

Symons's Meteorological Magazine.

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METEOROLOGY AT THE BRITISH ASSOCIATION.

THE British Association for the Advancement of Science held its seventy-sixth annual meeting at York, the city where it met for the first time, and where the Jubilee Meeting was held in 1881. Few towns possess such advantages as York for a meeting of the kind, and the local arrangements both for scientific gatherings and social functions were admirably made. An innovation which was much appreciated was an informal tea-party held every afternoon in the Museum Gardens of the Yorkshire Philosophical Society by the President of that Society, Dr. Tempest Anderson. These gardens contain a well-equipped meteorological station maintained by the Society, the position of which is perfectly adapted for giving a correct record of the climate of York.

Although there was a meeting of the department of Section A for Astronomy and Cosmical Physics, it was not organized this year as a sub-section, with a Chairman, and we cannot but regret the languid interest which continues to be shown by the British Association in Meteorology, and the utterly inadequate time allotted to meteorological papers. It is unfortunate that the few meteorological papers presented to the Association had been announced so late that no abstracts were available for distribution, and useful discussion was thus impossible.

The gathering of meteorologists at the meeting was more remarkable for those who were absent than for those who were present, and yet, considering the opportunities which such a meeting affords for the encouragement and stimulation of observers by contact with the leading exponents of meteorological science, we should naturally expect that some effort would be made by the official Meteorological establishments, to whom all the public money voted for meteorology in this country is confided, to take advantage of them.

The only attempt to bring together those specially interested in the study of atmospheric phenomena was in the Meteorological Breakfast, a spontaneous gathering of meteorological observers and students.

The Breakfast was held in Terry's Restaurant, on Monday, 6th August, at 9 a.m., and for the first time lady-observers were present.

There was no chairman and no formality, the object being to promote the mutual acquaintance of observers and meteorologists from all parts of the country who have no other opportunity of meeting. It was mentioned that at the previous York meeting in 1881, Mr. Symons held the last of the first series of these breakfasts, which, except for the breakfast given by Dr. Buchan in Edinburgh, in 1892, were not resumed until the first year of the present century, but have since been kept up at Glasgow, Belfast, Southport, Cambridge, Capetown, and now at York. The following is the list of the twenty-eight persons in the order in which their names were signed on entering the room:—

| | | | |
|------------------------|-----|-----|----------------------------------|
| Alfred Colson | ... | ... | Leicester. |
| Herbert Ellis | ... | ... | Leicester. |
| John Woodrow | ... | ... | Paisley (Coats Observatory). |
| Dr. W. S. Black | ... | ... | Edinburgh. |
| John Smyth, C.E. | ... | ... | Banbridge. |
| Mrs. D. D. MacKinnon | ... | ... | Speldhurst, Kent. |
| Patrick Y. Alexander | ... | ... | Portsmouth. |
| John Bolton | ... | ... | London. |
| Dr. H. R. Mill | ... | ... | London. |
| Arthur R. Hinks | ... | ... | Cambridge Observatory. |
| Col. A. C. Bigg-Wither | ... | ... | Godalming. |
| W. E. Plummer | ... | ... | Liverpool (Bidston Observatory). |
| Edward Kitto | ... | ... | Falmouth Observatory. |
| P. F. S. Amery | ... | ... | Ashburton. |
| J. Smith | ... | ... | Crathes. |
| James Murray | ... | ... | Edinburgh. |
| H. Yule Oldham | ... | ... | Cambridge. |
| A. Macdonald | ... | ... | Durris, Aberdeenshire. |
| J. Edmund Clark | ... | ... | Purley, Surrey. |
| James Kewley | ... | ... | Isle of Man. |
| Dr. A. J. Herbertson | ... | ... | Oxford. |
| Mrs. H. R. Mill | ... | ... | Mill Hill, N.W. |
| Miss Rich | ... | ... | Roedean, Brighton. |
| Dr. W. J. S. Lockyer | ... | ... | London. |
| Dr. J. R. Ashworth | ... | ... | Rochdale. |
| R. S. Kennedy, C.E. | ... | ... | London. |
| R. Cockburn Millar | ... | ... | Edinburgh. |
| E. P. Frost | ... | ... | Cambridge. |

Later in the day the following papers were taken in Section A:—

Report of Kites Committee.

Prof. A. Schuster, F.R.S., and Prof. H. H. Turner, F.R.S.

Note on Rainfall.

Miss C. O. Stevens.—*Telescopic Observations of Meteorological Phenomena.*

J. E. Clark.—*The York Rainfall.*

Dr. W. J. S. Lockyer.—*Some Barometric and Rainfall Changes of an oscillatory nature.*

Report of Falmouth Observatory Committee.

Report of the Ben Nevis Committee.

These papers, which would have more than filled a day by themselves, were crowded in one day's proceedings along with eight other

papers, one of them a discussion on Radioactivity and the internal structure of the Earth, in which six gentlemen were announced as expected to take part! It is to our mind absurd to overcrowd sections in this way, and it would be far better if the Organizing Committee freely exercised its right of rejecting offered papers, so as to retain no more than can be dealt with fairly in the time allotted.

Apart from the sectional proceedings at the Association, an important place is held by the Conference of Delegates from Affiliated and Associated Societies in all parts of the British Empire. Two meetings of this Conference are held, and the first—at the request of the Committee on Corresponding Societies (President, Sir Edward Brabrook, C.B.; Secretary, Mr. F. W. Rudler, I.S.O.)—an address was given on Local Scientific Societies and Meteorology.

LOCAL SOCIETIES AND METEOROLOGY.*

THE purpose of Scientific Societies is twofold, to advance science and to secure to the members the intellectual advantages which accrue from scientific study. The two aims are inseparable, but one or the other preponderates according to circumstances. While it is evident that a Society devoted exclusively to botany, or to entomology, must look for any development to the wider, or deeper study of the appropriate science, it is no less clear that a field club or local scientific association of a more general kind may be improved by the development of a department hitherto neglected or ignored, and it is to the representatives of societies of the latter category that my remarks are specially addressed. Such societies may be assumed to occupy the mean position in which the advancement of science and the intellectual advantages to the members are blended as equal aims. For the consideration of such societies I would direct attention on this occasion to Meteorology.

It has been suggested at an earlier meeting of this Association that it would be a good thing if all meteorological observations were stopped for a time, and the whole intellectual powers of the observers concentrated on the discussion of a specific problem. This was probably merely a strong way of saying that the aimless reading of instruments and the heaping up of records that are never discussed, are useless and harmful, and in so far I fully agree with it. But I think that meteorology can be advanced best by increasing rather than diminishing the number of observations; though only by insisting that these observations are well-planned and well carried out, mixed, in fact, "with brains."

Meteorology is the science of the atmosphere, as regards its movements and the conditions which bring about those movements. It

* Address given to the Conference of Delegates of Corresponding Societies, at the meeting of the British Association at York, by Dr. H. R. Mill.

is not keeping a record of the weather, though that is a necessary part of it, for the central aim of meteorology as a science is to discover the cause and trace the order of those changes which together constitute the weather. It is convenient for the ordinary affairs of life to be able to know in the morning, or the day before, what the weather is going to be, but the sailor or shepherd acquires this power by experience and tradition in a higher degree than a student of meteorology is likely to gain by reading text books, or even an isolated set of instruments.

So far as we can see weather forecasts must always depend on the study of the conditions prevailing simultaneously over a wide area of the Earth's surface, and of the changes these conditions undergo from hour to hour. Such knowledge can only be obtained by government establishments, maintained at great cost, and in telegraphic touch with a far-flung network of stations, reaching beyond our islands on every side. I do not hold out any promise of skill in weather forecasting as a reward for the study of meteorology, but I am sure that the existing weather forecasts would be improved if a large and intelligent public criticism were brought to bear on them. Criticism of the wrong kind abounds; no journalist is too young to fling a gibe at "the Clerk of the Weather;" hundreds of hasty enthusiasts are ready to declare that they could do better themselves. Amongst scientific paradoxers—circle-squarers, Earth-flatteners, perpetual-motionists, and all their kind—I really believe that the worst eminence is held by the weather-cycle-mongers, whose name is legion, for they are many. There is no cure for meteorological fads except the study of meteorological facts, and in the interest of common sense and sane judgment I strongly urge the serious study of meteorology on all who are attracted towards natural science. Sympathetic criticism by students who have taken the trouble to master the principles of weather forecasting, cannot fail to be helpful.

