent heat is liberated in a corresponding amount. Now an inch of rain corresponds to 22,635 gallons, or rather over 101 tons of water to the acre, or over 64,640 tons to the square mile. The heat developed or released under such conditions of condensation from vapour to water for an inch of rain to the square mile is estimated as equivalent to the work done by 100,000,000 horse-power for half-an-hour. Consider again the sweep of a wind, 500 miles across horizontally, and three miles high, allowing for an hour at the rate of 20 miles. The force of the mightiest explosion with all its gas put forth into the air is in comparison less than a drop in a bucket.

Firstly and lastly rainfall is concerned with temperature in its relation to aqueous vapour. Air at different temperatures will hold different quantities of water-vapour, which is an invisible gas and lighter than the air itself. For example, at 80° F. two cubic feet of air will sustain 22 grains weight of vapour, at 60° the same measure would hold 11½, but at 32° only 4¼ grains. Any additional moisture would be condensed at those temperatures, or a lowering of the temperature would have the same effect, namely, condensation. At ordinary temperatures the capacity of the air for vapour is doubled for every 18° F. Cooling the air by mixture of a cold upper current with a lower warm and vapour-laden one, the meeting of tropical and polar winds in circulating storms, a warm and moist air impinging on a cold surface would condense the vapour into dew, fog, rain or snow; and, on the contrary, a warm surface would evaporate water by the conduction of the heat from the ground. Until it can be shown that the temperature of the air can be controlled by gigantic cooling operations we may look in vain for any alteration in the natural and

well-established order of events by way of the production of artificial rain.

In ancient times and long before European settlement trees seem to have flourished in the Oamaru district, for I am told that big roots are still found in the soil, but, except around the homesteads, the country is very bare of trees. Around their homes the settlers have mostly planted pines, which have flourished wonderfully, but if larger and more varied plantations were made particularly in belts intercepting the N.W. and S.W. winds, though they might not increase the rainfall, yet the trees would not only act as shelters and windbreakers, but also conserve the rainfall which now occasionally runs off in floods. Where possible, the planting of deep-rooted rather than surface-rooting trees of a deciduous kind would bring up water from the lower water-tables, and not only prevent surface evaporation by the winds, but also as they transpire freely in the summer, create a beneficial humidity in their neighbourhood. The excessive heat of a bare sun-baked soil drives away the rain from a drought-stricken district, and thus diminish the "probability of rain," which could from time to time otherwise be reasonably forecasted. So far as one can see the only objections which can be urged against the planting of trees are the occupation of fertile lands by comparatively unproductive trees, and the possible harbouring of the small bird pest. The losses, however, would undoubtedly be more than compensated for by wider general benefits, and the whole question is one which assuredly concerns the community at large, and could with advantage be dealt with by local or general government regulations.

Action with regard to both the planting and destruction of the trees is a matter of vital importance to the country. Whether forest trees increase the rainfall or are themselves the result of an abundant precipitation is not the question one would raise at the present time, but rather considerations of evaporation, shelter, run-off, etc., as affected by tree-planting, and of more than passing interest to the people of Oamaru.

METEOROLOGICAL NOTE.

THE RANGE OF ICEBERGS IN THE ATLANTIC has an important bearing on the weather, and some interest has attached to the farthest point to the eastward at which icebergs have been seen. A statement had become vaguely current that large icebergs had once appeared off the Orkneys, and during his visit to London last year Professor Krümmel, of Kiel, enlisted the good offices of Captain Campbell Hepworth in the search for the original record. The result was to find an entry in the log of H.M.S. Cove, under the command of Captain James Clark Ross, R.N., which stated that two icebergs had been sighted in 60°55′ N., 5°50′ W. at 11.30 a.m. on 14th January, 1836. The authenticity of the occurrence of icebergs in the eastern North Atlantic has thus been proved.

RAINFALL TABLE FOR AUGUST, 1908.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1870-99.	1908.
		° ′	° ′		in.	in.
Camden Square	*London*	51 32	0 8	111	2·33	2·94
Tenterden	*Kent*	51 4	*0 41	190	2·37	3·56
West Dean	*Hampshire*	51 3	1 38	137	2·60	3·27
Hartley Wintney	,,	51 18	0 53	222	2·09	3·25
Hitchin	*Hertfordshire*	51 57	0 17	238	2·26	2·74
Winslow (Addington)	*Buckinghamshr.*	51 58	0 53	309	2·53	2·92
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·40	2·49
Brundall	*Norfolk*	52 37	*1 26	66	2·19	...
Winterbourne Steepleton	*Dorset*	50 42	2 31	316	3·18	5·33
Torquay (Cary Green)	*Devon*	50 28	3 32	12	2·91	4·00
Polapit Tamar [Launceston]	,,	50 40	4 22	315	3·19	4·42
Bath	*Somerset*	51 23	2 21	67	2·96	4·15
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·83	3·88
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	3·24	4·28
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·77	3·05
Boston	*Lincolnshire*	52 58	0 1	25	2·25	2·41
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·31	2·14
Derby (Midland Railway)	*Derbyshire*	52 55	1 28	156	2·42	3·81
Bolton (Queen's Park)	*Lancashire*	53 35	2 28	390	4·36	3·68
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	2·59	1·76
Arncliffe Vicarage	,, ,,	54 8	2 6	732	5·43	5·59
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·81	1·94
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	3·14	1·75
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	11·23	14·43
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·52	6·89
Haverfordwest (High Street)	*Pembroke*	51 48	4 58	95	4·04	5·08
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·60	5·14
Llandudno	*Carnarvon*	53 20	3 50	72	2·86	2·70
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·10	4·85
Hawick (Branxholm)	*Roxburgh*	55 24	2 51	457	3·33	3·50
Edinburgh (Royal Observy.)	*Midlothian*	55 55	3 11	442	...	1·68
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	4·34	4·65
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·79	2·68
Tighnabruaich	*Argyll*	55 55	5 14	50	5·13	6·25
Mull (Quinish)	,,	56 36	6 13	35	4·84	4·69
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	3·08	2·75
Braemar	*Aberdeen*	57 0	3 24	1114	3·83	2·33
Aberdeen (Cranford)	,,	57 8	2 7	120	3·22	2·73
Cawdor	*Nairn*	57 31	3 57	250	3·07	1·91
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	3·35	4·27
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	6·91	6·29
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·65	1·56
Castletown	*Caithness*	58 35	3 23	100	...	1·73
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	4·92	4·23
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·71	4·64
Broadford (Hurdlestown)	*Clare*	52 48	8 38	167	3·79	5·31
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·94	3·34
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	3·02	3·44
Ballinasloe	*Galway*	53 20	8 15	160	3·96	3·18
Clifden (Kylemore House)	,,	53 32	9 52	105	7·90	...
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	4·57	3·97
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	4·16	3·84
Seaforde	*Down*	54 19	5 50	180	3·52	2·51
Londonderry (Creggan Res.)	*Londonderry*	54 59	7 19	320	3·94	4·52

RAINFALL TABLE FOR AUGUST, 1908—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1870-99. in.	1908. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1870-1899. in.	STATION.
+ ·61	126	·74	23	16	15·45	17·87	+2·42	116	25·16	Camden Square
+1·19	150	1·09	23	15	16·18	16·09	— ·09	99	28·36	Tenterden
+ ·67	126	·73	31	14	17·83	16·76	—1·07	94	29·93	West Dean
+1·16	155	1·10	23	15	16·06	17·53	+1·47	109	27·10	HartleyWintney
+ ·48	121	·60	23	17	15·07	16·36	+1·29	109	24·66	Hitchin
+ ·39	115	·86	31	14	16·58	18·15	+1·57	109	26·75	Addington
+ ·09	104	·49	5	15	15·63	16·31	+ ·68	104	25·39	Westley
...	...	...	...	...	15·01	...	...	...	25·40	Brundall
+2·15	167	1·90	27	12	22·32	20·10	—2·22	90	39·00	Winterbourne Stpltn
+1·09	137	·85	31	13	20·69	15·99	—4·70	77	35·00	Torquay
+1·23	138	·90	31	15	21·57	23·01	+1·44	107	38·85	Polapit Tamar
+1·19	140	1·11	31	13	18·82	16·61	—2·21	88	30·75	Bath
+1·05	137	1·53	31	14	18·56	16·46	—2·10	89	29·85	Stroud
+1·04	132	1·05	31	15	20·21	22·48	+2·27	111	33·04	Wolstaston
+ ·28	110	1·21	31	15	18·08	17·32	— ·76	96	29·21	Coventry
+ ·16	107	·61	31	16	14·45	16·03	+1·58	111	23·30	Boston
— ·17	93	·61	20	15	15·63	15·35	— ·28	98	24·70	Hodsock Priory
+1·39	157	·68	26	16	16·53	17·80	+1·27	108	26·18	Derby
— ·68	84	·79	26	17	25·23	30·06	+4·83	119	42·43	Bolton
— ·83	68	·41	31	12	16·83	18·33	+1·50	109	26·96	Ribston Hall
+ ·16	103	1·30	31	19	36·87	42·35	+5·48	115	60·96	Arncliffe Vic.
— ·87	69	·38	31	16	16·55	14·68	—1·87	89	27·02	Hull
—1·39	56	·50	31	17	17·40	16·33	—1·07	94	27·99	Newcastle
+3·20	128	3·99	26	18	77·96	80·92	+2·96	104	132·68	Seathwaite
+2·37	152	2·15	31	14	25·23	23·27	—1·96	92	42·81	Cardiff
+1·04	126	1·19	31	15	27·41	26·95	— ·46	98	47·88	Haverfordwest
+ ·54	112	1·43	27	15	26·46	30·12	+3·66	114	45·41	Gogerddan
— ·16	94	·53	20	17	17·65	20·65	+3·00	117	30·98	Llandudno
+ ·75	118	1·06	26	13	26·15	32·32	+6·17	124	43·43	Cargen
+ ·17	105	·76	24	16	21·33	21·85	+ ·52	102	34·80	Branxholm
...	...	·88	31	12	...	15·95	...	...	...	Edinburgh
+ ·31	107	·92	26	20	28·46	32·48	+4·02	114	48·87	Girvan
—1·11	71	·68	31	13	22·09	22·32	+ ·23	101	35·80	Glasgow
+1·12	122	1·48	26	16	34·11	42·24	+8·13	124	57·90	Tighnabruaich
— ·15	97	·82	27	20	33·06	33·56	+ ·50	102	57·53	Quinish
— ·33	89	1·35	31	15	18·20	14·49	—3·71	80	28·95	Dundee
—1·50	61	...	...	...	21·66	22·26	+ ·60	103	36·07	Braemar
— ·49	85	·80	31	17	19·93	17·19	—2·74	86	33·01	Aberdeen
—1·16	62	·37	24	14	18·33	15·25	—3·08	83	29·37	Cawdor
+ ·92	128	1·08	9	13	25·75	28·52	+2·77	111	43·71	Fort Augustus
— ·62	91	1·72	9	20	49·41	57·17	+7·76	116	86·50	Bendamph
—1·09	59	·42	9	13	18·92	23·16	+4·24	123	31·60	Dunrobin Castle
...	...	·36	26	21	...	20·75	...	...	...	Castletown
— ·69	86	·93	22	15	34·90	28·90	—6·00	83	58·11	Killarney
+ ·93	125	·86	31	14	24·00	22·68	—1·32	94	39·30	Waterford
+1·52	140	·82	23	16	20·85	24·91	+4·06	119	33·47	Hurdlestown
— ·60	85	·56	22	17	22·19	20·66	—1·53	93	35·19	Abbey Leix
+ ·42	114	1·65	20	15	17·53	17·25	— ·28	98	27·75	Dublin
— ·78	80	·45	23, 31	16	23·19	21·44	—1·75	92	37·04	Ballinasloe
...	...	...	...	...	48·34	...	...	...	80·23	KylemoreHouse
— ·60	87	·97	31	14	29.90	34·22	+4·32	114	50·50	Enniscoe
— ·32	92	·66	24	19	25·32	30·62	+5·30	121	41·83	Markree Obsy.
—1·01	71	·51	31	15	23·84	25·90	+2·06	109	38·61	Seaforde
+ ·58	115	1·29	26	21	24·48	28·68	+4·20	117	41·20	Londonderry

SUPPLEMENTARY RAINFALL, AUGUST, 1908.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	4·75	XI.	Rhayader, Tyrmynydd	7·12
,,	Ramsgate	2·51	,,	Lake Vyrnwy	4·89
,,	Steyning	3·72	,,	Llangyhanfal, Plâs Draw	3·06
,,	Hailsham	3·82	,,	Criccieth, Talarvor	2·33
,,	Totland Bay, Aston House	2·23	,,	Llanberis, Pen-y-pass	11·58
,,	Emsworth, Redlands	3·36	,,	Lligwy	3·18
,,	Stockbridge, Ashley	3·43	,,	Douglas, Woodville	3·23
,,	Reading, Calcot Place	2·77	XII.	Stoneykirk, Ardwell House	3·44
III.	Harrow Weald, Hill House.	2·45	,,	Dalry, The Old Garroch	4·81
,,	Oxford, Magdalen College	2·93	,,	Langholm, Drove Road	7·03
,,	Pitsford, Sedgebrook	3·11	,,	Moniaive, Maxwelton House	3·84
,,	Huntingdon, Brampton	3·00	XIII.	N. Esk Reservoir [Penicuick]	3·35
,,	Woburn, Milton Bryant	2·87	XIV.	Maybole, Knockdon Farm	3·40
,,	Wisbech, Bank House	2·21	XV.	Campbeltown, Witchburn	3·90
IV.	Southend Water Works	2·41	,,	Inveraray, Newtown	7·25
,,	Colchester, Lexden	1·72	,,	Ballachulish House	7·12
,,	Newport, The Vicarage	2·66	,,	Islay, Eallabus	5·91
,,	Rendlesham	1·42	XVI.	Dollar Academy	3·33
,,	Swaffham	2·23	,,	Loch Leven Sluice	1·98
,,	Blakeney	2·33	,,	Balquhidder, Stronvar	6·24
V.	Bishops Cannings	4·08	,,	Perth, The Museum	2·93
,,	Ashburton, Druid House	6·36	,,	Coupar Angus Station	3·95
,,	Honiton, Combe Raleigh	3·48	,,	Blair Atholl	2·73
,,	Okehampton, Oaklands	4·73	,,	Montrose, Sunnyside Asylum	3·30
,,	Hartland Abbey	3·77	XVII.	Alford, Lynturk Manse	2·28
,,	Lynmouth, Rock House	5·47	,,	Keith Station	2·29
,,	Probus, Lamellyn	3·90	XVIII.	N. Uist, Lochmaddy	3·80
,,	North Cadbury Rectory	2·51	,,	Alvey Manse	1·88
VI.	Clifton, Pembroke Road	4·63	,,	Loch Ness, Drumnadrochit.	2·69
,,	Ross, The Graig	3·01	,,	Glencarron Lodge	5·33
,,	Shifnal, Hatton Grange	3·03	,,	Fearn, Lower Pitkerrie	1·36
,,	Blockley, Upton Wold	3·54	XIX.	Invershin	1·98
,,	Worcester, Boughton Park.	2·60	,,	Altnaharra	1·71
VII.	Market Overton	3·24	,,	Bettyhill	1·66
,,	Market Rasen	2·20	XX.	Dunmanway, The Rectory	4·95
,,	Bawtry, Hesley Hall	2·07	,,	Cork	3·38
,,	Buxton	3·97	,,	Darrynane Abbey	4·86
VIII.	Neston, Hinderton Lodge	2·83	,,	Glenam [Clonmel]	4·28
,,	Southport, Hesketh Park	3·33	,,	Ballingarry, Gurteen	3·95
,,	Chatburn, Middlewood	3·31	,,	Miltown Malbay	5·39
,,	Cartmel, Flookburgh	4·42	XXI.	Gorey, Courtown House	3·96
IX.	Langsett Moor, Up. Midhope	3·64	,,	Moynalty, Westland	2·39
,,	Scarborough, Scalby	2·53	,,	Athlone, Twyford	2·98
,,	Ingleby Greenhow	2·55	,,	Mullingar, Belvedere	3·16
,,	Mickleton	1·78	XXII.	Woodlawn	4·94
X.	Bardon Mill, Beltingham	...	,,	Westport, St. Helens	4·98
,,	Ewesley, Fallowlees	2·87	,,	Mohill	2·41
,,	Ilderton, Lilburn Cottage	1·49	XXIII.	Enniskillen, Portora	...
,,	Keswick, York Bank	7·52	,,	Dartrey [Cootehill]	3·13
XI.	Llanfrechfa Grange	6·69	,,	Warrenpoint, Manor House	2·78
,,	Treherbert, Tyn-y-waun	10·36	,,	Banbridge, Milltown	2·14
,,	Carmarthen, The Friary	6·28	,,	Belfast, Springfield	2·85
,,	Castle Malgwyn [Llechryd].	5·28	,,	Bushmills, Dundarave	3·82
,,	Plynlimon	9·70	,,	Stewartstown	...
,,	Crickhowell, Ffordlas	6·50	,,	Killybegs	5·41
,,	New Radnor, Ednol	4·97	,,	Horn Head	6·74

METEOROLOGICAL NOTES ON AUGUST, 1908.

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

LONDON, CAMDEN SQUARE.—The dry, sunny weather of the latter part of July continued until 4th, giving an absolute drought of 17 days. With the exception of a few fine days in the middle, the remainder of the month was unsettled with frequent R and occasional TS8. Duration of sunshine, 179·3* hours, and of R 48·4 hours. Mean temp. 60°·9, or 1°·2 below the average. Shade max. 83°·9 on 3rd; min. 45°·4 on 12th. F 0, f 0.

TENTERDEN.—Duration of sunshine, 224·0† hours. Shade max. 79°·0 on 4th; min. 41°·5 on 12th. F 0, f 0.

TOTLAND BAY.—Duration of sunshine, 251·6* hours. Shade max. 76°·1 on 3rd; min. 46°·1 on 17th. F 0, f 0.

PITSFORD.—Mean temp. 58°·4. Shade max. 81°·5 on 3rd; min. 39°·4 on 17th.

TORQUAY.—Duration of sunshine, 237·0* hours, or 30·4 hours above the average. Mean temp. 61°·3 or 0°·2 below the average. Shade max. 77°·9 on 7th; min. 47°·6 on 11th. F 0, f 0.

NORTH CADBURY.—Abundant sunshine was experienced to 19th, and no R fell, giving an absolute drought of 32 days. R fell every day from 19th to the end. Shade max. 81°·2 on 3rd; min. 41°·0 on 12th. F 0, f 0.

BATH.—Shade max. 79°·5 on 3rd; min. 41°·0 on 12th. F 0, f 0.

ROSS.—Shade max. 84°·6 on 3rd; min. 42°·0 on 12th. F 0, f 0.

HODSOCK PRIORY.—Shade max. 81°·8 on 3rd; min. 35°·6 on 17th. F 0, f 2.

BOLTON.—Mean temp. 55°·8, or 1°·0 below the average. Duration of sunshine, 124·3* hours, or 5·7 hours above the average. Shade max. 72°·4 on 2nd; min. 42°·9 on 12th. F 0, f 0.

SOUTHPORT.—Duration of sunshine, 187·7* hours, or 17 hours above the average; duration of R, 42·7 hours. Mean temp 58°·5, or 1°·0 below the average. Shade max. 70°·6 on 16th; min. 44°·9 on 17th. F 0, f 0.

HULL.—Duration of sunshine, 160* hours. Shade max. 80°·0 on 3rd; min. 41°·0 on 11th and 12th. F 0, f 0.

HAVERFORDWEST.—Fine and warm to 17th, then wet and unsettled. Duration of sunshine 217·4* hours. Shade max. 74°·6 on 3rd; min. 42°·4 on 17th and 18th. F 0, f 0.

LLANDUDNO.—Shade max. 74°·0 on 3rd; min. 50°·0 on 17th. F 0, f 0.

DOUGLAS.—Fairly dry to 19th, but thereafter extraordinarily bad weather, with a succession of strong N. winds. A violent gale on 31st caused the boats to be several hours late.

MAXWELTON.—Shade max. 81°·0 on 2nd; min. 37°·0 on 12th.

EDINBURGH.—Mean temp. 56°·1. Duration of sunshine, 196·1* hours. Shade max. 74°·2 on 2nd; min. 51°·5 on 20th. F 0, f 0.

DUNDEE.—Shade max. 80°·6 on 2nd; min. 38°·2 on 13th. F 0.

BALLACHULISH HOUSE.—Shade max. 78°·0 on 20th; min. 39°·0 on 11th. F 0, f 0.

WATERFORD.—Shade max. 77°·0 on 1st; min. 40°·0 on 12th. F 0.

DUBLIN.—Mean temp. 59°·1, or 0°·6 below the average. Shade max. 76°·3 on 3rd; min. 47°·2 on 11th. F 0, f 0.

MARKREE.—Shade max. 74°·8 on 3rd; min. 39°·9 on 17th. F 0, f 1.

WARRENPOINT.—Shade max. 72°·0 on 4th; min. 45°·0 on 11th, 16th, 29th and 31st. F 0, f 0.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, March, 1908.

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	58·1	24	25·6	15	48·1	34·7	37·3	87	97·6	20·8	2·37	18	6·4
Malta	64·4	2	47·6	15	60·0	51·6	48·1	76	133·9	...	2·98	12	5·1
Lagos	94·0	18	72·0	23	90·1	77·3	75·7	71	169·0	66·0	6·00	9	7·2
Cape Town	83·8	6	51·5	26	76·4	58·4	55·6	69	...	...	·46	6	3·9
Durban, Natal ...	92·9	12	57·8	25	81·2	65·8	...	...	146·2	...	4·76	13	5·0
Johannesburg	84·3	13	47·7	25	72·2	53·2	53·2	77	153·0	47·4	5·11	14	4·2
Mauritius	86·0	6	65·6	24	82·8	71·8	69·9	80	146·2	54·7	8·00	14	5·1
Calcutta...	104·9	31	60·1	3	94·6	69·1	63·1	58	157·7	51·1	·00	0	2·1
Bombay...	89·1	27	63·5	2	85·0	71·3	66·4	70	134·0	55·5	·06	1	1·1
Madras	97·5	10	62·5	9	90·1	71·2	69·6	73	143·4	57·5	·00	0	2·7
Kodaikanal	72·6	16	45·6	4	67·5	50·0	44·1	61	139·4	30·2	3·44	7	3·6
Colombo, Ceylon ...	91·6	21	72·0	12	89·7	74·5	72·5	75	160·8	69·2	4·48	11	4·4
Hongkong	79·1	31	46·6	7	65·9	57·0	54·4	76	124·7	...	·77	6	6·6
Melbourne	95·2	8	43·4	19	73·0	55·6	50·1	59	151·2	38·2	2·18	12	5·7
Adelaide	94·2	7	45·6	21	76·6	58·0	53·1	62	151·1	38·8	2·78	12	5·9
Coolgardie	...	...	...	...	...	...	...	...	...	...	...	...	...
Perth	...	...	...	...	...	...	...	...	...	...	...	...	...
Sydney	86·7	31	56·0	28	76·3	62·9	59·0	70	123·3	45·9	2·46	16	4·2
Wellington ...	72·0	1,2,3	46·0	16	64·1	55·6	52·2	76	124·0	31·0	4·87	16	4·0
Auckland	81·0	6	52·0	17	70·8	60·2	56·5	74	140·0	47·0	8·12	17	5·9
Jamaica, Kingston ...	91·8	9	63·3	6	87·1	68·3	69·0	75	...	...	1·27	9	...
Trinidad	89·0	var.	64·0	var.	87·4	66·3	73·4	88	162·0	61·0	1·79	7	...
Grenada	86·2	5	68·2	20	83·8	72·2	66·9	68	152·2	...	1·99	18	2·9
Toronto	63·8	26	7·5	4	39·0	23·9	...	84	...	...	1·68	16	7·3
Fredericton	54·0	24	-9·0	11	35·7	13·8	...	75	...	...	2·20	8	5·9
St. John's, N.B. ...	48·4	24	-1·0	10	35·6	20·7	...	...	...	...	3·76	14	5·5
Victoria, B.C.	55·2	23	27·2	6	49·6	37·7	...	77	...	...	4·58	17	7·0

MALTA.—Mean temp. of air 55°·8. Average hours of bright sunshine, 6·2.

Johannesburg.—Bright sunshine, 224·9 hours.

Mauritius.—Mean temp. of air 0°·5, dew point 0°·7, and relative humidity 0·5 per cent., below, and R 4·75 in. above, averages. Mean hourly velocity of wind, 13·8 miles, or 3·4 miles above average.

MADRAS.—Bright sunshine, 235·6 hours.

KODAIKANAL.—Bright sunshine, 239 hours, TSS on 8 days and hoar frost on 4 days.

COLOMBO.—Mean temp. of air, 82°·9 or 0°·8 above, of dew point, 0°·4 below, and R ·11 in. below, averages. Mean hourly velocity of wind, 4·4 miles.

HONGKONG.—Mean temp. of air, 61°·2. R 2·10 in. below average. Bright sunshine, 146·0 hours, mean hourly velocity of wind, 15·4 miles.

Melbourne.—Mean temp. of air 0°·8 above, and R ·05 in. above, averages.

Adelaide.—Mean temp. of air 2°·7 below, and R 1·71 in. above, averages.

Sydney.—Mean temp. of air 0°·4 above, and R 2·70 in. below, averages.

Wellington.—Mean temp. of air 0°·7 below, and R 1·42 in. above, averages.

RAINFALL OF THAMES VALLEY, SEPTEMBER, 1908.

The Edinburgh Geographical Institute. J.G.Bartholomew.

Symons's
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ANTARCTIC METEOROLOGY,—A REVIEW.

By L. C. Bernacchi.

Physicist to the National Antarctic Expedition.

When the results of the four most recent Antarctic expeditions are completed they will form an Antarctic library of about thirty large quarto volumes. The full official statement of the meteorological results of the *Discovery* is now practically completed, and has been published by the Royal Society in a quarto volume of some 550 pages,* prepared under the superintendence of the Director of the Meteorological Office, Dr. W. N. Shaw. Lieut. C. W. R. Royds, R.N., was in charge of the meteorological work on board the *Discovery*, which wintered in latitude 77° 50′ 50″ south, longitude 166° 55′ 45″ east. These observations are unique as they were continuous over a period of two years; from February, 1902, to March, 1904, observations were made every two hours. The volume also includes the observations taken on the various sledge journeys, and special papers on particular parts of the work by Captain Campbell Hepworth, Mr. R. H. Curtis, Mr. W. H. Dines, and Mr. C. T. R. Wilson.

The mean temperature observed at the *Discovery's* winter quarters for the two years February 9th, 1902, to January 31st, 1904, was —1°·7, the mean for the first year being 0°·4, and for the second —3°·0. The lowest mean temperature for any one month was —21°·1, for July, 1903, and the highest mean temperature 26°·1, for January, 1903. The absolute maximum temperature observed was 39°·0 in the first year, and 42°·0 in the second; both during the month of December. The absolute minimum temperature was —50°·5, in the first year, and —58°·5 in the second, the first being in August, and the second in September. The winter quarters were regarded as a somewhat warmer position in relation to others in the locality, corresponding minimum temperatures at Cape Armitage, in a more exposed position, on the barrier surface being —62°, and

* National Antarctic Expedition, 1901-1904. Meteorology, Part I. Observations at Winter Quarters and on Sledge Journeys, with discussions by various authors. Prepared under the superintendence of the Director of the Meteorological Office, with the co-operation of a Committee of the Royal Society. London. Published by the Royal Society, 1908. Size 12½ × 9½. Pp. xiv. + 548. *Plates.*

—64°·6 respectively. The lowest temperature actually noted was at Cape Armitage, on the 16th May, 1903, when the spirit minimum indicated —67°·7. Minimum temperatures of —52°·0; —58°·5; —61°·2; —64°·6, were noted on different sledge journeys during the early spring of 1902 and 1903.

Fluctuations of temperature were rapid and violent at all seasons; increase of temperature, especially during the winter being associated with a wind from the pole. The range of temperature during the winter months of June, July and August, 1903, was 64°. 66°·2, and 65°, respectively. Although the daily range is large on account of these sudden fluctuations, the mean diurnal variation is very small taking the average of the two-hourly readings, and amounts to only 1° in midwinter, and 3° in midsummer. The maximum range for the year 1903 was 100°·5.

The summers were very cold, only a few days gave a mean temperature above freezing. The low summer temperature is characteristic of the Antarctic regions, and is fully supported by the results of all other expeditions. The large mass of land ice, and the remarkable dryness of the air would seem to be partly responsible for this. The air is very transparent, fogs are infrequent, and precipitation is slight. An outstanding feature is the abundance of bright sunshine in the summer, the total amount for 1903 being equal to that of Scilly. The total of 490 hours in December, 1903, is equal to 66 per cent. of the possible amount. On one occasion there was a period of continuous sunshine of 87 hours, and on another occasion continuous sunshine for twelve days, with sunless intervals amounting to only 15 hours. The burn on the card of the sunshine recorder is sharp, generally goes right through the card, indicating strong solar action in a dry and dust free atmosphere. Solar radiation temperatures were very high, although the sun when it attained its greatest altitude in December was more than 60° from the zenith. The mean black bulb temperatures for December and January are only 14° less than the similar means (June and July) at Madras, with an almost vertical sun. The maximum reading approaches to within 3° of the Madras maximum.

The barometer stands higher than in other positions (all further north) in the Antarctic where observations have been obtained. The common semi-diurnal oscillation is clearly shown, amounting to about 0·002 inch, with maxima at about 10 a.m. and 10 p.m., at all seasons of the year. The highest pressure observed was 30·181 inches, and the lowest 28·140 inches. The surface winds at the ship were chiefly easterly, just as they were at Cape Adare, and on the German ship *Gauss*. All the observations taken on the sledge journeys clearly indicate that the direction of the prevailing wind at some distance away from the littoral is south-westerly. In connection with this matter it may be interesting to quote from Captain Hepworth's extremely interesting and instructive paper on the Climatology of South Victoria Land, he says:—

It seems not improbable, indeed, that from Cape Adare to Mount Longstaff, and even still further to the south, the distribution of pressure conforms largely to the configuration of the high land, and that an area of relatively high pressure lies over the land to the westward of the coast ranges, and relatively low over the Ross Sea, giving gradients for southerly winds during the greater portion of the year.

The tendency for the formation of a pressure gradient, with isobars along the coast line, is generally noticeable whenever land meets sea, and may probably be attributed to the temperature gradient between the land and the water. On the coast lines of the great continents the phenomenon is for the most part marked by the tendency of the average wind to follow the direction of the littoral.

* * * * * * *

The similitude in the rise and fall of mean pressure between Winter Quarter's pressure results on the one hand, and the pressure results of observations made on the southern journey during the same periods, suggests a mean distribution of pressure over the areas traversed to the eastward of the mountain ranges, represented by an isobar running about N.N.E. and S.S.W. This suggestion gains some confirmation by the fact that during the journey to the south, the wind's direction was mainly from south-south-westward.

As a member of the *Discovery* expedition I should be failing in my duty if I did not refer to the unjustified doubts and criticisms expressed in Dr. Shaw's introduction to the work. In order to dispel any possible misconstruction in the minds of those who read the introductory remarks, I venture to reply briefly to the various doubts and criticisms therein expressed.

On page xii., Dr. Shaw says: "It is curious that endeavours to reach, by two separate crucial tests, a definite conclusion upon the interesting point as to whether the easterly wind at winter quarters is a local wind, or a true general wind implying a high pressure to the south, fail through slight omissions in the observations or the records."

