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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.

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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.	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	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.