My first advice is never to start meteorological observations with cheap instruments. Enthusiastic weather observers frequently write me wanting to know where they can get a cheap set with which to observe, and my advice is always to wait until they can afford good instruments guaranteed by an official certificate. Imperfect or untrustworthy records are of no value whatever for any purpose. One year's observations are of little value, but they involve a considerable expenditure of time; but a thirty years' record is worth a great deal, and many observers have done as much. Such a record represents some 3000 hours' work, and an observer's time is worth little if it does not represent at least £150. It could easily be made with one set of instruments, and my argument is that it is false economy to render £150 worth of honest work absolutely useless for the sake of saving £5 in the initial cost of equipment. Yet again and again I have met people to whom a few pounds is neither here nor there, who prefer to save five shillings by buying an inferior instrument the record of which is not worth

the time they squander in reading it. It seems to me to be a matter eminently worthy the attention of the delegates whether they will make their societies centres of real scientific work by seeing that however little is done, that little is done well and with appliances that are worth expending time upon.

There is scope in meteorology for a great diversity of useful work suited for various tastes and aptitudes, requiring much or little in the way of equipment. There are some special problems which can only be profitably attacked by trained students. Of these perhaps the most attractive is the study of the conditions of the free atmosphere by means of kites or balloons carrying automatically recording instruments. It is in this department that most advance is now being made, and it promises important developments in meteorological theory. The methods have been developed largely by Mr. W. H. Dines, acting in conjunction with a joint Committee of the British Association and the Royal Meteorological Society, and it would be extremely desirable for the work to be extended. The requisites are a few meteorographs, some powerful kites, several miles of steel wire on which to fly them, and a suitable winding machine with a steam engine for drawing in the kites and controlling their movements. It is absolutely necessary for high flights that the experiments be carried on far from the haunts of men, as if a kite with a couple of miles of steel wire attached were to fall or to break away, disastrous results might follow if there were railways or highroads in its track. Kite work requires an initial expenditure of at least £150, and demands a good deal of mechanical skill as well as scientific enthusiasm on the part of the investigator.

Researches on hygrometry, the condition of the atmosphere as regards water-vapour, are also desirable. For this a good deal could be done with simple means, for the subject remains in a very unsatisfactory state. The relation of the wet and dry bulb thermometer to the hair hygrometer and other direct reading instruments wants to be more fully investigated. The variations of humidity at every hour of the twenty-four wants to be determined for a number of stations in different climates, and the tables for the reduction of the various instrumental readings want to be revised. Success in this research demands some knowledge of physics and mathematics.

The study of local climate may perhaps prove more attractive. Vast masses of observations have been accumulated which have never been utilized and never can be; but this is no reason for ceasing to make observations, quite the reverse. It is extremely desirable that every town of importance should have at least one well-equipped and properly conducted meteorological station. Such stations are maintained as a rule by individuals, though they are sometimes supported by corporations or local authorities, and it seems to me that it would be extremely appropriate for a scientific society to take charge of such an institution, thereby securing the advantages of intelligent oversight and of continuity.

(To be continued.)

THE THUNDERSTORM OF AUGUST 2nd.

THE month of July, during which thunderstorms are usually most numerous in the South of England, passed with fewer storms than were to be expected, but the first week of August showed the familiar electrical disturbances of hot summer weather in the form of sudden and severe thunder squalls in different parts of the country.

It would be difficult to define the individuality of a thunderstorm, or to decide whether the consecutive or simultaneous electrical discharges over a large area of country ought to be referred to as one storm, or as different storms, originating separately and pursuing independent paths, and certainly it would be hopeless to attempt any discussion of the kind with respect to a group of storms occurring in the holiday months, when many observers are from home, and correspondence is greatly delayed. We do not, therefore, attempt any full account of the uneasy weather of the first week of August, but confine ourselves to placing on record a few of the numerous communications sent to us on the subject, some of which give a very graphic account of what occurred.

The thunderstorms of August 2nd were experienced in all parts of the country, and as a rule, while the lightning was intensely vivid and the accompanying rain and hail very severe while they lasted, the duration was short, and few cases of serious damage are reported. After the storm passed a lunar rainbow was seen in many widely separated parts of the country, the contrast of the placid moonlight as the storm-cloud retreated, with the fierceness of the outburst of the short thunder-squall being frequently referred to.

In London the rainfall was comparatively slight, only $\cdot 12$ in. falling at Camden Square, where the shower lasted for 12 minutes. In other parts of London, however, much heavier falls took place $\cdot 79$ in. being recorded at Greenwich. The *Daily Telegraph*, in a lively account of the storm, records a humorous incident which we quote:—

“While Lord Hylton was speaking in the House of Lords last night, the thunderstorm burst with a suddenness that caused considerable surprise. The surprise, however, was turned to consternation when, through the open windows, the rain beat in heavily, pattering down upon the heads of the noble lords, many of whom left the Chamber hurriedly to get their hats. Others sought temporary refuge under the galleries. The Lord Chancellor did not weather the storm long, for he at once vacated the Woolsack, leaving Lord Halsbury to preside. The late Lord Chancellor lacking the protection of either wig or hat, anxiously rubbed his head with his hand, as if he seriously felt the inconvenience of the position, for he was unable to seek shelter, and for the occupant of the Woolsack to wear a hat would be a serious breach of the rules of the House. One of the bishops sheltered himself by holding a copy of the Education Bill over his head. Two Liberal lords were heard afterwards to

comment on the fact, one of them remarking that it could not now be denied that the bill had proved a protection to the Church. It was some minutes before the windows were closed. During the incident little attention was paid to the debate, members gathering and chatting together."

The storm appears to have been most severe at Guildford, where the strength of the squall seems to have reached a maximum and wrought great destruction. The remarkable site of the town, in a narrow gap of the North Downs, no doubt intensified the force of the wind. Excellent accounts appeared in the *Surrey Times* and *Surrey Advertiser*. Mr. J. H. Billing, at Maori Road, Guildford, recorded 1.01 in. of rain (including hail) in about 17 minutes. The wind destroyed immense numbers of fine old trees, and most of the damage to houses and structures was due to the fall of trees. Two fatal accidents occurred in this way, and the number of narrow escapes was remarkable.

The storm which visited the Guildford and Godalming district on the 2nd was so peculiar, that I am sending you cuttings about it from the *Surrey Advertiser*. Here, at Chiddingfold, we appeared to be just on the South-eastern edge of the storm, and felt very little of it, although it was very fierce at Witley, two miles north of us. The clouds in the forenoon were very striking, cirrus of various types: windy, thready, tailed and feathery; and in the feathery there was a remarkably conspicuous ring of cloud, which I suspect was really a spiral. The clouds were at different altitudes, and I should think rather high. About 8.15 p.m. a heavy cloud-bank passed over us, in which red lightning was incessant, darting from cloud patch to cloud patch, but apparently none to earth; and there was no blue lightning, the usual colour of cloud to earth discharges through dry air. The bank came up rather quickly from the south-west, and the greater mass of it passed north-west of us. As far as I could connect flash and report, the distance of the most intense flash, about 8.30 p.m., was 3 miles. As the rear of the bank lifted, about 8.25, the light underneath it showed heavy rain falling to the W.S.W., and we experienced sudden violent puffs of wind; the sound of rain reached us, and we were ready to bolt indoors should it come on, although at the time the rain which we could see was a long way off and not coming towards us, when a heavy spat of rain fell on us quite suddenly, as if a bucket of water had been thrown over us from the passing bank. It did not last long, and the total fall was .03 in. At 8.45 the storm was passing away, N.E. and S.E., with lightning still playing from cloud to cloud, whilst in the rear it was clearing up fine with little wind but cool air. Mr. Welch's barograph at Cranleigh shows a jump at 8.20 of about a tenth of an inch.

Colonel Godwin-Austen's position at Nore, on the east side of Hascombe Hill, was much more favourable for observing than ours,

as we are surrounded by tall trees. What he says about there being two storms is remarkable; I should be inclined to think that there was one, split into two branches by the Hindhead hills, as I have often seen rain pass S.W. and N.W. of those hills, whilst none fell directly under the lee of them. Doubtless you know that a good illustration of the brush discharge among clouds can be given by tearing wetted cotton wool into separate lumps, and connecting two sides with the terminals of an electric battery; the discharges dart from lump to lump.

J. P. MACLEAR.

Chiddingfold, Godalming, 11th August, 1906.

Colonel Godwin-Austen says in the *Surrey Advertiser*:—

“I was induced to make these notes owing to the appearance of the clouds on the westward, the rapidity with which the storm came up, and the rapid changes that took place. The position of Nore is very suitable for such observation, being 400 feet above the sea, and overlooking a great extent of the weald of Sussex.

7—7.30 p.m.—Distant thunder first heard on the west, where a very dense mass of irregular shaped cloud, dark purple in colour, was visible against a clear sky.

8.15.—Two storm centres were apparent. One was far distant in the Horsham direction, and some distance beyond that, probably over the Channel, indicated by a lofty pyramidal mass of cloud, lighted up from time to time by lightning flashes. (This was the storm severely felt at Seaford). The other was close on the west and moving on to the north-west, the southern edge of the clouds being directly above Nore; clear sky south of that, and moon bright.

8.20.—A few large drops of rain fell but soon ceased.