The first test apparently fails because of a doubt expressed (by Dr. Shaw and Mr. R. H. Curtis, page 489) as to whether the directions of the wind on the barrier sledge journey (November 10th to December 10th, 1903) were logged "true" or "magnetic," although Mr. Royds, who was in charge of the work, clearly states that the directions were "true." If we assume that it is the duty of an official department in charge of the preparation of so important a work, carefully to seek and examine every possible source of evidence, before expressing so serious a doubt, then it becomes difficult to understand how this doubt could have originated. Presuming, for the moment, that there is no other evidence than Mr. Royd's statement that the winds were logged "true," a glance at a magnetic chart of the locality of the barrier sledge journey shows the declination to be about 150° E., the horizontal force to be very small, and the vertical force very large. The obvious physical conclusion then is that a compass there would be sluggish and difficult to use, and

almost useless for steering a course or for observing individual wind directions. The map at the end of the volume, and column 3, page 352, showing true courses steered, indicate how uniformily correct the daily courses were, which would have been almost impossible by means of a compass. I was the only other officer on this barrier journey, and took astronomical sights nearly every day,—for latitude at noon, and longitude and *true bearing* of the sun during the late afternoon or early morning. These observations were reduced on the spot, and the true course laid down every morning before starting. This *true course* was retained throughout the day in two ways. (*a.*) By the persistent direction of the wind (from the S.W.) blowing out small pennants on the sledge and in front of the "ski," towards our left hand on the outward journey. These pennants were kept at almost right angles to the direction of motion. The plotted astronomical positions indicate an extremely straight S.E. true course. (*b.*) By means of a small, specially contrived, hand sun-dial, the principle of which I do not now recall, but I believe it is described in Captain Scott's narrative.

It was my business to take a set of magnetic observations every evening after the astronomical observations, including true bearing of the sun had been obtained. On the original observational sheets the direction of the wind (usually S.W.) has been clearly noted. In my private note book of the journey there are numerous references to the persistent wind from the S.W., to direction of "sastrugi" on the surface, &c.

The second crucial test failed, says Dr. Shaw, "from the fact that the explorers brought back no certain information about the amount of slope of the barrier surface towards the sea." In a paper on the *Discovery* results, read before the British Association in Dublin last month, Dr. Shaw spoke of the feasibility of a trigonometrical survey, having the high peaks to the south in sight of the great ice barrier surface, and which might give the variation of slope of the surface to within 3 feet. I venture to express the opinion, that the great physical difficulties of the locality, climate and otherwise, would severely task the ingenuity of the most skilled trigonometrical surveyors, and that the "probable error" might easily exceed 3 feet.

On page vi., Dr. Shaw writes: "Care was taken to draw up special instructions," and speaks of miscarriage of instructions due apparently to "*changes* in the staff. (*a.*) No meteorological instructions were ever seen on board the *Discovery*, and certainly none were printed in the Antarctic manual. (*b.*) The only *change* in the staff was that of the physicist, who was informed before sailing that he would not have charge of the meteorological work. Lieut. Royds was given charge of the department of meteorology some months before the sailing of the expedition, and with this end in view was sent to Ben Nevis Observatory for some days, to acquaint himself with the routine work there.

There are two other small points I would refer to, viz., the position

in which the barometer and Dines' self-recording anemometer were set up, to which exception is taken in the volume now published. The barometer was erected in the only really safe spot on board. Had it been in the confined living spaces below deck, it would probably have been seriously damaged. The anemometer was erected in the only really freely exposed position on the ship, away as much as possible from the rigging of the fore and mainmast, and the eddies of drifting snow around the deck houses. Had the pipes been attached to the stove pipe as suggested, the cold air in the pipe, sometimes —40° to —50°, would have rapidly condensed the moisture in the latter, and completely blocked it in a few hours.

THE GERMAN METEOROLOGICAL SOCIETY.

THE Eleventh General Meeting of the German Meteorological Society was held at Hamburg on September 28th—30th. The Society having reached the twenty-fifth year of its existence, the meeting was regarded as of special interest, and it was attended by a large number of members drawn from all parts of the empire. In addition, Australia was represented by Messrs. Hunt and Barton, the British Isles by Mr. Harries, France by M. Teisserenc de Bort, Hungary by Hofrat Konkoly, Norway by Vice-Director Aksel Steen, and the United States by Professor Rotch. Professor Hellmann, as President of the Society, opened the meeting with a congratulatory speech suitable to the interesting occasion; Admiral Herz, Director of the Deutsche Seewarte, was called upon to respond for the Official Meteorological Service; Mr. Harries, as representative of the Royal Meteorological Society, for the foreign visitors; Professor Dr. Voller for the Physical Institutions, and Dr. Friederichsen for the Geographical Societies. Dr. Hellmann then gave an address on the "Dawn of Meteorology." Subsequently there were five sittings, at which twenty-five papers were discussed, the subjects being General Meteorology, the Meteorology of the Upper Atmosphere, Weather Forecasting, and Atmospheric Electricity. Such an amount of work could only be got through by steady application from 9 a.m. to 6 p.m. daily. To make up for this the social side of the occasion was not neglected. On Monday night, the 28th, visitors were the guests of the Senate of the Free Town of Hamburg, in the Rathaus; on Tuesday there was a dinner at the Hamburger Hof; on Wednesday the Hamburg-America Steamship Company took the visitors round the harbour, and on a trip some miles down the Elbe, concluding the excursion with a visit to the liner *König Wilhelm II.* On Thursday the Seewarte and other institutions were thrown open to the visitors, and the afternoon and evening were devoted to the kite and balloon station at Grosse Borstel, the final act of the gathering being a dinner given by Professor and Mrs. Köppen.

It was further announced that MM. Angot and Teisserenc de Bort, Professor Rotch and Dr. Shaw had been elected honorary members of the Society.

BRITISH RAINFALL, 1907.

THE annual volume embodying the work of the voluntary rainfall observers of the British Isles was published on September 20th. The volume consists of 380 pages, the same number as last year. In Part I. there is a detailed discussion of the thunderstorm of July 21st and 22nd, 1907, illustrated by three maps, one in colours as a frontispiece, a diagram and four photographs of the effects of the storm. The article on the Staff of Observers shows that 3218 records are included from England, 324 from Wales, 574 from Scotland and 229 from Ireland, 4345 altogether, being 86 more than in the previous year. Altogether the volume contains the records of 375 stations not given in the previous issue, and 289 which appeared last year have dropped out. Large though the number of stations may appear, attention is called to many parts of the country where additional records are much wanted, amongst others—the Metropolitan Boroughs of Bethnal Green, Hammersmith and Southwark, the east of Kent and especially the eastern part of the North Downs, the centre and east of Hertfordshire from which records sent monthly are specially asked for, and in Oxfordshire "the desert area toward the east where gauges at Thame or Brill would be welcome." A special appeal is made for the establishment of new records at Ongar and anywhere within five miles of the western boundary of Essex. In Wiltshire the loss of many old records is scarcely alleviated by one or two new observers. East Gloucestershire, including the source region of the Thames, is in need of more rain gauges. The want of observers in the Highlands and in Ireland is as great as ever, and in the latter country for the first time since 1862 there is not a single observation to record from the county of Tyrone.

Notice is given of the death of 69 observers, and brief biographical notes concerning 19 of these are added.

In Part II. all the old features are preserved, including the extremely detailed discussion of number of rain days, frequency of daily falls of various amounts, droughts and rain spells at 73 selected stations. The discussion of monthly rainfall is given in greater detail than formerly, and the scale of the maps showing deviation from the average has been materially increased. In discussing the relation of the rainfall of the year to the average the following statement is made:—

"As we have pointed out in several successive volumes there has been a definite periodical relationship in the succession of wet and dry years since 1891, a wet year having been followed by two dry ones, without a single break, until 1906. The percentage figures of difference from the average for the British Isles in the last column of the rough comparison may be quoted:—

1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.
+5	−5	−12	**+5**	−5	−6	**+3**	−2	−5	**+8**	−11	−17	**+26**	−9	−14

"We also pointed out annually that as this relationship did not hold good before 1891, there was every probability that sooner or later it would cease to hold good again, and that remarkable as the series of recurrences was it would not be safe to trust to any empirical rule founded on it as a basis for prediction. If the rule had held 1906 should have been a wet year, and 1907 a dry year, but we find instead that the two years came out as nearly as possible the average. There does not seem to have been any other case of two consecutive years having had the same total rainfall, and none of any year before having had neither less nor more than the average. It has been suggested that a cycle of three years and a fraction would for a time give recurrences similar to those observed, and then a different order after a period of transition. No better period of transition could be imagined than two average years, and we look forward with interest to the future. Meanwhile we note that the 15 years during which the recurrence was observed had on the whole a rainfall 8 per cent. below the average, in other words there was a total shortage of more than one year's rainfall. It may be that a time of increasing rainfall has now set in. There is, however, the possibility that different parts of the British Isles may experience different recurrences of rainfall, and this is one of the many subjects on which we hope to be able to throw light when the large-scale rainfall maps for forty years have been completed, and a trustworthy average map compiled from them."

REVIEW.

Colony of Mauritius. Annual Report of the Director of the Royal Alfred Observatory for 1907. Size $13\frac{1}{2} \times 8\frac{1}{2}$. Pp. 18.

THE admirable work done at this observatory and the important position it occupies for observing the meteorological conditions of the Indian Ocean are well known. The position is of Imperial importance, because the observations made at Mauritius have a bearing on the climate of India, the East and South African colonies, and possibly of Australia; but the colony of Mauritius is poor, and like so many other local governments "economy" is practised on the already poorly endowed meteorological institutions. We greatly regret to see by the last paragraph in Mr. Claxton's Report that owing to the reduction of the vote for extra assistance it has been necessary to dismiss two computors, one of three and one of seven years' standing, so that the clerical work of the Observatory cannot be properly maintained, and the library work is at a standstill. The unhealthiness of the Observatory is attested by a list of seven deaths in five years. We sincerely hope that the colonial authorities will soon realize how greatly the reputation of Mauritius and the navigation of the Indian Ocean have been improved by the Observatory, which appears to be sadly in need of help and encouragement.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

GREAT RANGE OF TEMPERATURE.

MR. HAWKE's difference of 46°·0 in 60 hours is, of course, rather unusual in the south of England, but inasmuch as a range of more than 40° in a single day is by no means unknown here, one would expect to find quite a "respectable" number of cases similar to the one given in this month's issue of your Magazine.

The instance I remember best was at the end of August, 1906, when a minimum of 44°·2 at 6 a.m. on the 29th was followed 56 hours later by the highest maximum of the year, 94°·3 at 2 p.m. on the 31st. I doubt if this can be paralleled in the Greenwich records, though very likely at more exposed stations in the country such cases are less rare.

WALTER W. BRYANT.

Royal Observatory, Greenwich, Sept. 21st, 1908.

MAY I be allowed to draw attention to a note on "Greatest Variations of Temperature" in the *Quarterly Journal* of the Royal Meteorological Society, Vol. **29**, p. 223, where will be found several instances of extraordinary changes of temperature. Amongst those given might be mentioned that at Swarraton, near Alresford, in January, 1901, when the minimum temperature on the 9th, —1°·9, was followed on the 10th by a maximum of 49°·2, giving a rise of 51°·1 in the two days. At Marlborough, in August, 1887, the minimum on the 3rd, 36°·0, was followed by a maximum reading next day of 86°·5. At the same place during the great heat wave of 1906 the temperature on August 30th, after descending to 37°·1 in the early morning, rose to a maximum of 83°·6, or an increase of 46°·5, in probably less than 12 hours, and was followed on August 31st by a maximum of 87°·3, and on September 1st by 88°·3.

A. HAMPTON BROWN.

Royal Meteorological Society, Sept. 30th, 1908.

AVOIDING A THUNDERSTORM.

WITH reference to the heavy rain of Friday, 11th September, when 3·15 in. fell at Canterbury, the following notes may serve to call attention to the extremely local character of the shower.

A friend and I had arranged to walk that day from Rye towards Canterbury, *viâ* Ashford. About 10 a.m. the aspect of the sky in the direction of Ashford caused us to decide to make for Hastings instead. To the south-west the clouds (cumulo-stratus) were fairly high and the sun was shining, but to the north and north-east the sky was very black with heavy clouds, which continued to become more

dense, and soon the sky was so black in that direction that we could only just discern the outline of the hills.

We heard the first thunder between noon and 1 p.m., and from then until late in the afternoon the storm continued within sight. The thunder was very heavy and the lightning vivid; one or two flashes appeared to be vertical. It was a fine sight, and from the top of the cliffs where we were in the sunshine we had a good view of it, perhaps 15 or 20 miles away. We could see quite plainly the rain descending heavily from the dense clouds in the distance, showing the limits of the districts which were experiencing the downfall. About 4 p.m. the sky overhead gradually became more cloudy, and at 4.30 p.m., when near Fairlight, we were caught in a heavy shower (not accompanied by thunder or lightning), which lasted 15 or 20 minutes.

H. LESTER B. TARRANT.

September 15th, 1908.

GREAT HAIL STORM AT CANTERBURY.

YOUR readers may be interested in a short account of the extraordinary thunderstorm which occurred here shortly after 5 o'clock in the afternoon of Friday, September 11th, and which is very fully described in the local newspaper accounts. My rain gauge here recorded 1½ inches in about 20 minutes, and the lamp was, of course, not alight at this time of the year, so that all the hail and snow would not be washed into the gauge and melted at once. My total was 1·99 in., but in the southern part of the city as much as 3·15 in. was measured, whilst in the northern part less than half inch.

You may also be interested in my maximum temperatures for comparison with other places. Sept. 27th, 62°·0; 28th, 67°·0; 29th, 68°·2; 30th, 76°·2; Oct. 1st, 78°·2; 2nd, 78°·3; 3rd, 79°·8; 4th, 79°·6; 5th, 61°·9.

A. LANDER, F.R.Met.Soc.

Canterbury, 6th October, 1908.

THE BLACK BULB.

I THINK Mr. Gaster's objection in the September number to my statement that meteorologists know what they are measuring with the black and bright bulb solar radiation thermometers is met by the second part of the first clause of my sentence: "Meteorologists, of course, know what they *are* measuring, or *trying* to measure with this instrument" .... I was, of course, discussing the theory of the instrument, in which circumstance the consideration of defects inseparable from the process of manufacture found no proper place.

L. C. W. BONACINA.

Northwood, October 3rd, 1908.

METEOROLOGY AT THE FRANCO-BRITISH EXHIBITION.

By L. C. W. BONACINA, F.R.Met.Soc.

III.

THE remaining division (3) in the first article of this series comprises a mass of diverse meteorological information of a more or less statistical nature. These statistical matters are drawn up in the form of tables, maps and curves; but owing to the limits of space I propose to base the subject-matter of this article on two only of the exhibits. These are (*a*) a diagram illustrating the comparison of climatological details for a number of stations in the midland counties of England, (*b*) a map showing the relative forwardness of vegetation in the British Isles. To take (*a*) first. This diagram (which though catalogued for exhibition, was not in evidence on the occasion of my visits to the Franco-British Exhibition in the middle of June) presents the results of refined but laborious methods of handling masses of statistics, and illustrates a subject of paramount importance in the study of climatology. Briefly, it shows: the modification imposed by local conditions upon the intensity of weather elements in six distinct types of weather; which are cold, wet, warm, sunny types, &c.; and how the same type affects the different stations. Without confining our attention to the details of the diagram, which, as intimated above I have not seen, let us examine the nature of the subject which it illustrates. In winter time, more especially in time of frost, it is usual to find the western sea-board of Ireland warmer than the interior of England, and when on any day the temperature charts reveal a good average difference of temperature between the two regions, this is in itself a tolerably fair indication, which the pressure charts would probably help to confirm, that both regions are under the influence of the same type of weather, and that the general intensity of the type is the same in both. But if one day it is found to be freezing hard in the west of Ireland, and relatively warm in the centre of England, it is a certain deduction that the *general weather conditions* are dissimilar in the two regions, that there are differences of wind, sky, or humidity, connected, doubtless, in some manner whether the pressure charts show it or not, with the distribution of atmospheric pressure.

Another aspect of the subject may be considered. An invalid sent to pass the winter on the sheltered coast of Torquay, who had the misfortune to arrive there during a period of hard frost, or general cold, would say, if he regarded the matter scientifically: "This bitter cold is not due in any special manner to the local severity of the climate of Torquay, which is still as mild as the *general type* of weather will permit." On the other hand, of course, he will realize that however *relatively* mild Torquay may be, a really mild climate in the sense of entire freedom from winter frost and

bleak winds, or damp, gloom and fog, is not to be found above the 45th parallel, and not often till one passes far below it. Where the sun is so low, and the days so short during the winter half-year, northern rigors, even in the Scilly Isles, are bound at times to assert themselves in some form or another, however liberal may be the supply of mild air and warm water from the southern Atlantic; thus while outlying islands like the Hebrides, Orkneys and Shetlands, pride themselves upon a comparative immunity from prolonged frosts and deep snows, have instead what is much more disagreeable and difficult to endure, namely, an undue predominence of raw cold, wet sleet, and driving rain, and a summer which despite the almost perpetual daylight or twilight of northern Scotland in June, can only be described as feeble and miserable, the mean temperature barely reaching a level that would satisfy the popular conception of the summer season.

It is now time to take up division (*b*) of this article, discussing the relative forwardness of vegetation in the British Isles. For the production of this map thirteen plants have been selected; the average date for the first flowering of these is May 22nd, and the map indicates the differences from this date in the various districts. The map may doubtless be trusted to demonstrate in a more or less satisfactory manner that the "spring" is earlier in some districts than in others, and it confirms what everyone knows that in a general way the farther north one goes the more backward is vegetation in responding to the call of spring. But all thoughtful and interested persons on studying this map at the Exhibition will immediately enquire what is the method of observation employed in the accumulation of data required for the production of such a map, and how far that method may be considered *serviceable* and *reliable*; and having made the enquiry will forthwith find themselves involved in all the intricate and difficult questions associated with the making of phenological observations. In putting forth my opinion upon this subject I write as a close student of the English country-side throughout the year, and invite other such students who read this Magazine to state their own views upon the subject. In the first instance students of the map in question will probably want to know why it refers to the *first* flowering of the thirteen selected plants. The answer no doubt is that making use of the dates of *first* flowering is the only possible way of developing the subject with scientific precision. Now I hold the view that in the study of phenology such scientific precision as is here aimed at can only be attained at the expense of a large amount of more valuable knowledge and information, which can only be acquired and expressed in a manner depending upon a more general and comprehensive mode of systematizing the observations than the one used by the Royal Meteorological Society. In other words, I am of opinion that with reference to this subject of phenology as to many other subjects, our position with respect to nature is so difficult that to attempt to record the

exact dates of those various recurrent phenomena of animal and vegetable life, which mark the different stages in the cycle of the seasons, is not the first desideratum, when, as will be shown shortly, it is impossible to ascertain such exact dates if the observations are made in the best, most useful, and most intelligent—that is, of course, in the most scientific—manner possible. Referring to Mr. Marriott's "Hints to Meteorological Observers," prepared under the direction of the Royal Meteorological Society, one is told among the instructions to phenological observers, (1) to keep a careful watch for noting the *first* flowering of uncultivated plants, the arrival and song of birds, appearance of insects, &c.; (2) that a plant is to be considered "in flower" when the stamens of the *first* blossom on it first become visible; (3) that it is a matter of great importance to observe the *same individual* trees and shrubs which are not too forward or too backward for the district, and in the case of herbs, those growing in *precisely the same* spots. Let us now carefully examine these instructions and see where they lead us. Taking first of all one of the plants on the Royal Meteorological Society's list, let us select the wild rose (*rosa canina*), whose blossoms, so characteristic of the glorious month of June, are perhaps the very loveliest of all English wild flowers, not even excepting the primrose and hyacinth, and may be said to bring to an end the season of sweet spring wild flowers. Now according to instructions (2) and (3) above, the phenological observer if he wants to record the date when the wild rose is "in bloom" in his locality, must fix his attention upon some average individual plant, and note when the stamens of the first blossom on it become visible. Well! the definition of the stage in the development of a flower, at which it is to be considered "in bloom," is a good one, and some sort of an agreement is of course necessary as to when a flower is first "a flower" so to speak, since the petals of the wild rose (and many other species of plants) appear long before the stamens, &c. But now our phenological observer will come to grave difficulties if he is thoughtful enough. In the first place it is a very common experience to find the first blossom on any individual plant to be "in flower," as defined above, several days before any of the others. In this case the first blossom is clearly no criterion of the date of flowering of that particular individual plant. In the second place,—and this in my opinion is the most serious flaw of all in the present phenological instructions—wild rose bushes (like many other plants), even the more average ones, certainly make no pretence of commencing to bloom together, although of course there is usually a date on which a larger percentage (probably never higher than 30 or 40) of the total number of individual plants of the species in a given district are *beginning* to come into flower than on any other. What then is the phenological observer to do? Obviously if he wishes to draw a generalization through competent and accurate observations, and report to the Royal Meteorological Society, or any other body, that *the* wild rose, and not *a* wild rose in his locality is

bursting into flower, he must adapt himself to nature's ways by endeavouring to record *approximately* the date on which he estimates that about one-half of the individual rose plants taken at random in his locality are either in a well-advanced state of flowering (such as the few abnormally early individuals will be by that date), or are just commencing to bloom, as evidenced by the appearance not of one blossom only on the individual plants, but of several, in the stage of development defined by the first appearance of the stamens. The other half of the rose bushes will, of course, be still flowerless, and will include the relatively few very late individuals, which will not put forth their flowers till the very early ones are beginning to shed their petals.

(To be concluded next month.)

THE WEATHER OF SEPTEMBER, 1908.

By FRED. J. BRODIE.

THE weather of September was generally of a changeable character, and the fluctuations in temperature were frequent, and at times very considerable. The most prominent feature in regard to this element occurred at the end of the month, when the entire country was visited by a spell of summer heat of almost unprecedented intensity for so advanced a period in the season.

The month opened with the passage of a deep storm system across these islands, and with a violent westerly gale blowing on our western and southern coasts. As the disturbance travelled away across the North Sea a cool wind from north-west and north spread over the entire kingdom, and on the 3rd and 4th there were many places even in the south of England in which the thermometer failed to rise to a maximum of 55°. Sharp ground frosts were experienced about the same time in the northern and central parts of Great Britain; the exposed thermometer falling on the night of the 2nd to a minimum of 20° at Balmoral, 23° at Llangammarch Wells, 24° at Crathes and 26° at Birmingham (Edgbaston). In the second week the conditions over the entire kingdom were influenced by a new cyclonic system which travelled very slowly north-eastwards across the country, the passage of this depression being accompanied by heavy and continuous rains in the northern parts of Ireland and Scotland, and by a stiff gale from various quarters on many portions of our coast. The south-westerly wind in the front of this disturbance was a very warm one, and on the 7th and 8th the thermometer rose to between 70° and 75° in many parts of England and to 76° at Geldeston. With the north-westerly current which set in in the rear of the storm the weather, however, again became cool, and on the nights of the 11th and 12th another sharp ground frost was experienced, the terrestrial radiation thermometer even as far south as Greenwich falling to a minimum of 25°. Readings of about the same height were experienced at this time in many other parts of Great Britain; and at the

very exposed station at Llangammarch Wells the ground thermometer sank to 22°. With a southerly wind which set in after the 15th the weather again became mild, and between the 17th and 20th shade temperatures exceeding 70° were experienced over a large portion of Great Britain and as far north as Banffshire. In the east and south-east of England many places reported readings above 75°, and at Maidenhead on the 19th and Epsom on the 20th the thermometer touched 78°. After the 21st the southerly breeze died away, and between the 22nd and 24th, when a shallow barometrical depression moved slowly eastwards across England, the wind became rather variable and temperature fell slightly below the normal. Towards the close of the month the equatorial current again swept in, and the thermometer rose to an extremely high level, the abnormal warmth continuing throughout the opening days of October. On the 28th shade temperatures slightly above 70° were recorded in many parts of England and Wales, and on the following day several places in the northern parts of these countries reported readings slightly above 75°. The greatest September heat occurred, however, on the closing day of the month, when the thermometer rose well above 75° over a very large portion of Great Britain, and reached 80° or more at several English stations, including Greenwich. At Whitby the shade maximum on this day was as high as 81°, while at Epsom and Maidenhead the thermometer touched 82°, the readings being in many places the highest on record for so late a period in the year.

Nothwithstanding the various warm periods to which allusion has been made, the mean temperature of the month was below the average in nearly all parts of England and Ireland. In Scotland the mean values agreed very closely with the normal.

THE HIGH TEMPERATURE IN LONDON.

From September 29th to October 4th the maximum temperature on the Glaisher screen at Camden Square has reached or exceeded 75° each day, the readings being as follows:—

	September		October			
	29th.	30th.	1st.	2nd.	3rd.	4th.
Max. Temp....	75°·0	79°·0	77°·5	79°·0	77°·9	75°·9

This is remarkable because the temperature is high for the time of year, and on account of the number of consecutive days with high temperature.

Since 1858, when the record commenced, a shade temperature of 75° or over after September 29th has been recorded on only eleven occasions; six of these have just occurred on consecutive days as quoted above, two on consecutive days in 1895, and the other three are scattered over fifty years, thus:—

Sept. 29, 1869.....	76°·0	Oct. 4, 1859	80°·9
,, 29, 1895.....	77°·1	,, 4, 1886	78°·8
,, 30, 1895.....	77°·6		

The temperature of 79°·0 on October 2nd, 1903, has only been surpassed or equalled in October in 1859.

The minimum temperatures during the hot spell were comparatively high, but they had frequently been exceeded.

The only other prolonged spell of very hot weather late in the autumn was the last week of September, 1895, when the maximum temperatures from the 23rd to 30th were 82°·6, 80°·6, 82°·4, 82°·6, 79°·2, 77°·1, 77°·6.

ANNOUNCEMENT OF PRIZE OFFERED BY THE GERMAN METEOROLOGICAL SOCIETY.

DR. HELLMANN requests us to publish the following announcement, and we have great pleasure in doing so :—

The German Meteorological Society offers a prize of 3000 marks (£150) for the best discussion of the meteorological observations obtained in the international kite and balloon ascents so far as these are published.

CONDITIONS.

1. The judges hold themselves free to divide the prize should that prove advisable.

2. The competition for the prize is open to persons of any nationality.

3. The manuscripts for the competition must be legibly written in German, English or French, on one side of the paper. They must be anonymous and bear a motto; this motto must be written on a sealed envelope sent with the manuscript and enclosing the name and address of the sender.

4. The competition is open until December 31st, 1911, and the manuscripts should be sent before that date to the undersigned President of the German Meteorological Society (Geheimer Regierungsrat Professor Dr. G. Hellmann, 6 Schinkelplatz, Berlin, W., 56).

5. The result of the examination by five judges of the documents received will be published in 1912 in the *Meteorologische Zeitschrift.*

HELLMANN,
President of the German Meteorological Society.

METEOROLOGICAL NEWS AND NOTES.

AN ABSTRACT OF DR. SHAW'S ADDRESS to the British Association in Dublin, and various other articles which are standing in type, have to be held over for a future number. The addition of four extra pages to the Magazine now involves doubling the cost of postage, and we propose to enlarge the January number only as the Contents of the volume bring the postage within the higher rate in any case.

MR. W. MARRIOTT will lecture on meteorological subjects on behalf of the Royal Meteorological Society, at St. Lawrence College, Ramsgate, on October 23rd; at Christ's Hospital, Horsham, on October 31st; and at the Wolverhampton Literary and Scientfic Society, on November 5th.

RAINFALL TABLE FOR SEPTEMBER, 1908.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1870-99.	1908.
		° ′	° ′		in.	in.
Camden Square	*London*	51 32	0 8	111	2·29	1·27
Tenterden	*Kent*	51 4	*0 41	190	2·62	1·70
West Dean	*Hampshire*	51 3	1 38	137	2·58	1·72
Hartley Wintney	,,	51 18	0 53	222	2·38	1·62
Hitchin	*Hertfordshire*	51 57	0 17	238	2·26	1·43
Winslow (Addington)	*Buckinghamshr.*	51 58	0 53	309	2·38	1·37
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·49	2·01
Brundall	*Norfolk*	52 37	*1 26	66	2·57	1·97
Winterbourne Steepleton	*Dorset*	50 42	2 31	316	3·40	3·20
Torquay (Cary Green)	*Devon*	50 28	3 32	12	3·05	2·46
Polapit Tamar [Launceston]	,,	50 40	4 22	315	3·63	2·71
Bath	*Somerset*	51 23	2 21	67	2·89	2·11
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·72	2·23
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·74	2·13
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·71	2·33
Boston	*Lincolnshire*	52 58	0 1	25	2·30	1·62
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·18	1·80
Derby (Midland Railway)	*Derbyshire*	52 55	1 28	156	2·32	1·67
Bolton (Queen's Park)	*Lancashire*	53 35	2 28	390	4·38	4·96
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	2·53	2·21
Arncliffe Vicarage	,, ,,	54 8	2 6	732	5·13	8·09
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·40	1·99
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·36	1·80
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	12·76	17·17
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·08	3·48
Haverfordwest (High Street)	*Pembroke*	51 48	4 58	95	4·21	4·13
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·20	4·86
Llandudno	*Carnarvon*	53 20	3 50	72	2·92	3·39
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	3·71	4·99
Hawick (Branxholm)	*Roxburgh*	55 24	2 51	457	2·80	2·38
Edinburgh (Royal Observy.)	*Midlothian*	55 55	3 11	442	...	2·60
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	4·44	5·70
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·34	3·49
Tighnabruaich	*Argyll*	55 55	5 14	50	5·53	8·82
Mull (Quinish)	,,	56 36	6 13	35	5·47	7·05
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·55	4·80
Braemar	*Aberdeen*	57 0	3 24	1114	3·27	3·65
Aberdeen (Cranford)	,,	57 8	2 7	120	3·04	3·61
Cawdor	*Nairn*	57 31	3 57	250	3·01	4·74
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	3·93	5·59
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	8·28	11·91
Dunrobin Castle	*Sutherland*	57 59	3 56	14	2·71	3·69
Castletown	*Caithness*	58 35	3 23	100	...	5·42
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	4·67	5·95
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·08	6·03
Broadford (Hurdlestown)	*Clare*	52 48	8 38	167	2·98	6·20
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	2·86	6·82
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·15	2·31
Ballinasloe	*Galway*	53 20	8 15	160	3·17	4·24
Clifden (Kylemore House)	,,	53 32	9 52	105	6·72	...
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	4·12	7·30
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·85	7·37
Seaforde	*Down*	54 19	5 50	180	3·37	5·39
Londonderry (Creggan Res.)	*Londonderry*	54 59	7 19	320	3·77	6·71