8.25.—Clouds spreading more to the southward, a few scattered drifting across the moon from the south-west. Constant rumble of thunder and much nearer and incessant lightning on the west and north, often at a great height in the clouds, horizontal and ribbon like, and on four occasions from west to east, terminating suddenly and explosively into a cascade of large and small sparks, falling towards the east with the wind.

8.30.—The clouds had reached the southern side of the heavens, and stretched away in a great dark arm to the Downs near Petworth, near where rain could be seen descending in an isolated area. (I have since ascertained this was at Ball's Cross). But there was no lightning on that side. Flashes of lightning appeared very high on the north.

8.40.—The western horizon now clear. Wind rising, gusty, but not strong; storm passing away on the northward, from west to east, parallel to our position, this evidently being on the south edge of the disturbance. Rain beginning and a few scattered hailstones.

8.45.—Very dark and light, sharp-edged clouds to the south, the moon's light behind them adding to the striking effect.

8.50.—All overcast on southward, clear sky to the north-west. Distant thunder now going on to the north-north-east. The rain ceased at this

time: it just wetted the grass slightly. Second storm, lightning far to south-south-east, constant and high up in the clouds.

9.0.—The southern, sharp, defined edge of lofty cloud, passing north-eastward, over the zenith above Nore. The lightning and distant thunder now heard to the eastward.

9.5.—Vivid lightning to the south-east over the weald, with a very distant rumble of thunder not heard by myself. It appeared as if the two storms were meeting some 25 miles to the eastward.

9.10.—Most vivid lightning to the south-east; flashes constant on the east.

9.20.—Bright moonlight and clear sky to the south and west; lightning far away to the eastward.

9.40.—The storm had passed away far beyond Leith Hill, and northward of that elevation. Its position was now indicated by a lofty mass of cloud, and of no great breadth from south to north. It was apparent the area it covered at any one time was very limited, perhaps somewhat longer from west to east than from south to north. After 9.40, with the exception of a few thin scattered clouds coming up from the south-westward the sky was now cloudless.

The storm had a very defined southern edge, leaving the western weald, down to the coast, cloudless and rainless, except for the very partial cloud and rain that passed over Petworth, with a gusty wind.

From the accounts received since, the storm area had an extreme breadth of perhaps 12 miles, for from Nore to Loseley, where the force of the wind was at its maximum, is about six miles. The rain, with hail, only lasted ten minutes, and the storm from commencement to close on westward, reaching its maximum and departure, seemed to be covered in from 25 to 30 minutes.

H. H. GODWIN-AUSTEN."

A thunderstorm occurred in Surrey on the 2nd August which was remarkable at Haslemere for the rate of rainfall. From 6.30 p.m. beautiful cumulus clouds were passing over from the S.W.; in the N. a most curious fine net-like cloud of graceful form remained some time. At 8 p.m. lightning began in the S.W. and continued constantly, without noticeable intermission, for about an hour. Low growling thunder began about 8.15 and increased in volume, but was never very loud. At 8.30 rain suddenly began in torrents, flooding the lawn in a moment; at 8.38 it ceased quite suddenly—amount measured, .66 in., duration of fall, 8 minutes. This gives a rate of about 4.90 in. per hour. The thunder ceased after the rain, but the lightning continued, now in the N.E., where it came downwards to the earth in lines, occasionally in ordinary flashes. The storm travelled from S.W. to N.E. by way of S. and E. Wind remained S.W. and was of gale force for a few minutes about 8.25. Hail is reported one mile to the S.E., but none fell at Hazelhurst.

T. P. NEWMAN.

Hazelhurst, Haslemere, Surrey, August 2nd, 1906.

The following instrumental observations were made during the storm at Epsom :—

| Barometer (uncorrected . | | | Dry Bulb. | | | Wet Bulb. | | |
|--------------------------|------|------------|-----------|------|----------|-----------|------|--|
| 9 | a.m. | ... 29·880 | 9 | a.m. | ... 74·8 | ... | 66·3 | |
| 8 | p.m. | ... 29·688 | 7 | p.m. | ... 77·0 | ... | 66·0 | |
| 8.15 | „ | ... 29·670 | 8 | „ | ... 75·0 | ... | 65·0 | |
| 8.45 | „ | ... 29·660 | 9.20 | „ | ... 68·0 | ... | 66·0 | |
| 8.50 | „ | ... 29·638 | 10.30 | „ | ... 65·0 | ... | 64·0 | |
| 9 | „ | ... 29·650 | | | | | | |
| 9.7 | „ | ... 29·614 | | | | | | |
| 10.30 | „ | ... 29·612 | | | | | | |

Maximum Temperature, 85·2
Rain and hail, 9 p.m. to 9.10 p.m.
Amount = ·11 in.

The following are notes of visual observations :—

At 8 p.m. thin veil of cirro-stratus over sky, thunder clouds visible (1) in E. and S.E. (distant thunder had been heard previously in S.E. at 7.15) and (2) in S.W. and W. Wind S.E. to S., force 4, hot gusty puffs. 8.15 p.m., sheet lightning first seen in S.W. 8.20 p.m., sheet lightning continuous in S.W., W., and N.W. 8.25 p.m., fork lightning first seen due W. 8.30 p.m., distant rolling thunder first heard in S.W.; not possible to obtain a time interval owing to lightning being continuous. 8.45 p.m., thunder approaching nearer, continuous sheets of flame in S.W. to W., sheet and fork lightning blinding in its intensity. From 8.30 p.m. to 9 p.m. vivid continuous sheet and fork lightning, accompanied by distant and almost continuous rolling thunder. At 9 p.m. heavy drops of rain commenced, followed at 9.1 p.m. by a hail squall lasting four minutes, and heavy rain to 9.10 p.m.

Wind S.E. to S., force 4, to 9 p.m. (commencement of rain) when a strong squall broke lasting about five minutes, wind going round through S.W. and W. to N.W. and dropping calm.

9.10 p.m., loud thunder crash almost overhead, sheet and fork lightning continuous and very vivid. 9.15 p.m., storm passing away in a N.E. to E. direction, lightning playing all round the sky; sky clearing in W. and S.W., covered with broken pearly white cumulus, stars visible. 9.27 p.m., interval between lightning and thunder, 15 seconds. 9.50 p.m., thunder last heard in N.E. Sheet lightning (reddish to a bluish white) remaining visible in N.E. to E., practically continuous to 11 p.m.

SPENCER C. RUSSELL.

Epsom, Surrey, August 2nd, 1906.

At 8.57 p.m. on 2nd inst., a short but very heavy thunderstorm broke over this neighbourhood, accompanied by large hailstones (some of which were 3 inches in circumference) and wind at the force of a gale. At 9.10 p.m. the storm passed away to E.N.E. During the 13 minutes, ·33 in. of rain was recorded in a 5 in. gauge with deep funnel.

Considerable damage was done by hailstones and wind to glass, trees, flowers and fruit—apples being cut and bruised. The funnel of a copper Glaisher gauge was dented in several places, and a solar radiation thermometer smashed by the force of the hailstones.

Sheet and forked lightning was almost continuous, being visible from 8.15 to midnight.

W. J. CARTER.

Eldenfield, New Malden, Surrey, 3rd August, 1906.

On the evening of the 2nd inst. a thunderstorm was observed approaching from the S.W., the lightning being very vivid.

At 8.45 p.m. the first rain fell, the barometer standing at 29.64 in., the thermometer 71°.5. At 9 p.m. the barometer had *risen* to 29.72, at 9.9 p.m., when the rain ceased, it had *fallen* to 29.66, the thermometer to 66°. The storm lasted only 24 minutes, during which time .40 in. of rain fell, mixed with some hail, the stones measuring over $\frac{1}{4}$ inch in diameter.

I have never before observed such great fluctuations in the barometer in so short a time.

H. K. G. ROGERS.

Glenart, Weybridge, 3rd August, 1906.

[These fluctuations, a sudden rise followed by a more gradual fall, are familiar in most severe squalls and thunderstorms. The barograph at Camden Square showed this feature in a typical manner on August 2nd.—ED. S.M.M.]

On Thursday, August 2nd, there was a thunderstorm here at 8 p.m. with .72 in. of rain. Except for a few drops which fell two hours before, the whole of this amount fell in 20 minutes.

CHARLES J. P. CAVE.

Ditcham Park, Petersfield, August 4th, 1906.

A heavy rain in a short period took place here on the evening of August 2nd. .44 in. fell in 9 minutes, and the greater part of it probably came down in about 6. There was a little thunder and a strong wind.

W. M. CHRISTY.

Watergate, Emsworth, August 4th, 1906.