RAINFALL TABLE FOR SEPTEMBER, 1908—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1870-99. in.	1908. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1870-1899. in.	STATION.
—1·02	55	·67	3	13	17·74	19·14	+1·40	108	25·16	Camden Square
— ·92	65	·49	3	15	18·80	17·79	—1·01	95	28·36	Tenterden
— ·86	67	·60	3	18	20·41	18·48	—1·93	91	29·93	West Dean
— ·76	68	·52	3	13	18·44	19·15	+ ·71	104	27·10	HartleyWintney
— ·83	63	·39	3	15	17·33	17·79	+ ·46	103	24·66	Hitchin
—1·01	58	·33	3	15	18·96	19·52	+ ·56	103	26·75	Addington
— ·48	81	·78	24	13	18·12	18·32	+ ·20	101	25·39	Westley
— ·60	77	·54	21	15	17·58	18·70	+1·12	106	25·40	Brundall
— ·20	94	·57	3	20	25·72	23·30	—2·42	91	39·00	Winterbourne Stpltn
— ·59	81	·55	22	21	23·74	18·45	—5·29	78	35·00	Torquay
— ·92	75	·77	10	17	25·20	25·72	+ ·52	102	38·85	Polapit Tamar
— ·78	73	·54	3	17	21·71	18·72	—2·99	86	30·75	Bath
— ·49	82	·39	3	17	21·28	18·69	—2·59	88	29·85	Stroud
— ·61	78	·41	20	22	22·95	24·61	+1·66	107	33·04	Wolstaston
— ·38	86	·73	4	15	20·79	19·65	—1·14	95	29·21	Coventry
— ·68	70	·39	23	14	16·75	17·65	+ ·90	105	23·30	Boston
— ·38	83	·50	18	16	17·81	17·15	— ·66	96	24·70	Hodsock Priory
— ·65	72	·40	3	15	18·85	19·47	+ ·62	103	26·18	Derby
+ ·58	113	·84	16	21	29·61	35·04	+5·41	118	42·43	Bolton
— ·32	99	·60	18	15	19·36	20·54	+1·18	106	26·96	Ribston Hall
+2·96	158	1·38	16	24	42·00	50·44	+8·44	120	60·96	Arncliffe Vic.
— ·41	83	·43	22	18	18·95	16·67	—2·28	88	27·02	Hull
— ·56	76	·40	20	17	19·76	18·13	—1·63	92	27·99	Newcastle
+4·41	135	2·91	14	22	90·72	98·09	+7·37	101	132·68	Seathwaite
— ·60	85	·66	3	21	29·31	26·75	—2·56	91	42·81	Cardiff
— ·08	98	·80	25	21	31·62	31·08	— ·54	98	47·88	Haverfordwest
+ ·66	116	1·39	9	18	30·66	34·98	+4·32	114	45·41	Gogerddan
+ ·47	116	·84	8	18	20·57	24·04	+3·47	117	30·98	Llandudno
+1·28	134	·86	7	17	29.86	37·31	+7·45	125	43·43	Cargen
— ·42	85	·30	7	23	24·13	24·23	+ ·10	100	34·80	Branxholm
...	...	·68	26	21	...	18·55	...	...	...	Edinburgh
+1·26	128	·71	7	27	32·90	38·18	+5·28	116	48·87	Girvan
+ ·15	104	·74	7	21	25·43	25·81	+ ·38	101	35·80	Glasgow
+3·29	159	1·73	7	21	39·64	51·06	+11·42	129	57·90	Tighnabruaich
+1·58	129	1·19	5	23	38·53	40·61	+2·08	105	57·53	Quinish
+2·25	188	1·48	7	24	20·75	19·29	—1·46	93	28·95	Dundee
+ ·38	112	...	...	...	24·93	25·91	+ ·98	104	36·07	Braemar
+ ·57	119	·63	7	21	22·97	20·80	—2·17	91	33·01	Aberdeen
+1·73	157	1·35	8	18	21·34	19·99	—1·35	94	29·37	Cawdor
+1·66	143	1·09	8	25	29·68	34·11	+4·43	115	43·71	Fort Augustus
+3·63	144	1·12	8	26	57·69	69·08	+11·39	120	86·50	Bendamph
+ ·98	136	1·16	8	16	21·63	26·85	+5·22	124	31·60	Dunrobin Castle
...	...	2·10	8	23	...	26·17	...	...	...	Castletown
+1·28	127	·77	28	27	39·57	34·85	—4·72	88	58·11	Killarney
+2·95	196	1·09	19	23	27·08	28·71	+1·63	106	39·30	Waterford
+3·22	208	1·23	8	24	23·79	31·11	+7·28	131	33·47	Hurdlestown
+3·96	238	1·20	19	24	25·05	27·48	+2·43	110	35·19	Abbey Leix
+ ·16	107	·46	8	19	19·68	19·56	— ·12	99	27·75	Dublin
+1·07	134	·65	8	26	26·36	25·68	— ·68	97	37·04	Ballinasloe
...	...	...	...	...	55·06	...	...	...	80·23	KylemoreHouse
+3·18	177	1·17	8	26	34·02	41·52	+7·50	122	50·50	Enniscoe
+3·52	191	2·00	8	23	29·17	37·99	+8·82	130	41·83	Markree Obsy.
+2·02	160	·73	19	22	27·21	31·29	+4·08	115	38·61	Seaforde
+2·94	178	1·46	8	26	28·25	35·39	+7·14	125	41·20	Londonderry

SUPPLEMENTARY RAINFALL, SEPTEMBER, 1908.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	1·66	XI.	Rhayader, Tyrmynydd	3·99
,,	Ramsgate	1·23	,,	Lake Vyrnwy	...
,,	Steyning	1·46	,,	Llangyhanfal, Plâs Draw	3·10
,,	Hailsham	2·02	,,	Criccieth, Talarvor	...
,,	Totland Bay, Aston House	2·36	,,	Llanberis, Pen-y-pass	17·19
,,	Emsworth, Redlands	1·94	,,	Lligwy	3 67
,,	Stockbridge, Ashley	1·98	,,	Douglas, Woodville	4·52
,,	Reading, Calcot Place	1·73	XII.	Stoneykirk, Ardwell House	4·59
III.	Harrow Weald, Hill House.	1·72	,,	Dalry, The Old Garroch	7·20
,,	Oxford, Magdalen College	1·37	,,	Langholm, Drove Road	6·29
,,	Pitsford, Sedgebrook	1·43	,,	Moniaive, Maxwelton House	6·30
,,	Huntingdon, Brampton	2·83	XIII.	N. Esk Reservoir [Penicuick]	4·00
,,	Woburn, Milton Bryant	1·57	XIV.	Maybole, Knockdon Farm	4·37
,,	Wisbech, Bank House	1·11	XV.	Campbeltown, Witchburn	5·90
IV.	Southend Water Works	1·27	,,	Inveraray, Newtown	11·12
,,	Colchester, Lexden	·85	,,	Ballachulish House	9·67
,,	Newport, The Vicarage	1·35	,,	Islay, Eallabus	6·28
,,	Rendlesham	1·23	XVI.	Dollar Academy	7·15
,,	Swaffham	1·77	,,	Loch Leven Sluice	8·92
,,	Blakeney	1·83	,,	Balquhidder, Stronvar	10·15
V.	Bishops Cannings	2·43	,,	Perth, The Museum	3·96
,,	Ashburton, Druid House	3·21	,,	Coupar Angus Station	3·72
,,	Honiton, Combe Raleigh	2·99	,,	Blair Atholl	3·78
,,	Okehampton, Oaklands	2·59	,,	Montrose, Sunnyside Asylum	3·84
,,	Hartland Abbey	1·78	XVII.	Alford, Lynturk Manse	3·90
,,	Lynmouth, Rock House	2·13	,,	Keith Station	6 97
,,	Probus, Lamellyn	3·94	XVIII.	N. Uist, Lochmaddy	4·46
,,	North Cadbury Rectory	2·61	,,	Alvey Manse	3·82
VI.	Clifton, Pembroke Road	2·69	,,	Loch Ness, Drumnadrochit.	6 20
,,	Ross, The Graig	1·80	,,	Glencarron Lodge	11·06
,,	Shifnal, Hatton Grange	2·15	,,	Fearn, Lower Pitkerrie	4·12
,,	Blockley, Upton Wold	1·94	XIX.	Invershin	4·01
,,	Worcester, Boughton Park.	2·27	,,	Altnaharra	5·94
VII.	Market Overton	1·89	,,	Bettyhill	4·85
,,	Market Rasen	1·96	XX.	Dunmanway, The Rectory	7·24
,,	Bawtry, Hesley Hall	1·59	,,	Cork	4·38
,,	Buxton	3·38	,,	Darrynane Abbey	6·14
VIII.	Neston, Hinderton Lodge	3·27	,,	Glenam [Clonmel]	6·03
,,	Southport, Hesketh Park	4·13	,,	Ballingarry, Gurteen	5 50
,,	Chatburn, Middlewood	5·09	,,	Miltown Malbay	7·48
,,	Cartmel, Flookburgh	5·53	XXI.	Gorey, Courtown House	4·71
IX.	Langsett Moor, Up. Midhope	2·85	,,	Moynalty, Westland	5·19
,,	Scarborough, Scalby	2·10	,,	Athlone, Twyford	4 74
,,	Ingleby Greenhow	2·19	,,	Mullingar, Belvedere	5·68
,,	Mickleton	2·57	XXII.	Woodlawn	5·43
X.	Bardon Mill, Beltingham	3·26	,,	Westport, St. Helens	8·23
,,	Ewesley, Fallowlees	2·62	,,	Mohill	6·09
,,	Ilderton, Lilburn Cottage	1·54	XXIII.	Enniskillen, Portora	5·95
,,	Keswick, York Bank	5·02	,,	Dartrey [Cootehill]	5 12
XI.	Llanfrechfa Grange	3·11	,,	Warrenpoint, Manor House	5·09
,,	Treherbert, Tyn-y-waun	5·57	,,	Banbridge, Milltown	3·27
,,	Carmarthen, The Friary	3·66	,,	Belfast, Springfield	4·92
,,	Castle Malgwyn [Llechryd].	4·09	,,	Bushmills, Dundarave	4·00
,,	Plynlimon	10·40	,,	Stewartstown	...
,,	Crickhowell, Ffordlas	3·50	,,	Killybegs	8·83
,,	New Radnor, Ednol	2·75	,,	Horn Head	6·52

METEOROLOGICAL NOTES ON SEPTEMBER, 1908.

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

LONDON, CAMDEN SQUARE.—Strong winds and R prevailed during the first four days after which the weather was very changeable, bright sunshine alternating with dull, showery conditions until 25th. The last days were exceptionally fine and unusually warm. Duration of sushine 129·3* hours, and of R 23·9 hours. Mean temp. 57·1, or 0·6 below the average. Shade max. 79°·0 on 30th; min. 38·5 on 13th. F 0, f 0.

TENTERDEN.—Duration of sunshine, 176·0† hours. Shade max. 75°·0 on 19th; min. 36°·5 on 13th. F 0, f 1.

TOTLAND BAY.—Duration of sunshine, 156·4* hours. Shade max. 69°·0 on 30th; min. 41°·2 on 3rd and 13th. F 0, f 0.

PITSFORD.—Mean temp. 55°·1. Shade max. 77°·0 on 30th; min. 35°·6 on 22nd.

TORQUAY.—Duration of sunshine, 141·3* hours, or 26·3 hours below the average. Mean temp. 57°·2 or 1°·1 below the average. Shade max. 70°·7 on 30th; min. 42°·0 on 13th. F 0, f 0.

NORTH CADBURY.—A boisterous beginning was balanced by a fine end. The coldest September in 12 years, but a spell of very warm weather during the last three days raised the mean max. temp. by more than a degree. Shade max. 80°·5 on 30th; min. 36°·5 on 13th. F 0, f 1.

BATH.—Shade max. 78°·0 on 30th; min. 35°·0 on 13th. F 0. f 0.

ROSS.—Cold cloudy and ungenial until near the close when a sudden burst of exceptionally hot weather was experienced. Shade max. 79°·6 on 30th; min. 35°·4 on 13th. F 0, f 0.

HODSOCK PRIORY.—Shade max. 78°·1 on 30th; min. 33°·9 on 12th. F 0, f 5.

SOUTHPORT.—R ·93 in. above the average of 35 years. Duration of sunshine, 114·0* hours, or 17·0 hours below the average. Duration of R, 63·6 hours. Mean temp. 56°·1 or 0°·8 above the average. Shade max. 76°·4 on 30th; min. 34°·2 on 12th. F 0, f 1.

HULL.—Unsettled at times but with some mild periods and frequently calm nights. TS8 on 9th and 15th. Duration of sunshine, 106·4* hours. Shade max. 78°·0 on 30th; min. 37°·0 on 12th. F 0, f 3.

CARMARTHEN.—Cold, wet and stormy with little sunshine. The corn harvest was much delayed and damaged.

HAVERFORDWEST.—Wet, cold and unseasonable. Some damage was done by an unusually heavy R storm on 25th. Duration of sunshine 103·8* hours. Shade max. 72°·4 on 30th; min. 38°·8 on 3rd. F 0, f 0.

LLANDUDNO.—Shade max. 77°·0 on 30th; min. 41°·4 on 12th. F 0, f 0.

DUMFRIES.—A wet, dull and muggy month, during which harvest operations were entirely suspended, causing serious loss to farmers, much grain having been in stook for five weeks. Shade max. 68°·0 on 29th; min. 35°·0 on 5th and 12th.

EDINBURGH.—Shade max. 67°·7 on 30th; min. 38°·8 on 12th. F 0, f 0.

DUNDEE.—Shade max. 67°·8 on 30th; min. 36°·0 on 5th.

BALLACHULISH HOUSE.—Shade max. 68°·0 on 22nd; min. 32°·0 on 11th. F 1, f 1.

WATERFORD.—The wettest September since 1896. Much of the corn had not been got in at the end on account of the bad weather. Shade max. 65°·0 on 6th; min. 37°·0 on 5th.

DUBLIN.—Unsettled and rather rainy, with temp. below the average until 28th. when a spell of remarkably warm weather came, with a strong southerly air current. Mean temp. 55°·7. Shade max. 74°·4 on 30th; min. 39°·0 on 12th. F 0, f 0.

MARKREE.—Shade max. 66°·9 on 30th; min. 33°·0 on 24th. F 0, f 6.

WARRENPOINT.—Shade max. 67°·0 on 6th; min. 36°·0 on 11th. F 0, f 0.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, April, 1908.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity. 0-100	Absolute. Max. in Sun.	Min. on Grass.	Total Rain Depth.	Days.	Aver. Cloud.
	°		°		°	°	°		°	°	inches		
London, Camden Square	65·5	30	28·4	9	53·4	37·3	39·0	82	106·5	24·1	2·38	18	7·0
Malta	77·7	29	48·0	4	62·4	53·9	50·6	73	136·0	...	·31	4	4·4
Lagos	89·0	sev.	71·0	28	87·3	77·0	75·8	76	159·0	68·5	6·58	14	8·1
Cape Town	93·1	22	39·8	18	67·5	50·6	50·6	75	...	...	4·92	9	4·5
Durban, Natal ...	95·2	9	54·6	19	78·1	59·8	...	...	149·2	...	15·43	11	2·7
Johannesburg	74·0	1	34·0	10	66·7	45·5	39·2	57	136·2	32·4	·07	1	0·7
Mauritius	85·8	1	63·0	16	82·2	69·8	67·1	76	146·2	54·7	8·00	14	5·1
Calcutta...	106·9	2	72·9	16	100·8	78·8	72·2	62	159·4	65·3	·21	1	1·4
Bombay...	100·1	14	75·4	7	89·8	77·8	72·7	72	141·6	68·8	·00	0	1·4
Madras	109·6	26	75·1	1	95·7	78·5	76·1	77	150·1	72·3	·00	0	2·5
Kodaikanal	75·2	25	51·8	13	70·5	54·8	49·5	65	141·4	36·6	3·41	10	3·3
Colombo, Ceylon ...	91·3	12	73·8	17	89·6	77·7	76·1	79	151·0	72·2	10·87	22	5·0
Hongkong	79·9	2	62·0	15	71·7	65·5	65·2	89	133·4	...	11·15	15	8·7
Melbourne	83·7	7	39·8	30	67·9	50·6	47·4	65	126·5	34·6	·33	9	5·8
Adelaide	95·2	5	41·8	27	75·5	54·6	48·1	57	145·3	30·3	·58	4	4·8
Coolgardie	92·6	3	48·0	19†	69·9	54·0	...	59	151·0	42·0	3·18	11	6·3
Perth	89·3	1	49·9	5	74·9	56·6	...	60	139·2	45·0	·49	5	3·6
Sydney	80·8	10	47·3	27	71·0	57·8	54·0	80	127·0	40·9	2·95	26	5·2
Wellington ...	67·0	1, 4	43·0	9, 20	60·6	51·7	49·7	79	113·0	29·0	2·37	11	6·7
Auckland	73·0	3	47·0	7, 8	67·0	55·8	52·6	78	131·0	42·0	3·37	12	4·5
Jamaica, Kingston ...	89·4	23	66·8	2	87·0	69·8	67·9	74	...	...	·30	3	3·8
Trinidad	91·0	26*	65·0	sev.	88·0	67·3	69·4	75	164·0	62·0	·95	5	...
Grenada	...	...	...	...	...	...	...	...	...	...	...	...	...
Toronto	75·3	22	17·5	4	...	...	...	...	...	...	2·30	19	...
Fredericton	73·2	26	9·5	4	...	...	...	66	...	...	2·74	9	0·5
St. John's, N.B. ...	63·6	27	12·0	4	...	...	...	...	...	...	3·23	13	0·5
Victoria, B.C.	73·2	30	32·9	14	...	...	...	...	...	...	·63	8	0·7

* and 28. † and 21.

MALTA.—Mean temp. of air 58°·2. Average hours of bright sunshine, 8·6.

Durban.—Rainfall 12·37 in. above 35 years' average.

Johannesburg.—Bright sunshine, 316·9 hours.

Mauritius.—Mean temp. of air 0°·1 above, of dew point 1°·7, and relative humidity 4·9 per cent., below, and R 2·90 in. above, averages. Mean hourly velocity of wind 10·5 miles, or equal to average.

KODAIKANAL.—Bright sunshine 254 hours. TSS on 20 days.

COLOMBO.—Mean temp. of air 83°·4, or 0°·8 above, of dew point 1°·6 above, and R ·20 in. above, averages. Mean hourly velocity of wind, 5·1 miles.

HONGKONG.—Mean temp. of air 68°·5. R 5·27 in. above average. Bright sunshine, 80·8, or 23 hours, below, and mean hourly wind velocity 18·9 miles, or 4·0 miles above, averages.

Melbourne.—Mean temp. of air 0°·5 below, and R ·21 in. below, averages.

Adelaide.—Rainfall 1·27 in. below average. Grass minimum lowest on record.

Sydney.—Mean temp. of air 0°·2 below, and R 2·45 in. below, averages.

Wellington.—Mean temp. of air 0°·8 below, and R ·42 in. below, averages.

RAINFALL OF THAMES VALLEY, OCTOBER, 1908.

Symons's
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METEOROLOGY AT THE BRITISH ASSOCIATION.

We have rarely had more difficulty in preparing an abstract than in endeavouring to present in restricted space the brilliant address delivered by Dr. W. N. Shaw, Director of the Meteorological Office, as President of Section A. The statements were so interwoven with poetic imagery that the omission of passages not in themselves essential breaks the thread which binds the whole together. The following consists of passages of the Address without alteration of wording, though half the text has been cut out in order to get the other half in. Dr. Shaw said:—

It is with much misgiving that I endeavour to discharge the traditional duty of the President of a Section of the British Association. So many other duties seem to find a natural resting-place with anyone who has to reckon at the same time with the immediate requirements of the public, the claims of scientific opinion, and the interests of posterity, that, unless you are content with such contribution towards the advancement of the sciences of mathematics and physics as my daily experience enables me to offer you, I shall find the task impossible.

[After a reference to the loss to science of Lord Kelvin.]

In this country there is a widespread idea that meteorology achieves its object if by its means the daily papers can give such trustworthy advice as will enable a cautious man to decide whether to take out his walking-stick or his umbrella. Some of us are accustomed to look upon India as a place of unusual scientific enlightenment, where governments have a worthy appreciation of the claims of science for recognition and support. But Eliot was never tired of telling me that it was the administration of India, and not the advancement of science, that the Indian administrators had in view; and among his achievements the one of which he was most proud was that the conduct of his office upon scientific lines during his tenure had so commended itself to the administrators that his successor was to be allowed three assistants, with special scientific training, in order that the State might have the benefit of their knowledge.

It is, of course, easy to suggest in explanation of this success that the Department of Public Works in India cannot afford to be unmindful of the distribution of rainfall, and that there is an obvious connection between Indian finances and Indian droughts; but it is a new fact in British history that the application of scientific considerations to the phenomena of rainfall are of such direct practical importance that meteorological information is a matter of consequence to all Government officials, and that meteorological

prospects are a factor of finance. Imagine His Majesty's Chancellor of the Exchequer calling at 63, Victoria Street, to make inquiries with a view to framing his next Budget, or taking his prospects of a realised surplus from the Daily Weather Report. Yet in India meteorology is to such an extent a public servant that such proceedings would not excite remark.

I speak for the Office with which I am connected when I say its temptations to waste are very numerous and very serious. It is wasteful to collect observations which will never be used; it is equally wasteful to decline to collect observations which in the future may prove to be of vital importance. It is wasteful to discuss observations that are made with inadequate appliances; it is equally wasteful to allow observations to accumulate in useless heaps because you are not sure that the instruments are good enough. It is wasteful to use antiquated methods of computation or discussion; it is equally wasteful to use all the time in making trial of new methods. It is wasteful to make use of researches if they are inaccurate; it is equally wasteful to neglect the results of researches because you have not made up your mind whether they are accurate or not. It is wasteful to work with an inadequate system in such matters as synoptic meteorology; it is equally wasteful to lose heart because you cannot get all the facilities which you feel the occasion demands.

It is the business of those responsible for the administration of such an office to keep a nice balance of adjustment between the different sides of activity, so that in the long run the waste is reduced to a minimum. There must in any case be a good deal of routine work which is drudgery; and if one is to look at all beyond the public requirements and public appreciation of the immediate present, there must be a certain amount of enterprise and consequently a certain amount of speculation.

Let me remark by the way that there is a tendency among some of my meteorological friends to consider that a meteorological establishment can be regarded as alive, and even in good health, if it keeps up its regular output of observations in proper order and up to date, and that initiative in discussing the observations is exclusively the duty of a central office. That is a view that I should like to see changed. I do not wish to sacrifice my own privilege of initiative in meteorological speculation, but I have no wish for a monopoly. To me, I confess, the speculation which may be dignified by the name of meteorological research is the part of the office work which makes the drudgery of routine tolerable. For my part I should like every worker in the Office, no matter how humble his position may be, somehow or other to have the opportunity of realising that he is taking part in the unravelling of the mysteries of the weather; and I do not think that any establishment, or section of an establishment, that depends upon science can be regarded as really alive unless it feels itself in active touch with that speculation which results in the advancement of knowledge. I do not hesitate to apply to other meteorological establishments, and indeed to all scientific institutions that claim an interest in meteorology, the same criterion of life that I apply to my own office. It is contained in the answer to the question, How do you show your interest in the advancement of our knowledge of the atmosphere? The reply that such and such volumes of data and mean values measure the contribution to the stock of knowledge leaves me rather cold and unimpressed.

But to return to the endeavour after the delicate adjustment between speculation and routine, which will reduce the waste of such an institution to a minimum; experience very soon teaches certain rules.

I have said elsewhere that the peculiarity of meteorological work is that an investigator is always dependent upon other people's observations; his own are only applicable in so far as they are compared with those of others. Up to the present time, I have never known anyone take up an investigation that involved a reference to accumulated data, without his being hampered and harassed by uncertainties that might have been resolved if they had been taken in time. I shall give you an example presently, but, in the meantime, experience of that kind is so universal that it has now become with us a primary rule that any data collected shall forthwith be critically examined and so far dealt with as to make sure that they are available for scientific purposes—that is, for the purposes of comparison. A second rule is that as public evidence of the completion of this most important task there shall be at least a line of summary in a published report, or a point on a published map, as a primary representation of the results. Such publication is not to be regarded as the ultimate application of the observations, but it is evidence that the observations are there, and are ready for use.

You will find, if you inquire, that at the Office we have been gradually lining up these troops of meteorological data into due order, with all their buttons on, until, from the commencement of this year, anyone who wishes to do so can hold a general review of the whole meteorological army, in printed order—first order stations, second order stations, rainfall stations, sunshine and wind stations, sea temperatures and other marine observations —on his own study table, within six months of the date of the observations, upon paying to His Majesty's Stationery Office the modest sum of four shillings and sixpence. For all the publications except one the interval between observation and publication is only six weeks, and as that one has overtaken four years of arrears within the last four years, I trust that by the end of this year six weeks will be the full measure of the interval between observation and publication in all departments. This satisfactory state of affairs you owe to the indefatigable care and skill of Captain Hepworth, Mr. Lempfert, and Mr. R. H. Curtis, and the members of the staff of the Office who work under their superintendence. I need say little about corresponding work in connection with the Daily Weather Report, in which Mr. Brodie is my chief assistant, although it has received and is receiving a great deal of attention. The promptitude with which the daily work is dealt with hardly needs remark from me, though I know the difficulties of it as well as anyone. If I spend only one long sentence in mentioning that on July 1st, 1908, the morning hour of observation at twenty-seven out of the full number of twenty-nine stations in the British Isles was changed from 8 a.m. to 7 a.m., and the corresponding post-offices, as well as the Meteorological Office, opened at 7.15 a.m. in order to deal with them, so that we may have a strictly synchronous international system for Western and Central Europe, and thus realise the aspiration of many years, you will not misunderstand me to mean that I estimate the task as an easy one.

The third general rule is that the effectiveness of the data of all kinds, thus collected and ordered, should be tested by the prosecution of some

inquiry which makes use of them in summary or in detail. It is here that the stimulating force of speculative inquiry comes in; and it is in the selection and prosecution of these inquiries, which test not only the adequacy and effectiveness of the data collected but also the efficiency of the Office as contributing to the advance of knowledge, that the most serious responsibility falls upon the administrators of Parliamentary funds.

Scientific Shylocks are not the least exacting of the tribe, and there have been times when I have thought I caught the rumination:—

"Three thousand ducats? 'tis a good round sum!"

When Shylock demands his pound of flesh in the form of an annual report, it is not at all uncommon to find that some argosy that started on its voyage long ago 'hath richly come to harbour suddenly.' There have been quite a number of such happy arrivals within the last few years.

(To be continued.)

THE RAINFALL OF OCTOBER, 1908.

OCTOBER has generally the highest rainfall of any month in the year in the British Isles as a whole, and a dry October is a comparative rarity. In October, 1908, the rainfall exceeded 4·00 in. only in a few isolated spots in the Irish mountains, Wales, the Lake District and (somewhat doubtfully) in the south of Scotland; the largest area with more than 4 inches was in the south of Dorset, and to this very remarkable rain attention is called in our correspondence. Areas with less than 1·00 in. of rain occur in the north-east and south-west of Scotland, the east and centre of England and the extreme north of Ireland. On comparing the map of the month with those of the four dry Octobers (1879, 1888, 1897, 1904) in *British Rainfall*, 1904, p. 28, it is seen that although there have been instances of larger areas with less than 1·00 in., there has never before been so small an area with more than 4·00 in. The dryness was most conspicuous in the west of Scotland where not more than one-third of the normal rainfall was experienced, and there was only a narrow strip along the east coast of Scotland with so much as half the normal fall. Over the greater part of England and over half of Ireland less than half the average rainfall was experienced, and the average was only reached or exceeded in three patches, viz., the south-west of Ireland, Dorset and the east of Forfarshire and Kincardineshire. Compared with other dry Octobers the proportional amounts of rainfall over the different divisions of the country were (taking 100 as the average):—

October.....	1879	1888	1897	1904	1908
England and Wales ...	39	47	39	42	49
Scotland	54	84	68	64	45
Ireland.....	48	59	81	60	52
British Isles.....	44	59	54	51	48

It thus appears that only in 1879 was October so dry as this year, and so far as our records go there was never before so dry an October in Scotland, and especially in the west.

METEOROLOGY AT THE FRANCO-BRITISH EXHIBITION.

By L. C. W. BONACINA, F.R.Met.Soc.

III.

(*Concluded from p. 177.*)

I WILL now, at the risk of being tedious, afford another illustration to show more especially the liability to error, attendant upon fixing attention only on the same individual plants, however "average" these may be, of any particular species. The British oak (*quercus robur*) is a tree that unites in a high degree the qualities of magnificence and beauty; and although it is a genuine native of the soil, eminently adapted to the climate, conspicuous almost everywhere for size and abundance, receives such little attention, except during the processes of barking and sawing, that comparatively few persons, other than botanists, are even acquainted with its flowers. In an average year, in an average district in the southern counties of England, about a quarter of the total number of oak trees have either already opened their leaf-and-flower-buds, or are just commencing to do so, as early as the 30th of April; by the 7th of May this fraction has increased to about half; by the 14th of May to threequarters; whilst on the 20th of May it has approached unity, that is to say almost all, even the very backward individuals, have at last yielded to the call of spring, and are no longer bare with closed leaf-and-flower buds. I accordingly make a generalization and conclude that in the south of England the oak commences to burst into leaf and flower *about* the 7th of May. In the midland counties this approximate date falls, generally speaking, a few days later; in the north of England about a week later, whilst in south and central Scotland the retardation probably approaches ten days. It is to be noted that we cannot get farther than an approximation to the required dates, but that the approximate dates reached by observing a large number of individuals, are of much greater value than the exact dates by observing a single individual only.

And now we come to the most cogent reason of all why phenological observers should not confine their attention to any individual, or any very limited number of individuals, of a species. To keep to the case of the oak, had I followed the ordinary instructions and based my records one year only upon some mature specimen selected as being a good average tree as regards leafing and flowering, I might have been uncomfortably surprised the following year to find this very individual among the exceptionally early ones, and one of the last year's early trees among the average, or even late ones. For although it is undoubtedly true that some individual trees have a constitutional tendency to be in advance of, or to lag behind the bulk of their fellows, I have actually come across instances of an early tree one year becoming an average or late one the next, and *vice-versâ*. What has been said concerning plants applies also to birds and insects. Supposing that the observer hears the cuckoo's

note once or twice in the forenoon of April 15th, and not hearing it at all say on the 16th, he again hears it occasionally on the 17th, 18th and 19th; but that suddenly on the 20th, the sound of "cuckoo" issuing repeatedly from wood to wood, forces itself upon his attention all day long, his notes for the Royal Meteorological Society, or any scientific body for whom he is drawing them up, should take the following form: "I heard *a* cuckoo's note on April 15th and following days, but *the* cuckoo's note did not become a familar sound of the country-side in this locality until the 20th. I therefore record the 20th as the date *about* which the call of the cuckoo was *first* generally heard."

It might be mentioned in this connection that authentic records exist (though whether they have come before the Royal Meteorological Society or not I cannot say) of isolated instances in various quarters of Britain of January cuckoos, December swallows, March nightingales, and similar anomalies. Naturalists are often most obstinate in their refusal to believe such records, when it is a personal case of "eye hath not seen, nor ear heard;" but the marvel is not so much that exceptions to the ordinary course of nature should occur from time to time, as it would be that they should never. Admitted that these islands are not a desirable sanctuary for migratory birds during the cold, dark, foodless season of winter, there is surely nothing impossible or particularly wonderful in the supposition that some ill-starred swallow deceived by unseasonable warmth in the autumn, or driven out of its course by contrary winds, or victim to one of the thousand-and one accidents that might befall a migratory bird, should now and again be discovered nearly reduced to starvation by the climatic severities of the Cumberland dales, at a time when its more fortunate brethren were celebrating Yuletide upon a bounteous diet of such luscious insect morsels as are doubtless to be found in Algeria.

In summing up this somewhat lengthy discourse upon phenological observations, introduced by the map put before the public at the Franco-British Exhibition, I would point out that this very map, like any other founded on the present generally adopted scheme for observations, is useful and reliable (if it has been based upon a sufficient number of records in each large district) for comparing the dates in the different districts into which the kingdom is divided, but that the *absolute* dates are without doubt very much more uncertain and less valuable, for the reasons discussed above, than they would be if derived from the system I have proposed in this article. On the other hand it must be remembered that this system of observations is a difficult one, demanding on the part of the observer not only a considerable amount of time, but also as much accuracy of observation as, and a quicker judgment dependant upon a wider culture than, the one in more general use. In other words, the suggested method must be properly and assiduously carried out if its more interesting and comprehensive results are to be of certain scientific value.

THE WEATHER OF OCTOBER, 1908.

By FRED. J. BRODIE.

THE extraordinary warmth experienced over England at the close of September extended later to Ireland and Scotland; and in the western and northern parts of the United Kingdom generally the temperatures observed on October 3rd were not only the highest, but in many places considerably the highest, recorded at so late a period in the season for at least 37 years past. In Ireland there were apparently no readings higher than 75°, but in many parts of Great Britain that value was exceeded, a shade temperature of 78° being observed as far north as Gordon Castle in Banffshire. The piecing together of meteorological records made at two different places is scarcely a commendable practice, but it may not be altogether unfair to remark that the maximum temperature of 75° registered at Leith on the 3rd was higher than any October reading quoted in Mr. R. Mossman's valuable Edinburgh statistics extending back to 1841.

After about the 5th the air, which had hitherto come up from the southward, backed temporarily to south-east and east, and the weather became somewhat cooler, a slight ground frost being experienced at many inland stations on the night of the 6th. Until well after the middle of the month, however, the thermometer remained almost persistently above its average level, a fresh burst of abnormal warmth occurring between the 12th and 14th, when shade maxima slightly above 70° were recorded in several parts of England, and above 65° even at some places in the north of Scotland.

After the 20th the wind shifted from the south-eastward to the north-eastward and brought with it a spell of colder weather, lasting for about a week. On the 24th the daily maxima were below 50° in many places, and between the nights of the 21st and 24th sharp frosts occurred over a large portion of the kingdom; the lowest temperatures were experienced, as a rule, on the latest date, when the thermometer at many of the northern and central stations fell at least 5° below the freezing point, a reading as low as 18° being recorded at Balmoral, and a reading of 21° at Llangammarch Wells. On the surface of the ground the frost was naturally more severe, the exposed thermometer falling to 12° at Llangammarch Wells, to 15° at Balmoral, 17° at West Linten, and 18° at Crathes.

Towards the close of the month the wind veered round to south, and the thermometer again rose to an unusually high level. On the 29th and 30th shade readings of 65° and upwards were recorded in many parts of Great Britain and as far north as Glencarron, while at a few scattered places in England and Wales the thermometer rose to within a degree of 70°. For the time of year these values were nearly as remarkable as those at the beginning of the month.

Over the United Kingdom generally the month was undoubtedly the warmest October the present generation has witnessed. Prior to 1870 reliable records of temperature were rare, but at Greenwich no such warmth had been experienced in October since the year 1861.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

HEAVY RAINFALL IN DORSET.

On Wednesday, October 21st, a remarkable fall of rain occurred at Weymouth, 3·40 in. being measured in three hours, from 9 a.m. till noon; after this ·33 in. fell, the rain ceasing at 2 p.m. So far as I can gather information this rain appears to have been local. In the first half of the month only ·51 in. fell, after the 16th 5·94 in. were measured in 5 days, viz.:—

·04 on 17th.	·84 on 20th.
·96 ,, 18th.	3·73 ,, 21st.
·37 ,, 19th.	

From 21st to 25th no rain; from 25th to 31st, ·80 in.; total for month, 7·25 in.

H. W. GREEN.

Massandra, Weymouth.

During the tremendous rainfall experienced during the forenoon of October 21st, Weymouth was not quite the centre of the storm, as the rainfall recorded by the Superintending Civil Engineer at H.M. Breakwater here was much greater. The figures which I have obtained from him are as foilows:—

Rainfall recorded between 10 a.m. on the 20th October and 10 a.m. on the 21st was 3·98 in.; and the fall between 10 a.m. on 21st and 10 a.m. on 22nd, 2·91 in., of this latter amount 2·28 in. were recorded between 10 a.m. and 12 noon on the 21st. As there was very little rain before 8 a.m. on the 21st, and none after 1 p.m. on that date, almost the whole of this total of 6·89 in. fell in 5 hours, at any rate, after going carefully into the matter it is safe to assume that 6½ inches fell in 5 hours. At Weymouth I believe they had 4 inches in 5 hours. The distance of the rain gauge at the Breakwater from Weymouth is about 4 miles to the south. My rain gauge at Upwey is 5 miles to the north of Weymouth, and the record at our Waterworks there was ·56 in. at 9 a.m. on the 21st, and 2·67 in. at 9 a.m. on the 22nd. Of this latter amount 1·65 in. fell between 9 and 11, and ·92 in. between 11 and 1 o'clock, ·10 in. falling afterwards, The result of the storm was, of course, that all the low-lying streets were flooded.

R. STEVENSON HENSHAW,

Portland, Dorset, Nov. 10th, 1908. *Engineer & Surveyor.*

SMALL DIURNAL RANGE OF TEMPERATURE.

On looking over my register I find a rather unique occurrence, anyway within my records of meteorological observations, which are made with Kew verified thermometers in a Stevenson screen.

	Min.	Max.	Range.
October 20th, 1908	50°·3	51°·3	1°·0
October 21st, 1908	44°·0	44°·3	0°·3

Is it not very rare to have such a small range? My station is 302 feet above sea level.

G. HAMLIN.

40, East Street, Brighton, Oct. 23rd, 1908.

THE WARM AUTUMN AT YORK.

The official York records of maximum temperature from September 28th were this year 68°, 75°, 80°, 77°·5 (October 1st), 74°, 73°, 76° and 62° (October 5th). Having access to the values from 1832 on, I find that the previous highest October value was 71° in 1834 (on 5th), and in 1898. On only four other occasions was 71° reached, namely, in 1848, 1861, 1895 and 1900. Judging by the records to hand it seems probable that the mean temperature for the month will exceed any record, the warmest October previously having been 52°·9 in 1861, whilst the average is practically 48°. The lowest, taking as in the other cases the mean of max. and min. records, were 43°·3 in 1842, and 44°·1 in 1896.

J. EDMUND CLARK.

Asgarth, Riddlesdown Road, Purley, Surrey, Oct. 31st, 1908.

WEATHER PREDICTION.

The art of forecasting seasons, more or less definitely, will, I believe, be acquired in time; after many attempts, no doubt, and many stumbles. I may confess to making such attempts—and stumbles—in the appropriate shade of privacy.

It seems a legitimate question, discussable at any time: Here is a piece of knowledge available before a given season; is it, or is it not, a sufficient reason for expecting the season to be so and so?

In the course of these studies one comes across many sequences or tendencies with apparently high probability. It might be a good thing to tabulate such for practical use. For example, when the first three months of the year (at Greenwich) are all dry, we have generally a dry summer (11 cases out of 13); when we have 20 or more days with 80° or more in the hot season the autumn is generally warm (16 cases out of 19).

Among other helpful facts, I consider, is a relation which I have before noted elsewhere between Rothesay summers and Greenwich winters following—both regarded as typical for a region. Whatever the explanation (perhaps sunspot influence manifest in both), it appears that after a very wet summer at Rothesay we may look pretty confidently for a mild winter season at Greenwich (one with less cold than the average), and after a very dry summer a severe

winter. Corresponding inferences may be drawn from very severe or very mild Greenwich winters to Rothesay summers. The inference is in each case from extreme values to values which may or may not be extreme. If the terms "very" and "extreme" be objected to as vague, it is easy to make more precise statements.

We have just had an illustration of one of these sequences—a very wet Rothesay summer last year (14·8 in.); frost days at Greenwich last September to May 47, which is 7 under average.

With regard to our summer rainfall (at Greenwich), which fails of consistent agreement with the sunspot curve, there is something to be said for a recurrence at about 13 years' interval. The following method may be found instructive. Make out a series of sums of summer rainfall in five-year groups, 1841-45, '42-'46, &c.; then represent these values by dots according to scale in 13 columns (beginning with the group about '43 in col. 1, '44 in col. 2, and so on). One finds a tendency to low values in the earlier columns and high values in the later; and by considering the distribution in the column which is about to receive a fresh dot, and the relation of each dot in it to that which preceded, some light may be had, I think, on at least one limit for the rainfall of an approaching summer.

I made a (private) forecast of the Greenwich summer just ending (31st August) as "cold and wet," which may seem to some an egregious misnomer of a season notable for many delightful days. Yet we have these facts: 60 days cold out of 92; only 8 days with 80° or more (aver. 15); mean temperature of summer slightly under average; in all three months excess of rain.

It seems to me quite possible on scientific grounds to predict "wetness" or "dryness" for a Greenwich summer (in relation to average). This is vague, but not, I should think, despicable. I have succeeded with the previous five summers also. The possibility of "fluke" is not, of course, excluded. Let me add that in some other items of summer weather I have been quite wrong.

There are many ways of attacking these important problems, and it may be well to invite the attention of your readers to what seems a highly attractive line of investigation.

ALEX. B. MacDOWALL.

REVIEWS.

Aspirations-Psychrometer-Tafeln. Herausgegeben vom Königlich Preussischen Meteorologischen Institut. Braunschweig, Vieweg und Sohn, 1908. Size 13 × 10. Pp. xiv. + 88.

THESE Tables consist mainly of a detailed statement of the vapour tension and relative humidity for every tenth of a degree centigrade of the dry and wet bulb thermometers, from −30° to +24°·9 wet and 39°·9 dry (−22° to +76°·8 wet and 103°·8 F. dry bulb) at a pressure of 775 mm. (29·76 in.), with supplementary tables for correcting the relative humidity to its value for other pressures.

Climate considered especially in relation to Man. By ROBERT DE COURCY WARD, Assistant Professor of Climatology in Harvard University. (Progressive Science Series.) London, John Murray, 1908. Size 9 × 6. Pp. xvi. + 372. Price 6s. net.

PROFESSOR WARD has laid the English-speaking world under a debt by his translation of Hann's *Climatology*, and that debt is greatly increased by the present volume which meets a want that has been felt acutely by the comparatively small public who study climate scientifically. The book is based upon lecture notes and the material has been gradually brought together, tested and improved. As now completed the book is the best on its subject in the language, which might be poor enough praise for it has no competitors; but in our opinion even if treatises on climatology were as common as novels it would still hold a high rank. It does not claim to be original in the sense of setting the facts in a new light, and the author necessarily follows Hann pretty closely; he states indeed that the introduction is essentially a synopsis of the first six chapters of Hann's *Climatology*. It is one of Professor Ward's characteristics that he acknowledges the source of his information in a generous spirit.

The classification of climates is dealt with in considerable detail in chapters i. to v. Professor Ward says that we should certainly abandon the word *temperate* altogether in speaking of zones and substitute some such word as *intermediate*, while the words *torrid* and *frigid* should likewise disappear and their place be taken by *tropical* or *equatorial* and *polar*. No doubt there is something to be said for this; but alas for human nature, our author himself speaks guardedly of "temperate" and "torrid" for a chapter or two, then drops the quotation marks and relapses fairly into the old familiar phrases. In our opinion if *Torrid* is to go *Intertropical* is the best substitute; but so long as the simple zones determined by the obliquity of the ecliptic stand, and being natural they must continue, the name by which we call them is of little importance. A more detailed classification is necessary and Professor Ward gives an interesting summary of the divisions proposed by Supan, Köppen, Ravenstein and Herbertson; his conclusion is that the broad classification of climates into the three general groups of marine, continental and mountain with the subordinate divisions of desert, littoral and monsoon is convenient but incomplete, and on the whole he seems inclined to recommend Supan's classification, while noting the greater convenience of Köppen's for the study of plant geography.

After dealing with the character of the different types of climate, the hygiene of the zones and the conditions of human life in the tropics, the temperate and polar zones are entered into at some length, and this is the part of the book which will prove of most general value. It summarises the relation of climate to health in the light of the most recent data.

The final chapter deals with changes of climate; but here as in

other parts of the work the author presents the views of others rather than his own. We should have been grateful for a bibliography, for the book focusses a vast amount of reading and the references are rather scanty from the point of view of a student anxious to pursue special lines of research.

The publisher has presented the book in an attractive form and at a remarkably low price which must greatly extend its usefulness.

Bibliotheke Marsale. To Klima tes 'Ellados. Meros A. To Klima ton Athenon. Meros B. To Klima tes Attikes, upo DEMETRIOU AIGINETOU. [The Climate of Greece. Part. I.—The Climate of Athens. Part II.—The Climate of Attica, by Demetrius Aiginetes. Athens, 1908. Size 10 × 6½. Pp. 540, 488.

WE hope that we have transliterated the title properly. The volumes, which include a long prologue and a geographical and geological chapter introductory to the climatological discussions, is beautifully illustrated by plates of views in the neighbourhood of Athens and in Attica. We are sorry that we cannot read it; but we shall be happy to forward the work to the first of our readers conversant with modern Greek who expresses willingness to write a fuller notice.

The National Physical Laboratory. Report of the Observatory Department for the year 1907. With appendices. Teddington, 1908. Size 7 × 10½. Pp. 46.

THE General Board of the National Physical Laboratory contains official representatives of the Board of Trade, the Institutions of Mechanical, Civil and Electrical Engineers, the Iron and Steel Institute, the Society of Chemical Industry, and the Institution of Naval Architects; but, although the Director publishes this report separately because it "appeals to a different class of workers to that interested in the Engineering and Physics departments," there is no representative of the Royal Meteorological Society on the Board, and probably no member of the Board, with one possible exception, looks upon this as in any way anomalous! Yet a substantial portion of the work of the department here described is purely meteorological.

Das Klima von Berlin, eine meteorologisch-hygienische Untersuchung [The Climate of Berlin, a meteorologico-hygienic investigation], von OTTO BEHRE. Berlin, Otto Salle, 1908. Size 10 × 6½. Pp. IV. + 158. Price 5 marks.

THIS remarkably readable little book deals with the climate of Berlin statistically, but the discussion of figures is lightened by a happy literary style, and a number of singularly appropriate

quotations and historic instances. Between a brief introduction and conclusion there are five chapters dealing respectively with Temperature, Humidity, Pressure and Wind, Cloud, Fog and Sunshine, and Precipitation. The monthly means of the various elements are given for the years available, and there are also tables of extremes and of various groupings of figures designed to elucidate special points. The hygienic bearings of the various elements are also discussed. The climate is compared in detail with that of St. Petersburg, concerning which a Russian poet is quoted as saying that "we require an iron constitution in order to live under our leaden skies," and Berlin comes out very favourably from the comparison. The hottest day on record in Berlin, since 1848, was July 20th, 1865, with a maximum of 98°·6 F.; and the coldest, January 22nd, 1850, with a minimum of —13°·0 F. The comparison of death-rate with temperature gave no certain indication of a causal connection, but the author is inclined to believe that the spread of influenza is promoted by the absence of sunshine. The greatest hygienic value is, however, claimed for rain, and especially for snow, on account of the influence of precipitation in removing micro-organisms from the air, a point of view which it might be well for some of our health resorts who claim a small rainfall as an asset to consider.

Barometric Gradient and Wind Force. Report to the Director of the Meteorological Office on the Calculation of Wind Velocity from pressure-distribution, and on the variations of meteorological elements with altitude. By ERNEST GOLD, M.A. Published by the Authority of the Meteorological Committee. London, Printed for H.M. Stationery Office, 1908. Size 13 × 10. Pp. 44 + 14 plates. Price 2s. 6d.

MR. GOLD gives the details of a mathematical investigation into the relation of the velocity of wind, the pressure gradient, and the curvature of the path along which the wind blows. There is no question of greater importance in meteorology, for it is common to the theory of the winds and to the practical art of forecasting from synoptic maps. While Mr. Gold's paper is one for the student, the preface contributed by Dr. Shaw, gives a very clear exposition of the object and the results of the work. Although the effects of surface friction are not yet known, and there are cases in which the observed winds are at variance with the gradients as deduced from isobaric maps, these are surprisingly few, and Dr. Shaw is satisfied that the conditions tend to adjust themselves automatically so that the wind corresponds with the gradient by altering the curvature of its path, and that the exceptional cases are likely to be profitable subjects of meteorological study.

METEOROLOGICAL NEWS AND NOTES.

THE FRANCO-BRITISH EXHIBITION'S list of awards in the Group of Education, in which the Science Section appears to be included, contains the names of the Meteorological Office, the Royal Meteorological Society, Dr. H. R. Mill, as Director of the British Rainfall Organization, Messrs. Negretti and Zambra, Mr. J. J. Hicks, and many others, as being awarded the "Diploma for Grand Prize," the highest distinction given by the Exhibition. The Diploma for gold medal was awarded to Mr. John Aitken, F.R.S., Mr. Eric Stuart Bruce, Commander D. Wilson Barker, Mr. A. W. Clayden, Mr. W. E. Plummer, aHd others.

THE ROYAL METEOROLOGICAL SOCIETY will hold its opening meeting for the session in the hall of the Institution of Civil Engineers, Great George Street, on the evening of Wednesday, 18th November, at 7.30 p.m. It may not be generally known that visitors are welcomed at these meetings, on the introduction of a Fellow of the Society.

THE SERIES OF CONFERENCES AT THE METEOROLOGICAL OFFICE for this session opened in a very happy manner by an account of the work of the Australian Federal Weather Service by its chief, Mr. Hunt, on October 19th, and a discussion of the rainfall of the Transvaal, by the Director of the Meteorological Service of that colony, Mr. R. T. A. Innes, on November 2nd. Discussions will take place at the Meteorological Office, 63, Victoria Street, Westminster, on Mondays, at 5 p.m., the dates provisionally fixed being November 16th and 30th, December 14th, January 11th and 25th, February and March 8th and 22nd. The Director will be glad if ladies or gentlemen interested in Meteorology would attend and take part in the discussions.

FLOODS OF AN UNPRECEDENTED SEVERITY devastated the city of Haidarabad in the Deccan, towards the end of September last. While we hope that one of our Indian readers will forward authentic particulars of the meteorological data, we may state on the responsibility of the daily newspapers, that very heavy rainfall accompanying a cyclone caused the Musi river to rise from a trickling stream to a vast river 60 feet deep, which in 48 hours subsided again to its normal insignificance. On September 27th and 28th, it is reported that 15 inches of rain, nearly half the annual fall, came down in 36 hours. One of the suburbs was overwhelmed, and it and a part of the city, together measuring two miles by half a mile, were laid in ruins. Enormous destruction was done to buildings, and between 5,000 and 7,000 inhabitants lost their lives, while 100,000 were rendered homeless, and the damage to property probably exceeded a million and a quarter pounds sterling.

MR. W. MARRIOTT WILL LECTURE ON meteorological subjects, on behalf of the Royal Meteorological Society, at Uppingham School, on November 17th; at Harrow School, on November 21st; and at the Tunbridge Wells Natural History and Philosophical Society, on December 4th.

PHOTOGRAPHS OF THE UPPER SURFACE OF FOG form an attractive feature in a very interesting article by Dr. W. J. S. Lockyer, in the October number of *Knowledge*. The pictures were obtained during a balloon ascent on October 27th, 1907, made from Battersea, during a fog, which was found to extend to a height of 2,500 feet, and its upper surface revealed the familiar outlines of a cumulus cloud. One very striking picture was taken showing this fog-cumulus below and an alto-cumulus above.

TORRENTIAL RAINS IN CALCUTTA on June 17th-18th, 1908, caused serious flooding in that city and its suburbs, and the loss of several lives. According to *The Statesman* of June 19th, three and a half inches of rain fell during the twelve hours ending at 8 p.m. on 17th, and 11·95 in. in the twenty-four hours ending at 8 a.m. on 18th, making the heaviest daily fall on record for June at Calcutta, and, with the exception of 14 inches on September 20th, 1900, the heaviest in any month. As a result of the downpour the Hugli river was in high flood, and some casualties to shipping occurred. Great inconvenience also resulted by the flooding of streets, and damage to flimsy native buildings, several of which collapsed under the stress of the raging waters, burying their inmates in the debris. The storm appears to have been quite local, and was the result of a seemingly unimportant depression.

THE RIO DE JANEIRO OBSERVATORY has lost its distinguished chief, Professor L. Cruls, who died at Paris on June 21st, and Dr. H. Morize has been promoted to the position of Director.

MESSRS. C. F. CASELLA & Co. have issued a new catalogue of meteorological instruments, which cannot fail to be of interest to many of our readers. It is, we presume, necessary to quote in such lists instruments like the Howard rain gauge, which have had their day and done good work in their time but which have long since been superseded by better forms. There are in this catalogue, however, several novelties of a useful kind, and in addition to the prices and drawings of instruments it contains a list of standard works on meteorology, and several tables for the conversion of British and metric units.

DR. H. R. MILL has been elected a Corresponding Member of the German Meteorological Society.

RAINFALL TABLE FOR OCTOBER, 1908.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea.	RAINFALL OF MONTH.	
					Aver. 1870-99.	1908.
		° ′	° ′	ft.	in.	in.
Camden Square	*London*	51 32	0 8	111	2·85	1·95
Tenterden	*Kent*	51 4	*0 41	190	3·60	1·31
West Dean	*Hampshire*	51 3	1 38	137	3·53	1·25
Hartley Wintney	,,	51 18	0 53	222	3·08	2·32
Hitchin	*Hertfordshire*	51 57	0 17	238	2·72	1·82
Winslow (Addington)	*Buckinghamshr.*	51 58	0 53	309	2·89	1·04
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·66	1·42
Brundall	*Norfolk*	52 37	*1 26	66	2·98	1·63
Winterbourne Steepleton	*Dorset*	50 42	2 31	316	4·33	5·46
Torquay (Cary Green)	*Devon*	50 28	3 32	12	4·09	2·22
Polapit Tamar [Launceston]	,,	50 40	4 22	315	4·97	1·31
Bath	*Somerset*	51 23	2 21	67	3·22	1·72
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	3·10	1·51
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	3·99	1·87
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	3·18	1·11
Boston	*Lincolnshire*	52 58	0 1	25	2·62	·87
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·77	·67
Derby (Midland Railway)	*Derbyshire*	52 55	1 28	156	2·77	1·09
Bolton (Queen's Park)	*Lancashire*	53 35	2 28	390	4·72	2·40
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	3·18	1·21
Arncliffe Vicarage	,, ,,	54 8	2 6	732	6·55	4·16
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	3·26	·82
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·94	1·50
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	13·35	4·88
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·81	3·42
Haverfordwest (High Street)	*Pembroke*	51 48	4 58	95	5·63	3·57
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	5·58	1·28
Llandudno	*Carnarvon*	53 20	3 50	72	4·08	·98
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·39	2·19
Hawick (Branxholm)	*Roxburgh*	55 24	2 51	457	3·42	1·45
Edinburgh (Royal Observy.)	*Midlothian*	55 55	3 11	442	...	1·10
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	5·42	2·04
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·36	1·60
Tighnabruaich	*Argyll*	55 55	5 14	50	5·72	2·08
Mull (Quinish)	,,	56 36	6 13	35	6·09	2·30
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·71	2·81
Braemar	*Aberdeen*	57 0	3 24	1114	4·05	1·44
Aberdeen (Cranford)	,,	57 8	2 7	120	3·18	3·18
Cawdor	*Nairn*	57 31	3 57	250	2·85	·28
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	4·38	·91
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	9·98	3·20
Dunrobin Castle	*Sutherland*	57 59	3 56	14	3·32	·86
Castletown	*Caithness*	58 35	3 23	100	...	1·25
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	6·05	2·96
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	4·00	2·76
Broadford (Hurdlestown)	*Clare*	52 48	8 38	167	3·12	1·95
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·45	2·45
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	3·08	1·22
Ballinasloe	*Galway*	53 20	8 15	160	3·45	1·39
Clifden (Kylemore House)	,,	53 32	9 52	105	7·93	...
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	5·04	1·75
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	4·54	1·30
Seaforde	*Down*	54 19	5 50	180	3·82	3·77
Londonderry (Creggan Res.)	*Londonderry*	54 59	7 19	320	4·45	1·25
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·72	1·70

RAINFALL TABLE FOR OCTOBER, 1908—*continued.*

RAINFALL OF MONTH (*ron.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1870-99. in.	1908. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1870-1899. in.	STATION.
— ·90	68	·50	16	10	20·59	21·09	+ ·50	102	25·16	Camden Square
—2·29	36	·40	27	17	22·40	19·10	—3·30	85	28·36	Tenterden
—2·28	36	·36	20	12	23·94	19·73	—4·21	82	29·93	West Dean
— ·76	75	·83	18	11	21·52	21·47	— ·05	100	27·10	Hartley Wintney
— ·90	67	·65	16	14	20·05	19·61	— ·44	98	24·66	Hitchin
—1·85	36	·19	16†	12	21·85	20·56	—1·29	94	26·75	Addington
—1·24	53	·37	16	10	20·78	19·74	—1·04	95	25·39	Westley
—1·35	55	·57	9	10	20·56	20·33	— ·23	99	25·40	Brundall
+1·13	126	2·20	21	21	30·05	28·76	—1·29	96	39·00	Winterbourne Stpltn.
—1·87	54	·44	17	15	27·83	20·67	—7·16	74	35·00	Torquay
—3·66	26	·61	17	12	30·17	27·03	—3·14	90	38·85	Polapit Tamar
—1·50	53	·62	18	10	24·93	20·44	—4·49	82	30·75	Bath
—1·59	49	·56	18	14	24·38	20·20	—4·18	83	29·85	Stroud
—2·12	47	·62	18	14	26·94	26·48	— ·46	98	33·04	Wolstaston
—2·07	35	·41	27	13	23·97	20·76	—3·21	87	29·21	Coventry
—1·75	33	·24	16	12	19·37	18·52	— ·85	96	23·30	Boston
—2·10	24	·15	27	16	20·58	17·82	—2·76	87	24·70	Hodsock Priory
—1·68	39	·40	27	13	21·62	20·56	—1·06	95	26·18	Derby
—2·32	51	·53	20	10	34·33	37·42	+3·09	109	42·43	Bolton
—1·97	38	·23	26	13	22·54	21·75	— ·79	96	26·96	Ribston Hall
—2·39	64	1·69	19	17	48·55	54·60	+6·05	112	60·96	Arncliffe Vic.
—2·44	25	·27	27	12	22·21	17·49	—4·72	79	27·02	Hull
—1·44	51	·36	19	14	22·70	19·63	—3·07	86	27·99	Newcastle
—8·47	37	1·25	19	12	104·07	102·97	—1·10	99	132·68	Seathwaite
—1·39	71	1·62	19	14	34·12	30·17	—3·95	88	42·81	Cardiff
—2·06	63	1·03	17	12	37·25	34·65	—2·60	93	47·88	Haverfordwest
—4·30	23	·38	19	13	36·24	36·26	+ ·02	100	45·41	Gogerddan
—3·10	24	·32	28	13	24·65	25·02	+ ·37	102	30·98	Llandudno
—2·20	50	·72	19	11	34·25	39·50	+5·25	115	43·43	Cargen
—1·97	42	·43	19	14	27·55	25·68	—1·87	93	34·80	Branxholm
...	...	·18	30	11	...	19·65	...	...	...	Edinburgh
—3·38	38	·60	18	20	38·32	40·22	+1·90	105	48·87	Girvan
—1·76	48	·41	18	14	28·79	27·41	—1·38	95	35·80	Glasgow
—3·64	36	·68	18	11	45·36	53·14	+7·78	117	57·90	Tighnabruaich
—3·79	38	·51	18	15	44·62	42·91	—1·71	96	57·53	Quinish
+ ·10	104	·82	19	17	23·46	22·10	—1·36	94	28·95	Dundee
—2·61	36	...	...	...	28·98	27·35	—1·63	94	36·07	Braemar
·00	100	2·06	19	8	26·15	23·98	—2·17	92	33·01	Aberdeen
—2·57	10	·19	16	3	24·19	20·27	—3·92	84	29·37	Cawdor
—3·47	21	·41	10	6	34·06	35·02	+ ·96	103	43·71	Fort Augustus
—6·78	32	1·82	10	15	67·67	72·28	+4·61	107	86·50	Bendamph
—2·46	26	·35	18	9	24·95	27·71	+2·76	111	31·60	Dunrobin Castle
...	...	·23	18, 30	16	...	27·42	...	...	...	Castletown
—3·09	49	·56	20	22	45·62	37·81	—7·81	83	58·11	Killarney
—1·24	69	·58	15	16	31·08	31·47	+ ·39	101	39·30	Waterford
—1·17	63	·30	29	19	26·91	33·06	+6·15	123	33·47	Hurdlestown
—1·00	71	·67	15	14	28·50	29·93	+1·43	105	35·19	Abbey Leix
—1·86	40	·22	20	13	22·76	20·78	—1·98	91	27·75	Dublin
—2·06	40	·26	9	15	29·81	27·07	—2·74	91	37·04	Ballinasloe
...	...	...	...	...	62·99	...	...	...	80·23	Kylemore House
—3·29	35	·36	9	16	39·06	43·27	+4·21	111	50·50	Enniscoe
—3·24	29	·22	15	17	33·71	39·29	+5·58	117	41·83	Markree Obsy.
— ·05	99	1·04	20	18	31·03	35·06	+4·03	113	38·61	Seaforde
—3·20	28	·42	16	17	32·70	36·64	+3·94	112	41·20	Londonderry
—2·02	46	·48	16	16	30·55	...	...	...	37·85	Omagh

† and 20, 27.

SUPPLEMENTARY RAINFALL, OCTOBER, 1908.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	2·05	XI.	Rhayader, Tyrmynydd	3·43
,,	Ramsgate	1·29	,,	Lake Vyrnwy	2·73
,,	Steyning.....	1·41	,,	Llangyhanfal, Plâs Draw....	2·01
,,	Hailsham	2·04	,,	Criccieth, Talarvor.....	2·08
,,	Totland Bay, Aston House.	1·71	,,	Llanberis, Pen-y-pass	...
,,	Emsworth, Redlands..... ...	3·19	,,	Lligwy	1·57
,,	Stockbridge, Ashley	1·15	,,	Douglas, Woodville	1·91
,,	Reading, Calcot Place.....	1·87	XII.	Stoneykirk, Ardwell House	2·02
III.	Harrow Weald, Hill House.	2·45	,,	Dalry, The Old Garroch ...	2·53
,,	Oxford, Magdalen College..	1·05	,,	Langholm, Drove Road.....	4·24
,,	Pitsford, Sedgebrook.....	1·18	,,	Moniaive, Maxwelton House	2·22
,,	Huntingdon, Brampton.....	1·42	XIII.	N. Esk Reservoir [Penicuick]	...
,,	Woburn, Milton Bryant.....	2·48	XIV.	Maybole, Knockdon Farm..	·89
,,	Wisbech, Bank House	1·01	XV.	Campbeltown, Witchburn...	2·12
IV.	Southend Water Works.....	1·57	,,	Inveraray, Newtown	1·47
,,	Colchester, Lexden.....	1·14	,,	Ballachulish House.....	2·24
,,	Newport, The Vicarage.....	1·31	,,	Islay, Eallabus	2·19
,,	Rendlesham.....	1·39	XVI.	Dollar Academy	1·96
,,	Swaffham	1·14	,,	Loch Leven Sluice	2·61
,,	Blakeney	1·08	,,	Balquhidder, Stronvar	2·74
V.	Bishops Cannings	1·38	,,	Perth, The Museum	2·33
,,	Ashburton, Druid House ...	2·88	,,	Coupar Angus Station	2·86
,,	Honiton, Combe Raleigh ...	4·51	,,	Blair Atholl.....	1·91
,,	Okehampton, Oaklands.....	1·21	,,	Montrose, Sunnyside Asylum	4·04
,,	Hartland Abbey	2·09	XVII.	Alford, Lynturk Manse ...	2·13
,,	Lynmouth, Rock House ...	1·77	,,	Keith Station	·74
,,	Probus, Lamellyn	2·57	XVIII.	N. Uist, Lochmaddy	3·25
,,	North Cadbury Rectory ..	2·22	,,	Alvey Manse	·30
VI.	Clifton, Pembroke Road ...	1·91	,,	Loch Ness, Drumnadrochit.	·67
,,	Ross, The Graig	2·00	,,	Glencarron Lodge	1·96
,,	Shifnal, Hatton Grange.....	2·08	,,	Fearn, Lower Pitkerrie.....	·82
,,	Blockley, Upton Wold	1·97	XIX.	Inversbin	·44
,,	Worcester, Boughton Park.	1·95	,,	Altnaharra	1·56
VII.	Market Overton	1·96	,,	Bettyhill	·88
,,	Market Rasen	·93	XX.	Dunmanway, The Rectory..	3·94
,,	Bawtry, Hesley Hall.....	·65	,,	Cork	3·21
,,	Buxton.....	1·12	,,	Darrynane Abbey	1·95
VIII.	Neston, Hinderton Lodge...	1·71	,,	Glenam [Clonmel]	3·09
,,	Southport, Hesketh Park...	2·62	,,	Ballingarry, Gurteen	1·47
,,	Chatburn, Middlewood	1·99	,,	Miltown Malbay.....	1·73
,,	Cartmel, Flookburgh	...	XXI.	Gorey, Courtown House ...	3·33
IX.	Langsett Moor, Up. Midhope	1·56	,,	Moynalty, Westland	2·17
,,	Scarborough, Scalby	1·42	,,	Athlone, Twyford	1·80
,,	Ingleby Greenhow	·94	,,	Mullingar, Belvedere.....	1·25
,,	Mickleton.....	2·72	XXII.	Woodlawn	1·57
X.	Bardon Mill, Beltingham ...	2·75	,,	Westport, St. Helens	1·19
,,	Ewesley, Fallowlees	2·81	,,	Mohill	1·68
,,	Ilderton, Lilburn Cottage..	3·17	XXIII.	Enniskillen, Portora	1·34
,,	Keswick, York Bank.....	2·39	,,	Dartrey [Cootehill].....	1·46
XI.	Llanfrechfa Grange.....	2·58	,,	Warrenpoint, Manor House	3·10
,,	Treherbert, Tyn-y-waun ...	3·87	,,	Banbridge, Milltown	2·70
,,	Carmarthen, The Friary.....	2·22	,,	Belfast, Springfield	2·38
,,	Castle Malgwyn [Llechryd].	3·00	,,	Bushmills, Dundarave	1·12
,,	Plynlimon.....	4·50	,,	Sion Mills.....	1·29
,,	Crickhowell, Ffordlas.....	2·80	,,	Killybegs	1·80
,,	New Radnor, Ednol	3·64	,,	Horn Head	·83

METEOROLOGICAL NOTES ON OCTOBER, 1908.