Miss Mary A. Ewart favours us with the following graphic extracts from a letter written to her on August 3rd from Northbrook, Godalming :—

“ We are terribly affected by the awful three minutes' tornado last night. It was quite terrific, coming over from Hindhead and carrying all before it. The lightning came hot and forked, and ran along the paths, and no rain with

it at first; suddenly the hail came—enormous square pieces—then the wind and rain. We rushed to shut the front door, and it took all the strength of three of us to do it, but not before all the hall was strewn with hail. In my bedroom, the bed (16 feet from the window) was covered with hail and the floor white, as both windows were open when the hurricane struck us. Everything was soaked, and the carpet later on was like a pond. The wind made so much noise that we never knew until the hurricane passed over that all the trees, except three, were blown down or stripped of boughs and leaves. All the fine old elms that looked like an avenue down the field are gone, and the dear old oak has its boughs torn off, and snapped on the right side where the gale struck it. Hardly a tree on this high open ground has escaped, and the wrecked look is something too sad for words. The flower borders, which were really perfectly beautiful, are burnt and torn, and desolation under a burning sun is what we look at this morning. Trees are down across the road, and we hardly know where to begin clearing up. The oat crop, which was cut yesterday, is carried away by the wind, the straw shaken and not a grain left, no threshing machine ever equalled the work done by this three minutes of hurricane. It all seems like a bad dream, except that the poor torn stripped trees stare us in the face.”



Correspondence.

To the Editor of Symons's Meteorological Magazine.

VIOLENT RAINSTORM AT WEYBRIDGE ON JULY 12th, 1906.

AROUND the hour of 4 p.m. on July 12th, at Weybridge, a heavy thunder-shower characteristic of the season occurred. After the storm the river Thames was much swollen, and I saw the carcass of a pig afloat at Shepperton. I could not ascertain the amount of rain that fell in the district on the afternoon in question, but you will probably be able to state the figures.* The storm appeared to be heavy towards Surbiton.

The interesting feature of this storm, to my mind, was the light it threw upon the probable immediate cause of these midsummer cloud-bursts. An ascending current of air is generally regarded as the chief cause of the precipitation of rain; it should rather, perhaps, be considered as an essential accompanying condition of such precipitation, which, however, may be called an immediate cause. In the large cyclonic storms of the winter months, the comparatively light intermittent rains that are brought by south-westerly winds in those portions of the atmospheric depressions lying to the right of the paths of the centres may be regarded as the product of the strong

* On July 12th the rainfall at Surbiton was .24 in.—ED. S. M. M.

upward movement of the south-westerly winds, but the persistent and heavy "forty-eight hour" rains brought by north-easterly winds in those portions of the depressions lying to the left of the paths of the centres probably involve other additional causes.

Now it seems immensely improbable that heavy thunder rains of the type that occurred at Weybridge on the 12th inst. can be originated by a simple upward current of air even in very warm moist weather without a very much more marked local wind disturbance at the surface than is usually experienced on these occasions. On July 12th the temperature was distinctly low for the season, and the weather though fairly fine was cloudy and gusty all day, having shown a tendency to be showery from the early morning, so that it is even more unlikely that this particular storm owed its sole origin to a local upward convection current. Doubtless, the black cumulo-form clouds which rendered the storm possible, were the product of the ascent of moisture-laden air, and this assumption is borne out by the fact that the storm occurred soon after the warmest part of the day, but the actual deluge was probably occasioned by the impact against the clouds of a cold current of air associated with the peculiar distribution of atmospheric pressure. (Refer to Weather Chart of July 12th for distribution of pressure over England.) At the surface at Weybridge *cold gusts of wind* were persistent all day. The final court of appeal in these cases is, of course, direct observation and experiment; but direct observation and experiment, could kitesput the matter to the test, would probably show that upward convection currents *alone* are inadequate to precipitate the destructive rains of the type under discussion.

L. C. W. BONACINA.

Ide Hill, nr. Sevenoaks, Kent, July 25th, 1906.

Very different from the storm referred to above were the thunderstorms of the 2nd of August. Towards evening of that date, after a most oppressively hot day, thunderstorms of great intensity were developing "anywhere and everywhere" over the land, and the violent destructive local winds associated with the storms would seem to indicate powerful ascending currents of hot air as the prime cause of the disturbances.

Only on one other occasion, namely during the night of June 11th, 1900, at Clitheroe, Lancashire, have I seen a display of lightning of the same order of magnificence as that at Ide Hill on August 2nd.

At 7 p.m. red discharges were rending the clouds in all directions, and apparently running along their under surfaces from one end to the other; between 8 and 9 p.m. forked lightning of a very severe type prevailed, and there was practically no interval between the flashes.

L. C. W. B.

Ide Hill, Sevenoaks, August 4th, 1906.

THE METEOROLOGICAL OFFICE EXHIBIT.

ON July 6th, Dr. W. N. Shaw held a reception in the Meteorological Office, to show the Exhibit which had been prepared in illustration of Methods and Results of Meteorology, for the International Exhibition at Christchurch, New Zealand, to be held in the coming (antipodal) summer. It was largely attended, and the excellent arrangement of the exhibits representative of the meteorological activity of the British Isles was fully appreciated. The view taken by the Meteorological Office in preparing this exhibit was a wide one, and included the various bodies concerned in the study of meteorology, which are unaided by public funds, and untrammelled by government control, justice being thus done to the great army of volunteer Observers and to the Societies which help to maintain the independent status of meteorological science.

The exhibits were grouped in three divisions, which may be briefly summarized :

I.—*The collection and discussion of observations from the ships of H.M. Navy and the Mercantile Marine.* This consisted of sets of instruments exhibited by Messrs. Negretti and Zambra, and Mr. J. J. Hicks, photographs of the placing of the instruments on board ship, specimens of ship's logs, and a set of the publications in which the marine observations are set forth, after being worked up in the Meteorological Office, including the Monthly Meteorological Charts of the North Atlantic and Indian Oceans, various synoptic weather charts, and various charts of winds, currents, and sea-temperatures.

II.—*Telegraphic Reporting. Forecasts and Storm Warnings.* Here were shown a map of the world showing the portions of the globe for which daily weather reports are issued ; a set of instruments, lent by Mr. J. J. Hicks, as used at a telegraphic reporting station ; photographs of meteorological stations and a complete set of the books used in recording and dealing with the telegraphic reports and compiling the Daily Weather Reports. Included with those representing the work of the British Meteorological Office there was an exhibit contributed by Mr. R. F. Stupart, Director of the Canadian Meteorological Office, illustrating the work done in that colony.

III.—*British Meteorological Organizations. Voluntary Stations.* Here Messrs. Negretti and Zambra showed the full equipment of a normal climatological station. The Meteorological Office showed a complete set of the forms used in collecting the data and preparing the Weekly Weather Report, the Monthly Report and the meteorological pages of the Registrar-General's Quarterly Return. The Royal Meteorological Society sent a map showing the Society's stations and specimens of its publications, including the *Quarterly Journal* and *Meteorological Record*. The Scottish Meteorological Society was similarly represented, and so was the British Rainfall

Organization, the map in this case serving to show, not the individual rain gauges, but the comparative density of their distribution over the country. This map is reproduced on a small scale in *British Rainfall*, 1905.

A series of remarkably interesting diagrams illustrating the application of statistics was included in this section, the most attractive being the relations between weather and crops in England. Sir Norman Lockyer showed diagrams illustrating the probable relations between the meteorological conditions in widely distant parts of the Earth, and Mr. F. J. Brodie had a map of the mean annual prevalence of thunderstorms over the British Isles.

IV.—*Observatories (Stations of the First Order) and automatic recording instruments.* Photographs of the standard photographic recording instruments, and examples of various mechanical recording rain-gauges, anemometers and thermographs were shown, together with a very interesting set of records from the various instruments.

In this section also there were models of Mr. Dines's kites, specimens of his meteorographs, and microbarograph, as well as instruments for the observation of clouds.

Considering the value of such an exhibit to the ordinary observer, who has few opportunities of seeing the records of the more costly instruments, and to the general public, we wish that it could be found possible to arrange for permanent collections of the same nature in London and other large towns. The exhibit lent by the Royal Meteorological Society to local scientific societies is a move in the right direction, though it lacks the advantage of permanency.

SCOTTISH METEOROLOGICAL SOCIETY.

THE half-yearly meeting of this Society was held in Edinburgh, on the afternoon of July 12th, the Hon. Lord Maclaren in the chair.

Mr. Arthur Watt read a paper on the rainfall of May, 1906, in Scotland, illustrated by maps, showing the average rainfall for May, the distribution of rainfall in May, 1906, when unprecedented falls occurred in many districts, and the distribution of rainfall on two particular days, when heavy falls occurred in different parts of the country. Dr. Knott, Mr. R. T. Omond, Dr. Buchan, and others, took part in the discussion.

Mr. Watt also read a paper on the climate of Hebron, Syria, discussing the ten years' observations made by Dr. Alexander Paterson at that place, and Dr. Paterson contributed an interesting paper of a more general kind on Hebron and its climate, which he said was much the same as the scriptures showed it to have been 3000 years ago.