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

LONDON, CAMDEN SQUARE.—The first four days were remarkable for the prevalence of fog during the mornings, followed by unusually high temp. in the day. Generally fair and mild weather followed to 20th, after which the conditions were dull and cool. Duration of sushine 84·8* hours, and of R 43·1 hours. Mean temp. 53°·9, or 4°·1 above the average, and the highest in 51 years excepting in 1861, 1898 and 1906. Shade max., 79°·0 on 2nd, was the highest in any October since 1859; min. 32°·9 on 25th. F 0, f 1.

TENTERDEN.—Duration of sunshine 151·0† hours. Shade max. 78°·0 on 4th; min. 31°·0 on 25th. F 1, f 2.

TOTLAND BAY.—Duration of sunshine 143·1* hours. Shade max. 72°·5 on 2nd; min. 33°·9 on 25th. F 0, f 1.

PITSFORD.—Mean temp. 52°·3. Shade max. 77°·3 on 2nd; min. 28°·4 on 25th. F 2. R 1·90 in. below the average.

TORQUAY.—Duration of sunshine 114·1* hours, or 0·1 hour above the average. Mean temp. 56°·5, or 4°·5 above the average. Shade max. 69°·4 on 2nd; min. 34°·1 on 25th. F 0.

NORTH CADBURY.—Mild to 17th and then cooler, from 24th to 27th being quite cold, and the last four days again very warm. Shade max. 81°·5 on 2nd; min. 28°·5 on 25th. F 2, f 5.

BATH.—Shade max. 76°·8 on 1st and 2nd; min. 31°·0 on 25th. F 1.

ROSS.—The warmest October since 1861, the mean temp. being 53°·6, or 4°·5 above the average Shade max. 77°·6 on 1st; min. 27°·8 on 25th. F 4, f 5.

HODSOCK PRIORY.—Shade max. 77°·0 on 1st; min. 29°·7 on 22nd. F 2, f 4.

SOUTHPORT.—R 1·25 in. below the average. Duration of sunshine 119·0* hours, or 30·0 hours above the average. Duration of R 46·9 hours. Mean temp. 54°·4, or 5°·8 above the average. Shade max. 78°·0 on 1st; min. 30°·7 on 25th. F 1, f 5.

HULL.—Remarkably fine in the early part, and very mild with moderate R throughout. Duration of sunshine 72·2* hours. Shade max. 77°·0 on 1st and 3rd; min. 32°·0 on 25th. F 1, f 1.

CARMARTHEN.—Unusually fine and mild, with but little R. Water supplies were getting low. Fodder was abundant, and the country had the appearance of spring.

HAVERFORDWEST.—The warmest October in 63 years, but with a cold period from 21st to 28th. Duration of sunshine 111·1* hours. Shade max. 71°·4 on 2nd; min. 27°·3 on 25th. F 3, f 6.

LLANDUDNO.—Shade max. 76°·2 on 1st; min. 34°·4 on 25th. F 0, f 0.

DOUGLAS.—A truly blessed change from the bad weather of the previous six months. With the exception of 1879, the R was the least recorded in October in 35 years.

DUMFRIES.—Mean temp. 52°·8, or 5°·1 above the average of 49 years. Shade max. 75°·0 on 1st and 3rd; min. 26°·0 on 25th. F 3.

EDINBURGH.—Shade max. 76°·2 on 1st; min. 32°·8 on 25th. F 0, f 5.

DUNDEE.—Shade max. 72°·2 on 1st; min. 31°·0 on 25th. F 2.

FORT AUGUSTUS.—Shade max. 74°·0 on 3rd; min. 25°·6 on 26th. F 4.

CORK.—The warmest October since 1890. Shade max. 64°·0 on 3rd and 14th; min. 35°·0 on 26th. F 0, f 0.

DUBLIN.—Wonderfully mild, the mean temp. being 55°·4, or 5°·9 above the average. Shade max. 68°·7 on 2nd; min. 38°·0 on 26th. F 0, f 0.

MARKREE.—Shade max. 72°·5 on 3rd; min. 27°·2 on 26th. F 1, f 6.

WARRENPOINT.—Shade max. 68°·0 on 4th; min. 36°·0 on 26th. F 0, f 1.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, May, 1908.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	77·9	27	42·2	23	67·2	48·7	51·6	83	124·5	35·0	1·95	11	6·1
Malta	86·0	6	54·6	3	74·5	62·5	58·9	71	144·8	...	·00	0	2·2
Lagos	90·0	12*	72·0	31	87·2	75·5	75·1	75	162·2	·68	6·34	14	8 2
Cape Town	89·0	21	43·3	8	70·0	51·9	51·2	71	...	...	1·23	9	4·9
Durban, Natal ...	83·7	14	53·8	25	76·0	57·6	...	...	137·2	...	·37	8	2·1
Johannesburg	70·3	16	36·5	24	65·2	46·5	41·2	66	132·8	34·8	·00	0	0·8
Mauritius	82·6	2	62·6	14	79·7	67·3	65·3	77	145·3	51·7	1·35	13	5·0
Calcutta	101·1	15	69·3	8	95·6	77·5	73·5	69	164·5	66·1	4·64	8	4·2
Bombay	92·0	29	78·6	1	90·5	80·3	74·8	72	137·8	73·8	·00	0	2·8
Madras	109·6	30	78·0	2	100·6	81·7	74·5	69	154·0	75·9	·09	2	3·5
Kodaikanal	73·4	27	51·1	17	68·7	55·0	51·6	72	135·9	38·2	5·06	16	5·0
Colombo, Ceylon ...	90·0	20	70·0	10	87·7	77·7	76·2	81	150·6	69·2	9·00	18	6·0
Hongkong	90·3	29	65·2	2	80·8	72·1	69·3	79	144·4	...	1·33	10	6·2
Melbourne	77·1	1	37·2	24	60·1	45·8	43·8	71	118·6	30·2	·88	13	6·9
Adelaide	75·3	1	39·9	27	64·4	49·6	48·5	75	128·5	30·0	3·87	16	6·7
Coolgardie	78·0	2	36·9	21	63·9	45·9	7·9	53	144·9	33·2	1·74	11	4·9
Perth	75·5	18	41·9	13	68·2	51·5	5·2	66	134·6	40·4	6·29	14	6·2
Sydney	76·4	6	46·6	16	66·7	53·1	50·7	79	110·0	36·1	2·58	25	5·0
Wellington	64·0	5	42·0	11†	58·6	48·5	46·3	77	102·0	29·0	1·77	12	6·0
Auckland	66·0	8	46·0	11	62·6	53·7	49·5	74	128·0	39·0	5·88	15	5·4
Jamaica, Kingston ...	92·1	19	70·0	24	88·7	73·0	68·8	69	...	...	1·61	4	4·2
Trinidad	91·0	3	57·0	26	87·7	70·1	71·6	80	161·0	58·0	5·82	18	...
Grenada	88·6	16	72·6	23	84·6	74·6	70·4	74	141·2	...	4·71	22	4·0
Toronto	84·0	29	29·4	4	...	...	...	...	...	...	4·64	20	...
Fredericton	79·0	20	29·0	4	...	...	...	68	...	...	4·87	12	7·0
St. John's, N.B. ...	74·2	24	34·2	4	...	...	...	...	...	...	4·08	13	...
Victoria, B.C.	66·2	23	39·7	26	...	...	...	74	...	...	1·27	9	7·0

* and 17. † and 30.

MALTA.—Mean temp. of air 68°·4 or 4°·5 above average. Average hours of bright sunshine 12·1.

Johannesburg.—Bright sunshine, 311·3 hours.

Mauritius.—Mean temp. of air 0°·8 above, and R 2·53 in. below, averages. Mean hourly velocity of wind 9·5 miles, or 0·8 miles below average.

KODAIKANAL.—Bright sunshine 222 hours.

COLOMBO.—Mean temp. of air 81°·2 or 1°·1 below, of dew point 0°·9 above, and R 2·70 in. below, averages. Mean hourly velocity of wind, 7·5 miles.

HONGKONG.—Mean temp. of air 76°·1. R 10·97 in. below, bright sunshine 219·3 or 65·5 hours above, averages. Mean hourly velocity of wind 12·3 miles.

Melbourne.—Mean temp. of air 1°·0 below, and R 1·26 in. below, averages.

Sydney.—Mean temp. of air 1°·4 below, and R 2·55 in. below, averages.

Wellington.—Mean temp. of air 0°·8 above, and R 2·75 in. below, averages. Bright sunshine 144·4 hours.

Auckland.—Mean temp. of air 1°·0 above average, R 1·50 in. above average.

TRINIDAD.—R 2·03 in. above 43 years' average.

RAINFALL OF THAMES VALLEY, NOVEMBER, 1908.

Symons's
Meteorological Magazine.

No. 515. **DECEMBER, 1908.** Vol. XLIII.

THE RAINFALL OF NOVEMBER.

November proved a dry month in all parts of the British Isles except the extreme north of Scotland and in North Wales and part of Lancashire, where there was a very slight excess over the monthly average. In the south of England and South Wales there was less than 40 per cent. of the average rainfall, and, taking the country as a whole, it seems probable that within the last half century no November has been very much drier, though dry Novembers occurred in 1901, 1879, 1871 and 1867. The data for these earlier years have not been re-calculated in a comparable form, so we speak of them with some reserve In London, November was remarkably dry, with ·69 in., or 30 per cent. of the 50 years' average (2·30 in.), having only been surpassed, for low rainfall, on three occasions since the Camden Square record began in 1858. November, 1858, had ·53 in., or 23 per cent.; November, 1871, had ·60 in, or 26 per cent., and November, 1901, had ·59 in., or 26 per cent., of the average. The duration of sunshine bore some inverse relation to the amount of rain; there were 48·2 hours of bright sunshine, and since the sunshine recorder was established at Camden Square, in 1904, the brightest previous November had 35·0 hours. A writer in the *Saturday Review*, of December 5th, says:—"Our just expiring November has been mild enough and often sunny, but not sunny throughout; so it had even a more glorious predecessor in 1834." He bases this bold assertion on the slender foundation of a note by Bolton Corney in his "Curiosities of Literature, Illustrated." wherein that author, when he purchased D'Israeli's "Curiosities of Literature," states:—"I determind to reserve the *lively miscellany* as an antidote to the gloom of November; but the sun of summer shone throughout that month, an instance of ultra-felicity without parellel."

The statement cannot be checked because the sunshine recorder was not invented until twenty years later; but we have evidence at least that the rainfall of November, 1834, was more than twice as great as that of November, 1908.

During last month a large area round London, and in the Midlands, had less than one inch of rain, always a rare event in November, and

the general rainfall of the three kingdoms, for the month and for the eleven months of 1908, was as follows, expressed as a percentage of the average fall :—

	Nov., 1908.		Jan.-Nov., 1908.
England and Wales	52	.....	89
Scotland	77	.....	97
Ireland	77	.....	101
British Isles	63	.....	93

It appears, from the last column, that an average rainfall for December will bring Scotland and Ireland nearly up to their average for the year; but, unless December proves very wet, there will be a deficiency of rainfall for England and Wales. It seems not improbable that 1908 will be remarkable for having a rainfall very near the average, and if so, coming after two average years, the run of three will be unique in the history of British rainfall.

THE WEATHER OF NOVEMBER, 1908.

By Fred. J. Brodie.

The weather of November may be described briefly as changeable, but mostly very dry and mild, though never very warm, the two former qualities being seldom found in conjunction at so late a period in the autumn.

The month opened with a continuance of the genial southerly airs which prevailed at the end of October, and between the 1st and 3rd (chiefly on the 1st over Great Britain) the thermometer rose to 60° and upwards in many parts of the United Kingdom, and as far north even as Banffshire. At Southampton on the 1st, and at St. Aubins, Jersey, on the 2nd, the shade maximum was as high as 63°, while at Guernsey on the 3rd the thermometer touched 65°. On the 4th the wind began to back to the eastward, and after the 6th, when the polar current increased in strength, the weather became much colder, a sharp frost being recorded in many districts between the nights of the 6th and 9th. The lowest temperatures of the month were recorded in most places on the night either of the 8th or 9th, when the sheltered thermometer fell slightly below 20° in several parts of Great Britain, as far south as Wiltshire, and reached a minimum of 16° at West Linton. On the surface of the grass readings below 15° were equally common, the exposed thermometer sinking to 13° at Birmingham, 12° at West Linton, 9° at Greenwich, and 7° at Llangammarch Wells. After the 10th a mild south-westerly breeze set in, the wind continuing to blow from that point or from west for more than a week. No very high temperatures were recorded, but on the 11th and 12th the thermometer reached 60° in several parts of England and Ireland, and slightly exceeded that level at a few places in the south and south-west. The extension of an anticyclone from the Atlantic on the 19th was marked by a

temporary shift of wind to the northward, and in the course of the ensuing night a rather keen frost was experienced over Great Britain, grass temperatures below 20° being recorded at a few of the more northern stations. The wind, however, soon got back into a westerly or south-westerly quarter, and until very nearly the end of the month the thermometer was again above its normal level. The highest readings of this period were observed either on the 21st or 22nd, or on the 24th, the thermometer rising on each occasion to 55° and upwards in most districts. At Llandudno a temperature of 60° was recorded on the 21st and again on the 24th. Quite at the close of the month the equatorial current died away, and on the last two nights a sharp frost was again experienced in many parts of the kingdom.

With so decided a predominance of warmth, it is not surprising to find that the mean temperature of the month was above the average, the excess being large in the south of England and also on our extreme western coasts, from the Hebrides to the coast of Kerry. In Scotland the month was not so mild as in 1906 or 1902, but over the greater part of England and Ireland it was the warmest November since that of 1899.

METEOROLOGY AT THE BRITISH ASSOCIATION.

Dr. Shaw's address to Section A.

(Continued from p. 188.)

I will refer quite briefly to the interesting relations between the yield of barley and cool summers, or the yield of wheat and dry autumns, and the antecedent yield of eleven years before, which fell out of the body of statistics collected in the Weekly Weather Report since 1878. The accomplished statisticians of the Board of Agriculture have made this work the starting point for a general investigation of the relation between the weather and the crops, which cannot fail to have important practical bearings.

Let me take another example. For more than a full generation meteorological work has been hampered by the want of a definite understanding as to the real meaning in velocity, or force, of the various points of the scale of wind-estimates laid down in 1805 by Admiral Beaufort for use at sea, and still handed on as an oral tradition. The prolonged inquiry, which goes back really to the report upon the Beckley anemograph already referred to, issued quite unexpectedly in the simple result that the curve

$$p = \cdot 0105 B^3$$

(where p is the force in pounds per square foot, and B the arbitrary Beaufort number) runs practically through nine out of the eleven points on a diagram representing the empirical results of a very elaborate investigation. The empirical determinations upon which it is based are certainly not of the highest order of accuracy; they rely upon two separate investigations besides the statistical comparison, viz., the constant of an anemometer and

the relation of wind velocity to wind-pressure, but no subsequent adjustment of these determinations is at all likely to be outside the limits of an error of an estimate of wind-force; and the equation can be used, quite reasonably, as a substitute for the original specification of the Beaufort scale, a specification that has vanished with the passing of ships of the type by which it was defined. This result, combined with the equation $p = \cdot 003\, V^2$, which has been in use in the Office for many years, and has recently been confirmed as sufficiently accurate for all practical purposes by Dr. Stanton at the National Physical Laboratory and Monsieur Eiffel at the Eiffel Tower, places us upon a new plane with regard to the whole subject of wind-measurement and wind-estimation.

Results equally remarkable appear in other lines of investigation. Let me take the relation of observed wind velocity to barometric gradient. You may be aware that in actual experience the observed direction of the wind is more or less along the isobars, with the low pressure on the left of the moving air in the northern hemisphere; and that crowded isobars mean strong winds. Investigations upon this matter go back to the earliest days of the Office.

There can be no doubt that the relation, vague as it sometimes appears to be upon a weather chart, is attributable to the effect of the Earth's rotation. In order to bring the observed wind velocity into numerical relation with the pressure-gradient Guldberg and Mohn assumed a coefficient of surface 'friction,' interfering with the steady motion. The introduction of this new quantity, not otherwise determinable, left us in doubt as to how far the relation between wind and pressure distribution, deducible from the assumption of steady motion, could be regarded as a really effective hypothesis for meteorological purposes.

Recent investigation in the Office of the kinematics of the air in travelling storms, carried out with Mr. Lempfert's assistance, have shown that, so far as one can speak of the velocity of wind at all—that is to say, disregarding the transient variations of velocity of short period and dealing with the average hourly velocity, the velocity of the wind in all ordinary circumstances is effectively steady in regard to the accelerating forces to which it is subject. This view is supported by two conclusions which Mr. Gold has formulated in the course of considering the observations of wind velocity in the upper air, obtained in recent investigations with kites. The first conclusion is that the actual velocity of wind in the upper air agrees with the velocity calculated from the pressure distribution to a degree of accuracy which is remarkable, considering the uncertainties of both measurements; and the second conclusion affords a simple, and I believe practically new, explanation upon a dynamical basis of the marked difference between the observed winds in the central portions of cyclones and anti-cyclones respectively, by showing that, on the hypothesis of steady motion, the difference of sign of the effective acceleration, due to curvature of path and to the Earth's rotation respectively, leads to quite a small velocity and small gradient as the limiting values of those quantities near anti-cyclonic centres.

This conclusion is so obviously borne out by the facts that we are now practically in a position to go forward with the considerable simplification which results from regarding the steady state of motion in which pressure

gradient is balanced by the effective acceleration due to the rotation of the Earth and the curvature of the path, as the normal or ordinary state of the atmosphere.

I cannot forbear to add one more instance of an argosy which has richly come to harbour so lately as this summer. You may be aware that Kelvin was of opinion that the method of harmonic analysis was likely to prove a a very powerful engine for dealing with the complexities of meteorological phenomena, as it has, in fact, dealt with those of tides. In this view Sir Richard Strachey and the Meteorological Council concurred, and an harmonic analyser was installed in the Office in 1879, but subsequently numerical calculation was used instead. A considerable amount of labour has been spent over the computation of Fourier coefficients. Not many great generalizations have flowed from this method up to the present time. I have no doubt that there is much to be done in the way of classifying temperature conditions, for climatic purposes, by the analysis of the seasonal variations. A beginning was made in a paper which was brought to the notice of the Association at Glasgow. The most striking result of the Fourier analysis we owe to Hann, who has shown that, if we confine our attention to the second Fourier coefficient of the diurnal variation of pressure —that is, to the component of twelve-hour period—we get a variation very marked in inter-tropical regions, and gradually diminishing poleward in both hemispheres, but synchronous in phase throughout the 360 degrees of a meridian. The maximum occurs along all meridians in turn about 10 A.M. and 10 P.M. local time. This semi-diurnal variation with its regular recurrence is well known to mariners, and we have recently detected it, true to its proper phase, in the observations at the winter quarters of the "Discovery"; small in amplitude indeed—about a thousandth of an inch of mercury—but certainly identifiable.

The reality of this variation of pressure, common to the whole Earth, cannot be doubted, and, so far as it goes, we may represent it (if indeed we may represent pressure differences as differences in vertical heights of atmosphere) as the deformation of a spherical atmosphere into an ellipsoid, with its longest axis in the equator pointing permanently 30° to the west of the sun. Its shortest axis would also be in the equator, and its middle axis would be along the polar axis of the Earth. Somehow or other this protuberance remains fixed in direction with regard to the sun, while the solid Earth revolves beneath it. Whatever may be the cause of this effect, obviously cosmical, and attributable to the sun, at which it indirectly points, its existence has long been recognised, and further investigation only confirms the generalisation. It is now accepted as one of the fundamental general facts of meteorology.

Professor Schuster, for whose absence from this meeting I may venture to express a regret which will be unanimous, has already contributed a paper to the Royal Society pointing out the possible relations between the diurnal variations of pressure and those of terrestrial magnetic force. Going back again to the ubiquity of the application of the relation of pressure and wind, in accordance with the dynamical explanation of Buys Ballot's Law, we should expect the effect of a pressure variation that has its counterpart in that of terrestrial magnetism to be traceable also in wind observations.

Mr. J. S. Dines has just given me particulars of the discovery of that

effect in the great air-current, the variations of which I have called the pulse of the atmospheric circulation—I mean the south-east Trade Wind, the most persistent atmospheric current in the world. It is difficult as a rule to get observers to pay much attention to that current, because it is so steady; but in 1891 the Meteorological Council set up an anemometer at St. Helena, in the very heart of the current, and we have just got out the results of the hourly tabulations. When the observations for the hours 1 to 24 are grouped separately for months, so as to give the vector resultants for each hour and for each month, it appears that there is a conspicuous semi-diurnal variation in the current, which shows itself as a closed polygon of vector variations from the mean of the day.

If, instead of combining the south and east components to form a vector diagram, we plot their variations separately, the semi-diurnal variation in each is plainly marked; and the calculation of its constants shows that its amplitude is about three-quarters of a mile per hour both in the south and rather less in the east component. The easterly increment has its maxima at 10 a.m. and 10 p.m., and at these hours the phase of the variation of the southerly component is nearly opposite. Thus, to correspond with the semi-diurnal variation in the Trade Wind at St. Helena, which is equivalent to the superposition upon the resultant wind of a north-easterly component of about one mile per hour amplitude, with maxima at 10 a.m. and 10 p.m., the hours when the ellipsoidal deformation of the spherical atmosphere is passing over the locality.

I have only dealt with one month. I believe that when all the results that flow from this simple statement can be put before you, you will agree with me that the argosy which the Meteorological Council sent out in 1891 has indeed richly come to harbour.

It would be appropriate for me to add some words about the results of last year's work upon the upper air, in which we have had the valuable co-operation of the University of Manchester. These results have disclosed a number of points of unusual interest. But we are to have an opportunity of considering that subject in a discussion before the Section, and I need not deal with it here. I must, however, pause to give expression of the thanks of all meteorologists to Professor Schuster for his support of the Manchester University station at Glossop Moor. I may remind you that this generous contribution for the advancement of science on the part of Professor Schuster is in addition to the foundation of a readership in mathematical physics at Manchester, and a readership in dynamical meteorology, now held by Mr. Gold, at Cambridge.

I have said enough to show that the speculative ventures of official meteorologists are not all failures, and I will only add that if any mathematician or physicist would like to take his luck on a meteorological argosy he will be heartily welcomed. Part of the work will be drudgery; he must be prepared to face that; but the prospects of reaching port are reasonably good, so much so, indeed, that such a voyage might fairly lead to a claim for one of the higher academical degrees.

The most serious danger of waste in a busy office is that it should carry on its work without an adequate knowledge of what is being done in advancing science and improving methods elsewhere. I speak myself for

the Meteorological office alone, but I believe that the responsible officials of any scientific Government department will agree with what I say.

The actual volume of original contributions on these subjects is by no means inconsiderable. You are all aware that, some years ago, the Royal Society initiated a great international enterprise for the compilation of a catalogue of scientific literature. I have been looking at the fifth annual issue of the volume on Meteorology, including Terrestrial Magnetism. I may remark that the catalogue is quite incomprehensibly eclectic as regards official literature, but let that pass. I find that, in the year that closed with July, 1907, 1042 authors (not counting offices and institutions as such) presented to the world 2131 papers on Meteorology, 229 on Atmospheric Electricity, and 180 on Terrestrial Magnetism. This will give some idea of the annual growth in these subjects, and may convince you that, after all allowance is made for duplicate titles, for papers of no importance, and for mere sheets of figures published for purposes of reference, there remains a bulk of literature too large for any single individual to cope with if he has anything else to do.

If British students, official and unofficial, are to make the most of the operation of drawing the angels down, they need help and co-operation in dealing with this mass of literature, in winnowing the important from the unimportant, and in assimilating that which makes for the real progress of the practical application of Science. This is the more necessary for these subjects because there is no organised system of academic teaching, with its attendant system of text-books.

The want of opportunity for the discussion of progress in these sciences is specially lamentable, because in its absence they lose the valuable assistance of amateur workers, who might be an effective substitute for the students of an academic study. In no subject are there more volunteers, who take an active part in observing, than in meteorology; but how few of them carry their work beyond the stage of recording observations and taking means. The reason is not lightly to be assigned to their want of capacity to carry on an investigation, but far more, I believe, to the want of knowledge of the objects of investigation and of the means of pursuing them.

Among the agencies which in the past have fostered the knowledge of these subjects, and stimulated its pursuit, there stand out prominently the annual meetings of this Association. It was the British Association which, in 1842, re-founded the Kew Observatory for the study of the physics of the atmosphere, the Earth and the sun. It was the British Association which promoted the establishment of magnetic observatories in many parts of the Earth, and in the early sixties secured the most brilliant achievements in the investigation of the atmosphere by means of balloons. I know of no other opportunity of anything like the same potentialities for the writers of papers to meet with the readers, and to confer together about the progress of the sciences in which they are interested. But its potentialities are not realised. Those of us who are most anxious for the spread of the application of mathematics and physics to the phenomena of astronomy, meteorology, and geophysics, have thought that this opportunity could not properly be utilised by crowding together all the papers that deal with such subjects into one day, or possibly two days, so that they can be polished off with the rapidity of an oriental execution. In fact, the opportunity to be

polished off is precisely not the opportunity that is wanted. There are some of us who think that a British Association week is not too long for the consideration of the subjects of which a year's abstracts occupy a volume of six hundred pages, and that, if we could extend the opportunity for the consideration of these questions from one or two days to a week, and let those members who are interested form a separate committee to develop and extend these subjects, the British Association, the country, and science would all gain thereby. I venture from this place, in the name of the advancement of science, to make an appeal for the favourable consideration of this suggestion. It is not based upon the depreciation, but upon the highest appreciation of the service which mathematics and physics have rendered, and can still render, to the observational sciences, and upon the well-tried principle that close family ties are strengthened, and not weakened, by making allowance for natural development.

We regret to learn that, in spite of Dr. Shaw's strong appeal, the Committee of Section A. did not support the proposal for a special section, or sub-section, of meteorology.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE PRESENTATION OF RAINFALL STATISTICS.

It seems to me that the usually practised way of publishing rainfall statistics is very misleading to the general public. The year 1907 furnished a good example. The total amount was not greatly above the average, nor was the number of rain days. Yet the year was a most disastrous one for all interests depending on the weather. Here half the corn was lost and the potato crop is not yet all out of the ground, and half of the tubers are frostbitten. Why? Because in 1907 the dry weather was all packed into the four months, January, February, March and September, and the rest, viz., most of the time when crops were being saved were phenomenally wet; and not only so, but those months which had an average rainfall had an excessive number of rain days.

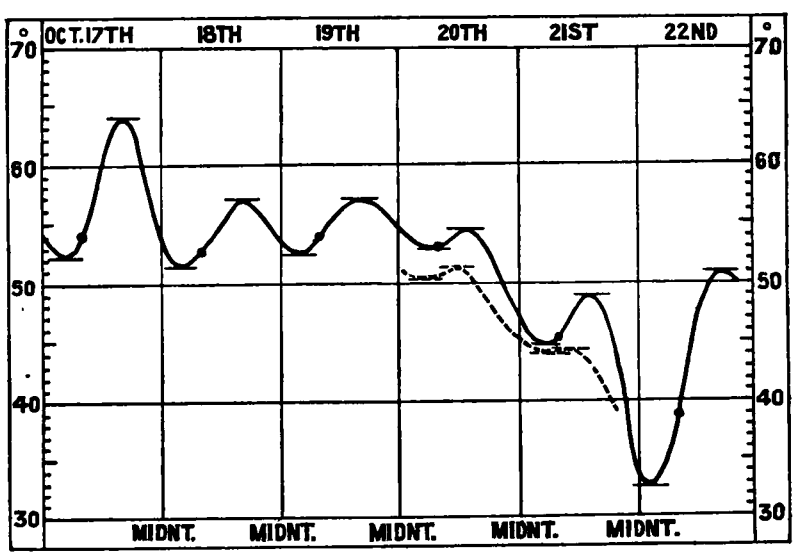
It seems to me that the *distribution* of rainfall has far more to do with the character of a season than its amount. The month of June, 1903, was an excellent example. Here the month gave a rainfall of nearly 5 in.; a very wet June. But over 4 in. of this fell on four days, and the total number of rain days was only 9, a very dry month.

WM. F. A. ELLISON.

Monart Rectory, January, 1908.

SMALL DIURNAL RANGE OF TEMPERATURE.

In the November issue of this Magazine, Mr. Hamlin calls attention to what would undoubtedly be a remarkably small diurnal range of temperature, if it were a fact that for a period of twenty-four hours the temperature did not vary by more than 1°·0 or 0°·3, the ranges quoted. That such a notable uniformity of temperature prevailed does not, however, appear to be proved by the figures given. Mr. Hamlin does not state at what hour he reads his thermometers, but it is evident he does not read them at 9 a.m., and quote the readings for the day of observation; for in that case the maximum reading for any day (*e.g.*, 21st) could not be lower than the temperature at the time of setting the thermometers on the previous day (20th), which in turn could not be lower than the minimum reading for that day, as is the case in the figures quoted by Mr. Hamlin. It thus appears that Mr. Hamlin adopts the not uncommon practice of taking the readings in the morning, and referring the maximum to the previous *civil* day. Now, in this case, nothing can be inferred from the maximum and minimum readings assigned to any day, as to the actual range of temperature on that day,* as I think will be at once evident from a consideration of the subjoined curve, which represents the general character of the temperature variation at this station for a few days at the period under discussion.



The thermometers are read at 8 a.m., and the maximum is referred to the previous day, the minimum being entered to the day of observation. In the diagram the dots represent the 8 a.m. readings of the dry bulb, and the short horizontal lines the values of the

* It is, of course, obvious that *simultaneous* readings of the max. and min. give the actual range since the previous setting.

minimum and maximum, which are assumed to occur in the early morning and afternoon respectively. This assumption may, of course, not always hold good—all that can certainly be affirmed being that the maximum and minimum entered for any day must be separated by the reading at the time of observation on that day, and that they may both occur very nearly at that time, and may not be actually the highest and lowest temperatures occurring on the *civil* day to which they are referred—in fact they may not have occurred on that *civil* day at all.

On the 20th of October at this station, the readings were :—

Min. 53°·0 (occurring at time of observation),
Max. 54°·5 (read at 8 a.m. on 21st),

giving an apparent range of only 1°·5. But a glance at the curve at once suggests that there was not a long time interval between these two readings, and that the slight rise in temperature on that day was but a brief check in the downward trend of the thermometer, which had started on the 19th and continued till the morning of the 22nd. I venture to think that this explanation will also fit Mr. Hamlin's temperatures (which I have represented by a dotted curve), and that though the fluctuations of temperature from the 18th to the 20th are seen to be small, they are not so small as would at first sight appear from the mere juxtaposition of the readings entered for each day.

J. ROWLAND, S.J.

St. Beuno's College, St. Asaph, N. Wales.

THE HIGH AUTUMN TEMPERATURES.

THE recent high temperatures are so remarkable that I venture to send my readings :—

	Maximum Temps.
1908.—Sept. 29th	73°·6
,, 30th	77°·4
Oct. 1st	79°·1
,, 2nd	76°·4
,, 3rd	78°·4

The only other October readings above 70° in my record of 30 years are :—

Oct. 5th, 1878	71°·3
Oct, 1st, 1895	71°·3

In 1895 a similar hot period occurred, but one week earlier, from September 23rd to September 29th inclusive.

1908.—Sept. 30th ..... 63°·0. Minimum temp.

This has only been exceeded twice in 30 years.

CHARLES L. BROOK.

Harewood Lodge, Meltham, October 8th, 1908.

THE WARM AUTUMN AT YORK.

On line 5 of "The Warm Autumn at York," on p. 193 of the November Magazine, 71° should be 70°, as indeed the context indicates.

As expected, October, 1908, was warmer than any previous October back to 1832. The mean was 54°·3, against the previous highest, 52°·9, in 1861. The range goes down 11° to 43°·3 in 1842.

J. EDMUND CLARK.

Asgarth, Riddlesdown Road, Purley, Surrey.

PHENOLOGICAL OBSERVATIONS.

Allow me to express my entire concurrence with Mr. Bonacina's remarks on the above on pp. 175-7. Many years ago I was one of the phenological correspondents of the Meteorological Society, but gave it up from a conviction that it was practically impossible for the observations to be sufficiently accurate to have any scientific value. In addition to the difficulties mentioned by Mr. Bonacina, I would call attention to that of the height of the locality of observation, not only above sea level, but also relatively to its own immediate neighbourhood. To give an instance from my own experience: this house is situated on the slope of a hill facing south, which rises 270 ft. in about 1,300 yards. Here every spring I see cuckoo-flowers (*cardamine pratensis*), primroses and wild hyacinths beginning to flower at the foot of the hill a long time before they flower at the top. Thus, on April 15th, 1907, my notes show that hyacinths were in flower at the foot of the hill; on May 5th "beginning to open" about 200 ft. higher (vertical)—none to be seen at the top; on May 14th "almost in full flower" at the top.

ALFRED O. WALKER, F.L.S.

Ulcombe Place, Maidstone, October 28th, 1908.

ROYAL METEOROLOGICAL SOCIETY.

The first meeting of this Society for the current session was held at the Institution of Civil Engineers, Great George Street, Westminster, on Wednesday evening, November 18th, Dr. H. R. Mill, President, being in the chair.

In opening the meeting the President gave a short account of the work carried on by the Society during the recess, and alluded to the death of Prof. E. Mascart, the late head of the French Meteorological Service, who was a distinguished Honorary Member of the Society.

Mr. H. Harries read a report of the proceedings at the Twenty-fifth Anniversary of the German Meteorological Society, which was held at Hamburg, on September 28th to 30th, and which he attended as the representative of the Royal Meteorological Society.

A paper on an "Investigation of the Electrical State of the Upper Atmosphere, made at the Howard Estate Observatory, Glossop," under the joint authorship of Mr. W. Makower, Miss Margaret White and Mr. E. Marsden, of the Manchester University, was read by the Secretary. The experiments were carried out in connection with the kite observations made at the Observatory. There exists under normal atmospheric conditions a potential gradient in the atmosphere surrounding the earth.* The earth being negatively charged with respect to the air, a continuous electric current flows from the upper atmosphere to earth. It follows, therefore, that a kite attached to an earth-connected wire will tend to assume the potential of the air surrounding it, and an electric current will flow continuously down the wire to earth through the winding machine to which the wire is attached. The experiments were undertaken with a view to determining the magnitude of this current when the kite was at different heights above the ground. The authors found that in general a high wind produced at a given altitude an abnormally high value of the current flowing down the wire. Whether the action of the wind is to be accounted for by the greater volume of air which passes in a given time over the sails of the kite, so giving a greater volume of air from which electricity is collected; or whether the effect of the wind is to be attributed to electrification by friction, the authors find it difficult to say; but there is no question that the velocity of the wind does play an important part in determining the current flowing down the kite wire. In further confirmation it may be added that observations made with a captive balloon in very calm weather gave abnormally low values of the current.

Mr. W. W. Bryant, Capt. D. Wilson-Barker, Mr. W. H. Dines, the President, and Mr. C. S. Rolls took part in the discussion.

A paper, by Capt. C. H. Ley, describing the Balloon Observations which he made at Birdhill, co. Limerick, during July and August, 1908, was also read by the Secretary. These observations were carried out on behalf of the Joint Kite Committee of the Royal Meteorological Society and of the British Association. Captain Ley in his paper gave full details of the observations made on 25 pilot balloons, 7 of which carried registering instruments. The method of measuring distance employed is similar to that known by surveyors as the subtense method; that is, obtaining the range of a known vertical bar by observation of the angle subtended by it at the theodolite with an eye-piece micrometer. In this case the bar is the line joining a hydrogen balloon and a comparatively heavy air-filled balloon, the two balloons appearing as discs to be bisected simultaneously by the fixed and movable wire of the micrometer. Several balloons were observed to a horizontal distance of 24 miles. Two of

* It is usual in these pages to distinguish, *when we can*, the name of the planet by a capital letter, a practice which prevents doubt as to the meaning of the word employed in at least three senses—Earth = the terrestrial globe, earth = soil, and earth = the technical electrical term.—ED., *S.M.M.*

the balloons dropped in the river Shannon; these were sent up in an exceptionally calm atmosphere, and Captain Ley considers that the river produced an effect of suction upon them. The immediate neighbourhood of stratus or cirrus cloud appears to cause a reduction of vertical velocity, and, generally speaking, the highest horizontal velocity of wind appears to occur below the cirrus level. A new method developed during the course of the experiments was the observation of the balloons at night by means of naked acetylene lights. After some trouble these proved quite successful, gave long runs with less risk of being lost in small clouds, and afforded points of light which could be observed with great accuracy.

Mr. W. H. Dines, Mr. C. J. P. Cave, Mr. C. S. Rolls, Mr. F. C. Bayard, Mr. W. W. Bryant, Capt. D. Wilson-Barker, Mr. W. Marriott, and the President, took part in the discussion.

The following ladies and gentlemen were elected Fellows of the Society:—Mr. C. W. Bartholomew, Mr. W. J. E. Biker, Miss F. Rouse Boughton, Mr. E. H. Casey, Capt. F. G. Cooper, F.R.A.S., Dr. J. E. Crombie, Mrs. J. H. Foster, Capt. J. O. Hatcher, Mr. Young Hee, Dr. A. J. Herbertson, Mr. T. B. Hewetson, Mr. W. W. Larkin, Mr. A. Lockwood, Capt. D. R. W. Parsons, Capt. V. C. White Parsons, Mr. A. R. Pillai, Mr. C. E. Rivers, Assoc.M.Inst.C.E., Mr. V. I. Stephens, and Mr. W. E. Whitehouse.

SCOTTISH METEOROLOGICAL SOCIETY.

A GENERAL meeting of this Society was held on December 1st, at 5, St. Andrew Square, Edinburgh, when Lord M'Laren presided over a large attendance.

Sir Arthur Mitchell, K.C.B., in submitting a paper on "The Obedience of Scarlet Fever to Seasonal Influence in Scotland," took up a new branch of an old piece of work. Many years ago, in conjunction with the late Dr. Buchan, he had considered exhaustively the influence of weather on mortality from different diseases in the case of London. It had been shown that, for London, deaths from scarlet fever were above the average from the middle of August to the beginning of January; that deaths from this disease reached their maximum in October, and their minimum in April; and that in years of epidemic the distribution of deaths throughout the year gave a curve closely agreeing with the normal curve. Coming to Scotland a similar enquiry was confined to the eight large towns, Glasgow, Edinburgh, Dundee, Aberdeen, Greenock, Paisley, Leith and Perth, since these were the only areas for which weekly statistics were available. On grouping together the figures for these eight large towns a curve was obtained that was in essential agreement with the London curve, and this was the more remarkable since the mass of figures was much smaller than that handled in the case of London. It was further found that the separate towns agreed,

more or less, closely with the general curve, and that when the cases of occurrence of scarlet fever were considered apart altogether from the resultant mortality, the seasonal progress of the disease was in all essential respects the same as that for deaths from the disease. The cases occurring included both those who lived and those who died, and a detailed examination of the statistics gave strong ground for holding that the obedience of scarlet fever to seasonal influence was even more strongly marked in the case of those who had the disease and recovered, than when dealing only with those who had the disease and died. Further, the fact that there were never such depressions below the mean as there were rises above it, seemed to indicate that the period of defect should be regarded as due rather to the absence of favouring conditions than to the presence of conditions positively and actively opposed to the occurrence of the disease.

The paper was illustrated by several striking diagrams, and it was in a way an advantage that the results were based on statistics collected some years ago when the death-rate from scarlet fever was much higher than it is to-day.

Sir Arthur was cordially thanked for his communication, and thereafter a business meeting of the Society was held. A report from the Council was adopted, and the first election of Council and Office-bearers under the new constitution of the Society took place. The following were elected for the ensuing twelve months:—

President, Sir Arthur Mitchell, M.D., K.C.B.; *Vice-Presidents*, Professor A. Crum Brown, F.R.S., Sir A. Buchan-Hepburn, Bart.; *Council*—The Hon. Lord M'Laren, Sir John Murray, K.C.B., F.R.S., J. Mackay Bernard, Ralph Richardson, W.S., John Aitken, LL.D., F.R.S., James Macdonald, C. G. Knott, D.Sc., David Paulin, Gilbert Thomson, C.E.; *Hon. Secretaries*—R. T. Omond, E. M. Wedderburn, W.S.; *Hon. Treasurer*—W. B. Wilson, W.S.

REVIEWS.

Transvaal Meteorological Department Annual Report for the Year ended 30th June, 1907. Pretoria, 1908. Size 13 × 8½. Pp. vi. + 126

We have before referred, with regret, to the decision of the Transvaal Meteorological Department to cut the year in the middle, as the inconvenience of having to refer to two volumes for the data of a single year, and the confusion sure to result in comparing annual data when the halves of two different years are added together, greatly affect the student consulting records. We allow, however, that it is better to have the season's rainfall in one total, as the method adopted secures.

With this exception we have nothing but praise for the volume itself and for the manner in which Mr. Innes has developed the scope and usefulness of his department. At the time of reporting there

were 407 meteorological stations in the Transvaal. Although daily weather charts are not published they are prepared and forecasts issued, which are telegraphed to every telegraph office in the Transvaal, and exhibited for the information of the public.

The Kew pattern of barometer has been found unsuited for use in the Transvaal, where the variations of pressure are very small, and Fortin barometers are gradually being introduced at all stations.

An interesting map of the cloudiness of the Transvaal, based on three seasons' observations, shows that in the south-west the average amount of cloud is less than 25 per cent., and on the eastern border a little more than 35 per cent., of the whole sky.

Is Our Climate Changing. By SIR JOHN W. MOORE, M.A., M.D., D.Sc., &c. Reprinted for the Author from the *Dublin Journal of Medical Science.* October, 1908. Size 8½ × 5½. Pp. 26. Tables.

THIS is the full text of the important paper read to Section A of the British Association at the Dublin meeting, in September, 1908. Sir John Moore gives a general discussion of climate changes in the British Isles, supplemented by a bibliography compiled by Mr. Lempfert, which might perhaps be profitably enlarged by the addition of more references to our earlier volumes and to those of *British Rainfall.* The observations made by Sir John Moore himself, since 1866, at FitzWilliam Square, Dublin, are discussed in a series of Tables with explanatory letterpress, and after reviewing the subject generally the conclusions are summed up thus :—

> In conclusion I venture to submit that the facts which I have put forward in this paper prove that, within the past six centuries at all events, no appreciable change has taken place in the climate of the British Isles. There is not a scintilla of evidence to show that—within historic times—any such change has taken place in the past, or is likely to take place in the future.

Royal Commission on Sewage Disposal. Fifth Report. Appendix V. Reports to the Commission, by Mr. BALDWIN LATHAM, M.Inst.C.E and Mr. R. A. TATTON, M.Inst.C.E. *Upon the Effects of Rainfall on the Flow of Sewage.* [Cd. 4283.] London. Printed for H.M. Stationery Office, 1908. Size 13 × 8½. Pp. 198.

THESE reports deal with one of the important practical applications of the study of rainfall.

METEOROLOGICAL NEWS.

MR. A. WATT, Secretary of the Scottish Meteorological Society, has just completed a course of twelve evening lectures on General Meteorology at the Royal Botanic Garden, Edinburgh, to Government students of horticulture, of whom a large number are employed in the Garden.

RAINFALL TABLE FOR NOVEMBER, 1908.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1870-99.	1908.
		° ′	° ′		in.	in.
Camden Square	*London*	51 32	0 8	111	2·45	·69
Tenterden	*Kent*	51 4	*0 41	190	3·22	1·09
West Dean	*Hampshire*	51 3	1 38	137	3·25	1·06
Hartley Wintney	,,	51 18	0 53	222	3·03	·85
Hitchin	*Hertfordshire*	51 57	0 17	238	2·56	·86
Winslow (Addington)	*Buckinghamshr.*	51 58	0 53	309	2·63	·85
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·50	1·12
Brundall	*Norfolk*	52 37	*1 26	66	2·71	1·66
Winterbourne Steepleton	*Dorset*	50 42	2 31	316	4·82	1·45
Torquay (Cary Green)	*Devon*	50 28	3 32	12	3·71	·75
Polapit Tamar [Launceston]	,,	50 40	4 22	315	4·29	1·77
Bath	*Somerset*	51 23	2 21	67	3·06	·84
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·99	1·05
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	3·18	1·61
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·80	1·15
Boston	*Lincolnshire*	52 58	0 1	25	2·14	1·21
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·10	1·20
Derby (Midland Railway)	*Derbyshire*	52 55	1 28	156	2·28	1·57
Bolton (Queen's Park)	*Lancashire*	53 35	2 28	390	3·91	3·65
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	2·23	1·49
Arncliffe Vicarage	,, ,,	54 8	2 6	732	6·00	6·07
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·45	1·13
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·65	1·46
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	13·91	12·26
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·26	1·77
Haverfordwest (High Street)	*Pembroke*	51 48	4 58	95	5·41	2·63
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·68	3·09
Llandudno	*Carnarvon*	53 20	3 50	72	3·38	3·48
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·50	2·97
Hawick (Branxholm)	*Roxburgh*	55 24	2 51	457	3·71	1·96
Edinburgh (Royal Observy.)	*Midlothian*	55 55	3 11	442	...	1·39
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	5·31	6·00
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·48	...
Tighnabruaich	*Argyll*	55 55	5 14	50	6·21	5·09
Mull (Quinish)	,,	56 36	6 13	35	6·43	4·87
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·76	1·68
Braemar	*Aberdeen*	57 0	3 24	1114	3·94	2·78
Aberdeen (Cranford)	,,	57 8	2 7	120	3·47	1·63
Cawdor	*Nairn*	57 31	3 57	250	2·65	2·00
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	4·52	4·35
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	9·79	10·08
Dunrobin Castle	*Sutherland*	57 59	3 56	14	3·26	3·57
Castletown	*Caithness*	58 35	3 23	100	...	3·91
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	5·85	3·48
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·91	2·46
Broadford (Hurdlestown)	*Clare*	52 48	8 38	167	3·19	3·06
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·21	2·69
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·60	1·24
Ballinasloe	*Galway*	53 20	8 15	160	3·60	3·02
Clifden (Kylemore House)	,,	53 32	9 52	105	8·25	...
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	5·63	4·11
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	3·93	2·99
Seaforde	*Down*	54 19	5 50	180	3·94	3·44
Londonderry (Creggan Res.)	*Londonderry*	54 59	7 19	320	4·19	3·67
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·53	3·09

RAINFALL TABLE FOR NOVEMBER, 1908—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1870-99. in.	1908. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1870-1899. in.	STATION.
—1·76	28	·22	21	10	23·04	21·78	—1·26	95	25·16	Camden Square
—2·13	34	·30	21	13	25·62	20·19	—5·43	79	28·36	Tenterden
—2·19	33	·41	21	9	27·19	20·79	—6·40	76	29·93	West Dean
—2·18	28	·33	21	11	24·56	22·32	—2·23	91	27·10	HartleyWintney
—1·70	34	·14	21, 29	15	22·61	20·47	—2·14	91	24·66	Hitchin
—1·78	32	·14	21, 29	12	24·48	21·41	—3·07	87	26·75	Addington
—1·38	45	·43	21	10	23·28	20·86	—2·42	90	25·39	Westley
—1·05	61	·40	21	12	23·27	21·99	—1·28	95	25·40	Brundall
—3·37	30	·44	21	12	34·87	30·21	—4·66	87	39·00	Winterbourne Stpltn
—2·96	20	·16	12	11	31·54	21·42	—10·12	68	35·00	Torquay
—2·52	41	·48	21	11	34·46	28·80	—5·66	84	38·85	Polapit Tamar
—2·22	27	·23	18	10	27·99	21·28	—6·71	76	30·75	Bath
—1·94	35	·23	21	14	27·37	21·25	—6·12	78	29·85	Stroud
—1·57	51	·41	12	16	30·12	28·09	—2·03	93	33·04	Wolstaston
—1·65	41	·29	18	14	26·77	21·91	—4·86	82	29·21	Coventry
— ·93	57	·49	21	12	21·51	19·73	—1·78	92	23·30	Boston
— ·90	57	·24	12	14	22·68	19·02	—3·66	84	24·70	Hodsock Priory
— ·71	69	·31	12	14	23·90	22·13	—1·77	93	26·18	Derby
— ·26	93	1·36	21	17	38·24	41·07	+2·83	107	42·43	Bolton
— ·74	67	·47	13	12	24·77	23·24	—1·53	94	26·96	Ribston Hall
+ ·07	101	1·16	25	19	54·55	60·67	+6·12	111	60·96	Arncliffe Vic.
—1·32	46	·40	21	14	24·66	18·62	—6·04	75	27·02	Hull
—1·19	55	·44	1	17	25·35	21·09	—4·26	83	27·99	Newcastle
—1·65	88	3·31	21	16	117·98	115·23	—2·75	98	132·68	Seathwaite
—2·49	42	·50	21	11	38·38	31·94	—6·44	83	42·81	Cardiff
—2·78	49	·69	28	13	42·66	37·28	—5·38	87	47·88	Haverfordwest
—1·59	66	1·09	21	11	40·92	39·35	—1·57	96	45·41	Gogerddan
+ ·10	103	·52	21	15	28·03	28·50	+ ·47	102	30·98	Llandudno
—1·53	66	·44	13	14	38·75	42·47	+3·72	110	43·43	Cargen
—1·75	53	·29	22	17	31·26	27·64	—3·62	88	34·80	Branxholm
...	...	·37	25	14	...	21·04	...	...	...	Edinburgh
+ ·69	113	·99	21	22	43·63	46·22	+2·59	106	48·87	Girvan
...	...	...	...	...	32·27	...	...	...	35·80	Glasgow
—1·12	82	1·18	21	18	51·57	58·23	+6·66	113	57·90	Tighnabruaich
—1·56	76	·82	21	18	51·05	47·78	—3·27	94	57·53	Quinish
—1·08	61	·36	24	18	26·22	23·78	—2·44	91	28·95	Dundee
—1·16	71	...	...	...	32·92	30·13	—2·79	92	36·07	Braemar
—1·84	47	·22	11, 21	18	29·62	25·61	—4·01	86	33·01	Aberdeen
— ·65	75	·50	22	12	26·84	22·27	—4·57	83	29·37	Cawdor
— ·17	96	·66	24	16	38·58	39·37	+ ·79	102	43·71	Fort Augustus
+ ·29	103	1·47	27	21	77·46	82·36	+4·90	106	86·50	Bendamph
+ ·31	110	·53	22	20	28·21	31·28	+3·07	111	31·60	Dunrobin Castle
...	...	·67	20	24	...	31·33	...	...	...	Castletown
—2·37	59	1·24	27	19	51·47	41·29	—10·18	80	58·11	Killarney
—1·45	63	·49	13	15	34·99	33·93	—1·06	97	39·30	Waterford
— ·13	96	·75	27	17	30·10	36·12	+6·02	120	33·47	Hurdlestown
— ·52	84	·60	28	18	31·71	32·62	+ ·91	103	35·19	Abbey Leix
—1·36	48	·36	13	12	25·36	22·02	—3·34	87	27·75	Dublin
— ·58	84	·65	13	23	33·41	30·09	—3·32	90	37·04	Ballinasloe
...	...	...	...	...	71·24	...	...	...	80·23	Kylemore House
—1·52	73	·80	21	17	44·69	47·38	+2·69	106	50·50	Enniscoe
— ·94	76	·61	21	17	37·64	42·28	+4·64	112	41·83	Markree Obsy.
— ·50	87	·67	18	17	34·97	38·50	+3·53	110	38·61	Seaforde
— ·52	88	·55	18	21	36·89	40·31	+3·42	109	41·20	Londonderry
...	88	·47	25	17	34·08	...	...	...	37·85	Omagh

SUPPLEMENTARY RAINFALL, NOVEMBER, 1908.

Div.	STATION.	Rain inches	Div.	STATION.	Rain. inches
II.	Warlingham, Redvers Road	·98	XI.	Rhayader, Tyrmynydd	4·91
,,	Ramsgate	1·20	,,	Lake Vyrnwy	...
,,	Steyning	1·64	,,	Llangyhanfal, Plâs Draw	2·57
,,	Hailsham	1·27	,,	Criccieth, Talarvor	2·79
,,	Totland Bay, Aston House	·85	,,	Snowdon, Cwm Dyli	10·58
,,	Emsworth, Redlands	1·36	,,	Lligwy	2·95
,,	Stockbridge, Ashley	1·05	,,	Douglas, Woodville	3·09
,,	Reading, Calcot Place	·85	XII.	Stoneykirk, Ardwell House	3·33
III.	Harrow Weald, Hill House	·89	,,	Dalry, The Old Garroch	5·82
,,	Oxford, Magdalen College	1·10	,,	Langholm, Drove Road	3·81
,,	Pitsford, Sedgebrook	·95	,,	Moniaive, Maxwelton House	3·43
,,	Huntingdon, Brampton	·79	XIII.	N. Esk Reservoir [Penicuick]	2·95
,,	Woburn, Milton Bryant	·86	XIV.	Maybole, Knockdon Farm	3·71
,,	Wisbech, Bank House	·91	XV.	Campbeltown, Witchburn	4·52
IV.	Southend Water Works	1·22	,,	Inveraray, Newtown	6·34
,,	Colchester, Lexden	1·03	,,	Ballachulish House	6·29
,,	Newport, The Vicarage	·96	,,	Islay, Eallabus	3·77
,,	Rendlesham	1·07	XVI.	Dollar Academy	3·35
,,	Swaffham	1·24	,,	Loch Leven Sluice	3·33
,,	Blakeney	1·18	,,	Balquhidder, Stronvar	7·37
V.	Bishops Cannings	1·68	,,	Perth, The Museum	2·40
,,	Ashburton, Druid House	2·17	,,	Coupar Angus Station	1·98
,,	Honiton, Combe Raleigh	1·50	,,	Blair Atholl	3·15
,,	Okehampton, Oaklands	2·30	,,	Montrose, Sunnyside Asylum	1·66
,,	Hartland Abbey	2·13	XVII.	Alford, Lynturk Manse	1·09
,,	Lynmouth, Rock House	2·58	,,	Keith Station	2·36
,,	Probus, Lamellyn	1·40	XVIII.	N. Uist, Lochmaddy	4·61
,,	North Cadbury Rectory	1·30	,,	Alvey Manse	3·27
VI.	Clifton, Pembroke Road	1·11	,,	Loch Ness, Drumnadrochit	3·39
,,	Ross, The Graig	1·05	,,	Glencarron Lodge	9·27
,,	Shifnal, Hatton Grange	2·11	,,	Fearn, Lower Pitkerrie	2·28
,,	Blockley, Upton Wold	1·30	XIX.	Invershin	3·75
,,	Worcester, Boughton Park	1·33	,,	Altnaharra	5·42
VII.	Market Overton	1·06	,,	Bettyhill	3·78
,,	Market Rasen	1·26	XX.	Dunmanway, The Rectory	3·45
,,	Bawtry, Hesley Hall	·83	,,	Cork	2·52
,,	Buxton	4·26	,,	Darrynane Abbey	2·70
VIII.	Neston, Hinderton Lodge	2·28	,,	Glenam [Clonmel]	2·68
,,	Southport, Hesketh Park	2·77	,,	Ballingarry, Gurteen	3·01
,,	Chatburn, Middlewood	4·15	,,	Miltown Malbay	2·78
,,	Cartmel, Flookburgh	4·56	XXI.	Gorey, Courtown House	2·39
IX.	Langsett Moor, Up. Midhope	2·77	,,	Moynalty, Westland	2·80
,,	Scarborough, Scalby	1·79	,,	Athlone, Twyford	2·82
,,	Ingleby Greenhow	1·62	,,	Mullingar, Belvedere	2·45
,,	Mickleton	1·90	XXII.	Woodlawn	3·56
X.	Bardon Mill, Beltingham	2·06	,,	Westport, St. Helens	4·00
,,	Ewesley, Fallowlees	1·41	,,	Mohill	3·31
,,	Ilderton, Lilburn Cottage	1·17	XXIII.	Enniskillen, Portora	3·41
,,	Keswick, York Bank	4·86	,,	Dartrey [Cootehill]	2·78
XI.	Llanfrechfa Grange	1·91	,,	Warrenpoint, Manor House	2·56
,,	Treherbert, Tyn-y-waun	5·67	,,	Banbridge, Milltown	2·46
,,	Carmarthen, The Friary	3·56	,,	Belfast, Springfield	3·05
,,	Castle Malgwyn [Llechryd]	3·57	,,	Bushmills, Dundarave	3·32
,,	Plynlimon	6·20	,,	Sion House	3·18
,,	Crickhowell, Ffordlas	2·50	,,	Killybegs	5·65
,,	New Radnor, Ednol	3·09	,,	Horn Head	3·99

METEOROLOGICAL NOTES ON NOVEMBER, 1908.

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

LONDON, CAMDEN SQUARE.—Fair to fine, dry and mild weather prevailed throughout with a remarkable absence of wind, except from 20th to 25th. The R was the lowest, for November, in 51 years with three exceptions, viz., 1858, 1871 and 1901, when the amounts were ·53 in., ·60 in., ·59 in. respectively. Duration of sunshine, 48·2* hours, and of R, 19·4 hours. Mean temp. 46°·8, or 3°·8 above the average. Shade max., 58°·5 on 12th; min., 23°·1 on 10th. F 3, f 7.

TENTERDEN.—Duration of sunshine, 97·0† hours. Shade max., 60°·0 on 1st and 12th; min., 26°·0 on 10th. F 3, f 12.

TOTLAND BAY.—Duration of sunshine, 115·9* hours. Shade max., 61°·7 on 1st; min., 29°·3 on 10th. F 1, f 2.

PITSFORD.—R 1·47 in. below the average. Mean temp., 44°·9. Shade max., 57°·0 on 1st and 11th; min., 18°·0 on 10th. F 6.

TORQUAY.—Duration of sunshine, 74·8* hours, or 5·5 hours above the average. Mean temp., 50°·8, or 3°·4 above the average. Shade max., 61°·3 on 2nd; min., 39°·7 on 8th. F 0, f 0.

ASHBURTON, DRUID HOUSE.—R 3·33 in. below the average of 43 years. Shade max., 57°·2 on 11th; min., 32°·6 on 8th. F 0.

BATH.—Shade max. 60°·0 on 1st; min. 24°·8 on 10th. F 4.

ROSS.—Shade max., 58°·6 on 22nd; min., 21°·2 on 10th. F 5, f 6.

HODSOCK PRIORY.—Shade max., 58°·9 on 12th; min., 17°·7 on 10th. F 8, f 12.

SOUTHPORT.—R ·47 in. below the average. Duration of sunshine, 55·5* hours, or 9·0 hours above the average. Duration of R, 41·3 hours. Mean temp., 45°·4, or 2°·1 above the average. Shade max., 57°·8 on 12th; min., 27°·9 on 10th. F 6, f 13.

HULL.—The weather was dull and often cold with frequent fogs. Duration of sunshine, 26·4* hours. Shade max., 56°·0 on 1st; min., 26°·0 on 8th. F 4, f 12

CARMARTHEN.—Fine and mild during the first fortnight, but R during the latter part. Leaves have remained on the trees unusually late.

HAVERFORDWEST.—Unusually fine, with small R and very little frost. Agricultural operations were well advanced. Duration of sunshine 78·5* hours. Shade max. 58°·3 on 11th; min. 31°·3 on 8th and 10th. F 3, f 7.

LLANDUDNO.—Shade max. 61°·8 on 3rd; min. 31°·2 on 10th. F 1.

DOUGLAS.—Unusually mild for the most part, with many beautiful autumn days, but wet and stormy from 16th to 28th.

DUMFRIES.—Shade max. 56°·0 on 2nd, 4th and 5th; min. 24°·0 on 10th. F 6.

EDINBURGH.—Shade max. 54°·7 on 28th; min. 30°·6 on 10th. F 2, f 7.

DUNDEE.—Shade max. 52°·8 on 24th; min. 27°·6 on 10th. F 3.

FORT AUGUSTUS.—Shade max. 55°·6 on 12th; min. 27°·0 on 20th. F 4.

WATERFORD.—Very mild, with a good deal of fog. Shade max. 59°·0 on 11th; min. 27°·0 on 30th. F 4.

DUBLIN.—Mean temp. 48°·1, or 2°·8 above the average. L occurred with a fresh to strong gale on the evening of 22nd. Shade max. 59°·6 on 11th; min. 31°·1 on 30th. F 1, f 2.

MARKREE.—Shade max. 60°·4 on 2nd; min. 26°·2 on 20th. F 6, f 15.

WARRENPOINT.—Shade max. 58°·0 on 2nd; min. 29°·0 on 30th. F 2, f 3.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, June, 1908.

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	86·0	4	41·1	7	73·6	51·7	51·2	71	126·6	36·9	1·26	9	6·5
Malta	86·0	3	62·0	1	79·8	66·8	62·5	68	149·2	...	·12	1	1·7
Lagos	90·0	10	71·0	4, 27	84·9	73·5	74·7	82	160·0	66·0	16·05	20	8·8
Cape Town	69·5	7	38·0	22	61·5	47·7	47·6	77	...	...	5·82	11	5·2
Durban, Natal ...	77·6	4	49·2	28	73·0	55·6	...	...	127·7	...	·52	4	3·1
Johannesburg	68·2	3	34·1	6	62·6	44·9	38·4	68	123·1	30·0	·00	0	2·0
Mauritius	81·7	4	57·7	20	77·0	63·6	61·8	77	134·1	48·6	4·82	16	5·2
Calcutta...	100·9	13	74·8	18	91·7	79·8	77·7	81	156·6	73·4	26·12	10	7·0
Bombay...	94·2	10	76·5	30	89·0	80·6	77·0	79	138·3	73·8	15·19	16	6·9
Madras	107·5	1	77·2	28	102·2	82·1	71·5	62	145·7	75·2	·48	9	6·0
Kodaikanal	70·0	5, 7	50·7	16	65·0	53·7	50·0	76	136·6	36·4	2·35	16	6·9
Colombo, Ceylon ...	88·1	1	73·8	12	86·0	77·5	75·3	81	130·5	72·1	4·27	16	7·2
Hongkong	87·9	23	71·3	7	83·6	77·2	75·0	84	143·1	...	15·25	24	8·4
Melbourne	64·2	18	29·9	3	53·2	41·9	39·9	76	92·7	25·0	3·94	17	6·7
Adelaide	67·1	17	35·9	21	57·2	42·9	42·8	78	125·0	27·1	5·42	18	5·8
Coolgardie	67·0	1	31·0	18	56·4	39·8	...	72	127·9	27·6	·14	11	4·3
Perth	74·2	1	37·2	8	61·2	45·3	...	70	120·0	34·0	·68	14	5·0
Sydney	66·5	1	39·1	25	57·9	44·6	39·6	74	93·3	32·9	·94	11	3·7
Wellington ...	61·0	9	39·0	17†	54·7	46·6	44·0	79	95·0	28·0	4·84	19	7·5
Auckland	63·0	13*	41·0	17‖	57·9	48·7	47·0	79	113·0	33·0	3·79	20	5·8
Jamaica, Kingston ...	91·6	11	68·5	3	87·8	72·8	70·6	76	...	...	6 93	4	5·1
Trinidad	95·0	30	65·0	22	87·5	69·5	72·2	81	161·0	65·0	5·22	17	...
Grenada	86·2	18	72·6	2	83·6	74·8	72·9	82	141·2	...	6·04	24	4·8
Toronto	88·2	21	42·7	3	77·3	55·2	...	...	119·5	40·0	3·07	10	3·2
Fredericton	91·5	9	34·3	3	74·8	48·3	...	68	...	...	2·16	8	4·4
St. John's, N.B. ...	78·7	25	35·0	2	64·0	50·2	...	...	...	...	2·43	9	5·1
Victoria, B.C.	79·4	30	46·0	6, 12	67·9	49·5	...	69	...	...	·09	4	5·0

* and 14. † and 21. ‖ and 18, 20.

MALTA.—Mean temp. of air 73°·8.

Johannesburg.—Bright sunshine, 273·3 hours.

Mauritius.—Mean temp. of air 1°·0, dew point 0°·7, and R 2·69 in. above averages. Mean hourly velocity of wind 11·2 miles.

KODAIKANAL.—Bright sunshine 130 hours.

COLOMBO.—Mean temp. of air 79°·5 or 1°·5 below, of dew point 1°·1 above, and R 3·64 in. below, averages. Mean hourly velocity of wind, 8·4 miles.

HONGKONG.—Mean temp. of air 80°·2. bright sunshine 147·8 hours. Mean hourly velocity of wind 13·0 miles.

Melbourne.—Mean temp. of air 2°·8 below, and R 1·89 in. above, averages.