TEMPERATURE FOR JULY, 1906.

| STATION. | COUNTY. | Lat. N. | Long. W. [° E.] | Height above Sea. ft. | TEMPERATURE. | | | | No. of Nights at or below 32° | |
|-------------------------------------|--------------------|---------|-----------------|-----------------------|--------------|--------|------|----------|-------------------------------|--------|
| | | | | | Max. | | Min. | | Shade. | Grass. |
| | | | | | ° | Date. | ° | Date. | | |
| Camden Square..... | London..... | 51 32 | 0 8 | 111 | 83·7 | 18 | 45·2 | 1 | 0 | 0 |
| Tenterden..... | Kent..... | 51 4 | *0 41 | 190 | 85·5 | 30 | 43·0 | 2 | 0 | 0 |
| West Dean..... | Hampshire..... | 51 3 | 1 38 | 137 | 80·0 | 30 | 37·0 | 1 | 0 | 4 |
| Hartley Wintney..... | "..... | 51 18 | 0 53 | 222 | 80·0 | 18, 23 | 40·0 | 13 | 0 | ... |
| Hitchin..... | Hertfordshire..... | 51 57 | 0 17 | 238 | 80·0 | 23, 30 | 43·0 | 4 | 0 | ... |
| Winslow (Addington)..... | Buckinghamsh. r. | 51 58 | 0 53 | 309 | 82·0 | 30 | 43·0 | 1, 21 | 0 | ... |
| Bury St. Edmunds (Westley)..... | Suffolk..... | 52 15 | *0 40 | 226 | 85·5 | 30 | 43·0 | 12 | 0 | ... |
| Brundall..... | Norfolk..... | 52 37 | *1 26 | 66 | ... | ... | ... | ... | ... | ... |
| Winterbourne Steepleton..... | Dorset..... | 50 42 | 2 31 | 316 | 75·2 | 4 | 36·4 | 1 | 0 | 1 |
| Torquay (Cary Green)..... | Devon..... | 50 28 | 3 32 | 12 | 75·6 | 22 | 44·5 | 1 | 0 | 0 |
| Polapit Tamar [Launceston]..... | "..... | 50 40 | 4 22 | 315 | 74·9 | 22 | 39·4 | 10 | 0 | 0 |
| Bath..... | Somerset..... | 51 23 | 2 21 | 67 | 80·0 | 30 | 43·0 | 12 | 0 | ... |
| Stroud (Upfield)..... | Gloucestershire.. | 51 44 | 2 13 | 226 | 80·0 | 30 | 50·0 | 10§ | 0 | ... |
| Church Stretton (Woolstaston)..... | Shropshire..... | 52 35 | 2 48 | 800 | 78·0 | 30 | 39·0 | 1 | 0 | ... |
| Bromsgrove (Stoke Reformatory)..... | Worcestershire.. | 52 19 | 2 4 | 225 | 78·0 | 30 | 37·0 | 13 | 0 | ... |
| Boston..... | Lincolnshire..... | 52 58 | 0 1 | 25 | 80·0 | 28 | 45·0 | 21 | 0 | ... |
| Worksop (Hodsock Priory)..... | Nottinghamshire | 53 22 | 1 5 | 56 | 80·4 | 30 | 38·7 | 12 | 0 | 4 |
| Derby (Midland Railway)..... | Derbyshire..... | 52 55 | 1 28 | 156 | 80·0 | 23, 30 | 44·0 | 1 | 0 | ... |
| Bolton (Queen's Park)..... | Lancashire..... | 53 35 | 2 28 | 390 | 71·9 | 5 | 45·6 | 13 | 0 | 0 |
| Wetherby (Ribston Hall)..... | Yorkshire, W. R. | 53 59 | 1 24 | 130 | ... | ... | ... | ... | ... | ... |
| Arncliffe Vicarage..... | "..... | 54 8 | 2 6 | 732 | ... | ... | ... | ... | ... | ... |
| Hull (Pearson Park)..... | " E. R. | 53 45 | 0 20 | 6 | 81·0 | 28 | 42·0 | 5, 12 | 0 | 0 |
| Newcastle (Town Moor)..... | Northumberland | 54 59 | 1 38 | 201 | ... | ... | ... | ... | ... | ... |
| Borwickdale (Seathwaite)..... | Cumberland..... | 54 30 | 3 10 | 423 | 73·8 | 4 | 42·9 | 12 | 0 | ... |
| Cardiff (Ely)..... | Glamorgan..... | 51 29 | 3 13 | 53 | ... | ... | ... | ... | ... | ... |
| Haverfordwest (High Street)..... | Pembroke..... | 51 48 | 4 58 | 95 | 73·6 | 26 | 43·3 | 12 | 0 | 0 |
| Aberystwyth (Gogerddan)..... | Cardigan..... | 52 26 | 4 1 | 83 | 81·0 | 31 | 35·0 | 11 | 0 | ... |
| Llandudno..... | Carmarvon..... | 53 20 | 3 50 | 72 | 79·0 | 26 | 49·0 | 3 | 0 | 0 |
| Cargen [Dumfries]..... | Kirkcudbright.. | 55 2 | 3 37 | 80 | 75·0 | 5 | 40·0 | 11 | 0 | ... |
| Lilliesleaf (Riddell House)..... | Roxburgh..... | 55 31 | 2 46 | 550 | 71·0 | 4† | 40·0 | 8 | 0 | 0 |
| Edinburgh (Royal Observatory)..... | Midlothian..... | 55 55 | 3 11 | 442 | 69·4 | 26 | 43·7 | 20 | 0 | 0 |
| Colmonell (Clachanton)..... | Ayr..... | 55 8 | 4 54 | 140 | 73·0 | 5‡ | 38·0 | 11 | 0 | ... |
| Glasgow (Queen's Park)..... | Renfrew..... | 55 53 | 4 18 | 144 | 72·0 | 5 | 43·0 | 11 | 0 | 3 |
| Tighnabruaich..... | Argyll..... | 55 55 | 5 14 | 50 | 64·0 | 5, 31 | 39·0 | 20 | 0 | ... |
| Mull (Quinish)..... | "..... | 56 36 | 6 13 | 35 | 72·0 | 5 | ... | ... | ... | ... |
| Dundee (Eastern Necropolis)..... | Forfar..... | 56 28 | 2 57 | 199 | 79·2 | 22 | 43·3 | 20 | 0 | ... |
| Braemar..... | Aberdeen..... | 57 0 | 3 24 | 1114 | ... | ... | ... | ... | ... | ... |
| Aberdeen (Cranford)..... | "..... | 57 8 | 2 7 | 120 | 75·0 | 22 | 42·0 | 8 | 0 | ... |
| Cawdor (Budgate)..... | Nairn..... | 57 31 | 3 57 | 250 | ... | ... | ... | ... | ... | ... |
| Invergarry..... | E. Inverness..... | 57 4 | 4 47 | 130‡ | ... | ... | ... | ... | ... | ... |
| Loch Torridon (Bendamph)..... | W. Ross..... | 57 32 | 5 32 | 20 | ... | ... | ... | ... | ... | ... |
| Dunrobin Castle..... | Sutherland..... | 57 59 | 3 56 | 14 | 68·0 | 13 | 35·0 | 1 | 0 | ... |
| Castletown..... | Caithness..... | 58 35 | 3 23 | 100 | 70·0 | 29 | 43·0 | 2 | 0 | 0 |
| Killarney (District Asylum)..... | Kerry..... | 52 4 | 9 31 | 178 | 74·0 | 23 | 48·0 | 29 | 0 | ... |
| Waterford (Brook Lodge)..... | Waterford..... | 52 15 | 7 7 | 104 | 74·0 | 22 | 42·0 | 4 | 0 | ... |
| Broadford (Hurdlestown)..... | Clare..... | 52 48 | 8 38 | 167 | 73·0 | 21 | 46·0 | 10 | 0 | ... |
| Carlow (Browne's Hill)..... | Carlow..... | 52 50 | 6 53 | 291 | ... | ... | ... | ... | ... | ... |
| Dublin (Fitz William Square)..... | Dublin..... | 53 21 | 6 14 | 54 | 76·5 | 22 | 47·4 | 4 | 0 | 0 |
| Ballinasloe..... | Galway..... | 53 20 | 8 15 | 160 | 72·5 | 21 | 42·0 | 3, 4, 12 | 0 | ... |
| Clifden (Kylemore House)..... | "..... | 53 32 | 9 52 | 105 | ... | ... | ... | ... | ... | ... |
| Crossmolina (Enniscooe)..... | Mayo..... | 54 4 | 9 18 | 74 | ... | ... | ... | ... | ... | ... |
| Seaford..... | Down..... | 54 19 | 5 50 | 180 | 81·0 | 22 | 43·0 | 11 | 0 | 0 |
| Londonderry (Creggan Res.)..... | Londonderry..... | 54 59 | 7 19 | 320 | ... | ... | ... | ... | ... | ... |
| Omagh (Edenfel)..... | Tyrene..... | 54 36 | 7 18 | 280 | 75·0 | 31 | 37·0 | 11 | 0 | ... |

Hitchin (June)..... Hertfordshire..... 51 57 | 0 17 | 238 | 76·0 | 23 | 35·0 | 4 | 0 | ..