Adelaide.—Mean temp. of air 3°·5 below, and R 2·44 in. above, averages.

Sydney.—Mean temp. of air 3°·0 below, and R 4·39 in. below, averages.

Wellington.—Mean temp. of air 1°·1 above, and R ·14 in. below, averages. Bright sunshine 86 hours.

TRINIDAD.—R 3·05 in. below 43 years' average.

Symons's

Meteorological Magazine.

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THE MASTERY OF THE AIR.

The year 1908 will be memorable in history as that which saw the art of aërial navigation or aviation perfected so far as to pass from the advanced experimental to the rudimentary practical stage. It had long been recognised that movement through the air can be effected by two types of machine, one lighter than air, *i.e.*, of the nature of a balloon, in which the problem is one of propulsion and steering only; the other heavier than air, in which the motive power must not only drive the machine forward, but maintain its position against the force of gravity. The latter, or aëroplane type, is essentially a kite, which instead of being lifted by the rush of air acting against the resistance of the surface held by the string, is lifted by the rush of the surface driven by a motor against the resistance of the relatively stationary air. The success of this type depended mainly on the construction of a motor which was sufficiently powerful and sufficiently light, and the provision of such a motor is the direct result of the development of internal combustion engines for road locomotion.

In 1908 Count Zeppelin's great balloon airship achieved the unprecedented feat of performing a whole day's journey in the air—the unhappy wreck of the vessel in no way detracted from the epoch-making nature of the cruise. In 1908 also Mr. Wilbur Wright, in an aëroplane of the heavier than air type and of the simplest possible construction, achieved the more remarkable feat of flying 77 miles in 2 hours 20 minutes without touching the ground, and with perfect control of movement both horizontal and vertical. The rest is merely the development of proved possibilities, and no doubt can be felt that within the next few years aviation will be one of the most pressing of practical problems.

Already questions are being asked as to how the law can be adapted to regulate aërial traffic, and no doubt the military authorities of all countries have been busy devising new methods of attack and defence. One of our German friends, as a gentle satire on the dread of invasion (which some portions of the British press have almost persuaded the less enlightened members of the foreign public to believe is a brooding terror in this country) sent us by way of a Christmas card a copy of

the curious French engraving, dated 1804, which we reproduce as a frontispiece to this volume. It depicts various plans supposed to have been worked out in Napoleon's camp at Boulogne when the invasion of England was nearer than it has been since, and it is curious to notice that the Channel tunnel—itself one of the bogies of the twentieth century—was there, and that the troop-balloon was to be hurled against our country only to be met by a corps of gallant riflemen, each suspended to the tail of a man-lifting kite.

Though there is no new thing under the sun in popular scares or scientific imagination, there will undoubtedly follow a vast impetus to meteorology, leading to the discovery of many new facts, as a result of the opening of the fields of the air to the activity of man, and for many years to come the advancement of our science and the perfecting of the art of aviation will progress by mutually benefiting each other.

THE RAINFALL OF 1908.

A PRELIMINARY study of the records of rainfall from 90 stations distributed fairly uniformly over the British Isles enables us to give a preliminary report on the rainfall of the year, though there has not been time to prepare a map to illustrate it. Our usual Table this month gives in addition to the data for December, the cumulative figures for the year, and in the discussion to which we refer it has been supplemented by something like as many more stations for the year. December was a dry month, in spite of a widespread snowstorm in the last week, the newspaper accounts of which led us to anticipate a much heavier precipitation than actually occurred. Judging from such rainfall data as we have found time to examine, the depth of snow could have exceeded a foot at very few places indeed, and the heavy drifts which isolated Aberdeen by stopping railway communication with the south, and those which blocked trains in both the south-west and the south-east of Scotland, fortunately affected very small areas. The result was that the year as a whole turned out to be dry.

Generalizing the results, we find the following percentages of the average for the general rainfall of 1908 : —

England, S.	Wales.	England, N.	Scotland.	Ireland.	BRITISH ISLES.
86	95	91	98	101	93

This shows a close approximation to the average in Ireland, which had just perceptibly more, and in Scotland which had just perceptibly less, rain than the normal amount. Wales had distinctly less than the normal; and England, especially in the south, was very decidedly dry. England and Wales together had a deficiency of 11 per cent., but in the 28 years since 1881 seven have been drier in those divisions, viz., 1884, 1887, 1893, 1898, 1901, 1902 and 1905.

Taking the year as a whole, Ireland, with the exception of the southern half of the east coast and an area stretching thence into the

RAINFALL OF THAMES VALLEY, DECEMBER, 1908.

The Edinburgh Geographical Institute
J.G. Bartholomew

interior, was wet. The western half of Scotland, and a narrow strip in the north-west of England running into North Wales, as well as the margin of the Moray Firth, were wet also. Part of Argyllshire, and a strip across the middle of the north of Ireland, had an excess of rainfall slightly exceeding 10 per cent. of the average, but no place was very wet. All the rest of the country was dry. From Dublin a dry belt with a deficiency exceeding, though not much exceeding, 10 per cent. ran west as far as the Shannon and south as far as Kilkenny. The extreme east of Scotland, south of Aberdeenshire, had a deficiency exceeding 10 per cent, and this dry belt was continued through most of the east and south of England and the south-east of Wales. A slightly less dry area stretched from the Wash to the middle of the south coast of England.

The driest part of all was a broad strip in Devonshire and the western counties, where a deficiency of more than 20 per cent. of the average prevailed, and the driest part of all seemed to be in the neighbourhood of Torquay, where the rainfall was less than in any year except 1887.

The British Isles as a whole had about 93 per cent. of the average rainfall in 1908, and a deficiency of more than 7 per cent. has occurred only eight times in the last 28 years. These occasions and the deficiency as per cent. of the average were :—1884, 10; 1887, 27; 1889, 10; 1893, 12; 1901, 11; 1902, 17; 1904, 9; and 1905, 14.

THE RAINFALL OF JAVA.*

By CARLE SALTER.

IT is by no means an easy task to write a perfectly unbiassed criticism of such a treatise as Dr. van Bemmelen's work on the rainfall of Java, which, though admittedly incomplete, contains much information of unusual interest, both from a meteorological and a practical point of view. The conditions under which the discussion of the considerable mass of data must be made are so widely different from any with which we are in the habit of coming into contact in the British Isles, that it is obviously unfair to look for such a degree of exactitude as we in this country should consider essential. Labouring, as he undoubtedly was, under enormous difficulties, we cannot help feeling that the author is to be sincerely congratulated on the results he has obtained.

The Island of Java is situated in the region exposed to the full effect of the Indian Ocean rain-bearing monsoon, and having at the same time a land surface broken by masses of lofty mountains, reaching 12,000 feet in height at many points, the resulting rainfall is such as to render its climate almost unique. The industries,

* Over den Regenval op Java (On the Rainfall in Java), by DR. W. VAN BEMMELEN, Acting Director of the R. Magnetical and Meteorological Observatory at Batavia. Batavia, 1908. Size 14½ × 11; pp. 83. Plates and Maps.

which consist almost entirely of plantations, depend in no small degree upon climatic conditions for their prosperity, but the available information on the subject is neither so abundant, nor so trustworthy as could be wished. Dr. van Bemmelen does well in pointing out in some detail the limits beyond which it would not be advisable to strain the data in drawing conclusions.

The first official observations of rainfall were inaugurated by Bergsma in 1879, at 74 stations, and the number was increased subsequently to 124, but only as recently as 1905. The remainder of the 700 stations utilized in the present discussion were made by private individuals, for the most part the managers of plantations, to whom naturally the matter is one of great moment. Only those records extending over a period of at least five years were included. The rain gauges in general use appear to have been of two types. Those at the Observatory stations were of the pattern devised by Bergsma, whilst private observers commonly used a simpler modification introduced by Dr. Figee in 1885, embodying some improvements. It is a matter for regret that it has been the practice to erect gauges at a height of four feet above the ground, a fact which probably accounts for much of the difficulty in making satisfactory comparisons between the results, particularly at high levels, where wind would undoubtedly vitiate many otherwise good observations. Possibly, however, the shelter caused by tropical vegetation might to some extent counteract this defect. No further details of exposure are given. The measurements were uniformly entered to the day of observation.

The author points out that, owing to the enormous difference between the fall at stations even fairly close together, any attempt to reduce the averages to their values for the same period proved utterly impossible, either by the method of comparison of short records with long ones, or by interpolating missing figures. This fact alone constitutes a serious defect in the results, since in a country subject to conditions so variable as those governing tropical rainfall, little reliance can be placed in the averages as representing the normal amounts. This being the case, Dr. van Bemmelen was obliged to abandon the attempt to express the average distribution by means of isohyetal lines; a decision which, after some detailed study of the maps on which the mean values are plotted, we can see to have been necessary.

For purposes of comparison, it was found advisable to divide the island into 16 rainfall districts; but, unfortunately, in the appended maps the limits of these districts have not been laid down, and in the absence of place names, it is only possible to distinguish them by means of tedious reference to the tabulated lists of stations. Conclusions as to the geographical and seasonal distribution are based on the monthly averages of all the stations in each district. The method is open to criticism, but as isohyetal lines could not be drawn, it was the only one applicable. The groups are arranged in

such a manner as to bring together the localities exposed to similar conditions, the various plains and shores being separated from the mountains, which are again grouped with regard to the direction of their slopes. By this means the primary fact is established that the variation in total amount of annual rainfall on the mountains is distinctly related to altitude ; whilst that on the plains is, as a rule, dependent on the position of the stations with reference to the higher land. The wettest districts stand out prominently as the high land in the centre of the island, on which the average works out at 164 inches per annum for the southern, and 168 inches for the northern slopes. On the latter, at an elevation of 2837 ft., is Tombo, the wettest ascertained spot, with a mean fall of 283 inches. At this station 386·75 inches fell in 1893, curiously enough a year of exceptionally prolonged drought in this country. The eastern portion of the northern plain is driest at all seasons, the mean value for that group amounting to about 59 inches. One or two stations give averages somewhat below 40 inches, but they are rare. The grouping of the stations is more particularly utilized in studying the seasonal incidence and its connection with the orographical features ; and a series of curves representing the averages of rainfall, rain days and maximum daily falls in each month, forms a valuable appendix.

Over the whole island the rainy season occurs during the West monsoon, in the (Southern Hemisphere) summer half-year ; but the winter season is nowhere absolutely rainless, and in every district a slight, but perfectly distinct, secondary maximum occurs about June. The average values for the groups are moderate, considering the high annual amounts ; the highest being slightly less than 30 in. in February in the mountains of Pekalongan, and the mean for the whole island 14·50 in. in that month. It falls to less than 3 inches in August, and in the drier districts to less than an inch. In the northern coastal plains the monsoon rains are both earlier and heavier in the western than the eastern part, whilst on the south coast the rains commence earlier in the middle than in the eastern part, whilst the drought of the east monsoon is more pronounced. In the mountainous regions of the west two distinct maxima are developed, one in December and a second in April, this feature being most strongly marked in the southern mountains, Comparing the northern slopes of the mountains with the southern, it appears that the north receives more rain in general in the early part of the year, and the south more in the latter, owing to the seasonal development of the monsoon winds. In dealing with the monthly values, it should be borne in mind that the averages are in no case for periods of any great length, the longest being for 27 years. From an instructive table giving the percentage which the maximum fall in 24 hours is of the monthly amounts, we gather that this is, on the average of all statons, 29 per cent., and reaches 50 or even 60 per cent. for some of the low-level groups during the east monsoon, showing that the monthly values are liable to be influenced enormously by the fall of a single day.

Although it does not appear that during the dry season any part of the island is always rainless, considerable periods of drought are common everywhere. The method adopted for bringing out the normal prevalence of dry spells is ingenious: it consists in counting, for selected stations, the number of days in each month which formed part of rainless periods of six days or more, and averaging the values thus obtained. No wide differences are apparent between the various groups; but the seasonal variation is naturally strongly marked, the curve rising from practically zero in January and February to a maximum of about 20 days between July and September. In three instances droughts extending over more than 200 days are recorded.

Appended to the volume are comprehensive lists giving the names and, where available, the altitudes of all the stations used, together with the period of observation. The monthly and annual averages of rainfall, rain days (·02 in. or more) and maximum daily fall are set out in full. The rainfall averages for the months of February (wettest) and August (driest), and for the whole year, are also plotted on maps on the scale of 1 : 1,000,000, or about 16 miles to the inch, with hill shading and the principal rivers, but with a deplorable absence of place names which detracts somewhat from their value for locating positions.

ROYAL METEOROLOGICAL SOCIETY.

The monthly meeting of this Society was held on Wednesday evening, December 16th, at the Institution of Civil Engineers, Westminster, Dr. H. R. Mill, President, in the chair.

Mr. Eric Stuart Bruce read a paper on "Some Forms of Scientific Kites," in which he brought to the notice of the Society some forms of kites lighter and less fragile than the well-known box-kite invented by Mr. Hargrave. The latter possesses the indisputable advantages over the lighter forms of stability, ascending steeply, and exerting great force, and when there is wind enough to fly it, it would appear to be unsurpassed. Mr. Bruce considers that the lighter forms of kites, which are specially adapted for use in very light winds, would be of great service in securing the continuity of meteorological records in weather when the box-kite would not rise. He described the Brogden six-winged bird-kite, the Salmon eighteen-winged kite, the Barclay honeycombed-kite, the Cody bat-winged box-kite, the Balston butterfly-kite, and the Burgoyne aluminium-kite. Mr. Bruce thought that the work which has already been done with scientific kites in this country by Mr. Dines, Mr. Cave, and others, justified the hope that before very long a permanent national aërial observatory may be established, where will be gathered together every useful form of kite, and, in fact, every contrivance that is fitted to further the investigation of the upper air.

Mr. C. J. P. Cave read a paper on "The Registering Balloon Ascents in the British Isles, July 27th to August 1st, 1908." These ascents were made in connection with the extended series of ascents of kites and balloons organized by the International Meteorological Commission on Scientific Aëronautics. Twelve balloons were sent up for the Meteorological Office, under the direction of Mr. W. H. Dines, six ascents being from Crinan, on the west coast of Scotland, and six from Pyrton Hill, Oxfordshire; six were sent up by the Meteorological Department of the Manchester University, under the direction of Mr. J. E. Petavel; six by Capt. C. H. Ley, from Birdhill, Co. Limerick, for the Kite Committee; and four by Mr. C. J. P. Cave, from Ditcham Park, Petersfield. Of those sent up, four from Crinan, five from Manchester, three from Pyrton Hill, and two each from Birdhill and Ditcham, have been recovered. The meteorographs used were of the type designed by Mr. Dines, in which the traces are made on copper-plates, electro-plated with silver. (See this Magazine, **41**, p. 101). Some of the records show considerable differences of temperature between the up and down traces, which seems to indicate that fairly rapid fluctuations of temperature may occur in the upper air. The average height reached was 10·2 miles, the greatest height being 14·3 miles. All the balloons, except one, reached the "isothermal layer," showing that the diminution of temperature with height ceases after a certain point, or that there is a rise of temperature; the rise of temperature is quite marked, even in the case of balloons which have attained their highest point after sunset, and cannot therefore be the effect of solar radiation.

Mr. C. J. P. Cave also read a paper on "Balloon Observations at Ditcham Park, near Petersfield, July 27th to August 2nd, 1908." He described how the registering balloons which were sent up were followed by means of theodolites, for the determination of wind direction and velocity at different heights. The balloons were observed until after they had entered the "isothermal layer," and in each case there was a well-marked diminution of wind velocity at its lower limit.

An interesting discussion followed the reading of the papers, in which Mr. Balston, Mr. Brogden, Mr. Dines, Dr. Shaw, and the President, took part, and Mr. Bruce and Mr. Cave replied.

The following gentlemen were elected Fellows of the Society:—Mr. P. A. Cobbold, M.A., Mr. T. Curley, Mr. J. S. Dines, B.A., Mr. J. A. Greenwood, F.R.A.S., Mr. H. H. Haines, F.L.S., Mr. N. Holden, F.R.A.S., Mr. F. W. Nash, Sardar Nawrojee Pudumjee, Mr. T. Robinson, and Prof. R. Wallace, F.L.S.

THE WEATHER OF DECEMBER, 1908.

By FRED. J. BRODIE.

UNTIL very nearly the close of the month the weather of December was characterised by few features of striking interest. The thermometer was usually above its average level, but the absolute maxima were by no means remarkable; the frosts which occurred from time to time were such as we get in almost any ordinary December; rains were frequent but seldom heavy; and the gales experienced were of moderate severity for a month which has often been characterised by some of the worst storms of the whole year. In the opening week, when the distribution of pressure was anticyclonic, some rather sharp frosts were recorded in various parts of the country, but there were few places in which the sheltered thermometer fell as many as 10° below the freezing point; and on the surface of the grass readings of 17° or less (fifteen degrees of frost) appear to have been observed only at a few widely scattered stations in North Britain. Throughout the entire middle portion of the month the wind was almost always from some point between South and West, and the weather consequently mild, but in the rear of a deep cyclonic disturbance which moved eastwards across the country on the 10th and 11th, a cold air swept down from the northward, and on the mornings of the 12th and 13th a rather sharp frost was again experienced in many northern districts.

The striking spell of weather which set in at Christmas time was due to the formation of an anticyclone over northern Europe, and a consequent backing of the wind in these islands to South-East, and afterwards to East. A period of cold had previously set in over the Continent, and on the 26th the wintry air began to drift across England, where the weather gradually increased in severity. On the 29th or 30th, minimum temperatures of 10° or less were recorded at nearly all stations in the midlands and also at most inland places situated in our eastern and southern counties, the thermometer even at some of the south coast stations falling below 20°. The indications of the thermometer in the screen included readings of − 1° at Liphook, + 3° at Garforth, Raunds and Swarraton, 4° at Buxton, Marlborough and Epsom, and 5° at Bawtry and Kingston-on-Soar. In many places the terrestrial radiation thermometers were buried in deep snow which fell about this time, and thus rendered ineffective, but at Tunbridge Wells the ground temperature fell 2° below zero, at Raunds 7° below it, and at Epsom as many as 8° below zero. Over by far the greater part of England the weather on these two days was more severe than at any time since the great frost of February, 1895, when readings below zero were registered very commonly even by the sheltered thermometer. In its greatest strength the cold air failed to reach Scotland, where very few of the thermometric minima were below 20°. In Ireland the frost was of the lightest possible description, while in West Cornwall and the Scilly Islands there was prac-

tically none at all, the lowest readings observed at Falmouth and St. Mary's being respectively 35° and 40°. For the week ending with January 2nd the mean temperature at Falmouth was nearly 14° higher than at Greenwich, and nearly 16° higher than at some places in the more central parts of England.

In the latter part of the 30th, when the anticyclone over northern Europe began to move southwards, a mild air from south-west set in over the south-western parts of the United Kingdom, and by the end of the month a rapid thaw was in progress in all districts. The period of cold, though sharp, was therefore very short, and at all but a few places in northern and central England was insufficient to counteract the effect of the previous long run of mild weather, the mean temperature for December being slightly in excess of the average, even in some of the coldest parts of the country.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

NOTES ON THE EXTRAORDINARY WEATHER OF THE LAST DAYS OF 1908.

Till the 27th December the weather had been dry and not cold for some days; on that day (Sunday) slight snow fell all day, with light air from N. to E., with temperature just below freezing; towards evening it got finer, and during the night the thermometer fell to 19°. The 28th was fine and bright, though cold, and the little coating (about half an inch=·04 in. rain) of snow on the grass disappeared by evening; that night temperature fell to 20°, and on the morning of the 29th, at 7 a.m., snow set in from E. to E.S.E., with moderate wind, and fell all day till 4 p.m., the temperature varying little from 23°, the total depth being 5½ inches=·46 in. of rain. The sky cleared after 4 p.m., and wind shifted to N.E. for a time, after which it fell calm, and a most severe frost set in, the minimum recorded being 7½°, the lowest ever seen here by me. The 30th was a brilliant cloudless day, but very cold, with little wind; as the temperature could not, from my records, have risen much above 19°, and sunk to 11°, during the early evening, this day must have been decidedly colder than the previous one. About 8 p.m., however, the thermometer began to rise, and during the early hours of the 31st thaw set in, with light rain from S.E., which continued all day. By evening rain stopped, and fog came on, the temperature being about 34°, at which figure it kept all night, the barometer rising steadily. On the morning of 1st January the fog was very thick, there was no wind, temperature rose to over 40° by noon, and the barometer attained the unusual height of 30·52 in.

A. C. BIGG-WITHER.

Tilthams, Godalming, 1st January, 1909.

THE COLD OF DECEMBER 29th, 1908.

THE spell of cold weather with which 1908 came to a close seems to have been unusually severe in parts of the country, so I trouble you with a few notes concerning low maxima in December. Here the highest temperature on Tuesday, December 29th, was 21°·2, by Negretti's verified maximum, and during the meteorological day (9 p.m to 9 p.m.) 23°·6. This latter reading occurred about 10 p.m. on Monday, the 28th. Heavy snow fell continuously all Tuesday after 8 a.m., the depth on the ground at 9 p.m. being 5 inches. It fell with a strong N.E. wind, and was much drifted. The 9 a.m. reading was 19°·5, and at 2 p.m. 18°·3. Subsequently the temperature rose to 19°·6 at 6 p.m. and to 21°·0 at 9 p.m. The snow then ceased and the sky cleared, temperature falling rapidiy. It was 18°·0 at 10 p.m., and during the night the minimum in the Stevenson screen was 14°·2. On a chair in the garden, however, it fell to 10°, and on the surface of the snow to 5°·6. At 9 a.m. the snow when melted yielded ·38 in. in the Snowdon gauge and ·30 in. in the Glaisher gauge (the funnel of which was full).

An examination of past December records in the *Quarterly Journal* of the Royal Meteorological Society shows no lower December maxima than these in the London district. The great frost of 1890-91, in fact, gave as its lowest maximum 21°·2 at Reading. Round London the lowest was 23°·7 at Greenwich. These are, I believe, the lowest official maxima. In *British Rainfall, 1890*, under date December 22nd, we find it stated that at West Kensington the maximum during the day was 19°·5, with dense fog. The recent frost has certainly been remarkable as regards day temperature.

E. L. HAWKE.
2, Akenside Road, Fitzjohn's Avenue, Hampstead, N.W.

[At Camden Square the maximum for the 29th was 23°·7, the lowest maximum recorded in December since the record began in 1858; and the lowest in any month, with one exception, January 4th, 1867, when it was 16°·9. The minimum temperature for the 30th was 14°·4, which was once equalled in December on the 17th, in 1859, and passed by lower minima twice, 6°·7 on the 25th, in 1860, and 14°·0 on the 25th, in 1870. In January and February the minimum has been lower than 14°·4 on 14 occasions, of which 4 were in January, 1881, and 5 in February, 1895].

THE MILD WINTER IN CORNWALL.

THE abnormally mild weather which has been experienced this winter, and has continued in Cornwall notwithstanding the severe snowstorms and hard frost which have visited other parts of England and Scotland, affords some justification for its adopted name of "the

Riviera of England." The contrast is remarkable between our maximum and minimum temperatures and those of less favoured districts. The following are the particulars for the last week of 1908 taken from the climatological station at the Falmouth Observatory:—

	Max.	Min.		Max.	Min.
	°	°		°	°
Dec. 25.....	46·9	40·8	Dec. 29.....	50·8	35·3
,, 26.....	46·6	43·9	,, 30.....	51·9	40·2
,, 27.....	44·8	39·7	,, 31.....	53·7	42·0
,, 28.....	45·7	33·9			

It will be seen that we have escaped any frost, and we have had no snow whatever. There was, however, a heavy rainfall during the 24 hours ending the 29th inst. at 10.30 a.m. amounting to 1·63 in., of which 1 inch fell between 4 and 7.20 a.m.

A list of 144 shrubs and plants in bloom in a garden in this neighbourhood, viz., at "Enys," appeared in the *Western Morning News* of the 5th inst. Doubtless the list might have been very much increased, if not more than doubled, by the addition of the names of other shrubs and plants flowering in other gardens in the district.

WILSON L. FOX.

Falmouth, 31st December, 1908.

SNOWDONIA'S TRADITIONAL AUGUST FLOODS.

The Cwm Dyli valley, situated to the E. of Snowdon, bounded on the N. by the "Cribs," the S. by Lliwedd and Wenalt, and extending from Snowdon to Llyn Gwynant, is traditionally supposed to be visited by three floods during the month of August, and this year was no exception to the rule.

The first occurred on the 20th, when 1·11 in. of rain fell from noon onwards; a very heavy fall about 9.30 p.m. causing the streams to rise rapidly and flood the low-lying land above Gwynant.

On the 26th the weather was fine and bright at sunrise. At 7 a.m. a mist filled the valley, afterwards turning into a very fine rain. The afternoon was gloomy with an occasional shower, but very little rain was recorded until about 7 p.m., when a very heavy fall lasting two hours took place. The Afon Glaslyn, which takes the overflow from Glaslyn, Llydaw and Teyrn Lakes, and drains the lower western slopes of Moel Siabod, rose about 6 feet. This rise, considering the gradient of the river bed, and also that the river was only a few inches above normal 35 minutes after the downpour ended, is a large amount. The total rain for the day was 1·79 in.

The barometric readings for the day were:—9 a.m., 29·41 in.; noon, 29·39 in.; 11 p.m., 29·10 in.

The third flood occurred on the last day of the month. The morning on this date was cloudy, with showers at intervals all morning. The afternoon was cloudy, rain falling at 3 p.m., and continuing gently till 6 p.m., when it became fine. About 9 p.m.

some lightning was noticed, but no rain fell till about 2 a.m., when a very heavy fall occurred, lasting about 80 minutes. During that time an inch of rain fell. The total rainfall for the day was 1·32 in.

At Llyn Llydaw, for the corresponding times, the rainfall was:—On the 20th, 1·33 in.; 26th, 3·16 in.; and 31st, 2 53 in.

The country-side immediately after one of these floods looks extremely beautiful, and it is well worth a soaking to see the magnificent waterfalls which are formed.

A. LOCKWOOD.

Cwm Dyli, Beddgelert

THE PRESENTATION OF RAINFALL STATISTICS.

MR. ELLISON calls attention to the effect of the rainfall in Ireland in 1907. Although the conditions seem to have been much the same as in England, the results were very different. The official returns of the Board of Agriculture show that so far as agriculture was concerned, 1907 in England was one of the most prolific years on record. The Registrar-General's returns show that it was one of the healthiest, and the death-rate for the summer quarter was the lowest that has been published since registration commenced. The year was, therefore, in England the reverse of disastrous for the chief interests that depend on the weather. The popular newspaper belief is that an absence of rain and a high temperature are the most favourable conditions possible; but, like many other popular beliefs, this is a false one, as was strikingly shown in the year in question. The connection between the crops and the weather is certainly far more complex than is commonly supposed.

W. H. DINES.

Pyrton Hill, Oxon, 1st January, 1909.

METEOROLOGICAL NEWS AND NOTES.

THE PRESENT NUMBER is probably the largest issue of this little Magazine hitherto published (there is not time to verify the fact), and we take advantage of the opportunity of exceeding the halfpenny postage to make an effort to overtake arrears in our reviews of current meteorological literature. We wish we could do more in this direction, for it is difficult to over-rate the importance of placing on record an epitome of the world's work in meteorology.

DR. H. R. MILL has arranged to lecture for the Gilchrist Trust on "Climate—a Bond of Union," at Abergavenny on February 8th, Glyn Neath on the 9th, Maerdy on the 10th, Penygraig on the 11th, and Aberaman on the 12th. He hopes to be able to inspect a number of rainfall stations during his visit to South Wales.

WIRELESS TELEGRAPHY FROM ATLANTIC LINERS is, we learn from the daily press, which no doubt has received authentic information, about to be employed to supplement the daily reports of weather sent in to the Meteorological Office.

REVIEWS.

Handbuch der Klimatologie von Dr. Julius Hann, *ordentlicher Professor der Geographie in der Universität in Wien. Band I.—Allgemeine Klimalehre. Mit 22 Abbildungen im Text. Dritte, wesentliche umgearbeitete und vermehrte Auflage* [Handbook of Climatology by Dr. Julius Hann, Professor of Geography in the University of Vienna. Vol. I.—General Study of Climate. With 22 illustrations in the text. Third edition, greatly revised and enlarged]. Stuttgart, J. Engelhorn, 1908. Size 9 × 6½. Pp. xiv. + 394. Price 13 marks.

There is, we believe, only one man who attempts to keep his head above water in the rising flood of meteorological literature, and if that man did not happen to be Dr. Hann we fear he would be overwhelmed; but Dr. Hann is superhuman in his power of combining the passion for classifying innumerable details with an instinctive grasp of general principles. How fully he has assimilated the recent literature of climatology is shown by the natural way in which the results of the latest writers fall into line with the classics of the science. The copious references to authorities make the original work indispensible to English as to Continental students.

The new edition appears in the larger form now given to the "Library of Geographical Handbooks," edited by Professor Penck, and the numerous tables are presented in a much more satisfactory manner than before. It is difficult to say of such a work that the new edition is better than the old, but retaining the quality which could not well be improved it has increased in amount and been kept up to the latest results. It is no small satisfaction to English readers to see how frequently the pages of British meteorological journals are cited by the Author.

This first volume is really a text-book of general climatology dealing with the broad principles and the facts of world wide application; the succeeding volumes will fill up to date the storehouse of facts regarding the different climates of the globe.

The Rainfall of Kent. By Hugh Robert Mill. From the "Water Supply of Kent." Memoir of the Geological Survey, 1908, pp. 20 to 27, Size 10 × 6. Pp. 10. Map.

The rainfall of Kent is mapped here on a small scale, but as a reduction from a map on the scale of two miles to the inch, it may be treated as of a higher degree of accuracy than its scale suggests. The rainfall corresponds very closely with the configuration. Less than 22·5 inches occurs along the Thames estuary, and the gradual slope from the Thames southward has less than 25 inches up to the contour line of 250 or 300 feet. The low rainfall follows the Medway

gap for a short distance into the Weald. The low ground of Romney Marsh has less than 25 inches. In all parts of the county more than 500 feet above the sea the rainfall exceeds 30 inches, and the isohyetal of 30 outlines the North Downs, the Greensand ridge, south of Sevenoaks, and the eastern extremity of the Forest Ridges. In continuation of the summaries for Lincolnshire, Suffolk and the East Riding of Yorkshire, given in this Magazine for October, 1906 (Vol. **41**, pp. 173, 174), we quote :—

KENT.—*Average General Rainfall*, 26·75 *in.*

ZONE.	Sq. miles.	Per cent. of total area.	General Rainfall of Zone.
Below 20·0 in.....	12·4	0·8	19·8 in.
20·0 to 22·5 ,, ...	143·2	9·4	21·6 ,,
22·5 to 25·0 ,, ...	302·2	19·7	23·8 ,,
25·0 to 27·5 ,, ...	394·6	25·8	26·4 ,,
27·5 to 30·0 ,, ...	488·1	31·8	28·7 ,,
30·0 to 32·5 ,, ...	142·6	9·3	31·1 ,,
32·5 to 35·0 ,, ...	39·6	2·6	33·1 ,,
Above 35·0 ,, ...	9·5	0·6	37·0 ,,
Total	1532·2	100·0	...

Meteorological Atlas of the Indian Seas and the North Indian Ocean, prepared chiefly by W. L. DALLAS, under the direction of GILBERT T. WALKER, M.A., Sc.D., F.R.S., Director General of Observatories, Simla, 1908. Size 12 × 15½. Thirty-six charts and letterpress. Price 17s. 6d.

THE charts in this atlas are reproduced with the clearness and finish usual in the work of Mr. Bartholomew, who is responsible for the cartographic part of the work. The atlas is designed for the use of captains navigating the Indian Ocean north of 10° S., and the subjects dealt with are as follows : Charts I.–XII.—The normal pressure at 8 a.m., wind-direction and force, and sea currents for each month. Charts XIII.–XXI.—Monthly storm tracks in the Arabian Sea and Bay of Bengal between 1893 and 1903. Charts XXII.–XXXI.—Typical storms at different seasons of the year in the Arabian Sea. Charts XXXII.–XXXVI.—Typical storms at different seasons of the year in the Bay of Bengal.

In the first set of monthly maps the data have been compiled as 11-year averages for squares of 4°, and the figures are entered on each square, while the isobars of each ·05 in. are drawn in red over the sea-surface. The second series of monthly charts shows the tracks of a selection of typical cyclones, showing the position of the centre for each day during which they were apparent, and the remaining charts show the isobars and wind-directions and force for each day of a selection of typical cyclones. The accompanying letterpress describes clearly how the maps may be used to assist navigators.

Solar Physics Committee. Monthly Mean Values of Barometric Pressure for 73 selected stations over the Earth's surface. Compiled at the Solar Physics' Observatory, South Kensington, under the direction of SIR NORMAN LOCKYER. London. Printed for H.M. Stationery Office, 1908. Size 12 × 10. Pp. vi. + 98 + vi. + 32 plates. Price 6s.

THIS volume is singular for a Government publication in being printed with leaded type and a generous allowance of blank spaces on a highly surfaced "art" paper, giving an appearance of luxury rare in scientific works. It is a fact perhaps not fully appreciated by the general public that an institution is maintained at the public expense for the investigation of the phenomena of the sun, and of the influence which solar activity exerts on the Earth and in its atmosphere. Sir Norman Lockyer points out that there is a curious "see-saw" in the variations of barometric pressure in different parts of the world, *e.g.* :— in the years when the pressure in Bombay is abnormally high it is abnormally low in Cordoba, and *vice-versâ*, and that a large number of stations agree in variation of pressure with one or the other type. Records of monthly mean barometric pressure for 73 stations in different countries are here reproduced in figures, and the annual means in curves; but the tables lose some of their value by being given in inches, or millimetres, as observed, instead of being reduced to the same units, and the curves are drawn on different scales for height, the object being to call attention to the date of the maxima and minima, not to compare the ranges. A few blank charts are added ruled for the years from 1905 to 1950, so that the diagrams can be carried on by the student for some years to come. No data regarding solar activity are given for comparison with the pressure curves.

A Discussion of Types of Weather in Madras. By R. LL. JONES, M.A., Meteorologist, Madras. Memoirs of the Indian Meteorological Department. Vol. **20**, Part **4**. Simla, 1908. Size 12½ × 10. Price 1 rupee.

WE must demur to the pagination of this memoir, if indeed we can use such a word with reference to a work in which the pages are not numbered. Each leaf is numbered consecutively on one side which bears letterpress, the other side bears two lithographed maps, each numbered as a separate "plate," except the last one which has only one map, "Plate 35"—altogether a bibliographical irritant. Each "plate" represents the 8 a.m. weather chart of southern India and the Bay of Bengal for a day on which a particular weather type was apparent. The four chief types of Madras climate are (1) the cold-weather type from the end of December to the end of February, (2) the hot-weather type from the beginning of March to the end of May, (3) the south-west monsoon type from the beginning of June to

the first week in October, and (4) the north-east monsoon type from the second week in October to the third week in December. The charts show pressure by isobars, wind by arrows, and rain by a figure within a circle at certain stations.

Commonwealth Bureau of Meteorology, Melbourne. A new form of Pressure Anemometer. By H. A. HUNT, Commonwealth Meteorologist. By Authority, Melbourne. (Not dated.) Size 10 × 6. Pp. 10. Plates.

THE instrument consists of an aluminium cube one foot in the side mounted on a vane and capable of moving under the pressure of the wind, towards which one face is always directed. The movement is checked and the pressure measured by a spiral spring, and the record of direction and force is written by means of a novel form of pen (a toothed wheel, the side opposite the paper revolving on an ink pad) on a roll of paper driven by a clock, the whole of the mechanism being inside the cube.

Skizze des Klimas der Heard-Insel (Sketch of the Climate of Heard Island). Von W. MEINARDUS. Reprinted from the Reports of the German Antarctic Expedition of 1901-03. Berlin. (Not dated.) Size 13 × 10. Pp. 26.

PROFESSOR MEINARDUS essays the somewhat remarkable task of describing the climate of an island on which no series of meteorological observations has ever been taken. Heard Island lies on the line which joins Kerguelen Island with the winter quarters of the Gauss on the Antarctic circle. Simultaneous observations were made at Kerguelen and the winter quarters, and the temperature at Heard Island is calculated on the assumption of a uniform fall of temperature from north to south, and also by reference to the mean temperature of the air over the South Indian Ocean deduced from charts compiled from ships' observations.

An Analysis of the Meteorological Elements of Rochdale. By J. R. ASHWORTH, D.Sc. (From the *Transactions* of the Rochdale Literary and Scientific Society.) Rochdale, 1908. Size 8½ × 5½. Pp. 18. Plates.

DR. ASHWORTH has subjected the monthly means of the 30 years' records of meteorological data at Rochdale to mathematical study, and determined, in the first place, the simple sine curve which most nearly corresponds to the actual figures as plotted. The peculiarity of the sine curve is that for a given period of recurrence it has one maximum and one minimum, with a regular fall and rise. It is rarely that a curve of any meteorological element is regular, but a mathematical expression, taking account of its irregularities, may be

approximated to by compounding with the simple curve similar curves of shorter period. The outcome of Dr. Ashworth's work is to show that the normal temperature maximum at Rochdale occurs on or about July 23rd, and the minimum on or about January 22nd; the maximum humidity about December 20th, and the minimum about June 20th. The barometric curve is treated as compounded of a dry-air pressure curve and a vapour pressure curve, the latter having a simple and well-defined annual period; but the former retains many of the irregularities of the actual pressure curve. The rainfall curve is also irregular and corresponds ill with the nearest simple sine curve. While the annual period with maximum in October and minimum in April is the most distinct, a period of 73 days, or one-fifth of a year, is also important. This sub-period has its maximum on December 29th and every successive 73rd day. It remains, of course, to find the physical explanation.

Der tägliche Gang der Temperatur in der äusseren Tropenzone [Daily March of Temperature in the Outer Tropical Zone.] *B Das Indische und Australische Tropengebiet* von JULIUS HANN. Wien, 1907.

DR. HANN concludes in this third treatise his discussion of the daily march of temperature within the tropics. The first part dealt with the conditions of daily temperature in the equatorial part of the tropical zone, the second with the American and African portion of the outer tropical zone, and this with the Indian and Australian portion of the same.

A very valuable and comprehensive series of tables discusses the diverse aspects of the subject, among which may be mentioned that dealing with the corrections required for the values of the daily mean temperature as derived from observations made at the hours 7, 2, 9; 7, 2, 9, 9; 6, 2, noon; 6, 2, 8; and the daily maximum and minimum. A close examination of these five different methods by which the daily mean temperature may be arrived at shows that the mean $\frac{7+2+9+9}{4}$ gives the best results whilst the mean $\frac{\max+\min}{2}$ yields the worst. In the tropical zones the mean of the daily extremes is as much as possible to be avoided, although in higher latitudes more reliance may be placed upon it. The figures showing the yearly variation from month to month of the periodic daily amplitude of temperature at numerous places in India are interesting as showing the influence upon them of the monsoon changes with their attendant wet and dry seasons. Thus at Calcutta in January and February the amplitude is 9·8, whilst in July and August during the wet season it is 3·2 and 3·1 respectively. The daily maximum temperature in general falls considerably earlier in the wet than in the dry season, and the minimum is slightly earlier in the dry season. The greatest periodic daily amplitudes of temperature occur at the following

mentioned places: Poona, 16°·7 in February and March; Deesa, 17°·5 in December and 17°·1 in February; Allahabad, 16°·5 in April; Lucknow and Jeypore, 16°·5 in November; Roorkee and Lahore, 16°·6 and 16°·7 in November; and Alice Springs, in the heart of Australia, 15°·9 in August.

Dr. Hann discusses the diurnal, semi-diurnal, tri-diurnal and quadri-diurnal waves of temperature in relation to the sine-constants as determined by Eliot and Blanford. In all portions of the tropical zone the amplitude of both the mono- and the di- or semi-diurnal range of temperature is greater in the dry than in the wet seasons as might have been expected. L.C.W.B.

Bihang till Meteorologiska Iakttagelser i Sverige, 49 Bandet. Medeltal och extremer af Lufttemperaturen i Sverige, 1856-1907, af H. E. HAMBERG. [Appendix to Swedish Meteorological Observations. Vol. 49. Means and extremes of Air Temperature in Sweden, 1856-1907. By H. E. HAMBERG.] Uppsala, 1908. Size 12 × 10. Pp. iv. + 82 + 20 plates.

THE text is given in parallel columns, Swedish and French. The plates include maps of the Scandinavian peninsula, showing mean temperature for about 40 years (1859-1900 for Sweden, 1841-1890 for Norway) for every month and for the year, isotherms being shown for intervals of 1° C., the temperatures being reduced to sea level. A set of maps on a smaller scale shows for Sweden only the monthly and annual mean temperatures as actually observed at the stations without correction for sea-level. Tables are given of the mean and extreme values for the stations individually. The most interesting fact regarding the temperature of Sweden, is that in summer there is a centre of high temperature, and in winter of low temperature, both in South Sweden and in North Sweden, separated by a region of less extreme temperature in Jämtland. At all seasons the main isotherms run appreciably parallel to the coast.

Report on the Administration of the Meteorological Department of the Government of India in 1907-8. [Simla, 1908.] Size 13 × 8½. Pp. 24.

THE service in India is carried on by "observatories" of four classes, the "fourth class observatory" taking account only of rain and temperature; but in addition there were in March, 1908, no less than 2,677 rainfall stations, of which 730 were inspected in the year. The Report shows steady progress in improving and simplifying the meteorological service, increasing the utility of the records to agriculture and engineering, and accelerating the publication of reports.

Comparaisons graphiques des valeurs mensuelles saisonnières et annuelles des principaux éléments météorologiques dans diverses stations françaises pour l'année, 1906. [Graphic comparisons of the monthly, seasonal and annual values of the principal meteorological elements at various French meteorological stations for 1906] Par G. EIFFEL. [Paris, 1908.] Size $12\frac{1}{2} \times 9\frac{1}{2}$. Pp. 4 + 13 plates.

Atlas météorologique pour l'année 1907 d'après vingt-quatre stations françaises. [Meteorological Atlas for 1907, based on 24 French stations.] Par G. EIFFEL. Paris, 1908. Size 13 × 10,

THE former publication consists of a series of map-diagrams to be added to the Atlas for 1906. The latter takes the form of an elegantly designed portfolio containing (1) a pamphlet of 52 pages of letterpress of a general character, (2) a cover containing 50 folded sheets giving monthly means in figures and daily values in curves of all the elements at the 24 stations dealt with, (3) a cover containing a set of the curves for each station, printed on tracing-paper so that they can be laid over the sheets of any of the stations in cover 2 and allow of exact comparisons being made, and (4) a pamphlet containing twelve "synoptic maps," showing the conditions for each element graphically.

The synoptic maps are not maps of distributions, but merely maps on which 24 diagrams of the nature familiar to us as wind-roses are placed on the various stations. Thus, the rainfall map shows 24 rosettes, each of twelve rays, each representing by its length the rainfall of a month. The result makes an appeal to the eye, and some of the diagrams are extremely ingenious; but considering the elaborate nature of the whole publication, we are of opinion that really valuable maps of each element could be constructed with but little more expense, such maps as would bring out the relation of the various conditions to the physical features of the country.

Practical Exercises in Physical Geography, by WILLIAM MORRIS DAVIS. Boston, R. Ginn & Co. [1908]. Size $7\frac{1}{2} \times 5\frac{1}{2}$. Pp. xii. + 148. Atlas for above, size $8\frac{1}{2} \times 10$. Plates 45.

THESE publications by the leading American exponent of geographical education, devote a fair amount of space to isothermal and isobaric maps, and their interpretation. The system of exposition is by means of a series of questions, such as no doubt experience has shown to be congenial to the youthful mind, for it is widely adopted in books by practical teachers. To us, however, this system is so uncongenial that we have read many pages in order to test our power of resisting the temptation to give way to irritation. Apart from the style, enforced, as we believe, by the demand on the part of the teachers, the matter is beyond praise, and the clever drawings in the atlas are a pleasure to study.

The Relation of Anti-cyclonic Weather to the prevalence of La Grippe and Pneumonia on the Northern Himisphere. By C. M. RICHTER, M.D., San Francisco. Reprinted from the *Journal of the American Medical Association.* August 22nd, 1908, pp. 660-663. Chicago, 1908. Size 8½ × 6. Pp. 12.

DR. RICHTER'S conclusions, drawn mainly from statistics of San Francisco and Chicago, are :—

Pneumonia is not merely a concomitant of the cold weather season.

Its prevalence depends on anticyclonic weather, summer and winter, on the northern hemisphere, and not on low temperature.

There is sufficient reason to assume that the quality of the air of an anti-cyclone changes in conformity with changes in the activity of the sun, and that the prevalence of grip and pneumonia is subject to a specific quality of such air.

Report of the International Meteorological Conference at Innsbruck, September, 1905. Published by Authority of the Meteorological Committee. London. Printed for H.M. Stationery Office, 1908. Size 10 × 6. Pp. iv. + 156. Price 2s.

THIS is translated by Mr. Lempfert from the German original, dated 1906. The most valuable part of the publication is the series of appendices containing the text of the various proposals submitted to the Conference, some of which are of great interest.

Rainfall Map of the Commonwealth of Australia. Bulletin No. 2 of the Commonweatth Bureau of Meteorology, Melbourne. Published under the authority of the Minister of Home Affairs, by H. A. HUNT. Melbourne, 1908. Size 10 × 6. Pp. 10. Map.

MR. HUNT has prepared a map of the rainfall of Australia on the scale of about 125 miles to an inch, showing the average precipitation for the ten years, 1897-1906, and plotted from the observations at 700 stations. The objects of the publication are to give authentic information and to dispel many of the erroneous impressions that are current respecting the rainfall of Australia and Tasmania. The period was selected in order to ensure a fair distribution of stations and it is pointed out that the period was an unusually dry one. A table is given comparing the ten years average with the average of all the years of observation for the longer records; but the time has hardly come yet for attempting to draw a map showing the normal rainfall with precision. It is pointed out that one-third of the area of Australia receives less than 10 inches of rain per annum, one-third receives between 10 and 20 inches, and the remaining third has from 20 to 130 inches, the greatest falls occurring on the east coast of Queensland and the west coast of Tasmania. It is justly pointed out that compared with other continents Australia is by no means so arid as is often supposed.

Hourly Readings obtained from the Self-recording Instruments at Four Observatories in connection with the Meteorological Office, 1907. Thirty-ninth year. New Series. Vol. 8. Published by the authority of the Meteorological Committee. London. Printed for H.M. Stationery Office, 1908. Size 12 × 10. Pp. xviii. + 198. Price 25s.

THIS volume marks an epoch. It brings the records of the four First Order stations up to date, and henceforth the publications of the Meteorological Office will have the additional utility of being placed in the hands of the public at the following intervals. *Daily Weather Report*, daily at 2.30 p.m., giving the 7 a.m. observations of the same day at 29 telegraphic reporting stations. *Weekly Weather Report*, giving records at 109 stations, every Thursday. *Monthly Weather Report*, giving summaries for all stations of the first, second and third orders [and also, though this is not mentioned in the preface from which we quote, a rainfall map based on about 900 records compiled at the *British Rainfall* office] on the 28th of the following month. *Daily Observations at 20 second order stations* six weeks after the close of the month to which they refer, and the *Hourly Readings*, under the title at the head of this notice, in separate sections for each observatory, about three months after the month to which they refer.

The British public are entitled to look with satisfaction on the prompt service they now receive for the money voted by Parliament for meteorological purposes; but we may point out that for forty-seven years the voluntary observations of rainfall, published by private enterprise, have out-stripped the official records by months and even years. The voluntary work, burdened as it is by growing volume and stationary resources, has not dropped behind though it has very properly been overtaken at last by the Government Office.

Bericht über die Tätigkeit des Königlich Preussischen Meteorologischen Instituts im Jahre, 1907. Erstattet vom Direktor. [Report of the work of the Royal Prussian Meteorological Institute in the year 1907. By authority of the Director.] Berlin, Behrend & Co., 1908. Size 10½ × 7½. Pp, 76. Price 3 marks.

IN this brief, but comprehensive Report, Dr. Hellman not only summarises the work of the great Institute over which he presides, but gives also a biographical notice of his predecessor, Dr. von Bezold illustrated by an admirable portrait.

Ceylon. Administration Reports, 1907. Meteorology. Report of the Surveyor-General. [Colombo, 1908.] Size 13½ × 8½. Pp. 58. *Plates.*

IN addition to the usual data and rainfall maps of Ceylon, this report contains an account, with illustrations, of a cyclone at Batticaloa on on March 9th; and a description of remarkable surges of the sea and great waves on the south and west coasts on January 4th, apparently the result of earthquakes near Sumatra.

Report of Rainfall Registration in Mysore for 1907, by N. VENKATESA IYENGAR, B.A. Bangalore, 1908. Size 12 × 10. Pp. 48. Plates.

Nedboriagttagelser i Norge udgivet af det Norske Meteorologiske Institut, 1907. [Rainfall Observations in Norway, issued by the Norwegian Meteorological Institute.] Christiania, 1908. Size 14½ × 11. Pp. 218. Plates. Price 5 kronor.

WE have only to repeat our annual tribute of praise to Professor Mohn, for his annual lesson in the prompt and full presentation of rainfall statistics, not untouched by harmless envy of the magnificent *format* of his publication, which of itself is an incitement to good work.

Die tägliche Variation der Windstärke auf den Berggipfeln in Südindien in ihrer Beziehung zu der täglichen Luftdruckschwankung, [The diurnal variation of wind-force on the mountain summits of Southern India in relation to the diurnal pressure changes.] Von J. HANN. From *Sitzungsbericht.* K. Akad. Wiss. in Wien. Math.-Naturwiss, Klasse. Bd. **117**. Abt II. a. Mai, 1908. Size 9½ × 6½. Pp. 64.

PROFESSOR Hann has worked up the hourly values of wind velocity for Kodaikanal, and the earlier results for Dodabetta. He deduces as a conclusion that there is chiefly a whole-day period of wind-force on mountain summits, with its maximum at night and its minimum about noon ; the cause of which is the warming of the lower layers of air by day and the cooling at night. A secondary half-daily period shows a close relation to the diurnal pressure changes.

Zur Meteorologie der Adria. [On the Meteorology of the Adriatic.] Von J. HANN. From *Sitzungsbericht.* K. Akad, Wiss. in Wien. Math.-Naturwiss. Klasse. Bd. **117**. Abt. II. a. Juni, 1908. Size 9½ × 6½. Pp. 36.

LORD Kelvin used to delight in concealing a pun in the heart of the severest physical discussion, and we almost suspect Professor Hann of following in his footsteps, when he points out that the small size of the little rocky islet *Pelagosa* makes its meteorology of a *pelagic* character! Thus he discusses the meteorology of Pelagosa as representative of that of the Adriatic Sea.

Peruvian Meteorology, by SOLON J. BAILEY. Observations made at the Arequipa Station, 1892-1895, pp. 104. Observations made at the auxiliary stations, 1892-1895, pp. [126]. From Annals of the Astronomical Observatory of Harvard College, vol. **49**. Cambridge, Mass, 1907, 1908. Size 12 × 9½.

THESE are tables of data, with a brief letterpress introduction to each volume.

Nautical Meteorological Annual, 1907. Published by the Danish Meteorological Institute. Copenhagen, 1908. Size 12 × 9½. Pp. lii. + 150.

THE most interesting part of this valuable annual report, which is printed in Danish and English in parallel columns, is the discussion of the state of the ice in the Polar seas, with maps.

Results of the Meteorological Observations made in Japan for each period of five years since 1876, *and for the* 10, 15, 20, 25, 30 *years ending* 1905. Published by the Central Meteorological Observatory. Tokio, 1906. Size 13 × 8. Pp. 160.

ALTHOUGH dated 1906, this important collection of data has only recently been received.

Mysore Meteorological Memoirs, No. II., containing for the period of the twelve years, 1895 to 1906, the means of the hourly records of the weather elements obtained with the self-recording instruments at the Bangalore Observatory; together with the twelve-year monthly means of various weather elements and miscellaneous observations. Published by authority of the Government of Mysore, by JOHN COOK, M.A., F.R.S.E. Bangalore, 1908. Size 14½ × 11. Pp. iv. + 34.

Recherches sur les courants les plus bas de l'Atmosphère au-dessus de Paris. [Researches on the lowest atmospheric currents over Paris.] Par F. ÅKERBLOM. Upsala, 1908. Size 11 × 8½. Pp. iv.+46.

THIS is a reprint of a paper from the *Nova Acta* of the Royal Society of Sciences of Upsala. It deals with the conditions of movement in the layer of air which lies between the level of the Parc St. Maur and of the Central Meteorological Bureau in Paris and that of the summit of the Eiffel Tower, a vertical distance of 286 metres or 949 feet. The factors discussed are the barometric gradient, and the angle which the resulting winds make with the gradient at the surface and at the top of the tower.

The Science Year Book. Diary, Directory, Biography and Scientific Summary for 1909. By Major B. BADEN-POWELL. London: Office of *Knowledge.* Size 9 × 5. Price 5s. net.

WE have pleasure in calling attention once more to this most useful and ingeniously arranged diary and book of scientific reference.

RAINFALL TABLE FOR DECEMBER, 1908.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH.	
					Aver. 1870-99.	1908.
		° ′	° ′		in.	in.
Camden Square	*London*	51 32	0 8	111	2·12	1·89
Tenterden	*Kent*	51 4	*0 41	190	2·74	3·58
West Dean	*Hampshire*	51 3	1 38	137	2·74	2·93
Hartley Wintney	,,	51 18	0 53	222	2·55	2·36
Hitchin	*Hertfordshire*	51 57	0 17	238	2·05	1·71
Winslow (Addington)	*Buckinghamshr.*	51 58	0 53	309	2·27	1·97
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·11	1·83
Brundall	*Norfolk*	52 37	*1 26	66	2·13	1·28
Winterbourne Steepleton	*Dorset*	50 42	2 31	316	4·13	5·21
Torquay (Cary Green)	*Devon*	50 28	3 32	12	3·46	3·82
Polapit Tamar [Launceston]	,,	50 40	4 22	315	4·39	3·98
Bath	*Somerset*	51 23	2 21	67	2·76	2·73
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·48	2·35
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·92	3·01
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·44	2·36
Boston	*Lincolnshire*	52 58	0 1	25	1·79	1·16
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	2·02	1·36
Derby (Midland Railway)	*Derbyshire*	52 55	1 28	156	2·28	1·50
Bolton (Queen's Park)	*Lancashire*	53 35	2 28	390	4·19	3·41
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	2·19	1·41
Arncliffe Vicarage	,, ,,	54 8	2 6	732	6·41	5·38
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·36	1·59
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·64	1·12
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	14·70	12·15
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·43	4·26
Haverfordwest (High Street)	*Pembroke*	51 48	4 58	95	5·22	7·63
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·49	4·92
Llandudno	*Carnarvon*	53 20	3 50	72	2·95	2·28
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·68	4·19
Hawick (Branxholm)	*Roxburgh*	55 24	2 51	457	3·54	1·38
Edinburgh (Royal Observy.)	*Midlothian*	55 55	3 11	442	...	·23
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	5·24	5·46
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·53	3·18
Tighnabruaich	*Argyll*	55 55	5 14	50	6·33	7·17
Mull (Quinish)	,,	56 36	6 13	35	6·48	7·22
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·73	1·61
Braemar	*Aberdeen*	57 0	3 24	1114	3·15	1·59
Aberdeen (Cranford)	,,	57 8	2 7	120	3·39	4·95
Cawdor	*Nairn*	57 31	3 57	250	2·53	1·27
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	5·13	4·56
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	9·04	13·08
Dunrobin Castle	*Sutherland*	57 59	3 56	14	3·39	1·82
Castletown	*Caithness*	58 35	3 23	100	...	3·28
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	6·64	5·36
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	4·31	6·27
Broadford (Hurdlestown)	*Clare*	52 48	8 38	167	3·37	5·62
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·48	3·89
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·39	1·74
Ballinasloe	*Galway*	53 20	8 15	160	3·63	4·81
Clifden (Kylemore House)	,,	53 32	9 52	105	8·99	...
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	5·81	6·70
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	4·19	4·98
Seaforde	*Down*	54 19	5 50	180	3·64	5·70
Londonderry (Creggan Res.)	*Londonderry*	54 59	7 19	320	4·31	3·90
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·77	3·51

METEOROLOGICAL NOTES ON DECEMBER, 1908.

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

LONDON, CAMDEN SQUARE.—Dull, sunless and mild weather prevailed until 27th, when S fell with a falling temp. Cold conditions predominated on 28th and 29th, and on the latter day a heavy and almost continuous fall of S occurred, measuring over 3 inches in undrifted places. Duration of sunshine 14·0* hours, and of R 64·6 hours. Mean temp. 40°·5, or 1°·3 above the average. Shade max. 52°·9 on 13th; min. 14°·4 on 30th. The shade max. on 29th was 23°·7, the lowest in December during 51 years. F 5, f 13.

TENTERDEN.—Duration of sunshine 28·5† hours. Shade max. 53°·0 on 13th; min. 14°·0 on 30th. F 6, f 13.

TOTLAND BAY.—Duration of sunshine 57·6* hours. Shade max. 53°·8 on 13th; min. 16°·1 on 30th. F 5, f 8.

PITSFORD.—Mean temp. 37°·1. Shade max. 50°·5 on 21st: min. 6°·2 on 30th. F 10.

TORQUAY.—Duration of sunshine 47·8* hours, or 5·6 hours below the average. Mean temp. 46°·2, or 2°·5 above the average. Shade max. 58°·2 on 19th; min. 27°·8 on 30th. F 2, f 7.

NORTH CADBURY.—Mild till 22nd, followed by a steady fall in temp. till 29th, which was a most wintry day. A sudden rapid thaw occurred on 31st. Shade max. 56°·2 on 13th; min. 12°·5 on 30th. F 5, f 13.

ROSS.—Shade max. 53°·6 on 23rd; min. 17°·6 on 30th. F 7, f 12.

HODSOCK PRIORY.—Shade max. 52°·9 on 20th; min. 6°·5 on 30th; the latter was the lowest temp. recorded since February, 1902. F 14, f 21.

SOUTHPORT.—Mild until 23rd, then severely cold and wintry, with a 12 hours' blizzard on 29th. Duration of sunshine 25·4* hours, or 4·0 hours below the average. Duration of R 66·6 hours. Mean temp. 39°·9, or 0°·6 above the average. Shade max. 51°·3 on 21st; min. 15°·9 on 30th. F 8, f 12.

HULL.—Exceptionally dull, with fogs and often stormy. Duration of sunshine 2·9* hours. Shade max. 50°·0 on 8th and 21st; min. 12°·0 on 30th. F 7, f 15.

CARMARTHEN.—Dark, gloomy, and wet, with heavy T shower on 14th. About 3½ inches of S fell on 26th, and again more on 28th.

HAVERFORDWEST.—Unusually mild to 24th, after which colder weather set in, with a considerable fall of S. Duration of sunshine 43·3* hours. Shade max. 53°·8 on 20th; min. 26°·9 on 30th. F 5, f 7.

LLANDUDNO.—Shade max. 54°·0 on 21st; min. 23°·7 on 29th. F 5.

DOUGLAS.—Wet and mild generally, with a violent E.S.E. gale and heavy S from 27th to 29th.

DUMFRIES.—Duration of sunshine 48·0* hours. Mean temp. 38°·5 Shade max. 52°·0 on 5th; min. 22°·0 on 29th. F 11.

EDINBURGH.—Shade max. 52°·3 on 20th; min. 18°·7 on 29th. F 8, f 19.

DUNDEE.—Shade max. 49°·7 on 8th and 20th; min. 19°·9 on 28th. F 12.

FORT AUGUSTUS.—Shade max. 53°·0 on 22nd; min. 21°·0 on 26th. F 11.

WATERFORD.—Shade max. 55°·0 on 20th; min. 28°·0 on 28th. F 8.

DUBLIN.—Mild, damp and foggy, with almost constant S. to W. winds. A blizzard of S and sleet from S.E. occurred on 28th. Mean temp. 44°·2. Shade max. 56°·7 on 21st; min. 27°·9 on 16th. F 2, f 10.

MARKREE.—Shade max. 54°·4 on 22nd; min. 24°·0 on 27th. F 8, f 22.

WARRENPOINT.—Shade max. 55°·0 on 1st; min. 21°·0 on 27th. F 6, f 9.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, July, 1908.

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	87·3	3	47·2	20	73·7	54·5	55·5	78	130·2	44·0	3·36	12	6·0
Malta	...	...	...	...	...	...	...	.	...	...	...	...	...
Lagos	87·2	5	72·0	16	83·2	73·8	73·1	81	158·2	67·5	5·70	12	8·5
Cape Town	78·1	24	38·6	30	62·7	47·2	47·8	77	...	...	2·68	10	5·1
Durban, Natal ...	77·9	4	45·0	22	73·3	53·8	...	...	129·2	...	·40	6	2·1
Johannesburg	68·0	30	31·8	21	58·4	41·0	38·3	72	124·8	27·1	·84	3	2·4
Mauritius	76·6	10	53·8	14	74·4	61·7	59·2	75	133·6	46·8	2·55	19	5·2
Calcutta...	91·9	4	76·0	21	88·1	78·9	77·6	87	139·0	75·0	24·64	24	8·5
Bombay...	86·1	3	75·4	1	83·7	77·6	76·4	86	127·7	72·8	21·13	29	9·7
Madras	101·1	3	73·3	11	96·6	79·7	72·7	70	144·6	72·0	1·62	18	7·6
Kodaikanal	65·7	2	49·9	30	61·8	52·2	50·7	85	132·1	40·9	4·89	24	8·3
Colombo, Ceylon ...	88·2	15	73·3	20	86·1	76·8	73·4	77	150·9	73·0	1·41	13	6·9
Hongkong	92·6	16	74·2	28	87·0	78·7	76·2	82	144·7	...	22·27	17	6·5
Melbourne	60·9	19	33·3	28	53·6	41·0	41·5	81	97·5	26·6	1·65	17	5·9
Adelaide	66·3	19	32·0	24	57·5	42·2	43·0	80	122·0	26·0	1·21	15	6·1
Coolgardie	68·9	17	35·4	9	59·8	40·6	36·1	54	143·6	30·6	·52	6	5·1
Perth	73·5	16	38·0	30	63·5	46·3	44·7	70	120·2	32·0	5·68	10	4·1
Sydney	73·0	20	37·8	2	58·2	44·4	42·4	85	106·7	31·0	11·59	22	4·[illegible]
Wellington ...	58·0	23	33·0	4, 12	50·2	40·9	39·4	79	96·0	23·0	6·29	21	7·0
Auckland	60·0	23	37·0	30	54·6	44·9	43·8	79	114·0	33·0	5·63	24	6·6
Jamaica, Kingston ...	92·9	6	69·9	10	90·0	73·2	70·6	75	...	...	·95	7	4·1
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	..
Grenada	87·4	21	69·8	4	83·4	74·7	72·0	79	145·6	...	7·37	21	4·[illegible]
Toronto	92·2	12	51·7	9	81·6	59·8	...	...	127·1	49·4	2·93	9	3·
Fredericton	90·5	7	45·0	17	80·8	56·0	...	69	...	...	2·43	6	4·
St. John's, N.B. ...	84·5	6	49·8	16	70·4	56·5	...	...	...	...	2·93	8	5·
Victoria, B.C.	83·2	12	44·2	26*	62·7	52·2	...	66	...	...	·15	4	3·

* and 29.

Johannesburg.—Bright sunshine, 246 hours.

Mauritius.—Mean temp. of air 0°·1 above, of dew point 0°·2 below, and R ·30 in above averages. Mean hourly velocity of wind 12·4 miles, or 0·4 above average.

KODAIKANAL.—Bright sunshine 75 hours.

COLOMBO.—Mean temp. of air 79°·3 or 1°·3 below, of dew point 0°·1 above, and R 3·13 in. below, averages. Mean hourly velocity of wind, 6 miles.

HONGKONG.—Mean temp. of air 82°·3, bright sunshine 227 hours or 25 hour above, and R 9·50 in. above, averages. Mean hourly velocity of wind 9·1 miles.

Melbourne.—Mean temp. of air 1°·2 below, and R ·20 in. below, averages.

Adelaide.—Mean temp. 1°·7 below, and R 1·36 in. below, averages.

Sydney.—Mean temp. of air 1°·0 below, and R 6·98 in. above, averages.

Wellington.—Mean temp. of air 2°·0 below, and R ·37 in. above, averages.