† and 21, 29. ‡ and 26, 30 § and 12, 20 || and 18, 28.

RAINFALL FOR JULY, 1906.

| RAINFALL OF MONTH. | | | | | | RAINFALL FROM JAN. 1. | | | | Mean Annual 1870-1899. | STATION. |
|--------------------|-------|--------------------|----------|-------------------|-------------|-----------------------|-------|----------------------|----------|------------------------|-----------------------|
| Aver. 1870-99. | 1906. | Diff. from Av. in. | o of Av. | Max. in 24 hours. | No. of Days | Aver. 1870-99. | 1906. | Diff. from Aver. in. | o of Av. | | |
| in. | in. | in. | | in. Date. | | in. | in. | in. | in. | in. | |
| 2'49 | ·61 | -1'88 | 24 | ·21 26 | 7 | 13'12 | 12'09 | -1'03 | 92 | 25'16 | Camden Square |
| 2'26 | ·43 | -1'83 | 19 | ·15 11 | 9 | 13'81 | 12'72 | -1'09 | 92 | 28'36 | Tenterden |
| 2'62 | ·44 | -2'18 | 17 | ·24 18 | 9 | 15'23 | 16'67 | +1'44 | 109 | 29'93 | West Dean |
| 2'58 | ·56 | -1'82 | 24 | ·15 18 | 7 | 13'97 | 13'25 | -'72 | 95 | 27'10 | HartleyWintney |
| 2'35 | ·55 | -2'00 | 22 | ·48 27 | 6 | 12'81 | 13'01 | + '20 | 102 | 24'66 | Hitchin |
| 2'77 | ·48 | -2'29 | 17 | ·17 28 | 6 | 14'05 | 13'48 | - '57 | 96 | 26'75 | Addington |
| 2'91 | ·45 | -2'46 | 15 | ·10 18 | 10 | 13'23 | 14'30 | +1'07 | 108 | 25'39 | Westley |
| 2'70 | ·53 | -2'17 | 20 | ·10 23 | 11 | 12'82 | 16'31 | +3'49 | 127 | 25'40 | Brundall |
| 2'78 | 1'37 | -1'41 | 49 | ·59 28 | 9 | 19'14 | 22'55 | +3'41 | 118 | 39'00 | WinterbourneSt Martin |
| 2'73 | ·78 | -1'95 | 29 | ·29 28 | 8 | 17'78 | 16'14 | -1'64 | 91 | 35'00 | Torquay |
| 2'93 | 1'54 | -1'39 | 53 | ·53 26 | 17 | 18'38 | 21'61 | +3'23 | 118 | 38'85 | Polapit Tamar |
| 2'83 | 1'03 | -1'80 | 36 | ·49 28 | 8 | 15'86 | 14'76 | -1'10 | 93 | 30'75 | Bath |
| 2'90 | 1'16 | -1'74 | 40 | ·38 28 | 9 | 15'73 | 14'64 | -1'09 | 93 | 29'85 | Stroud |
| 2'66 | ·61 | -2'05 | 23 | ·11 13+ | 11 | 16'97 | 14'31 | -2'66 | 84 | 33'04 | Woolstaston |
| 2'38 | ·80 | -1'58 | 34 | ·29 14 | 8 | 12'95 | 12'91 | - '04 | 100 | 24'50 | Bromsgrove |
| 2'44 | ·36 | -2'08 | 15 | ·16 10 | 7 | 12'20 | 11'17 | -1'03 | 92 | 23'30 | Boston |
| 2'51 | ·44 | -2'07 | 17 | ·21 28 | 5 | 13'32 | 10'74 | -2'58 | 81 | 24'70 | Hodsock Priory |
| 2'63 | ·55 | -2'08 | 21 | ·14 11 | 10 | 14'11 | 12'20 | -1'91 | 86 | 26'18 | Derby |
| 4'12 | 1'90 | -2'22 | 46 | ·39 16 | 17 | 20'87 | 24'67 | +3'80 | 118 | 42'43 | Bolton |
| 2'61 | 1'57 | -1'04 | 60 | ·65 30 | 11 | 14'24 | 13'51 | - '73 | 95 | 26'96 | Ribston Hall |
| 4'97 | 2'91 | -2'06 | 59 | ·56 30 | 17 | 31'44 | 37'06 | +5'62 | 118 | 60'96 | Arncliffe Vic. |
| 2'50 | 1'75 | - '75 | 70 | ·52 11 | 12 | 13'74 | 12'06 | -1'68 | 88 | 27'02 | Hull |
| 2'91 | 1'46 | -1'45 | 50 | ·37 31 | 13 | 14'26 | 14'38 | + '12 | 101 | 27'99 | Newcastle |
| 9'37 | 8'42 | - '95 | 90 | 1'71 18 | 17 | 66'73 | 71'87 | +5'14 | 108 | 132'68 | Seathwaite |
| 3'52 | ·97 | -2'55 | 28 | ·34 13 | 16 | 20'71 | 24'55 | +3'84 | 119 | 42'81 | Cardiff |
| 3'70 | 1'68 | -2'02 | 45 | ·32 30 | 16 | 23'37 | 24'51 | +1'14 | 105 | 47'88 | Haverfordwest |
| 4'27 | 2'51 | -1'76 | 59 | ·38 13 | 17 | 21'86 | 26'55 | +4'69 | 121 | 45'41 | Gogerddan |
| 2'61 | ·82 | -1'79 | 31 | ·21 13 | 11 | 14'79 | 16'54 | +1'75 | 112 | 30'98 | Llandudno |
| 3'30 | 2'45 | - '85 | 74 | ·66 22 | 11 | 22'05 | 22'43 | + '38 | 102 | 43'43 | Cargen |
| 3'26 | 2'38 | - '88 | 73 | ·71 22 | 17 | 17'14 | 16'83 | - '31 | 98 | 33'04 | Riddell House |
| ... | 1'79 | ... | ... | ·54 2 | 16 | ... | 14'72 | ... | ... | ... | Edinburgh |
| 3'30 | 2'63 | - '67 | 80 | ·80 14 | 17 | 22'13 | 21'38 | - '75 | 97 | 44'85 | Colmonell |
| 3'36 | 2'35 | -1'01 | 70 | ·46 18 | 21 | 18'30 | 20'25 | +1'95 | 111 | 35'80 | Glasgow |
| 4'33 | 4'30 | - '03 | 99 | ·76 14 | 19 | 28'98 | 35'73 | +6'75 | 123 | 57'90 | Tighnabruaich |
| 4'38 | 4'49 | + '11 | 103 | 1'08 17 | 22 | 28'22 | 27'28 | - '94 | 97 | 57'53 | Quinish |
| 3'02 | ·90 | -2'12 | 30 | ·60 31 | 8 | 15'12 | 11'75 | -3'36 | 78 | 28'95 | Dundee |
| 2'89 | 1'20 | -1'69 | 41 | ... | ... | 17'83 | 18'61 | + '78 | 104 | 36'07 | Braemar |
| 3'02 | 2'54 | - '48 | 84 | 1'31 31 | 14 | 16'71 | 16'49 | - '22 | 99 | 33'01 | Aberdeen |
| 3'34 | 2'01 | -1'33 | 60 | ·54 17 | 15 | 15'26 | 16'14 | + '88 | 106 | 29'37 | Cawdor |
| 3'78 | 3'95 | + '17 | 104 | 1'35 17 | 7 | 28'50 | 30'40 | +1'90 | 107 | 56'00 | Invergarry |
| 6'46 | 9'24 | +2'78 | 143 | 2'45 18 | 27 | 42'50 | 54'72 | +12'22 | 129 | 86'50 | Bendamph |
| 2'82 | 3'34 | + '52 | 118 | 1'13 17 | 11 | 16'27 | 21'64 | +5'37 | 133 | 31'60 | Dunrobin Castle |
| ... | 2'28 | ... | ... | ·43 19 | 18 | ... | 20'47 | ... | ... | ... | Castletown |
| 3'99 | 3'97 | - '02 | 99 | ·79 1 | 26 | 29'98 | 26'76 | -3'22 | 89 | 58'11 | Killarney |
| 3'10 | 1'81 | -1'29 | 58 | ·37 31 | 13 | 20'29 | 18'67 | -1'62 | 92 | 39'30 | Waterford |
| 2'94 | 3'43 | + '49 | 117 | ·60 26 | 23 | 17'06 | 21'39 | +4'33 | 125 | 33'47 | Hurdlestown |
| 3'02 | 1'59 | -1'43 | 53 | ·26 12 | 15 | 18'05 | 16'32 | -1'73 | 90 | 34'44 | Carlow |
| 2'63 | 1'02 | -1'61 | 39 | ·28 1 | 13 | 14'51 | 13'66 | - '85 | 94 | 27'75 | Dublin |
| 3'31 | 3'64 | + '33 | 110 | ·67 31 | 24 | 19'23 | 22'29 | +3'06 | 116 | 37'04 | Ballinasloe |
| 6'15 | 6'22 | + '07 | 101 | 1'05 27 | 19 | 40'44 | 41'00 | + '56 | 101 | 80'23 | Kylemore House |
| 3'59 | 3'75 | + '16 | 104 | ·69 27 | 24 | 25'33 | 29'44 | +4'11 | 116 | 50'50 | Enniscoie |
| 3'40 | 2'50 | - '90 | 74 | ·50 22 | 18 | 20'32 | 17'93 | -2'39 | 88 | 38'61 | Seaford |
| 3'47 | 2'02 | -1'45 | 58 | ·39 12 | 22 | 20'54 | 23'04 | +2'50 | 112 | 41'20 | Londonderry |
| 3'39 | 2'75 | - '64 | 81 | ·40 12 | 22 | 19'25 | 23'24 | +3'99 | 121 | 37'85 | Omagh |

1'89 || 3'81 || +1'92 || 202 || 2'69 || 28 || 12 || 10'26 || 12'46 || +2'20 || 121 || 24'66 || Hitchin

SUPPLEMENTARY RAINFALL, JULY, 1906.

| Div. | STATION. | Rain. inches | Div. | STATION. | Rain. inches |
|-------|-----------------------------------|-----------------|--------|-----------------------------------|-----------------|
| II. | Abinger Hall | ·74 | XI. | Rhayader, Tyrmynydd | 1·44 |
| „ | Ramsgate, West Cliff Villas | ·39 | „ | Lake Vyrnwy | 1·25 |
| „ | Hailsham | ·52 | „ | Llangyhanfal, Plas Draw | ·84 |
| „ | Crowborough, Uckfield Lodge | ·90 | „ | Criccieth, Talarvor | 1·10 |
| „ | Osborne, Newbarn Cottage | ·74 | „ | Llanberis, Pen-y-pass | 4·45 |
| „ | Emsworth, Redlands | ·45 | „ | Lligwy | 1·20 |
| „ | Alton, Ashdell | ·46 | „ | Douglas, Woodville | 2·39 |
| „ | Newbury, Welford Park | ·68 | XII. | Stoneykirk, Ardwell House | 3·11 |
| III. | Harrow Weald, Hill House | 1·17 | „ | Dalry, The Old Garroch | 3·70 |
| „ | Oxford, Magdalen College | 1·00 | „ | Langholm, Drove Road | 3·06 |
| „ | Bloxham Grove | ·86 | „ | Moniaive, Maxwellton House | 2·92 |
| „ | Pitsford, Sedgebrook | ·77 | XIII. | N. Esk Reservoir [Penicuik] | 2·90 |
| „ | Huntingdon, Brampton | ·63 | XIV. | Maybole, Knockdon Farm | 2·47 |
| „ | Wisbech, Bank House | ·31 | XV. | Campbeltown, Witchburn | 2·95 |
| IV. | Southend Water Works | ·77 | „ | Inveraray, Newtown | 4·91 |
| „ | Colchester, Lexden | ·25 | „ | Ballachulish House | 6·70 |
| „ | Newport, The Vicarage | ·75 | „ | Islay, Eallabus | 3·31 |
| „ | Rendlesham | ·15 | XVI. | Dollar Academy | 2·47 |
| „ | Swaffham | ·67 | „ | Loch Leven Sluice | 1·29 |
| „ | Blakeney | ·54 | „ | Balquhider, Stronvar | 4·50 |
| V. | Bishops Cannings | 1·06 | „ | Perth, Pitcullen House | 1·24 |
| „ | Ashburton, Druid House | ·78 | „ | Coupar Angus Station | ·92 |
| „ | Okehampton, Oaklands | 1·27 | „ | Blair Atholl | 2·65 |
| „ | Hartland Abbey | 1·55 | „ | Montrose, Sunnyside Asylum | 1·76 |
| „ | Lynmouth, Rock House | ·72 | XVII. | Alford, Lynturk Manse | 1·99 |
| „ | Probus, Lamellyn | 1·72 | „ | Keith Station | 2·70 |
| „ | Wellington, The Avenue | ·55 | XVIII. | N. Uist, Lochmaddy | 3·88 |
| „ | North Cadbury Rectory | 1·40 | „ | Alvey Manse | 1·93 |
| VI. | Clifton, Pembroke Road | 1·35 | „ | Loch Ness, Drumnadrochit | 2·02 |
| „ | Moreton-in-Marsh, Longboro' | 1·12 | „ | Glencarron Lodge | 8·51 |
| „ | Ross, The Graig | ·50 | „ | Fearn, Lower Pitkerrie | 1·93 |
| „ | Shifnal, Hatton Grange | 1·08 | XIX. | Invershin | 3·44 |
| „ | Cheadle, The Heath House | ·85 | „ | Altnaharra | 3·27 |
| „ | Coventry, Kingswood | ·97 | „ | Bettyhill | 3·87 |
| VII. | Market Overton | 1·14 | „ | Watten Station | 2·16 |
| „ | Market Rasen | 1·16 | XX. | Dunmanway, The Rectory | 4·15 |
| „ | Bawtry, Hesley Hall | ·58 | „ | Cork | 3·27 |
| VIII. | Neston, Hinderton | 1·11 | „ | Darrynane Abbey | 4·30 |
| „ | Southport, Hesketh Park | 1·18 | „ | Glenam [Clonmel] | 2·47 |
| „ | Chatburn, Middlewood | 2·08 | „ | Ballinagarry, Gurteen | 3·30 |
| „ | Cartmel, Flookburgh | 2·98 | „ | Miltown Malbay | 3·28 |
| IX. | Langsett Moor, Up. Midhope | 3·30 | XXI. | Gorey, Courtown House | 1·07 |
| „ | Scarborough, Scalby | 1·08 | „ | Moynalty, Westland | 2·76 |
| „ | Ingleby Greenhow | 1·66 | „ | Athlone, Twyford | 3·56 |
| „ | Mickleton | 1·51 | „ | Mullingar, Belvedere | 2·34 |
| X. | Bardon Mill, Beltingham | 1·87 | XXII. | Woodlawn | 3·75 |
| „ | Ewesley, Fallowlees | 2·28 | „ | Westport, Murrisk Abbey | 2·60 |
| „ | Ilderton, Lilburn Cottage | 1·54 | „ | Collooney, Markree Obsy | 2·22 |
| „ | Keswick, York Bank | 2·82 | XXIII. | Enniskillen, Portora | 2·42 |
| XI. | Llanfrechfa Grange | ·73 | „ | Warrenpoint, Summer Hill | 2·41 |
| „ | Treherbert, Tyn-y-waun | 2·38 | „ | Banbridge, Milltown | 1·91 |
| „ | Carmarthen, The Friary | 1·68 | „ | Belfast, Springfield | 2·25 |
| „ | Castle Malgwyn [Llechryd] | ·95 | „ | Bushmills, Dundarave | 1·75 |
| „ | Plynlimon | 4·75 | „ | Stewartstown, The Square | 2·96 |
| „ | Tall-y-llyn | 2·00? | „ | Killybegs | 4·76 |
| „ | New Radnor, Ednol | ·87 | „ | Horn Head | 2·77 |

METEOROLOGICAL NOTES ON JULY, 1906.

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.—Splendid weather prevailed throughout, with high temp., a large amount of sunshine and pronounced absence of R. TS on the morning of 27th. Mean temp. $64^{\circ}9$, or $1^{\circ}6$ above the average. Duration of sunshine $235\cdot9^*$ hours and of R $8\cdot6$ hours.

CROWBOROUGH.—Brilliant weather with no extreme or oppressive heat. Several moderate TSS. R $1\cdot89$ in. below the average of 35 years. Mean temp. $61^{\circ}5$.

BURY ST. EDMUNDS.—Dry and hot, with the least R, except in 1868, for 50 years.

WINTERBOURNE STEEPLTON.—A cold July, especially at night, grass frost being registered on 1st. R about an inch below the average.

TORQUAY.—Duration of sunshine $272\cdot8^*$ hours, or $49\cdot8$ hours above the average. Mean temp. $62^{\circ}1$, or $0^{\circ}3$ above the average. Mean amount of ozone $4\cdot4$.

NORTH CADBURY RECTORY.—Pleasant and summerlike, with low R but temp. below the average. The air was frequently very humid and a large hay crop was got in with difficulty.

CLIFTON.—Fine on the whole, with moderate temp. and weather mostly of the "westerly type" with slight R every few days, the total being $1\cdot65$ in. below the average.

ROSS.—Remarkably dry, with no TSS and average temp. Only 4 previous Julys had lower R since 1818.

BOLTON.—Very bright and dry. Owing to excessive humidity and absence of wind, the heat was on many days oppressive, though the mean temp., $56^{\circ}6$, was $1^{\circ}0$ below the average. Duration of sunshine $150\cdot7^*$ hours, or $0\cdot5$ hours above the average.

SOUTHPORT.—The tenth consecutive abnormally dry July. Mean temp. $59^{\circ}2$, or $0^{\circ}5$ below the average. Duration of sunshine $224\cdot4^*$ hours, or $12\cdot0$ hours above the average. R $1\cdot81$ in. below the average; duration $25\cdot3$ hours.

LILBURN.—Very dry, with warm days and cool nights. Severe TS on 31st, and severe damage by L in many places, but not here.

HAVERFORDWEST.—Fine and warm, with small R. Hay crops were good and well saved and crops generally were looking well. Duration of sunshine $148\cdot0^*$ hours.

DOUGLAS.—Fine on the whole, with much bright sunshine and many beautiful days. The record was, however, sadly marred by wet, windy and even wintry weather from 12th to 20th.

INVERARAY.—Variable, with only two or three days of real summer weather. The earlier part was cold and the latter wet.

ABERDEEN.—TS on 31st with $1\cdot31$ in. of R from 11 a.m. to 7 p.m.

WATTEN.—The first part was dry and cloudy. A severe and prolonged storm of wind and R occurred on 19th and 20th.

CASTLETOWN.—About midnight on 18th a strong westerly gale set in, attaining the force of 8—9 during the forenoon of 19th and lasting till noon on 21st. The last few days were dry, warm and foggy, except 31st, which was wet.

DARRYNANE ABBEY.—R $14\cdot8$ per cent. above the average, only 3 days being without R. Fog on 21st and 22nd.

MILTOWN MALBAY.—Generally damp, with lowering skies and little sunshine. As usual, this weather left potato blight, which is now general.

DUBLIN.—A favourable month, with westerly winds, often cloudy skies, an frequent but not heavy R. Mean temp. $60^{\circ}7$.

OMAGH.—As a rule the weather was dark and cloudy, but as the R was below the average for the first fortnight a heavy crop of hay was saved in excellent order in all but backward districts.

* Campbell-Stokes.

Climatological Table for the British Empire, February, 1906.

| STATIONS. <i>(Those in italics are South of the Equator.)</i> | Absolute. | | | | Average. | | | | Absolute. | | Total Rain. | | Aver. Cloud. |
|--|-----------|-------|----------|-------|----------|-------|---------------|-----------|-----------------|-------------------|-------------|-------|-----------------|
| | Maximum. | | Minimum. | | Max. | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth. | Days. | |
| | Temp. | Date. | Temp. | Date. | | | | | | | | | |
| London, Camden Square | 51·1 | 24 | 26·1 | 22 | 45·0 | 33·3 | 34·7 | 87 | 85·1 | 20·3 | 1·89 | 21 | 6·1 |
| Malta | 67·9 | 28 | 40·2 | 14 | 57·9 | 47·3 | 43·9 | 76 | 115·5 | 34·3 | 6·45 | 18 | 5·3 |
| Lagos | 91·0 | 6, 9 | 72·0 | 2 | 88·1 | 76·3 | 73·1 | 76 | 140·0 | 63·5 | 2·18 | 8 | 4·5 |
| Cape Town | 101·5 | 20 | 54·0 | 2 | 79·5 | 62·1 | 56·9 | 62 | ... | ... | ·05 | 2 | 2·2 |
| Durban, Natal | 92·0 | 13 | 60·1 | 18 | 84·1 | 67·6 | ... | ... | 154·4 | ... | 6·31 | 15 | 4·9 |
| Johannesburg | 79·8 | 26 | 47·6 | 19 | 73·3 | 54·8 | 56·1 | 84 | 155·6 | 43·2 | 8·54 | 13 | 4·9 |
| Mauritius | 90·1 | 8 | 71·4 | 24 | 87·2 | 74·0 | 73·6 | 81 | 160·4 | 65·3 | 5·04 | 23 | 7·2 |
| Calcutta | 87·4 | 9 | 53·1 | 1 | 79·0 | 62·7 | 62·5 | 76 | 154·0 | 48·5 | 7·96 | 8 | 5·1 |
| Bombay | 90·0 | 28 | 62·0 | 25 | 81·3 | 66·9 | 61·9 | 68 | 142·0 | 53·6 | ·15 | 2 | 1·5 |
| Madras | 94·8 | 19a | 64·4 | 3 | 87·9 | 72·6 | 71·0 | 77 | 146·3 | 60·3 | ·94 | 3 | 3·2 |
| Kodaikanal | 73·1 | 23 | 47·2 | 3 | 67·3 | 50·7 | 47·3 | 68 | 141·8 | 29·7 | 3·37 | 4 | 4·0 |
| Colombo, Ceylon | 90·0 | 21 | 70·6 | 5 | 88·2 | 75·7 | 72·1 | 76 | 151·0 | 68·0 | ·85 | 4 | 2·5 |
| Hongkong | 79·1 | 22 | 47·0 | 2 | 64·0 | 56·6 | 57·2 | 87 | 131·2 | ... | 2·25 | 15 | 9·1 |
| Melbourne | 105·1 | 21 | 48·3 | 25 | 81·4 | 58·4 | 55·2 | 62 | 159·1 | 37·2 | ·44 | 7 | 4·7 |
| Adelaide | 108·6 | 7 | 53·5 | 10 | 92·0 | 66·4 | 55·3 | 45 | 160·4 | 45·0 | ·12 | 3 | 3·3 |
| Coolgardie | 105·0 | 19 | 58·1 | 9 | 93·6 | 66·2 | 61·5 | 53 | 175·9 | 56·9 | ·89 | 8 | 3·2 |
| Sydney | 97·3 | 22 | 60·2 | 14 | 78·2 | 66·6 | 61·2 | 69 | 134·8 | 53·2 | ·38 | 14 | 6·0 |
| Wellington | 70·0 | 2 | 41·8 | 20 | 63·3 | 52·8 | 51·3 | 80 | 130·0 | 38·0 | 7·48 | 16 | 7·0 |
| Auckland | 76·0 | 2 | 50·0 | 21 | 69·8 | 56·2 | 52·3 | 69 | 140·0 | 45·0 | 2·25 | 8 | 5·0 |
| Jamaica, Negril Point. | 87·9 | 11 | 64·9 | var. | 83·4 | 68·5 | 68·7 | 80 | ... | ... | 2·05 | 5 | ... |
| Trinidad | 90·0 | 24 | 63·0 | 23b | 85·5 | 66·6 | 69·0 | 77 | 169·0 | 58·0 | ·50 | 4 | ... |
| Grenada | 85·8 | 26 | 69·0 | 16 | 83·1 | 71·4 | 68·2 | 73 | 150·8 | ... | 1·92 | 18 | 3·0 |
| Toronto | 53·0 | 24 | -12·8 | 2 | 31·0 | 13·6 | 16·2 | 79 | 71·0 | -16·0 | ·80 | 12 | 5·8 |
| Fredericton | 53·3 | 22 | -14·3 | 17 | 34·4 | 7·8 | 8·3 | 60 | ... | ... | 2·04 | 7 | 5·7 |
| Winnipeg | 38·4 | 19 | -32·5 | 13 | 14·2 | -10·5 | ... | ... | ... | ... | ·21 | ... | 3·5 |
| Victoria, B.C. | 55·2 | 17 | 31·0 | 12 | 49·4 | 33·5 | ... | ... | ... | ... | 1·66 | 14 | 6·4 |
| Dawson | 15·0 | 27 | -39·0 | 22 | -2·6 | -13·9 | ... | ... | ... | ... | ·51 | 6 | 5·0 |

a and 23. b and 24, 25, 26.

MALTA.—Mean temp. of air 52°·2, or 1°·8 below average. Mean hourly velocity of wind 13·6 miles. Mean temp. of sea 56°·7.

Johannesburg.—2·42 in. of R fell in 43 minutes, tearing holes 6 feet deep in roads.

Mauritius.—Mean temp. of air 1°·4, of dew point 2°·7 above and R 2·20 in. below, averages. Mean hourly velocity of wind 6·8 miles, or 4·2 below average.

MADRAS.—Bright sunshine 226 hours.

KODAIKANAL.—Bright sunshine 202 hours.

COLOMBO.—Mean temp. of air 82°·0, or 1°·8 above, of dew point 1°·6 above, and R 1·22 in. below, averages. Mean hourly velocity of wind 6·7 miles.

HONGKONG.—Mean temp. of air 60°·4, or 2°·6 above, bright sunshine 41·3 hours, or 45·4 below average. Mean hourly velocity of wind 17·0 miles.

Adelaide.—Mean temp. of air 5°·3 above, and R ·49 in. below, averages.

Coolgardie.—Mean temp. of air 4°·9 above average.

Sydney.—R 4·34 in. below, and mean temp. of air 1°·3 above, averages.

Wellington.—Mean temp. of air 4°·4 below, and R 4·24 in. above, averages.